# DESIGNING A FRAMEWORK FOR THE IMPLEMENTATION OF STUDENT TEAMS ACHIEVEMENT DIVISIONS (STAD) FOR TECHNOLOGY IN A CULTURAL-DIVERSE SCHOOL SETTING


**By**

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## DECLARATIONS

"I, Charles Sechaba Masoabi, declare that the dissertation that I herewith submit for the Doctorate degree in Curriculum Studies at the University of the Free State, is my independent work and that I have not previously submitted it for a qualification at another institution of higher education."

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## DEDICATION

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# ABSTRACT

Cooperative learning is a teaching approach whereby learners work together so that the group members can gain a joint benefit from the group activity. One particular cooperative learning teaching technique, student teams achievement divisions (STAD) has been described as the simplest of a group of cooperative learning techniques referred to as Student Teams Learning Methods. In the STAD approach students are assigned to four or five member teams reflecting a heterogeneous grouping of high, average and low achieving students of diverse ethnic backgrounds and different genders. Moreover, STAD, as a cooperative learning technique is supported by a constructivist paradigm that suggests learners construct and apply knowledge as they interact with one another or the teacher and their environment. This doctoral study explored the effects of (STAD) on learners' social skills, attitudes, academic performance and retention of taught content in Technology as a subject. The study expatiated on various theories, such as motivation theories, self-determination theory, self-efficacy theory and cooperative learning theory as theories that formed the basis for using STAD in Technology. The researcher employed STAD in Grade 8 Technology classes for the purpose of fulfilling the aim of the study. This research is guided by the interpretive and methodological bricolage designs during the fieldwork for collection of data and data analysis. Data was collected on learners working in STAD cooperative learning groups. The data was gathered at school as a social and cultural setting where learners are taught to adapt particular traditions and social interactions intended to impact positively on their social skills, attitudes, academics and motivation levels. The researcher observed groups' interactions, processes and how learners communicate with each other amongst their groups. This study employed the Bricolage design, qualitative methods of collecting data and quantitative methods to achieve the requirements of this inquiry. Therefore the findings of this study have indicated that the environment played an influential role in cultivating learners' social skills and positive attitude toward Technology as a school subject. Furthermore, STAD has shown to be instrumental in developing learners' self-efficacy and self-determination that could eventually build up intrinsically motivated learners regarding high academic achievement.

**Key words: STAD, Cooperative Learning, Technology, Social skills, Attitude, academic performance and retention.**

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| | |
|---|---|
| DBE | Department of Basic Education |
| FSDoE | Free State Department of Education |
| GIL | Group Interviews with Learners |
| NDE | National Department of Education |
| OBE | Outcomes-Based Education |
| POL | Peer Observers on Learners |
| POT | Peer Observers on the Teacher |
| SAQA | South African Qualification Authority |
| STAD | Student Teams-Achievement Divisions |
| TSL | Tests Scores of Learners |

# CHAPTER 1

# PURPOSE AND THE RESEARCH PROBLEM

## 1.1. Introduction

In this study, Student Teams-Achievement Divisions (STAD) as a cooperative learning technique was used in order to explore its effects on learners' academic achievement, retention, social skills and attitude towards Technology.

Traditional methods of instruction are said to be teacher centred methodologies, in which the educator transmits the content orally in large amounts to students, who are passive (Berry, 2008: 149-150). According to the researcher, in lecture methods learners are passive participants only absorbing large quantities of content without getting an opportunity to construct their own knowledge or understanding of the content and instead memorise it, since there is no platform for stating one's view.

Johnson, Johnson and Smith (2004: 6) define cooperative learning (CL) as individuals working together to achieve shared goals and to maximize their own and each other's learning. Cooperative learning techniques are several, to mention but a few, they are Teams-Games-Tournament (TGT), Jigsaw, Team Assisted Individualisation (TAI) and Student Teams-Achievement Divisions (STAD) (Tarim & Akdeniz, 2007: 78). The first technique, TGT works on principles of weekly competitions in the form of games, i.e. an academic spelling and terminology tournament with members of teams competing against other teams to earn team points (Slavin, 1980: 252-253; Kuntz & Mclaughlin, 2001:42 and Van Wyk, 2009: 203). In Jigsaw each learner in a group prepares a part of the assignment and teaches the information to the rest of the members (Doymus, Simsek, Karacop & Ada, 2009: 35). Furthermore, TAI make use of group rewards with individualized instructional format, appropriate for individual skill levels and each learner works independently and is checked by group members to make sure that every member is ready for the final test on the unit or topic (Kuntz & McLaughlin, 2001: 43). Each STAD team is a microcosm of the entire class. There are five main steps a teacher should follow when implementing STAD. Firstly the teacher introduces new material (content) to be learned, team members then study worksheets of new material until mastery level is attained – followed by individual quizzes – afterwards the teacher combines the individual scores to create team scores and lastly, a winning team is rewarded, i.e. certificates, place in school's newsletter (Slavin, 1977: 9; Balfakih, 2003: 608).

The process chart below illustrates the sequence of work done for this study in various chapters.

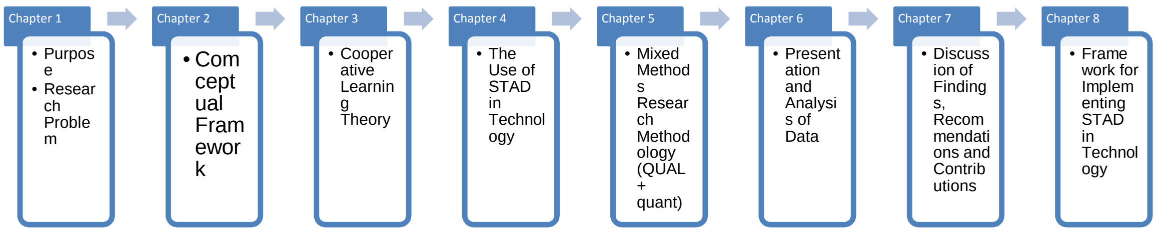


Figure 1.1 Chronology of the Study

## 1.2. Rationale of the Study

Outcomes-based education (OBE) forms the foundation of the National Curriculum Statement Grades (R-9). This curriculum was introduced in South African schools in the year 2003. Thereafter, the National Curriculum Statement Grade (R-9), that was also revised at a later stage, strove to enable all learners to achieve to their maximum abilities. This it did by setting the outcomes to be achieved at the end of process. The outcomes encouraged a learner-centred and activity-based approach to education (NDE, 2002a:1).

The Department of Basic Education (DBE), which was instated in place of the previous National Department of Education, was, however, converted and divided into the Department of Higher Education (DHE) and the Department of Basic Education.

Therefore the Department of Basic Education modified the Revised National Curriculum Statement Grades (R-9) and the National Curriculum Statement Grades (10-12) and were replaced by the Curriculum and Assessment Policy Statement (CAPS).

Moreover, the Curriculum and Assessment Policy Statement was made by the National Curriculum Statement that stipulated the content topics that should be addressed in Technology classes. The principles and values that are adapted in the Curriculum Assessment and Policy Statement constitute the later National Curriculum Statement for South African schools. Therefore, according to the new Curriculum and Assessment Policy Statement for Technology, learners should be developed into team players that are able to think critically and use their knowledge to produce designs (DBE, 2011: 4).

Furthermore, learners should be able to solve problems, make decisions, communicate effectively and collect, analyse and critically evaluate information, because "they should not just memorise knowledge but use it" (DBE, 2011: 5 -12).

In addition, Van Wyk's (2007: 251) findings in the study that was done in the Free State schools with economic educators contended that current teaching strategies and approaches that are implemented by educators at high school level did not pertain to the ways in which learners comprehend best and were not learner-centred. Gaith (2003: 454), in his study, that was done in Beirut, reported that cooperative learning has been proclaimed as an effective instructional approach in promoting cognitive and linguistic development of learners and more effective than individualistic instructions in improving acquisition of learners. Therefore, the researcher asserted that cooperative learning, as an instructional strategy, was an option for educators in South Africa as a learner-centred method of teaching to compliment the National Curriculum Statement (NCS). Some researches, however, stated that cooperative learning is currently the least utilized method of instruction in schools - while methods such as lectures, seat works or competition methods in which learners are isolated from one another and forbidden to interact - where 80% of classroom time is spent in "teacher talk" with only 1% of the learners' classroom time used for reasoning about or expressing an opinion are dominant (Abu & Flowers, 1997: 3; Zakaria & Iksan, 2007: 3 ; Berry, 2008: 150).

Slavin (1977:18) reports on the powerful effects of teams on social variables, such as mutual concern and peer support for academic performance. Slavin (1977: 18) further states that for most practitioners (educators),, these social variables may be the most important effects of them all. Slavin (1977: 19) also asserts that these effects have been put to good use in special settings particularly in need of greater mutual concern, such as integrated schools.

Hendrix (1999: 57) also argued that traditional whole-class instruction is not an effective way for learners to develop academically or socially in classroom, because such instruction encourages individualistic and competitive learning that usually only benefits strong or high achieving learners. It allows little opportunity for learners to raise questions, discuss their work or express their opinions. In addition, several studies reported that STAD as a cooperative learning technique is more effective than the traditional method of whole-class or individualistic instruction in improving academic achievement, retention, social skills and attitudes of learners (Scott, 1998: 5; Ghaith, 2003: 454; Tarim & Akedeniz, 2008: 85).

The researcher has probed into the effectiveness of STAD as a teaching and learning technique in Technology in Grade 8. The study investigated the effectiveness of STAD pertaining to the improvement of learners' academic achievement, development of social skills, retention of the work that had been taught, and attitudes towards Technology as a school subject. Since the social and school's context of the proposed study is culturally diverse, the researcher therefore believed that STAD could be an appropriate technique to do group work in these types of schools as (Digest, 1985: 1; Balfakih, 2003: 610; Wise hat, 2004: 1) stated that STAD uses heterogeneous teams with widely varying academic abilities and different cultural, racial or ethnic backgrounds.

STAD has not so far been investigated as an alternative technique for teaching Technology as a school subject in South Africa.

## 1.3. Problem statement

As a teacher for more than ten years of experience, the researcher has been observing learners in different classes and discovered that: some learners experienced difficulty in working harmoniously with one another face to face without distracting others; some learners have a competing attitude and do not like supporting others with school work; some learners are concerned about the individual recognition they get at the end of the year during prize giving ceremonies;

some learners do not complete their tasks often; some learners lack confidence to contribute constructively among their peers during group work; some learners lack confidence to respond to the educator's questions in class with everyone listening and that some learners choose to work hard in the learning areas they like most or they think will contribute to their future careers.

Therefore, the researcher studied cooperative learning methods of teaching to help learners improve active participation and collaboration in class without fear of losing their high achieving status while assisting others to also improve.

Slavin (1980: 252-253) emphasizes that the traditional reward structure is competitive; good grades, approval and other rewards are given to the learners who rank highest in their classes. This reward structure is individualistic; learners work by themselves most of the time and rarely are encouraged to help one another.

Messerschmidt (2003: 107) also asserts that classrooms as found in the Mangaung schools, in Bloemfontein, can be described as "extremely traditional" and the teaching methods reflect the behaviouristic view on learning and instruction. In contrast the new way of teaching is based on a social constructivist view. Furthermore, in literature that was studied, no significant existence of where STAD is investigated on improving intrinsic motivation on learners was found (citations).

## 1.4. Theoretical framework of this study

Within this section various theories that form the framework for this study, such as pragmatic mixed methods research paradigm, social constructivism and cooperative learning have been briefly discussed.

### 1.4.1. Pragmatic mixed methods research paradigm

Mixed methods research, as a pragmatic paradigm, allows the use of both qualitative and quantitative data for the purpose of employing the strengths of each method where the other one is weak (Zandvanian & Dryapoor, 2013: 528; Creswell, 2012: 535; Gray, 2009: 204). Thus, epistemological position of mixed methods research acknowledges multi-paradigm stance, whereby qualitative and quantitative data was collected and analysed, concurrently, sequentially given equal weight or priority given to either one of them (Creswell, Klassen & Plano-Clark, 2011: 4; McMillan & Schumacher, 2010: 396).

Thus the amalgamation of two methods forms the basis for emergence of mixed methods. The purpose of the fusion is intended to connect findings of two rival paradigms in a single study to provide thorough and comprehensive understanding of the phenomenon (Zandvanian & Dryapoor, 2013: 528; Wahyuni, 2012: 71; Morgan, 2007: 71).

### 1.4.2. Social constructivism as a teaching and learning paradigm

According to Cottone (2007: 192) and Sohel (2010: 2), social constructivism posits that what is known or understood derives from communities of understanding rather than an individual operating as an isolated entity. In simple terms, the researcher asserts that the learner is affected by every other learner in a mutual process of interaction.

Jackson, Karp, Patrick and Thrower (2006: 2) contend that social constructivism emphasizes the importance of culture and context in understanding of what occurs in society and constructing knowledge based on this understanding – and that social constructivism is based on specific assumptions about reality, knowledge and learning. Firstly social constructivists believe that reality is constructed through human activity. Secondly knowledge is also a human product and is socially and culturally constructed and lastly, learning is a social process, not within an individual, but occurs when individuals are engaged in social activity.

Sohel (2010: 4) posits that social constructivism forms one of the major theories of child development arising from Piaget’s theory of cognitive development and Vygotsky’s theory of zone of proximal development. Piaget believed children need to construct an understanding of the world for themselves while Vygotsky believed that social interaction is an integral part of learning.

Furthermore, Powell and Kalina (2009: 243-244) emphasize that social constructivism is a highly effective method of teaching that all learners can benefit from, since collaboration and social interaction are incorporated. This involves the social constructivist method where learners act first on what they can do on their own followed by the assistance of the teacher to learn a new concept. Therefore, cooperative learning could help to create a deeper understanding and also create a social constructivist classroom.

The underlying premise of constructivism is that learning is an active process in which learners are effective sense makers who seek to build coherent and organised knowledge (Geelan, 1995: 1; Martin-Stanley & Martin-Stanley, 2007: 1; Kinniburgh, 2010: 76).

### 1.4.3. Cooperative learning

According to Johnson and Johnson (1995a: 1020), there are at least three general theoretical perspectives that have guided research on cooperative learning; cognitive-developmental, behavioural and social interdependence. Firstly, the cognitive development is largely based on the theories of Piaget and Vygotsky. Slavin, Hurley and Chamberlain (2003: 181) and Slavin (1995: 2) divide the cognitive theory into cognitive developmental and cognitive elaborations theories, thereby coming up with four theoretical perspectives. The work of Piaget indicates that when individuals cooperate on the environment, socio cognitive development conflict occurs, which in turn stimulates cognitive development – while Vygotsky's theory is based on the premise that knowledge is social, constructed from cooperative efforts to learn, understand and solve problems. Secondly, Johnson and Johnson (1995a: 1020) and Johnson, Johnson and Stanne (2000: 2) contend that behavioural learning theory perspective focuses on the impact of group reinforcement and rewards on learning. Lastly, social interdependence exists when individuals share common goals and each person's success is affected by the actions of the others.

Nagel (2007: 365) emphasizes that the first key element of cooperative learning is positive interdependence where the gains in knowledge of the individual as well as those in the group are positively correlated.

Slavin (1977: 9) and Slavin (1980: 252) assert that a long tradition of research has established the effects of the team rewards systems usually increase performance and further add that motivation to perform a task as the product of the probability of success at a task and the incentive value of that task to the individual.

## **1.5.** Aim of the study

Emanating from the problem statement the aim and specific objectives are formulated for the purpose of the study.

The aim of this study is to design a framework for the implementation of STAD as a teaching method for the subject Technology. The researcher chose to use STAD as a cooperative learning technique due to the fact that it is said to be the easiest of all cooperative learning methods of teaching. As a novice in cooperative learning, it would be comfortable for the researcher to learn and implement STAD in a Technology class (Slavin, 1980: 253).

Based on the problem statement, the researcher decided to examine the effectiveness of STAD as a cooperative learning technique and teaching method, on the learners' academic achievement, attitudes, retention and social skills in Technology.

Taking the main purpose of this study into consideration, the following research objectives are formulated:

1. To explore through a literature review the theoretical frameworks underpinning STAD as a cooperative learning technique.
2. To investigate through a literature review the nature, the scope and characteristics of cooperative learning as a teaching approach.
3. To determine through the literature study the nature, the scope and characteristics and the design features of modified STAD within the subject Technology.
4. To explore by means of empirical investigation the effect of STAD on learners' academic achievement, retention, social skills and attitude in a culturally diverse school setting.
5. To investigate the effect of STAD as a teaching method on the researcher's praxis.

## 1.6. Research questions

The primary research question for this study is: What effect *will STAD, as a teaching technique, have on the researcher's praxis and the learners' academic performance, attitude, retention and social skills in Technology?*

The following secondary research questions are formulated for the purpose of conducting this study:

1. What are the theoretical frameworks which ground STAD as a cooperative learning technique?
2. What are the nature, the scope and characteristics of cooperative learning as a teaching approach?
3. What are the nature, scope and the characteristics and the design features of a modified STAD within the subject Technology?
4. How will STAD, as a learning technique, effect the academic achievement, retention, social skills and attitude of learners in a culturally diverse school setting?
5. How will STAD as a teaching method have an effect on the researcher's praxis?

## 1.7. Research methodology

In this study the interpretive and methodological Bricolage design (Denzin & Lincoln, 1999; Denzin & Lincoln, 2000: 174; Kincheloe, 2001; Berry, 2006;

Denzin & Lincoln, 2009: 6) has been employed to understand the phenomenon in depth, regarding the effects of STAD on learners and on the researcher as a teacher (Creswell, 2012: 535). The utilisation of mixed methods was further stirred by the ability to permit the employment of both qualitative and quantitative methods in a single study (Creswell, 2012: 535; McMillan & Schumacher, 2010: 396; Gray, 2009: 204; Creswell, 2006: 10).

This study is guided by the interpretive and methodological Bricolage designs during the fieldwork for collection of data and data analysis. Data was collected on grade 8 Technology learners working in STAD cooperative learning groups. The data was gathered at school as a social and cultural setting, where learners are taught to adapt particular traditions and social interactions intended to impact positively on their social skills, attitudes, academics and motivation levels. The researcher observed group interactions, processes and how learners communicate with each other amongst their groups. Furthermore, the researcher sought to explore interpretive and methodological Bricolage for this study, as similar research studies done on STAD are mostly quantitative in nature, for example Scott (1998: 2-3) in the study that was done in the grade twelve classroom in Mississippi. Adesoji and Ibraheem (2009: 16-18) did their study in Nigeria with chemistry learners and Van Wyk (2010: 84) did his study with B.Ed. honours students at the University of the Free State in South Africa. The intent of employing qualitative investigation is to probe the effectiveness of STAD as a teaching technique with regard to academic achievement, retention, social skills development and attitude towards Technology.

According to the purpose of this study, the effects on performances of learners in their test results could be clearly understood and elaborated on by using quantitative analysis methods that would add extra information and supplement the qualitative data (Creswell, 2012: 545; Creswell, et al. 2011: 8).

### 1.7.1. Research design

Various designs that are classified under interpretive and methodological Bricolage designs emanating from mixed methods research are briefly introduced below.

#### 1.7.1.1. Convergent or concurrent design

Concurrent designs are used where qualitative and quantitative data is collected on a parallel basis during the field session of the research. In this design both qualitative and quantitative data is valued as equal sources of information that validates and complements each other (Creswell, 2012: 540; Terrell, 2012: 268; Creswell, et al. 2011: 8).

#### 1.7.1.2. Sequential explanatory design

Sequential explanatory design takes place when the results of the quantitative data is used as primary source in order to initiate the collection of qualitative data that would supplement the quantitative findings. Therefore, the qualitative results are expected to give a comprehensive description on the quantitative findings or extend the scope of quantitative results (Creswell, 2012: 542; McMillan & Schumacher, 2010: 401; Gray, 2009: 2008).

#### 1.7.1.3. Sequential exploratory design

On the contrary to the above design, sequential exploratory design researchers begin by gathering qualitative data to examine the contextual circumstances. Then they would collect quantitative data to help clarify relationships regarding variables and the contextual descriptions of qualitative data analysis. Moreover, the qualitative information takes precedence over the quantitative data (Creswell, 2012: 544; Creswell, et al. 2011: 8).

#### 1.7.1.4. Embedded or nested design

Embedded design allows the employment of the preceding three mixed methods designs. Thus, qualitative and quantitative data could be collected concurrently or sequentially in any order during single study fieldwork, although priority is given to one of the forms of data. Therefore, the purpose of the secondary data is to supplement the findings of the primary data. Secondly, the secondary data could be used to provide additional information that could not be obtained through the primary data only (Creswell, 2012: 545; Terrell, 2012: 270; Creswell, et al. 2011: 8).

#### 1.7.1.5. Transformative designs

According to Creswell (2012: 546), transformative design could use any of the previous four designs of mixed methods research. The main purpose for this design is, however, to transform or improve the existing social issues or situation of marginalised communities. Therefore, this design is guided by the transformative framework (Creswell, 2012: 546; Terrell, 2012: 266).

#### 1.7.1.6. Multi-Phase design

Lastly, multi-phase emerged from data that is collected through different studies or a single topic that was investigated by various researchers in phases or separate studies. Moreover, it employs any of the first four designs as a transformative design does. The main purpose of this design is, however, to embark upon large-scale projects (Creswell, 2012: 547).

### 1.7.2. Qualitative research design

Though, mixed methods has been explained as part of theoretical framework, this study is qualitative in nature and therefore guided by the naturalistic, interpretivist and constructivist paradigms. These paradigms regard research participants as valuable sources of meaningful inquiry process (Denzin & Lincoln, 2000: 175; Denzin & Lincoln, 2009: 8). Creswell (2009: 173) and Gray (2009: 166) state that qualitative inquiry employs different philosophical assumptions; strategies of inquiry, and methods of data collection, analysis and interpretation. Furthermore, qualitative research is a means of exploring and understanding the meaning that individuals or groups ascribe to a social or human problem. Creswell (2009: 4, 61) further adds that qualitative inquiries use theory in their studies in several ways. Much like in quantitative research, it is used as a broad explanation for behaviour and attitudes and it may be complete with variables, constructs and hypotheses.

Furthermore, qualitative research is research that attempts to collect rich descriptive data in respect of a particular phenomenon or context with the intention of developing an understanding of what is being observed or studied. It therefore focuses on how individuals and groups view and understand the world and construct meaning out of their experiences (Nieuwenhuis, 2010: 50). Moreover, qualitative research, as a research methodology, is concerned with understanding the process and the social and cultural contexts which underlie various behavioural patterns and is mostly concerned with exploring the ‘why’ questions of research. Therefore, qualitative research typically studies people or systems by interacting with and observing the participants in their natural environment and focusing on their meanings and interpretations. Thus, the emphasis is on quality and depth of information and not on the scope or breadth of information provided (Nieuwenhuis, 2010: 51; Johnson & Christensen, 2004: 46).

### 1.7.3. Quantitative research design

Johnson and Christensen (2004: 32) contend that quantitative research often uses a narrow angle perspective in the sense that only one or a few factors are studied at the same time. Quantitative researchers attempt to operate under the assumption of objectivity. They assume that there is an external reality ‘out there’ to be observed and rational observers would basically agree on its existence. Moreover, quantitative researchers try to remain as value free as possible as they can and avoid human bias whenever possible. Furthermore, Creswell (2009: 51) adds that in quantitative research, a theory is an interrelated set of constructs (variables) formed into propositions or hypotheses that specify the relationship among variables, in terms of magnitude or direction. A theory might appear in a research study as an argument, a discussion or a rationale and it helps to explain or predict phenomena that occur in the world. Moreover, quantitative research is a process that is systematic and objective in its ways of using numerical data from only a selected subgroup of a universe or population to generalize the findings to the universe that is being studied (Maree & Pietersen, 2010: 145)

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### 1.7.4. Literature study

Relevant literature from primary and secondary sources will be consulted. The primary sources will include a number of official national and provincial Departments of Education policy documents, such as the Revised National Curriculum Statement (RNCS) for Technology Grade R-9 and assessment guidelines for Technology Grade R-9. Secondary sources will include books, research journals, reports and conferences papers.

In the literature review, the nature and the field of study of Technology in the General Education and Training (GET) phase will be outlined. The review was further done on the nature of the new National Curriculum Statement of South Africa with regard to Technology as a school subject. The nature of cooperative learning strategy will be discussed - STAD as a cooperative teaching and learning technique and the design of the use of and modification of STAD for use in Technology.

### 1.7.5. Sampling

Sampling included learners in two Grade 8 classes where Technology was taught using STAD as a teaching technique. The classes consisted of 30 learners in each class totalling to 60 male learners from different cultural backgrounds. Both classes were taught by using STAD to improve the credibility of the study. Convenient sampling was employed as the researcher works as a teacher at the same school. Therefore, for the purpose of this study the available participants were only these two Grade 8 classes.

Research methods: The researcher's intent was to conduct a research study by employing qualitative and quantitative research methods for collection and analysis of data to achieve the purpose of the study.

### 1.7.6. Research instruments

Research tools for quantitative methods: Individual class tests' scores and examinations' scores were used to determine the effects of STAD on the academic achievement and retention of content in Technology. Furthermore, self-designed semi-structured interview schedules were employed for collection of data pertaining to the development of social skills and attitudes in Technology lessons where STAD was implemented. Moreover, class tests' results were used to collect data for learners' academic achievement, and the November (end of year) examinations' scores were used to determine retention of Technology content that was taught using STAD.

Qualitative data gathering tools, such as a reflective journal, self-designed observation schedules for collecting data on video recordings were used. Furthermore, the researcher designed observation schedules that my teaching colleagues used to observe my class presentations and learners' group work during the implementation of STAD in Technology classes. McMillan and Schumacher (2010:350) and Mack, Woodsong, MaQueen, Guest and Namey (2005:13) further contend that observation is a way for the researcher to see and hear what is occurring naturally in the research site. Typically the nature of observation is comprehensive in the sense that it is continuous and open to whatever may be significant and field notes are recorded and reflected on.

Self-designed semi-structured interview schedules were used to collect data during STAD groups' interviews. The group interviews were used to acquire in-depth knowledge pertaining to their interpretation of the phenomenon; whereas the observation schedules were employed to get the opinions and views of other teachers regarding their experiences as they observed the STAD proceedings in Technology classes.

The researcher acquired permission from the Department of Education, schools' principal and learners' parents by means of official letters from the University of the Free State in order to administer research at his school. According to Creswell and Garrett (2008: 322) and Ivankova, Creswell and Clark (2010: 262), when researchers bring together both quantitative and qualitative research, the strengths of both approaches are combined, leading, it can be assumed, to a better understanding of research problems than either approach alone. An embedded concurrent design of mixed methods research used in this study integrated qualitative and quantitative data for a better understanding of the phenomenon where STAD was implemented and its effects on the learners and the researcher's praxis (Jang, McDaugall, Dallen, Herbert & Russell, 2008: 223; Leech & Onwuegbuzie 2007: 268).

### 1.7.7. Data analysis

Qualitative data was analysed using inductive methodologies, such as determining categories and subcategories that emerged from the data and a constant comparison method of grounded theory was used for analysing groups' interview data (see Figure 6.1 Constant Comparison Analyses). Reflective journal data was deductively matched with cooperative learning elements from the literature review.

Lastly, descriptive statistics were used to analyse the Technology tests and examinations' scores.

## **1.8.** Research validity in qualitative research

According to Creswell (2009: 190) and Johnson and Christensen (2004: 249), qualitative validity means that the researcher checks for the accuracy of the findings by employing certain procedures – qualitative must be plausible, credible, trustworthy, and therefore defensible. The types of qualitative validity are descriptive validity, interpretive validity and theoretical validity. Moreover, one potential threat to qualitative validity is researcher's bias. This threat tends to result from selective observation and selective recording of information and also from allowing personal views and perspectives to affect how data is interpreted and how the research is conducted (Johnson & Christensen, 2004: 249).

Internal validity refers to the degree to which a researcher is justified in concluding that an observed relationship is causal. After potential causal relationships are studied using qualitative research, they should, however, be tested and confirmed by using experimental methods when it is feasible. In this way, more conclusive evidence about cause and effect can be obtained (Johnson & Christensen, 2004: 253).

External validity is important when the researcher wants to generalize from a set of research findings to other people, settings, times, treatments and outcomes. Typically generalization is not the major purpose of qualitative research. Subjects are rarely randomly selected and that qualitative research is more interested in documenting findings (Johnson & Christensen, 2004: 255).

### 1.8.1. Research reliability in qualitative research

Qualitative reliability indicates that the researcher's approach is consistent across different research studies and different projects. Therefore researchers should document as many of the steps of reliability procedures as possible (Creswell, 2009: 190).

## **1.9.** Research validity in quantitative research

The validity of an instrument refers to the extent to which it measures what it is supposed to measure. The types of validity are face validity, content validity construct validity and criterion validity (Maree & Pietersen, 2010: 216). Therefore the researcher will make sure that the research questionnaires, interview schedules and observation checklists will cover all the aspects of different variables of this study to meet the requirements of different types of validity.

Internal validity refers to the approximate validity with which it infers that a relationship between two variables is causal. Although the research is conducted for the multiple purposes of description, exploration, explanation, prediction and influence, the research focuses on the goal of attempting to determine whether a causal relationship exists between the variables being investigated (Johnson & Christensen, 2004: 230).

Creswell (2009: 162) adds that internal validity threats are experimental procedures, treatments or experiences of the participants that threaten the researcher's ability to draw correct influences from the data about the population in an experiment.

External validity refers to the extent to which the results of a study can be generalized to and across populations of target groups, settings, times, outcomes and treatment variations (Johnsons & Christensen, 2004: 242). There are, however, threats to external validity that can arise when experimenters draw incorrect inferences from the sample data to other persons, settings and past and future situations (Creswell, 2009: 162).

### 1.9.1. Research reliability in quantitative research

The reliability of an instrument is when the same instrument is used at different times or administered to different subjects from the same population, the findings should be the same. Therefore, reliability is the extent to which an instrument is repeatable and consistent. There are different types of reliability, namely: the test-retest reliability; equivalent form reliability; split-half reliability and internal reliability (Maree & Pietersen, 2009: 215).

## **1.10.** Definition of terms

The terms that are mostly used or referred to throughout this study are explained to give an overview about the inquiry. The terms include cooperative learning as the study is on: the cooperative learning techniques and student teams'-achievement divisions, which are also defined under this section. Other operational terms that are defined in this part are Technology as a school subject and National Curriculum Statement as policy document that governs basic education in South Africa.

Furthermore, teaching strategy and teaching technique are also explained as terms that are constantly used in this study. Lastly, mixed methods research is also briefly defined.

### 1.10.1. Cooperative learning

Cooperative learning is a teaching strategy whereby learners work together so that the group members can gain a joint benefit from the group activity (Van der Horst & McDonald 1997: 128; Van Wyk 2009: 159). Furthermore, Van Wyk (2007: 53) contends that the central feature of cooperative learning is the opportunity to learn through the exploration and expression of diverse ideas and experiences in cooperative company. They further maintain that, in the cooperative classroom, learners will be encouraged to work with one another rather than to be in competition. Therefore, learners will be predisposed to use the resources of the group to share ideas, deepen knowledge and understanding (Brandt, 1991:3). Slavin (2005: 13) adds that cooperative learning also refers to a set of instructional methods in which learners work in small, mixed ability learning groups of four or five members (one high achiever, two average achievers and one low achiever). Learners are responsible to learn and help group members to achieve a group goal (Brandt, 1991: 3).

According to Dikici and Yavuzer, (2006: 36) cooperative learning has three essential components: group goals, individual accountability and equal opportunity for success. Group goals refer to the incentives within cooperative learning that help create a team spirit and encourage learners to help each other. In addition individual accountability requires that each member of a cooperative learning group demonstrate mastery of the concepts and skills being taught. Lastly, equal opportunity for success means that all learners, regardless of ability or background, can expect to be recognized for their efforts. Thus, heterogeneous groups characterize cooperative learning groups.

Johnson, Johnson and Smith (2004: 8) indicate that there are three types of cooperative learning, the formal cooperative learning groups, informal cooperative learning groups and cooperative base groups. These types differ mainly with the duration of time the groups work together.

### 1.10.2. Student Teams-Achievement Divisions (STAD)

STAD has been described as the simplest of a group of cooperative learning techniques referred to as Student Teams Learning Methods. In the STAD approach learners are assigned to four or five member teams reflecting a heterogeneous grouping of high, average and low achieving students of diverse ethnic backgrounds and different genders. Each week, the teacher introduces new material through a lecture, class discussion or some form of instruction. Team members then collaborate on worksheets designed to expand and reinforce the material taught by the teacher. Team members may work on the worksheet in pairs, take turns quizzing each other, discuss problems as a group or use whatever strategies to learn the assigned material. Each team will then receive answer sheets, making clear to the learners that their task is to learn the concepts, not simply fill out the worksheets. Team members are instructed that this is not complete until all team members understand the given material (Scott, 1998: 1; Van Wyk, 2010: 83; Wise Hat, 2004: 1; Digest, 1985: 1; Balfakih, 2003: 610; Dikici & Yavuzer, 2006: 37).

Slavin (1991: 83) explains that, in STAD learners are assigned to four-member learning teams mixed in performance level, sex and ethnicity. The teacher presents a lesson and then learners work within their teams to make sure that all team members have mastered the lesson. Finally, all learners take individual quizzes on the material, at which time they may not help one another. Learners' quiz scores are compared to their own earlier performances. These points are then summed to form team scores, and teams that meet certain criteria earn certificates or other rewards.

### 1.10.3. Technology

The Department of Basic Education defined Technology as "the use of knowledge, skills, values and resources to meet people's needs and wants by developing practical solutions to problems, taking social and environmental factors into consideration" (DBE, 2011: 8).

From the above definition of Technology the researcher deduced that learners needed to be taught using cooperative learning to assist them to develop values that would arouse awareness of considering the effects of their decisions on other society members. Therefore, a learner in the Technology classroom should know how to treat and communicate with others in an acceptable manner.

Technology, as a school subject, aims at stimulating the development of innovative, creative and critical thinking of learners. Therefore it teaches learners to use their time and material resources effectively and promotes collaborative (cooperative) learning that nurtures team work (DBE, 2011: 8).

### 1.10.4. National Curriculum Statement (NCS)

The National Curriculum Statement Grades R-12 serves as a policy statement for learning and teaching in South African schools and consists of the following documents: Curriculum and Assessment Policy Statements (CAPS) for all subjects approved for South African schools; National Policy regarding the programme and promotion requirements of the National Curriculum Statement Grades R-12 and National Protocol for Assessment Grades R-12 (DBE, 2011: 3).

The National Curriculum Statement Grades R-12 prioritises the acquisition of knowledge, skills and values that are recommended for learning in South African schools. It further strives to ascertain that learners gain and apply knowledge and skills meaningfully, regarding local context and global requirements. The National Curriculum Statement Grades R-12 is further based on the following principles: social transformation; active and critical learning; high knowledge and high skills; progression of content and context for each grade; human rights; inclusivity; environmental and social justice; valuing indigenous knowledge systems and credibility, quality and efficiency (DBE, 2011: 4).

### 1.10.5. Teaching method

Moodie (1995: 102) contends that teaching methods are a common set of techniques that can be used regardless of what is taught. Avenant (1986: 235) further states that method suggests planned action by a teacher, the intention of which is the transferral of certain knowledge, skills and attitudes to his learners and further explains that it implies a planned work method through which the teacher strives to create preconceived learning experiences for the learners to tune them physically, psychologically and spiritually in a manner that reality develops in them.

#### 1.10.6. Teaching technique and model

According to Hornby (1995: 749 -1226), a technique is a method or a way of performing something and a model is a simple description of a system, used for explaining. From this definition it can be deduced that a teaching technique is the manner in which a teacher presents a lesson and learning takes place in a classroom.

### **1.11.** Mixed methods research

Mixed methods research is defined as a procedure for collecting, analysing and mixing both quantitative and qualitative data at some stage of the research process within a single study to understand a research problem more completely (Ivankova, Creswell & Clark, 2010: 263). Moreover, mixed methods research is an approach of inquiry that combines or associates both quantitative and qualitative forms. It involves philosophical assumptions and the mixing of both approaches is intended so that the overall strength of a study is greater than either quantitative or qualitative research (Creswell, 2009: 4).

### **1.12.** Value of the study

The value of this study is to contribute to the body of knowledge through the development of modified or improved STAD as a learning-teaching technique in SA schools. Secondly, it is to contribute to the teaching profession by improving classroom practice in Technology towards achieving good academic performance, retention, social skills and the Learning, Developmental and Critical Outcomes as stated in the NCS. Thirdly, to make recommendations toward training teachers in STAD as South African curriculum encourages cooperative learning

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## 1.13. Demarcation of the field of study

This study is limited to the employment of STAD as cooperative learning technique and teaching method in Grade 8 in the General Education and Training Phase. The necessity of conducting this investigation reinforces the view that a study of STAD as cooperative learning technique and teaching method is limited to the modification of the technique and training of Technology teachers in Grade 8. This study focuses on the learners, Technology teachers, Heads of Department of Technology who are employed by the Free State Department of Education (FSDoE). The geographical area of the study is limited only to the Grade 8 classes in the school where the researcher is employed as a Technology teacher.

The study is conducted within the Department of Curriculum Studies, lodged in the Faculty of Education of the University of the Free State.

## 1.14. Conclusion

In this chapter the researcher focused on introducing the background that influenced the commencement of the study. Furthermore the researcher listed several aspects of the problem that have been investigated.

This chapter also explained the theoretical framework that formed the basis for this study. Under this section the researcher expounded on the mixed methods research paradigm, social constructivism as paradigm for teaching and learning and cooperative learning.

Moreover, the aim of the inquiry from which the research questions emanated; was fully extrapolated indicating the specific points for investigation within this study. Furthermore, the researcher explained the research methodology for this study, including mixed methods research designs and the reasons for employing mixed methods as the research design for this study. The reasons basically included the two types of data that needed to be collected for the purpose of this study; because mixed methods allow the use of multi-paradigms in a single study.

Therefore, the researcher further summarised the qualitative design, the quantitative design and the literature review as methods to be used to acquire information to answer the questions raised in this study. The researcher further described the methods of obtaining the validity of this study qualitatively and quantitatively.

Lastly, various terms that are of significant importance for this study have also been defined to enlighten the reader. The value and the demarcations of the study were also stated in this chapter.

In chapter 2 the study focused on unfolding the theoretical framework that governed the inquiry. Different theories were discussed and explained how they relate to this investigation.

# CHAPTER 2

# CONCEPTUAL FRAMEWORK

## **2.1.** Introduction and contextualisation

In the previous chapter, the researcher alluded on the background and the aim of the study – citing the proceedings including research methods, research problem and questions.

This chapter elaborates on the contextualisation of Student Teams-Achievement Divisions as a teaching method and a learning technique in a culturally diverse school setting. As a teaching method it would be a vehicle a teacher uses to deliver the content accurately to learners. A learning technique would be a way for learners to implement and learn the content or material at hand, including social skills that they need. Thereafter, it expands on the conceptual framework through the explanation and interpretation of theories underpinning this study and concepts. Thus the relationship and the appropriation of the theories and the overall study would be aligned (Hertz-Lazarowitz, Kirkus & Miller, 1992: 1).

The context in which the study was undertaken will be discussed with reference to situational conditions that include the education policies overview, political influences of the past and present and the social state. The researcher will expatiate on the role of education policies and geographical circumstances towards classroom practice and societal values and norms and how the implementation of STAD could be fruitful.

The theories that validate the study would then be unpacked to show their relevance, implications and applicability to the research. Social constructivism as one of the main theories, stresses learning as a social activity where one is mostly influenced by engaging in contact sessions with other members of the society, being peers or more knowledgeable individuals rather than in isolation (De Kock, Sleegers & Voeten, 2004: 146). Secondly, cooperative learning theory claims cooperative interdependence of learners in a classroom as a basis to improve both academic and social relations. Also that it is natural for children to grow and learn through social interaction and share a belief of creating more long term benefits for the overall society (Hertz-Lazarowitz, Kirkus & Miller, 1992: 1). Motivational theory depicts motives as reason for people to initiate and portray certain voluntary attributes, including perceptions, cognition, emotions and behaviour (Reiss, 2004: 179). The self-efficacy theory can be seen as the belief that learners have about their abilities to perform well in their academic tasks. The higher the self-efficacy a student has the higher the goals they set for themselves (Usher, 2009: 275; Ritchie & Williamon, 2011: 147; Niehaus, Rudasill & Adelson, 2012: 120).

Cooperative learning as a teaching strategy has shown improvement of intercultural and social relations among pupils of different cultures. A cooperative learning classroom set-up would be employed by the researcher in order to facilitate healthy cross cultural relationships among learners. Therefore, STAD as a cooperative learning method of teaching and a team learning technique, developed by Robert Slavin was used to improve interpersonal and intercultural skills around the schools in the United States of America- this learning technique was administered for the purpose of content delivery and group learning in Grade 8 Technology (Cowie, Smith & Remalaver, 1994: 39; Scott, 1998:1; Schniedewind, 2004: 59; Abuseileek, 2007: 494; Coffey, 2008:1). The studies proved that STAD can be a useful tool to inculcate cultural blindness or cross the ethnic and cultural boundaries.

This study was administered in the Republic of South Africa (RSA). RSA has a unique cultural and political setting when compared to other African countries. The South African set-up has various race classifications, Whites, Blacks, Coloureds and Indians that were politically and economically unequal for many years. The other differentiations resulted from numerous African cultural tribes that are separated by means of language, cultural practices and geographical locations. It can be argued that the South African political and cultural background is similar to that of the USA. Their similarities could be based on their historical backgrounds that display the oppression of the natives by the European settlers. Natives were deprived of equal rights and opportunities when compared to the European colonists. The cultural segregation is, seems still to be dominant in the RSA due to our young democracy that took over from the apartheid government with cultural and ethnic educational divisions.

The recent change in government paradigm brought along new developments in educational structures and policies. Racially segregating and discriminative education structures and policies of the apartheid regime had to be replaced with new democratic ones.

## **2.2.** Education restructuring in RSA

As stipulated earlier the apartheid education system was a brutal device in oppressing the intellect and potential of the majority of the South African youth. The democratic government set a schooling system in place where all learners from different racial and ethnic groups have access to the same quality of education. Therefore the new approach to education is intended to bring unity to the nation, redress the imbalances and break the barriers of the past racial and ethnic divisions and inequalities of the apartheid education system (NDE, 2003: 3; Motala, 2009: 185). This new education system should develop all people's talents and capabilities and promote democratic transformation of society by advancing diverse cultures and tolerance (NDE, 2001: 13). Furthermore, the SA Schools Act (1996: 3; DBE, 2010: 20) make education for all children from all races and ethnic groups compulsory from the age of seven years to the age of fifteen years or Grade 9. After Grade 9, school is no longer compulsory. A child can choose to start working or go to Further Education and Training (FET) Colleges to follow a particular trade.

In 1997 the South African education system under the National Department of Education (NDE) pioneered C2005. The Curriculum 2005 was based on outcomes, hence the term Outcomes Based Education (OBE). Learners were expected to achieve and display stipulated outcomes and competencies at the end of General Education and Training (GET) Band or Grade 9. Outcomes Based education is clearly focussing on organising everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experience. This means starting with a clear picture of what is important for students to be able to do, then organising curriculum, instruction and assessment to make sure this learning ultimately happens as Spady explained in SAQA (2001: 10), Msila (2007: 150) and Lekgoathi ( 2010: 107).

The National Department of Education structured Curriculum 2005 around the 12 essential outcomes derived from the constitution of the country. The NDE aimed at developing an education system that would unify the nation by inculcating values and principles of a democratic South Africa.  For outcomes based education to be successful, the four principles governing it should be properly implemented. Starting with the principle of clarity of focus on the learning outcomes, indicates that the taught content, instructional method and assessment strategies should help or lead a learner to ultimately demonstrates the intended outcomes. Secondly, design down the curriculum from intended outcomes, such as abilities, skills, knowledge, and attitudes. Therefore, the development of the curriculum starts as a broad end, and then narrowed down to the content and activities that will enable learners to eventually arrive at the broad end (SAQA, 2001: 11; Msila, 2007: 150).

Moreover, high expectations are set and all learners are expected to achieve the intended outcomes. Therefore stakeholders and the curriculum structure should make it possible that all learners achieve the outcomes. Lastly, expanded opportunities promote flexibility beyond set boundaries of time and traditional organisation of learning institutions by creating more opportunities that would encourage and help all learners to meet the requirements of the given outcomes (SAQA, 2001: 11; Msila, 2007: 150).

In South Africa during the implementation of Curriculum 2005, all teachers were expected to be curriculum designers. There was no specific content of knowledge that was recommended towards achieving the outcomes – therefore, teachers were responsible to gather the learning content to teach according to individual interpretations. This approach on its own brought imbalances as teachers in different geographical areas would resort to locally available resources to develop learning content that they presumed to be leading to the achievement of the prescribed outcomes.

Due to the above mentioned circumstances, standards of demonstrating these outcomes would be different from school to school and learning area to learning area. As Learning Areas are a merging of two or more subjects, educators would be tempted to focus mostly on the part they feel more comfortable with. In Technology a more mechanically inclined or qualified teacher would, for example spend more time on the mechanical section than on the electrical and structural parts is not confident to teach.

Furthermore, Curriculum 2005 used an assessment based approach to teaching, called continuous assessment (CASS). CASS is a process of gathering valid and reliable information about the performance of the learner on an on-going basis against clearly defined criteria, using a variety of methods, tools, techniques and context. This is a school based assessment consisting of different types of tasks done by learners to cover skills, knowledge, attitudes and values (SKAV) in that learning area (NDE, 2001:14). Curriculum 2005, however, adopted radical constructivism where learners were expected to withdraw from their previous experiences and knowledge to lead their learning experience and teachers only facilitating. Teaching was criticised as rote learning not promoting critical thinking amongst learners.

This ideology could not be sustained as standardisation of education is necessary to guide and help teachers, textbook publishers and learners as well. Standardised and organised learning content would be relevant to the cognitive level of learners in different grades and progression would also be manageable and monitored. Without standardisation, it would be detrimental for further education institutions' admission requirements. Therefore education standards would depend entirely on schools' resources, staff abilities and aims to offer higher standards to meet the requirements of the post-secondary education. It would take the country's education back to the apartheid era where institutions of higher learning would adopt a system of classifying schools and preference was given to learners from more resourceful schools. The main reason being the stipulated outcomes were not content specific as articulated by (Msila, 2007: 151).

Because of the above mentioned fall back in Curriculum 2005, the Department of Education made further developments and changes to the curriculum to introduce the Revised National Curriculum Statement (RNCS) Grades R-9 for schools. The terminology in Curriculum 2005 was simplified and some concepts removed to make it more manageable and understandable by teachers in the RNCS. In RNCS, Learning Outcomes (LO) were made to be content based and encouraged learner centred methods of teaching to help learners achieve the Critical and Developmental

Outcomes deduced from the constitution of South Africa. A number of Assessment Standards (AS) under every LO were designed to help learners achieve the requirements of the LO. The AS showed the progression in terms of complexity of knowledge through the grades. The maintenance of the expenses of lower grades as the content they would cover was, however, much less than a year long. Secondly the integration of subjects was not in equilibrium as one would find the same content in two Learning Areas and in different grades.

RNCS promoted cooperative teaching in schools with regard to the planning of phase teachers, by doing learning programmes and work schedules together and shared Learning and Teaching Support Materials (LTSM) where possible. RNCS were an embodiment of the nation's social value and is therefore underpinned by the principles of social justice, healthy environment, human rights and inclusivity (NDE, 2003a: 5; Msila, 2007: 152; Jansen, 2009: 174).

Briefly, social justice refers to one's responsibility to care for others to the common good of society. A socially just education system takes humanity into recognition and provides equal opportunities and support for all learners. Moreover, a socially just education system should do away with all forms of social inequalities within the structure, including redistribution of resources and access to schools. Therefore, a social justice education is not only focussed on curriculum delivery, but also policies that would ensure practice and inclusion of expected societal values and norms. It does so by eradicating the imbalances brought by past experiences of the society, be they economic , cultural, political or educational (Pendlebury & Enslin, 2004: 40; Carr, 2006: 2; Riddell, 2009: 4; Woods, 2012: 4).

The South African urban schools, such as the researcher's school, represent the global identity of diversity. Learners are composed of those who originate in South Africa, other countries in Africa and around the globe due to immigration and the industrialised world. Teaching learners to tolerate, accept and embrace diversity is essential to cultural competence and social justice in schools (Banks, 2004: 293; Kumagai & Lypson, 2009: 782).

Therefore, there is a need to implement methods of teaching that would encourage and enable learners to actively be involved in practicing social justice and intercultural values. STAD as cooperative learning method would assist towards addressing the needs of social justice in the culturally diverse classroom. A healthy environment includes all spheres that contribute to people's lives and well-being. While human rights are grounded on daily experiences of people with their local environment, inclusivity encourages full participation of learners in schools, irrespective of their various backgrounds and abilities (NDE, 2003a: 6; Themane & Mamabolo, 2010: 8).

For learners to achieve and demonstrate most developmental outcomes, cooperative learning would be a vital contribution. Cooperative learning as a social constructivist approach to teaching and learning, advocates for a learner centred classroom environment as required by the RNCS. The adjustments were made to RNCS by including Grades 10-12 under outcomes based education and the National Curriculum Statement (NCS) Grades 10-12 for schools was established by the Department of Basic Education (DBE) (DBE, 2012: 3).

The most recent change in South African education was the birth of the Curriculum and Assessment Policy Statement (CAPS), which is a comprehensive curriculum and assessment policy document for the replacement of subject statements, learning programmes guidelines and learning area assessment guidelines in Grades R-12. According to the new National Curriculum Statement (NCS) Grades R-12 consists of a CAPS document, the policy document pertaining to the programme and promotion requirements and the National Protocol for Assessment as of January 2012 (DBE, 2012:3). Therefore NCS Grades R-12 replaced RNCS Grade R-9 and NCS Grades 10-12. The new CAPS articulate the topics of content that should be taught in every subject. It also indicates the depth of what should be covered under each topic including duration in terms of an hour spend per topic. The content specific skills and knowledge which learners have to acquire are also addressed (DBE, 2012b:33).

The National Protocol for Assessment (NPA) grades the importance and types of assessments expected to be undertaken by learners through the year. The recording and reporting of learner performance is done against the assessment task and mark obtained in a term, semester, or year respectfully. With the NPA Grades R-12 learning outcomes and assessment standards are no longer applicable as setters of the recording standards. The NCS Grades R-12 is a more content based approach than its predecessor curriculum that was outcomes based (DBE, 2012c: 3; DBE, 2012c: 16; DBE, 2011a: n).

Since the new curriculum does not dictate on methods of teaching, it is therefore an open field on which teachers can explore. The implementation of STAD in a culturally diverse Technology classroom even after the implementation of NCS Grades R-12 would be helpful towards achieving the general aims of the South African curriculum as documented in the curriculum. The STAD would also promote the principles on which the new curriculum is based, including social transformation, active and critical learning, high knowledge and skills.

Therefore, when working in teams learners could be moulded and developed to the end product envisaged by the NCS Grades R-12. Products, such as decision makers, critical thinkers, effective team workers and responsibility towards their surroundings would be achieved as learners cooperatively interact with one another working on the content given. During these sessions learners challenged each other within their teams to improve their understanding of knowledge and interpersonal skills (DBE, 2012a:5). Therefore social constructivism as a theory that underpins cooperative learning will be discussed in the next section of this paper.

## **2.3.** Constructivism

Constructivism depicts that learners should actively participate in learning in order to be able to construct their own knowledge of the subject matter (Horn, 2009: 515). Learners would be expected to incorporate their everyday knowledge to help them interpret the new learning experience in the classroom. By constructing their own knowledge learners would apply the acquired knowledge critically to make informed decisions that would display expected competences (Jansen, 2009: 175).

As indicated in the previous section the new curriculum is more content based. It is inclined to behaviouristic principles where knowledge is an objective reality ensuring the achievement of educational objectives of mastering the intended and taught content (Warin, Kolski & Saga, 2011: 1596). In the process of learning and mastering the prescribed content and material, schools still need to impart skills that learners need to be team players, critical thinkers, leaders and effective members of the society at the end of schooling. Therefore, STAD as a social constructivist method of teaching and learning technique would be essential for academic and non-academic skills development. In this study, guided discovery and team learning are encouraged to help construct knowledge and process the information acquired through Technology lessons.

### **2.3.1.** Social constructivism

De Kock, Sleegers and Voeten (2004: 146) assert that social constructivism is founded on Piagetian theory that contests learning as an individual process which is influenced by participating in social activities including team discussions during the STAD lesson. Therefore constructivism advocates theories that sort to show construction of knowledge by individuals and the society (Sanchez & Loredo, 2009: 335).

Pouliot (2007: 361) also concurs with them by bringing up the meta-theoretical stand of constructivism that states knowledge as socially constructed; social reality is also constructed and lastly knowledge and reality are essential inseparable components that go together. They further argue that social construction of knowledge and reality are opposite sides of one coin. This epistemological declaration is founded on Vygotsky's view that more knowledgeable members of the society guide social interactions and provide gradual construction of knowledge by the less knowledgeable members of the community and Vygotsky referred to this situation as 'zone of proximal development'.

Powell and Kalina (2009: 242) and Palmer (2005: 1854) content by saying Piaget's theory is 'cognitive constructivism' and that 'social constructivism' is developed from the socio cultural perspective of Vygotsky that states learning takes place in a particular social context which en-cultures students with ways of thinking that are common to their community.

The researcher is of the opinion that society, culture and language have an impact towards learners' construction of knowledge. This building of knowledge does not take place in isolation or passive mode, but in a collaborative and active mode (Kinniburgh, 2010: 76; Sohel, 2010: 21; Martin-Stanley & Martin-Stanley, 2007: 1).

During the Technology STAD lessons, learners would experience social interactions as they work together within their teams discussing, debating and arguing their standpoints with regard to the content. Through these kinds of interactions learners formulate their own understanding and knowledge that will assist them to improve on existing or develop counter facts that disapprove or disagree with the acquired knowledge. On this notion the panorama of Vygotsky, insisting that social learning is prime to individual learning that happens after social effect,  plays a leading role in this regard (Hertz-Lazarowitz, Kirkus & Miller, 1992: 2; Stears, 2009: 399).

On the one hand Glasgow (2010: 321) disputes the ontological notion that social reality is constructed, basing his argument on race as a social reality that cannot be constructed. The researcher's perspective in this situation, however, supports the stand by using the classroom environment, where a teacher and learners can together and actively create a social learning reality. Furthermore races construct their social realities that help them adapt and manipulate their environment for their survival (Stears, 2009: 399).

Therefore, it can be deduced from the above that social reality and social construction of knowledge go hand in hand. The classroom reality can either be a behaviourist situation where there is no interaction for learners to express their world view or social constructivist where learners and the teacher interact allowing the mutual construction of understanding of concepts and skills.

Harkness (2009:243) concurs that in a social constructivist classroom, learners are able to raise different views to those of the teacher or textbook by indicating how they see things. In Technology learners also need to link text book material to the reality of their existence, like well-known old debates on the shape of the earth whether it is flat or spherical and secondly, whether the earth is revolving or the sun is orbiting around the earth. Withdrawing from the existing knowledge about reality to constructing own knowledge is imperative to learning as it develops inquiry skills, reasoning, critical thinking and competencies among learners as they get to sense the ownership of their knowledge (Blaik-Hourani, 2011: 231).

Therefore, constructivism perceives learning as more than just receiving and dissemination of acquired information or content matter, but rather as an active and personal construction of knowledge. Primarily learning occurs during problem solving and working with others and has little to do with the transmission of knowledge which is the case in the traditional or behavioural classroom (De Kock, Sleegers & Voeten 2004: 146).

The researcher believes that learners get to learn what could be referred to as the hidden curriculum by engaging in collaborative group discussions in the Technology classroom. The researcher further believes that learners would be able to develop mechanisms of acquiring knowledge in a different set-up or classroom environment to the one they are used to, as cognitive constructivism showed in the following section of this chapter.

### **2.3.2.** Cognitive constructivism

The above mentioned also emanates from the cognitive constructivism's view established from Piaget's concept that emphasizes cognitive processes that occur within an individual. Cognitive constructivism recognises a child as a scientist, through children's investigative efforts to make sense of the world around them. This conviction states that learning can be induced by physical, psychological or social experience. Where physical experiences are interactions with the environment, psychological ones entail engaging in constructive thought over the practice and knowledge gained and then the social environment involves interaction with adults and peers (Palmer, 2005: 1854; Powell & Kalina, 2009: 242).

In the Technology class where STAD was employed as a physical learning environment, learners were exposed to the subject matter, its application and relevance to their everyday life as a psychological experience, and as they interact with each other in a social situation, different world views would be tabled. Individual learners would get opportunities to digest the experiences by analysing, synthesising and evaluating them to develop their knowledge.

At the same time the above context would be exposing Vygotsky's perception that learning is social and takes place in a particular social context which cultures students with ways of learning and thinking that are common to their learning community. According to Palmer (2005: 1855), children learn more in social environments, as they interact with people that are more competent, who slowly direct them towards constructing their own understanding of the phenomena through personal interpretation. Cultural values, such as language and other practices used by specific communities from which children come from are learnt through interactions that give them a sense of belonging.

Therefore, by basing the argument on the above perspective, the researcher contends that as learners interact with one another in their STAD teams, less knowledgeable ones would be motivated to become valuable members. The competent learners could facilitate by helping weaker ones to contribute meaningfully toward the common goal of the group. By so doing confidence would be built among the less gifted learners.

Both the cognitive and the social constructivism recognise the individual construction of knowledge through engaging critically and reasonably with the learned material and experiences. Secondly, learners are viewed are active and not passive members and are allowed to bring forth their own worldview that makes sense to them in order to build up coherent and organised knowledge. The above mentioned attributes of constructivism are ideal for a cooperative learning classroom, where a teacher also becomes a part of the learning community when different interpretations and ideas unfold during team interactions (Cottone, 2007: 193; Kinniburgh, 2010: 76).

Moreover, STAD as cooperative learning method of teaching involves both the participants and the researcher and sees them as all active members in decision making, would be employed for the purpose of this study.

### **2.3.3.** Cooperative learning

Cooperative learning is founded on social interdependence theory that emanates from social constructivism beliefs and principles expatiated on in the previous subsections of this chapter. Therefore cooperative learning as a teaching strategy is also based on the cognitive development of learners, whereby individual learner's process of learning is taken into cognition. Social learning takes place where there is social interdependence by means of sharing views and ideas with peers and more knowledgeable others (Attle & Baker, 2007: 77).

Therefore, cooperative learning is a system where teaching and learning takes place in an environment that supports learners to become active participants in their process of learning, not just passive recipients of abstract knowledge. Thus, learners are guided to take ownership of the learning process through interactions with peers and posing questions to the teacher for generation of their group and individual understanding and interpretation of the subject matter. Cooperative learning could induce internal influence [motivation] within learners to be proactive in meaningful contribution of knowledge to peers and oneself through a supportive and less intimidating situation (Laing, 2002: 17; Messerschmidt, 2003: 107; Johnsen & Curtis, 2009: 5; Panitz, 2011: 2).

Referring to the context of a culturally diverse classroom, including the historical background of South Africa, cooperative learning would enhance interracial and cross-ethnic relationships and also accommodate the intellectual diversity of learners. Cooperative learning could also improve social skills that would lead to instilling discipline in a proactive and positive manner through positive interdependence, 'we swim or sink together' (Streeter, 1999: 1; Johnson, Johnson & Smith, 2004:6; Teed, McDavis & Roseth, 2010: 1).

## **2.4.** Motivation theories

Motivation theories form a crucial part of this inquiry as one of the aims is to improve learners' intrinsic motivation through the employment of STAD, which is one of the cooperative learning methods of the teaching and learning technique.

Motivation can be defined as the drive that directs and informs people's behaviour towards doing something (Frith, 1996: 1; Lai, 2011: 4). The forces could either be internal or external influences. Motivation has also been explained as the level of effort a person is intending to utilise toward the achievement of a goal (Pew, 2007: 14). Therefore, highly motivated individuals willingly put more effort, vigour and time into the journey leading to the achievement of intended outcomes. Brooks and Shell (2006: 78) add that motivation is a process through which a learner intentionally or involuntarily allots working memory to a learning task at hand. Furthermore, Huitt (2011:1) broadly defines motivation as an internal or external condition that seems to prompt or stimulate and energise the persistence of behaviour towards a desired direction. There are six basic components of motivation mentioned as needs, self-efficacy, curiosity, attitude, competence and external motivators (Frith, 1996: 3).

There are various theories of motivation that indicate different ways in which people get motivated to accomplish certain goals in their lives, including education and learning. These theories have been discussed in this section to guide the development of the framework for implementing STAD in Technology.

### **2.4.1.** Maslow's needs theory

Maslow in his theory of human motivation (needs theory) mentions five basic needs, which he postulates to motivate people to desire to satisfy them. These basic hierarchical needs include, physiological, safety, love (social), esteem and self-actualisation needs. The theory of hierarchical needs describes how learners strive to attain the five levels. It also maintains that if the first two central needs are met, being physical and safety, the next three needs, social, esteem and self-actualisation would intrinsically motivate learners to achieve them (Maslow, 1943: 4; Frith, 1996: 3; Pajares, 2001: 27; Pew, 2007: 15; Huitt, 2011: 11). This suggests that, if the lower or primary levels needs of children are met at home or by other means, it is easier for such learners to meet the secondary level needs by themselves. Thus learners would be able to receive affirmation to boost self-esteem, which in turn would enable a child reach self -actualisation. Then the learner would also begin to embrace his or her abilities, talents and pursue them, because of the internal force to achieve in order to satisfy the highest need.

According to Maslow's hierarchy of needs, the lowest levels are physiological drives that are activated by deficiency in the body system. For instance, when one thirsts for water, it is due to the body reporting imbalance in homeostasis. This is an indication of lack towards maintaining bodily fluids in a correct state (Maslow, 1943

:4; Poston, 2009: 349). Therefore hungry learners would not be able to focus on educational demands due to the unmet physiological need for food to maintain healthy body systems. In this case educational needs are hindered and covered by the unmet need for food.

When physiological needs are met, then another set of needs emerge that are regarded as safety needs. These needs would include shelter, good health, justice, fairness and consistency as basics that a child seeks to experience on daily basis. Other safety needs depend on the family set-up, such as divorce, dysfunctional parents, death and assault that takes place in the home (Maslow, 1943: 4; Martin & Joomis, 2007: 72; Idenobi, 2011: 169). The researcher assumes that learners experiencing lack of safety at home would find it difficult to trust or feel safe around another adult person, such as the teacher. It could lead to learner's withdrawal or they could portray discrete characteristics as defence mechanisms in a classroom situation, due to the insecurities of life the pupil is familiar with and directly affected by them. A learner's perception of the world around them could be negatively impacted by the above mentioned situation.

Thirdly, the love (social) needs arise, once the first two levels of physiological and safety needs are fairly well satisfied. Then a person would hunger for affection, belonging and association from other members of the community, such as friends. A learner would strive to claim his or her place among the classmates and enjoy being appreciated and recognised as a valuable member of the class as a whole. Learner's confidence within the community gets stronger (Maslow, 1943: 9; Martin & Joomis, 2007: 73; Poston, 2009: 350). If learners' social needs are well met, it would be easier for such learners to work harmoniously with others in a cooperative learning set-up and perhaps set higher academic goals due to boosted confidence.

The fourth need according to Maslow's hierarchy of needs is the need for self-esteem. At this level, desire of strength to achieve and to be confident with respect to tasks assigned arises. Independence and freedom from insecurities and to be in control of life experiences grow within the self. A need to be recognised by others as having a good reputation or prestige also comes up as self-esteem inspiration and enhancer (Maslow, 1943: 10; Poston, 2009: 351; Redwoods, 2010: 2). When this need is met in the life of a student, it would increase his or her confidence towards any task ahead. Such students would become courageous and set high standards of life goals including academic goals. They would also like to earn the respect of their peers and the teacher by excelling in class activities and participating confidently in group environments.

Lastly, when the esteem need is also satisfied, a new discomfort would develop, unless people are already doing what fulfils them. Self-actualisation as the highest needs are desires to achieve full potential of who one is and become whatever one is capable of becoming (Maslow, 1943: 10; Frith, 1996: 3; Huitt, 2004: 7; Gagné & Deci, 2005: 336). Learners at this level of the hierarchy of needs set themselves even higher set of goals in life and academics in order to achieve their future dreams that represent their full potential and capabilities. This stage could fall under the self-determination theory (SDT) that is centralised by the distinction between autonomous (self-determining) motivation and controlled (regulated) motivation. Autonomous or independent means approving and condoning individuals' performance at the highest level of manifestation and demonstration (Gagné & Deci, 2005: 334).

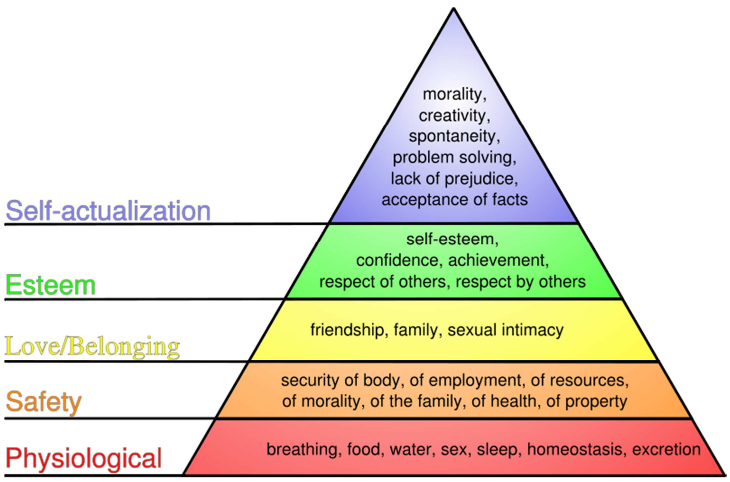


**Figure 2.1** Maslow's Hierarchy of Needs Diagram **(**http://www.pensiveprimate.com)

In the following section, the researcher will expound on the ERG model of motivation and the relationship it has with the Maslow's hierarchy of needs.

### 2.4.2. Alderfer's ERG model

Clayton Alderfer's ERG theory from 1969, compressed Maslow's five human needs into three categories; existence, relatedness and growth in order to allow more flexibility of movement between needs (Ball, 2012: 9; Life in MBA, 2012: 1; Redmond and Cramer, 2012: 2).

Existence needs include different forms of physiological desires, material needs and safety, which cover the two lower level needs in Maslow's hierarchy of needs theory. Physiological needs refer to people's wanting to satisfy bodily needs, such as relaxation, exercise, sleep, while material needs would include food, clothing and water. Safety needs would refer to protection from threat, fear, stress or tension by providing shelter and financial security (Yang, Hwang and Chen, 2011: 7886; Ball, 2012: 9; Life in MBA, 2012: 1; Redmond and Cramer, 2012: 2). Therefore, meeting the existence needs of learners would give them a sense of being taken care of physically to help them interact boldly with others in class. If these needs are not satisfied, learners' focus would be hung on how to fulfil them due to unease that arose in them.

Relatedness needs refer to the developing and sustaining interpersonal relationships, such as family, friends, educators and other cultural or ethnic groups. With regard to Maslow's hierarchy of needs theory, relatedness would encompass safety and social needs. Safety needs are also met by a sense of trust one has in colleagues, peers and teachers. On the one hand needs for a sense of belonging, respect and appreciation would be able to be accomplished through interpersonal relationships, where one gives to and receives love, acceptance, care and respect from others (Williams, 2003: 2; Lifvendahl, 2005: 4; Borkowski, 2005: 118; Yang, Hwang & Chen, 2011: 7887). It is essential that learners need families, friends and educators that give them love, recognition, respect and care for their well-being. When children feel free to associate with the significant others they find themselves around at school and at home, it would be easier for them to focus on meeting their educational needs. Moreover, as this study employs STAD as a cooperative teaching method and a learning strategy, feeling safe and trustworthy among group members brings about social health among individuals. Growth needs refer to individuals' intrinsic need to be creative and make useful and productive contributions, meeting the needs for personal growth and development. They also involve needs for self-esteem and self-actualisation whereby a person would want to grow in knowledge, confidence, competence and independence. These serve as internal drives to pursue personal goals and reach one's highest potential (Williams, 2003: 2; ABAHE, 2005: 1; Borkowski, 2005: 118; Yang, Hwang & Chen, 2011: 1887). In the context of this discourse, when learners are given opportunities to be creative and produce useful contributions within their teams and classroom, their self-esteem would be boosted or positively affected. This, in the process, would increase internal (intrinsic) motivation to become an even more valuable member of the group and class. Thus learners would like to discover and perform at their highest potential by improving their confidence and competence through groups and class discussions and debates.

Alderfer's ERG (Existence needs/Relatedness needs/Growth needs) theory states that individuals and cultures have different priorities concerning their needs. Therefore needs could be met according to priority, not levels from lower to higher needs. This theory suggests needs could be satisfied as requirements arise in any order. Alderfer further argues that it is important to understand the aspects of the frustration and regression principle. The prior mentioned principle asserts that when impediments prevent individuals from obtaining a higher level need, people may regress to a lower level need in order to get satisfaction. It is therefore important for teachers to foster growth by developing the confidence and competence of all learners in their classrooms through expanded opportunities (Williams, 2003: 2; ABAHE, 2005: 1; Borkowski, 2005: 119; Redemond & Cramer, 2012: 2).

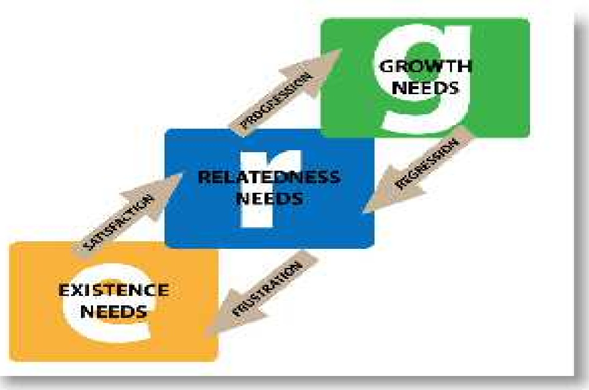


**Figure 2.2** Alderfer's Motivation Diagram adapted from (Ball, 2012: 9)

### 2.4.3. McClelland’s achievement motivation theory

McClelland’s achievement motivation theory, which is also known as the acquired needs theory or the learned needs theory, aspires to clarify and predict behaviour and performances based on the three motivational needs identified by McClelland. The learned needs are identified as the need for achievement, need for power and need for affiliation (Moore, Grabsch & Rotter, 2010: 25; Redmond & Cramer, 2012: 3).

According to various researchers (Borkowski, 2005: 127; Moore, Grabsch & Rotter, 2010: 25; Ball, 2012: 5; Redmond & Cramer, 2012: 2), McClelland’s theory asserts that individual’s specific needs are learned over time and moulded by experiences. Furthermore, McClelland also believed most people have a mixture of these motivation needs with varying measures from a low to a high level of each need. These needs are briefly explained as follows: Need for achievement is defined as a need to excel and succeed.

Therefore, people with higher drive to achieve tend to tackle challenging tasks as a highlight for their individual efforts. They are also keener to get feedback on their efforts than low achievers. Secondly, need for power is explained as a push to influence and gain control over others in order to make an impact or achieve set group or organisational goals. The need for power is classified into two categories, personal and institutional.

The prior as the term personal states, is found in individuals with a low need for affiliation and therefore other people’s inputs or views are not considered as important by these individuals. Power to them is to display personal prestige. The latter refer to someone who is organisational and brings together efforts of others to achieve organisational goals. These kinds of people tend to become more effective managers than those with a need for personal power.

As the former category would even sought after improper values just to gain personal power over others, the second category on the contrary would embrace institutional values to guide others towards achieving team outcomes (Lifvendahl, 2005: 6; Moore, Grabsch & Rotter, 2010: 26; Ball 2012: 6). Furthermore, the need for affiliation is described as a desire to build and maintain positive affective relationships with other people. Individuals with a high level of this characteristic tend to seek to belong to a group or organisation that fills the need to be accepted and liked by others. Due to this aspect, these persons only settle for a low level leadership or management, because of their fear of rejection and it would be difficult for them to make decisions. They do, however, appear to be good team players, because of their nature to conform to group's norms (Borkowski, 2005: 127; Lifvendahl, 2005: 5; Ball, 2012: 6).

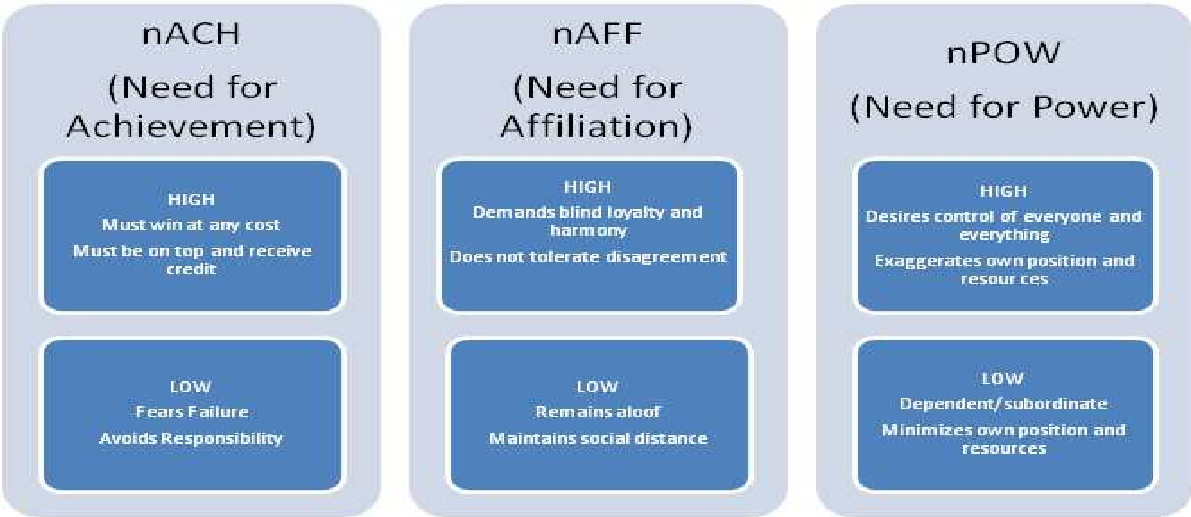


**Figure 2.3** McClelland's achievement motivation theory diagram

Redmond, 2010 (http//:wikispaces.psu.edu)

### **2.4.4.** Herzberg motivation-hygiene theory (Two Factor Theory**)**

The Herzberg motivation-hygiene theory, also referred to as the two factor theory, like other content (need) theories was developed to establish satisfaction and dissatisfaction causes at workplaces. This theory is based on two types of motivators or factors that influence job satisfaction and dissatisfaction (Manisera, Dusseldorp & Van der Kooij, 2005: 4; Gautrean, 2011: 6; Teck-Hong & Waheed, 2011: 76). It further suggests that factors that cause work satisfaction are independent from those that trigger job dissatisfaction. Herzberg's theory states that the presence of the one set of factors or characteristics lead to work satisfaction, while the absences of another separate group of factors lead to dissatisfaction at work (Warraich & Ameen, 2010: 2; Horak, 2011: 1). The two factor theory classifies the factors that bring work satisfaction as motivators or satisfiers and the ones that cause dissatisfaction as hygiene-factors or dis-satisfiers. These motivators and hygiene-factors are not regarded as opposites, because if the hygiene-factors are improved, it does not necessarily guarantee work satisfaction as they are mostly contextual or external. While the motivators refer to the content which is work itself, its nature is to allow self-actualisation (Nichols, 2004: 2; ABAHE, 2011: 1). Therefore it can be deduced from the above that the motivators are mostly psychological needs and the hygiene-factors regarded as physiological needs (ABAHE, 2011: 2).

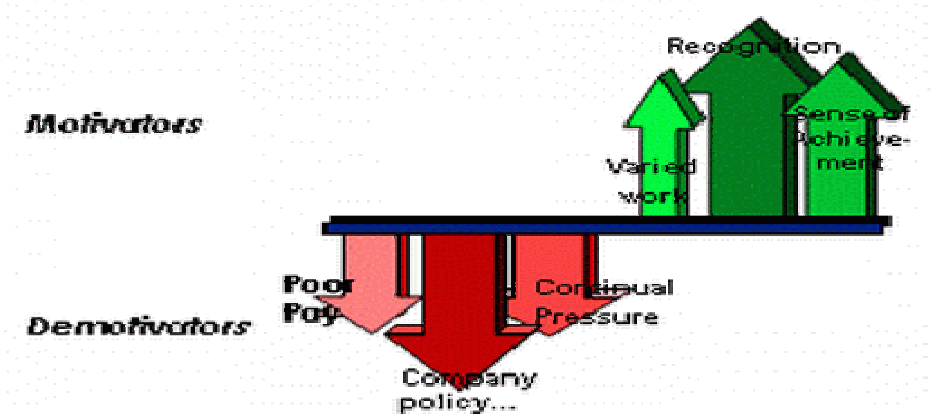


Figure 2.4 Two Factor Theory

Herzberg Motivation Hygiene Theory diagram (http//:www.learningandteaching.info**)**

The above content theories were mostly established to motivate employees at work through satisfying the stipulated needs. When these needs are met, employees are expected to improve productivity and job satisfaction including workmanship with colleagues. The motivational needs theories would be applicable to determine possible educational needs and how those identified needs could be met in order to improve learners' academic achievement and social competencies. Learners whose physiological and psychological needs are met would also be expected to improve in academics and be able to build healthy relationships with peers in class. Such learners are also expected to develop social skills and good attitudes toward their studies, considering cultural implications with regard to the group or cooperative classroom set-up. Therefore, the inquiry would be made in order to identify the hygiene-factors of the classroom set-up and administration including subject application and comprehension. In the following section of this chapter the researcher is going to probe the process motivational theories and their relevance to the study. These theories include self-efficacy and self-determination theories.

## **2.5.** The process motivational theories

Under this section the researcher has discussed theories that are based on particular processes to improve motivation within individuals. Theories, such as self-efficacy by Bandura, self-determination theory promoted by Deci and colleagues, cultural diversity and social interdependence advocated by Johnson and Johnson have been introduced in the following sections of this chapter.

### **2.5.1.** Self-efficacy theory

Academic self-efficacy could be defined as beliefs that students have about their abilities to perform well in their academic tasks. The higher academic self-efficacy learners have, the higher they set own academic goals and also earn higher grades (Usher, 2009: 275; Ritchie & Williamon, 2011: 147; Niehaus, Rudasill & Andelson, 2012: 120).

According to Bandura (1986 as cited in Richie & Williamon, 2011: 147), self-efficacy is influenced in four main ways: through accomplishing a task, observing the completion of a task, verbal encouragement or physical signals. Moreover, self-efficacy beliefs are tasks, a person (learner) with high self-efficacy would tend to exhibit certain positive personal qualities, such as persistence, use of varied strategic approaches and high achievement. These characteristics contribute to positive and effective independent learning.

Self-efficacy is also driven by behavioural and environmental determinants, such as cognitive, vicarious (observational experiences), self-regulatory and self-reflective processes, all of which play a significant role in people’s adaptation and change. The above mentioned aspects or determinants are illustrated as follows: cognitively, learners form their self-efficacy by selecting and interpreting information from own previous performances or mastery experience. Thus learners define and judge their first attempts. Secondly, through vicarious experiences of observing their peers' performances, learners are able to build their self-efficacy beliefs. They would form a belief that if other peers could do well, then we also could obtain the same results if we apply their strategies. Thirdly, learners shape their self-efficacy based on social-persuasions they receive from others. Parents, teachers and peers help provide evaluative feedback, judgements and appraisals concerning learners' academic performances. Positive talk and the environment that would be created in the Technology STAD class could help individual learners to regulate their learning toward better academic performance. Lastly, self-efficacy beliefs are informed by emotional and psychological states, such as arousal, anxiety, mood and fatigue. If learners are in a stable emotional and psychological state due to healthy group conditions whereby they help each other succeed, they are likely to have a good advantage to focus on academics and improve their performance in class (Zimmerman, 2000: 87; Inman, 2001: 3; Usher, 2009: 16).

Zimmerman (2000: 86) and Rahimi and Abedini (2009: 16) also indicate that self-efficacy is highly correlated with learners' intrinsic motivation. It has shown to increase effort toward a high rate of performance and good channelling of energy to difficult work, while low self-efficacy creates self-doubt that may keep a learner away from trying.

Zimmerman (2000: 87) and Bandura (2001: 10) further stipulate that self-efficacy puts and triggers a sense of urgency in learners, thereby motivating their learning through the use of a self-regulatory process of goal setting, self-monitoring, self-evaluation and use of various learning strategies. Learners with high self-efficacy are better at monitoring their working time, being persistent, solving contextual problems and are less likely to give up than inefficacious learners of equal ability. Efficacious learners' time is precious, time lost is never recovered and they apply themselves timely. They are perceptual in pressing to attain their performance goals and minimising the chances to terminate their endeavours before achieving expected outcomes. The researcher set activities in such a way that learners would learn to work effectively within a given timeframe for completion of tasks. Learners would be encouraged to evaluate their progress based on given time opportunities to achieve their goals. They would also be motivated to set goals for themselves and examine how they had reached or failed to attain their set goals. Applying these strategies could help learners to address their areas of lack and direct their efforts toward building up efficacy toward school work.

The previous paragraph referred to the learning strategies that learners should use in a class situation. Inman (2001: 10) mentions and defines them as mastery learning, imitation, modelling and social persuasion. Mastery learning refers to the development of competence in work at hand, leading to the increase in self-efficacy. Secondly, imitation as the second strategy is regarded as the continuous individual practice that solidifies learning from various observational experiences. Thirdly, modelling is based on observing others' performances that will serve as reference for future functions. While social persuasion relies on verbal praises and encouragement that lead to learners applying more effort, learners could receive these comments from peers during STAD lessons when doing group activities, also from the teacher by encouraging and motivating learners to be consistent in applying themselves and setting high standards for themselves. Parents at home also play a significant role in helping learners to use their time effectively.

It is, however argued (Bandura, 2001: 16; Gushue & Whitson, 2006: 114) that culture plays a role in shaping ways in which learners develop self-efficacy beliefs. They contend that learners from individualistic cultures feel more self-efficacy and belief to perform better in an individualistic and competitive class setup, whereas learners from collectivistic cultures assess themselves as more efficacious and productive when working in a group-oriented situation. Furthermore, social factors affect self-efficacy in certain subjects and determine interests and performance goals.

### **2.5.2.** Self-determination theory

Self-determination makes an important additional differentiation that falls within the class of behaviour that is intentional or motivated. It differentiates between self-determined and controlled types of intentional regulations. Moreover, motivated actions and learning are self-determined to the extent that they are engaged in wholly volitionally ways and supported by sense of self. On the contrary, controlled actions and learning are prompted by some interpersonal or intra-psychic force (Deci, Vallerand, Pelletier & Ryan, 1991: 326; Deci & Ryan, 2008: 182; Van den Broeck, Vansteenkiste, Lens & De Witte, 2010: 302). Therefore, self-determined behaviour is regulated by choice, while controlled behaviour is regulated by compliance (Gagné & Deci, 2005: 337). Learners in STAD class should be assisted to go beyond performing well to satisfy or prove to others that they can achieve, but rather to owe it to themselves and maintain the performance due to personal choice.

Self-determination theory addresses the energising and directing of behaviour of learners through the satisfaction of three essential psychological needs natural to human life, namely competence, relatedness and autonomy (Gillard, 2007: 1; Bachman & Steward, 2011: 181). Self-determined learners would experience a sense of freedom and interest in working with others towards attaining group goals in a classroom where STAD is employed. Self-determination theory also suggests that people are actively involved towards their growth and development by interacting with their environment (Gillard, 2007: 1; Van den Broeck, Vansteenkiste & De Witte, 2008: 1). This theory further maintains that the growth oriented nature of learners requires necessary nutrients to build and nourish these imbedded tendencies, which are found in the environment that support individuals' inherent growth tendencies (Van den Broeck, Vansteenkiste and De Witte, 2008: 2).

The researcher is of the opinion that a STAD classroom environment would be conducive to nurture these inherent tendencies by meeting the above mentioned needs. Competence in learners could be improved as they discuss and debate facts within their groups and among different groups in the classroom. Learners sharpen one another on the content they are learning and problem that they are solving as they argue their different views and also meet the given time frames. Competence as one of the psychological needs includes learners' understanding of the way to obtain variety of external and internal outcomes and being efficacious in performing the required actions and to display ability to influence necessary outcomes (Deci et al. 1991: 327; Stone, Deci & Ryan, 2008: 4; Bachman & Stewart. 2011: 182).

Secondly, relatedness involves building secure and satisfying relationships with others in one's social context which are supportive, encouraging and motivational. Therefore, individual learners need to belong, to be loved and recognised as valuable members of a group or society. During the course of a Technology STAD lesson, learners interact with each other, thereby also learning how to work with others in harmony, giving others and receiving from others love, support and encouragement, building psychological health among team members (Deci et al. 1991: 327; Stone, Deci & Ryan, 2008: 4; Bachman & Stewart, 2011: 182).

Lastly, the need for autonomy encompasses one’s intrinsic need for freedom and choice. When a learner does an activity he should not feel manipulated or prompted to think, feel or behave in a certain manner (Bachman & Stewart, 2011: 181). Learners in a Social Science STAD classroom should eventually reach the stage where academic work is no longer an obligation to satisfy teachers and parents, but as internal zeal to achieve due to the enjoyment they find in the subject.

Deci and Ryan (2008: 183), Stone et al. (2008: 5) and Ryan (2009: 2) indicate that research has been done in a variety of cultures, including collectivistic and individualistic cultures and proven the satisfaction of the above psychological needs as optimal functioning in a broad range of highly varied cultures. Since these needs are essential in various cultures, a culturally diverse and inclusive classroom would be a relevant environment to help learners improve their intrinsic drive toward their academics to build their competence and cross cultural relationships in a STAD classroom setup.

Thwarting of these psychological needs would hinder individuals’ process towards self-determination and developing high levels of intrinsic motivation or undermines adjustment and optimal performance (Deci & Niemec, 2009: 268; Van den Broeck , Vansteenkiste, Lens & De Witte, 2010: 801; Hill, 2011: 1). The teacher in a STAD classroom should maintain an environment that promotes development of competence, relatedness and direct learners’ energy toward developing autonomy in their academics.

Self-determination theory classifies motivation into intrinsic (autonomous) and extrinsic (controlled) motivations. Intrinsic motivation is regarded as the highest level of self-determined regulation and it involves doing an activity, because it is interesting and enjoyable. The researcher should design Technology STAD lessons and activities in such a way that they stimulate learners to enjoy doing them.

Extrinsic motivation refers to conducting and persevering activity to achieve certain outcomes apart from the activity itself (Ryan & Deci, 2000: 55; Barkoukis, Tsorbatzoudis, Grouios, & Sideridis, 2008: 39; Yahaya, Yahaya, Ramli, Hashim, & Zakariya, 2010: 129; Ali, Akhter, Shahzad, Sultana, & Ramzan, 2011: 306; Bachman & Stewart, 2011: 182). STAD as a teaching method uses incentives, such as awards for winning groups and schools in South Africa, including the school where the research is going to be executed or use marks or grades to recognise learners' academic achievement. The researcher also intends using grades as well to recognise groups' and individuals' academic achievements. The South African education policies regard recording of learners' grades as essential for learners' profiles and promotion schedules at the end of each year (NDE, 2002: 59; NDE, 2003a: 42; NDE, 2003b: 10).

Deci et al. (1991: 328), Deci and Ryan (2008: 182) and Stone et al. (2008: 7) further postulate that intrinsically motivated people engage in a task for interest sake, freely with a sense of volition, without rewards. These behaviours represent a prototype of self-determination as they emanate from within the self and are fully endorsed. The autonomous (intrinsic) motivation includes the highest level of extrinsic motivation in which individuals have identified with the value of the activity and have integrated it into their sense of self. Through the employment of STAD in the Grade 8 Technology class, the researcher used rewards in a form of certificates to motivate learners (extrinsic motivation) to set high academic goals. The intention was to eventually have learners integrating high academic goals into self, whereby they begin to enjoy activities without incentives, but do them autonomously and volitionally.

Moreover, Ryan and Deci (2000: 56) claim that natural motivational tendencies are important elements in cognitive, social and physical development, because it is through pursuing imbedded curiosities that one grows in knowledge and skills. Therefore, the implementation of STAD in the Technology class might be viewed as a vehicle behind learners' cognitive development during content discussion. It could be a context conducive to promote inherent curiosities that would help learners' growth in knowledge. Social skills would also be developed whilst learners are working in their groups, improving their interpersonal and intercultural interaction skills.

Extrinsic motivation, as a lower level of self-determination, can be categorised in the descending order of self-determination accumulation or internalisation in an individual from external to interjected, identified in self and finally become integrated regulation (Deci et al., 1991: 329; Bachman & Stewart, 2011: 182; Demir, 2011: 1400). As stated earlier in the chapter, STAD was implemented to facilitate learners' motivation to grow gradually from extrinsic to intrinsic motivation, by starting with rewarding high achieving groups, designing lessons that stimulate curiosity and slowly do away with incentives.

Well internalised forms of extrinsic motivation are regarded as autonomous, whereas under internalised forms of extrinsic motivations are considered controlled. The least autonomous form of extrinsic motivation is referred to as external regulation. External regulation is about behaviours that are externally influenced for a person to initiate, especially if there is a tangible reward to obtain or punishment to be avoided when the outcome is accomplished. These contingencies are regarded as loci of initiation and regulation. In this situation, a person is forced to do the task, because of these external demands. Thus, self-determination is directed to obtain reward, avoid punishment or meet deadlines not to the internal satisfaction of completing a task at hand (Deci et al., 1991: 329; Vansteenkiste, Lens & Deci, 2006: 21). At the beginning, the researcher would introduce rewards, such as certificates to recognise the groups that achieve high grades and show improvement in social interactions including interpersonal, intra-group interactions and social interdependence.

Introjected regulation is the second level of extrinsic motivation where people engage in a task to comply with external pressures. The external constrains include sense of guilt for not doing the task, or doing an activity for reward, such as promotion or just to prove oneself. At this stage, regulations are partially internalised not yet part of an individual (Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005: 484; Vansteenkiste et al. 2006: 21; Barkoukis et al. 2008: 40). Learners at this level need the teacher's words of encouragement toward improving their academic achievement to be able to pass the grade at the end of the year and promote social interdependence so that they could assist one another to succeed.

Thirdly, identification refers to the process of occupying the value of a task and also being able to identify the personal relevance and the importance of the activity.

Identification helps individuals to begin to participate in an activity volitionally or willingly. The portrayed behaviours at this level are regarded more autonomous or self-determined than in the first two levels of extrinsic motivation, as individuals have now internalised the locus of causality. Although people have exercised choice or volition, it is still regarded as extrinsic, because of separable outcomes, such as improvement or usefulness of the activity (Deci et al. 1991: 329; Vansteenkiste et al. 2006: 21; Bachman and Stewart, 2011: 182). Learners were encouraged to identify with the subject and activities during STAD lessons and relate them to real life application of the content in their lives and not to settle for the mediocre, but excel in their academic work.

Lastly, integrated regulation is the most developmentally advanced kind of extrinsic motivation. At this phase, internalisation is fully integrated to one's logic sense of self. Identifications are assimilated with the individual's other values, needs and identities. When full integration of regulatory process has taken place, the portrayed behaviours become an expression of who the person is. Therefore, an individual has developed forms of autonomous self-regulation to become an intrinsically motivated person. Qualities, such as willingness, creativity, intuition and understanding could be used to evaluate the extent of integration. The difference between integrated regulation and intrinsic motivation is only the locus of causality which is the importance of task to self and interest in the task respectively (Deci et al. 1991: 330; Ryan & Deci, 2000: 60; Bachman and Stewart, 2011: 182). The researcher implemented aspects of the self-determination theory by providing an autonomous-supportive environment in the STAD classroom to allow volition to invigorate learners' imbedded curiosities toward developing the importance of the subject, working harmoniously in teams and interest in the subject and working with others. According to Vansteenkiste et al. (2006: 21), Bachman and Stewart (2011: 184), an autonomy-supportive environment should empathise with learners' perspective, provide timely instructional feedback and avoid controlling language and pressures. Furthermore, autonomy support from a teacher provides a worthwhile part toward improving learners' intrinsic and self-determined extrinsic motivation (Gillet, Vallerand & Lafreniére, 2012: 90).

Since the study was administered in a culturally diverse classroom setting, the next section of this chapter will probe cultural diversity in a multi-cultural school context.

## 2.6. Cultural diversity

Culture is a ubiquitous, complex and universal phenomenon, since every community has its own culture that separates it from others. Samovar, Porter and McDaniel (2010: 23) define culture as a set of human-made objective and subjective components that in the past have increased the probability of survival of a specific community. These components also resulted in gratification for the members in an ecological niche. The features became shared among those communities that lived at the same time and in the same place and had a common language. In this context the ecological environment is a culturally inclusive classroom situation where STAD was employed to assign learners into culturally diverse groups with different learning abilities. The set-up is made to help learners manage cross-cultural relationships and develop intercultural tolerance.

As it is indicated above that culture is complex, it therefore has many definitions for different contexts. In this study, interrelated factors which are important to teaching and learning are going to be adopted to define culture.

Lemmer, Meier and van Wyk (2012: 20) list the following ten (10) elements as related to teaching and learning.

- Cultures are processes of social and human interactions. For the purpose of this research learners' interactions would develop a culture of learning together towards achieving a group goal.
- Cultures embrace a body of knowledge.
- Cultures are dynamic, creative and continuous processes.
- Cultures are created by people.
- Cultures change continuously over time.
- Every culture has its own system of values, beliefs, norms and attitudes.
- All cultures have material artefacts.
- Cultures have unique verbal and non-verbal patterns of communication.

- Cultures are shared and learned.
- Cultures influence the way people think, feel and behave.

Cultures have visible and hidden faces, those that can be easily recognised and those that are discreet. As a teacher, it is crucial to take into cognisance both the explicit and implicit forms of culture. The same applied to learners as during group discussions and processes they encountered one another's explicit and hidden cultural faces that make each one of them unique. They shared knowledge, resources and influenced each other to adopt certain behavioural aspects, values, attitudes and learning styles, thereby also creating their own group culture of learning and deportment.

Baker and Clark (2010: 263), for example state that Chinese people appreciate individualism more that teamwork. Their culture promotes individual contribution, which is a more competitive situation than the cooperative learning environment. Moreover, Lemmer,Meier and Van Wyk (2012: 22) stress that there are various micro-cultures that can influence classroom teaching, such as gender, whereby teachers should recognise and plan gender-appropriate educational experiences. Technology as a subject is relevant to address gender education as topics, such as gender inequalities which are taught and how different historical events affected different genders. Secondly, teachers need to adopt ways of accommodating the different learning and language abilities of learners, socio-economic differences and various family structures they find themselves in. In schools there are learners with slow and impaired learning abilities that need teachers' attention. There are also learners from different economic backgrounds; therefore assignments should not be a costly exercise that could disadvantage those from lower income families. The society is now composed of various family structures ranging from nuclear families, single parents, extended families and child headed households that also need to be taken into consideration.

Allison and Rehm (2006: 51) and Sharan (2010: 197) suggest cooperative learning as a generic and diversified pedagogy as being able to reach out to multicultural education. Cooperative learning offers teachers in culturally diverse classrooms a broad variety of teaching strategies to help cope with different backgrounds and learning styles. In this case STAD as a cooperative learning method, was employed to help the researcher develop a framework for Technology teachers to enable them to manage culturally diverse classrooms effectively.

Furthermore, culture affects learning, because of preferences with regard to the learning styles of various cultures. Learners, who grow up in societies with strong uncertainty avoidance or with low tolerance of uncertainty, prefer structured learning situations. They are comfortable with precise goals, detailed assignments and strict timeframes. These types of learners view teachers as experts that have all the answers and therefore are afraid to give wrong answers (Allison & Rehm, 2006: 51; Baker & Clark, 2010: 263; Sharan, 2010: 199), whereas learners from cultures with strong tolerance of uncertainty have no problem in answering spontaneous questions with more than one correct answer. In STAD groups learners would need to learn to be free in giving opinions that could either be accepted or rejected by teammates. The socio-cultural perspective also views learning as an activity that takes place through participation, as cognition is distributed across group practices, mediated actions whereby people are affected by this cultural and social environment in the classroom where STAD is employed (Eames & Bell, 2005: 156; Ali, Rohindra & Coll, 2008: 152).

Vaughan (2002: 471) contends that instructional strategies and learning styles favoured in the schools are inconsistent with cognitive styles, cultural orientation and cultural characteristics of some learners and therefore suggests the use of cooperative learning in the schools. Frisby (1993: 1), however, argues that there is no compelling evidence supporting the belief that Black (African) learners learn any differently that White (European) learners as a function of their ethnic or racial culture. Hale (1993: 3), McNaughton, Lai, MacDonald and Farry (2004: 190), Phuong-Mai, Terlouw, Pilot and Elliott (2009: 871) maintain that it is evident that learning styles of learners differ according to their background, based on cultural, ethnic and racial differences.

Moreover, Samovar, Porter and McDaniel, (2010: 199) explains that individualism as a cultural value embraces individuals as important entities within a society and therefore promotes independence rather than interdependence and rewards individual achievement. Collectivism is then defined as a cultural value that emphasises the views, needs and group goals over individuals and therefore encourages interdependence more than independence (Samovar, Porter, McDaniel & Roy, 2012: 202). It is then clear to the researcher that learners from individualistic types of cultures were not easily incorporated into the cooperative learning classroom set-up where STAD is used, whilst it could be much easier to encourage the use of STAD groups by learners from collectivistic cultures, as they are brought up in an environment that supports interdependence.

Furthermore, culturally relevant pedagogy argues that learners should be empowered to scrutinise what they are learning and how relevant it is towards creating a democratic and multicultural society. Learners should be able to identify application and inclusion of culture in the curriculum and instruction that assist them to comprehend the fabric and the socio-political nature of their society. When these attributes are understood, students would develop motivation to acquire cultural knowledge pertaining to their own cultural ways and systems (Milner IV, 2011: 71; Ali, Rohindra & Coll, 2008: 152).

Cultural diversity covers a wide range of dimensions and can be defined as a representation of differences by race, ethnicity, heterogeneity, physical features as well as attitudinal differences (Addison, 2006: 3; Ranaivoson, 2007: 4). Cultural diversity is strongly supported by the schools' curriculum of South Africa as it states that education should bring about social transformation, promote inclusivity and sensitivity to issues of diversity, such as poverty, inequality, race, gender, language, age, and disabilities (DBE, 2012: 5). The researcher also included aspects pertaining to the awareness of cultural diversity in his framework to help educators to design classroom activities that would promote cultural tolerance among the learners. Secondly, the research would help to incorporate the various learning styles of learners that teachers may assist learners with, such as field-dependent and field-interdependent learners in a classroom where STAD is used as a teaching method (Lemmer, Meier and Van Wyk, 2012: 89).

Since the study is going to be administered in a cooperative learning atmosphere, it is important to include and discuss social interdependence in this chapter as it is a foundational theory for cooperative learning methods.

## 2.7. Social interdependence

Social interdependence theory provides a foundation on which cooperative learning is built. Its application to education has become one of the most successful and wide spread applications of social and educational psychology to practice (Johnson & Johnson, 2005: 287; Attle & Baker, 2007: 77; Johnson, Johnson & Smith, 2007: 16; Johnson & Johnson, 2009: 365; Smith, 2010:4).

Social interdependence occurs when individuals' actions affect others' achievement of outcomes including their own (Johnson and Johnson, 2009: 366). Therefore, learners in a STAD classroom environment work together to learn and are responsible for their team-mates' learning as well as their own (Holmes, 2002: 3; Sonthara & Vanna, 2009: 2).

According to Johnson, Johnson and Smith, (2007: 16), Johnson and Johnson (2009: 316) and Smith (2010: 4) there are, however, two types of social interdependence, positive (cooperation) and negative (competition). Positive interdependence implies that individuals understand that they can reach their goals if and only if the other persons with whom they are cooperatively grouped as in STAD groups also obtain their goals. Members of STAD teams are expected to be supportive of each other's efforts to achieve the expected team and individual aims of performing well in class and improving their academic achievement.

Secondly, negative interdependence takes place when learners believe that for them to obtain their intended outcomes, this can only happen if those who are competitively linked to them fail to obtain their goals. In this situation learners obstruct each other's exertions to achieve their goals (Johnson, Johnson & Smith, 2007: 16; Johnson & Johnson, 2009: 316; Smith, 2010: 4).

This kind of environment should be remedied by teaching learners how to work cooperatively during the Technology STAD lessons and be encouraged to help one another for the purpose of improving everyone's academic achievement and social skills and also enhance cross-cultural relationships. Choi, Johnson and Johnson (2011: 977) indicate that no interdependence is when learners are aware that they do not need one another to achieve their goals and are also not bothered by others achievements or no achievements. Each of the above situations of interdependence ends in a particular psychological process.

### **2.7.1.** Psychological processes

There are three psychological processes resulting from interdependence: substitutability, as the degree to which actions of one person substitute for the actions of another individual. Infusibility is the openness to being influenced and to influencing others. Lastly, cathexis is regarded as an investment of psychological energy in objects outside oneself, such as teammates, friends, family and colleagues at work (Johnson, 2003: 935; Johnson & Johnson, 2005: 290; Johnson, Johnson & Smith, 2007: 17).

The above processes show how personal interest is expanded to joint interest and the way new aims and motives are created in cooperative learning and competitive situations (Johnson, Johnson & Smith, 2007: 17). Therefore, there is a high possibility that in a Technology class where STAD is employed, individual group members would influence one another to adopt good work ethics and values in order to obtain group goals. Team members are expected to invest their efforts and emotions in one another and build joint application of them for the purpose of team success. Thus group interest should eventually become the priority of each member. Johnson, Johnson and Smith (2007: 17) further indicate that negative interdependence creates the psychological process of non-substitutability, infusibility and cathexis, thus there is no transformation of actions within a group, resistance to influence by other members and each individual is pressing for personal goal without compromise.

### **2.7.2.** Interaction patterns

The central property of social interdependence is the manner in which interdependence is structured, that determines how people interact and the interaction pattern determines the outcomes of the situation. Positive interdependence brings about promotive interaction, whereas negative interdependence produces oppositional or congruent interaction, whilst no-interdependence results in the absence of interaction (Johnson & Johnson, 2005: 292; Johnson, Johnson & Smith, 2007: 17).

Positive interaction is defined as individuals engaging in actions that encourage, facilitate each other's effort to increase the possibilities of each member's success in obtaining a mutual goal. It is determined by variables, such as mutual assistance, exchange of resources, effective communication, mutual influence, trust and constructive conflict management. Oppositional interaction may be defined as individuals discouraging and obstructing each other's efforts to complete tasks, achieve, or produce in order to reach their goals. Individuals in a group focus both on increasing their productivity and hindering other members to achieve more than they do. It consists of aspects, such as obstruction of each other's efforts to achieve their goals, threats and coercion, ineffective and misleading communication, distrust and striving to win in conflicts at all costs (Johnson, 2003: 935; Johnson & Johnson, 2005: 293; Johnson, Johnson & Smith, 2007: 17).

Lastly, no interaction is defined individuals working independently to obtain their own goals without affecting the achievement of outcomes by others. Individuals focus only on their own productivity and achievement and ignore the efforts of others as irrelevant (Johnson, 2003: 935; Johnson & Johnson, 2005: 293; Johnson, Johnson & Smith, 2007: 17). Therefore, cooperation exists when people take action to achieve a goal in a positive interaction and competition happens when individuals take action to achieve a goal in a contradictory interaction situation (Johnson and Johnson, 2005: 293).

The application of the social interdependence theory in this study is based on positive interdependence that enables promotive interaction within STAD groups to obtain stated team goals, increase possibilities of high academic achievement and improve in taught social skills and a positive attitude in the Technology classroom. Learners would be taught how to positively depend on one another and build trust among team members and embrace behaviours and characteristics, such as mutual influence, trust, effective communication, sharing of resources and constructive management of conflicts.

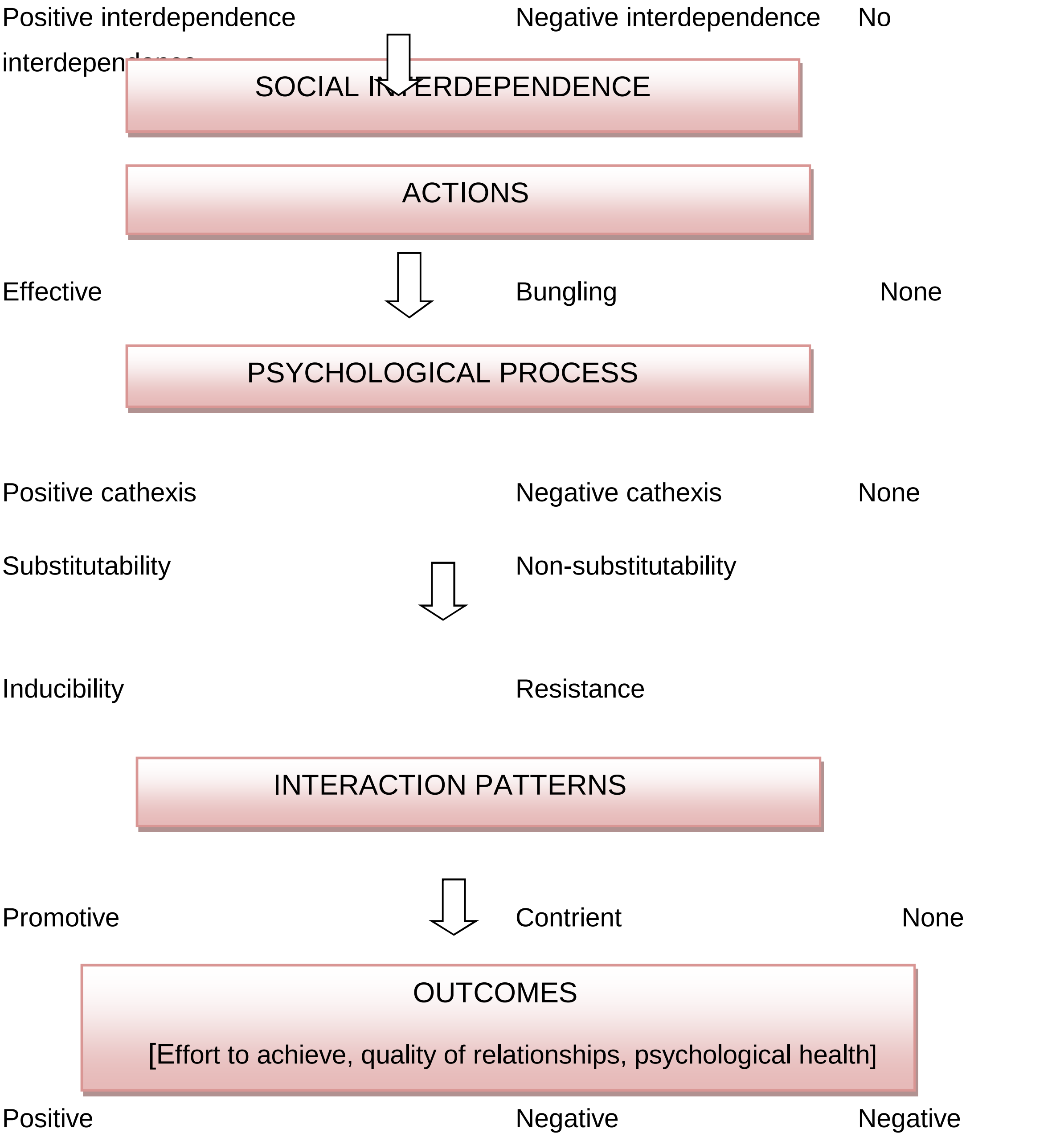


Figure 2.5 Overview of Social Interdependence Theory (Johnson & Johnson, 2009: 367)

## 2.8. Conclusion

This chapter's discourse focussed on the theories that underpin the study for the purpose of attainment of the aims of this inquiry.

The chapter covered a brief background of the South African Education System from the late 1990s when Outcomes-Based Education was introduced as Curriculum

2005. The South African government, through the Department of Education, praised the then new curriculum as democratic and eradicating the evils of the apartheid education and promoting nation building in schools and in classrooms. The National Curriculum Statement (NCS), came as a follow-up on complications of language and content management of Curriculum 2005. The NCS simplified the complex terminology and made content to be more manageable toward attaining the specified outcomes.

These two models encouraged the use of cooperative learning methods in the classroom in order to help learners to develop critical thinking, social skills and practice social justice to become team players in the society.

After a decade, the Department of Basic Education introduced a new National Curriculum known as Curriculum and Assessment Policy Statement (CAPS) to remedy the cry of back to basics, as complaints were raised that NCS standards are low. Therefore, CAPS stipulated the exact content or subject matter and specific topics to be covered in every grade through the course of the year. This model does not specify or propose use of any method of teaching to achieve its goals. CAPS still promote the outcomes stated in the NCS, such as critical thinkers, social responsibility, cultural diversity and social justice.

As the study intends to develop a framework for Technology teachers to implement STAD in their classrooms and also to modify STAD toward inclusion of intrinsic motivation in order to help learners aim and obtain improved academic achievement and attitude toward Technology and STAD.

For these purposes, constructivism, as a macro theory of learning underpins the study, because STAD is a cooperative learning method of teaching and it is governed by social interdependence that is founded in social and cognitive constructivism. Various theories of motivation were elaborated on to assist and direct the study to the inclusion of intrinsic motivation in STAD. Lastly, social interdependence theory has been discussed to explain the principles that govern the use of STAD in the classroom.

In the next chapter, cooperative learning as the mother-body strategy for teaching from which STAD emanates will be critically discussed.

# CHAPTER 3

# COOPERATIVE LEARNING AS A TEACHING AND LEARNING APPROACH

## **3.1.** Introduction

In the preceding chapter a brief overview of the South African education systems has been discussed, from the end of the apartheid era into the democratic period. It indicates that the apartheid education system was regarded as a vicious tool used to oppress the other section of the South African youth (Motala, 2009: 185). This was the main concern for the new democratic government, which needed serious attention to rectify.

The new curriculum was then introduced as outcomes based education (Curriculum 2005), intended for all schools in the country to break the inequality barriers. This curriculum evolved over the years to the Revised National Curriculum Statement, National Curriculum Statement and now the Department of Basic Education is in the process of introducing Curriculum and Assessment Policy Statement (CAPS) in all the phases of basic education. The changes were influenced by ways of adjusting the terminology to be more user-friendly and easily comprehended by implementers (educators) and trimming the outcomes to developmental and critical outcomes that could be reached through the assessment standards. These assessment standards also shed light on the content that should be covered per grade. The latter development in the curriculum was mainly to stipulate the exact topics to be taught in a period of time, such as an hourly term span.

Nejadghanbar and Mohammadpour (2012: 22) assert that cooperative learning is rooted in theories, such as social interdependence by Deutch, Johnson and Johnson, cognitive development by Piaget and Vygotsky and behavioural learning theories of Bandura and Skinner.

The researcher discussed various theories that support this study on STAD as a group learning technique and a teaching method of cooperative learning. Constructivism, as one of the theories, was introduced as a belief that learners who actively take part in group learning are able to make relevant meaningful usage of knowledge obtained from the discussion of the subject matter (Horn, 2009: 515; Jansen, 2009: 175). The researcher further alluded to theories of motivation in order to bring about intrinsic motivation to learners in a Technology class where STAD is employed. It is an important factor that learners should develop enjoyment of the subject and has desires to aim at achieving work of high standard. This could be attained through intrinsic motivation, where learners are internally influenced and convinced to direct their energy toward achieving the higher goals they have set for themselves as individuals and STAD groups. In STAD learners are required to focus their energy and effort toward obtaining group and individual goals.

Since learners would be working in groups, it was necessary to also discuss a brief role of cultural diversity and learning styles as the environment of the study is within a culturally diverse setting. It is fundamental to understand how different cultural backgrounds can play a major role in the way students prefer to learn at school.

Lastly social interdependence was discussed as a theory that governs cooperative learning. It was indicated that social interdependence can be positive, negative or non-existent in a group set-up and this would determine the ability of a team to achieve its goals.

The researcher is of the opinion that cooperative learning, as a social constructivist approach, is fore-grounded on the John Dewey's publication entitled: *Democracy in Education Theory.* The author argued that the school does not represent the contemporary social movement (democracy) of freeing the intelligence of learners, but contended that learners are not expected to think outside the prescribed curriculum that is presented by the teacher (Dewey, 1903: 193-204; Sherman, Schmuck & Schmuck, 2004: 195).

Dewey further mentioned various societies, including criminal gangs, that common goal or interest is found in them with a certain amount of interaction and cooperation to plan and work together to achieve the goal of the group. Therefore, educational setting methods of instruction and disciplines should be revolutionised to minimise the doctrine of extreme individualism and emancipate learners to cooperate and be agents of a comprehensive and progressive society (Dewey, 2008: 40; World Wide School, 2013: 19). Dewey believed that learning is a social activity and the curriculum should be aimed at intense comprehension, which includes interdisciplinary and multidisciplinary curricula, projects, portfolios and other methods of assessment that engage learners to blend ideas and showcase their competence (Smith, 2006: 2).

## **3.2.** The brief history of cooperative learning

In the early 1900s one of Gestalt-theory proponents by the name of Kurt Koffka was of the opinion that the organism-environment interaction influences the behaviour of the organism based on the experiences (Koffka, 1922a: 3; Ash, 1981: 352), since the phenomenon of consciousness, unconsciousness and the function of the organism go hand in hand.

Koffka who was, however, influenced by Gestalt did not bring significant influence to learning, but it can be seen or deduced from his conclusion that he believed that an environment in which a learner finds himself or herself in, such as the classroom, play a pivotal role toward modifying his or her behaviour, due to the experiences brought by interaction with other learners (Koffka, 1922b: 16; Koffka, 2010: 377). Koffka further attested that societal groups are committed entities with various levels of interdependency (Van Wyk, 2007: 154).

Koffka was then followed by Kurt Lewin, who was one of Koffka's students. Lewin focused on the processes that determined individual behaviours. One of these processes included group dynamics, that states a team is not established on similarities or dissimilarities of individual team members, but the interdependence of destiny, whereby this interdependence of group members affect change in individuals' behaviours (Schein, 1995: 20-23; Sherow, 2006: 8; England & Chernauskas-Beecher, 2012: 14-18).

It is historic also to mention Lewin's passion in children's lives with regard to their feedback or reaction to discouragements, levels of aspiration and various leadership styles (autocratic, democratic and laissez-faire) and tasks (Sherman, Schmuck & Schmuck, 2004: 193). This is relevant to this study as learners in the Technology classroom are children and are going to react differently to cooperative learning, due to their various perceptions about working in teams. They would also meet challenges pertaining to their leadership roles and conflict resolution abilities.

The baton was then received by Morton Deutsch, as one of Lewin's scholars. Deutsch developed the interdependency notion further in the late 1940s (Van Wyk, 2007: 154). His theory was more relating not only to the individuals and group achievements of cooperation and competition, but to the processes which would promote these aims (Deutsch, 1991: 3; Deutsch, 2006: 8).

Deutsch further identified two essential types of goal interdependence and types of actions taken by people involved in the process. Promotive interdependence is where intentions are joined positively and contradictory interdependence is where the goals are negatively connected. Therefore, a promotively linked group is "sink or swim together"; while a joint group is "others sink and others swim". These also include no goal interdependence. The two types of actions he came up with are effective actions, which improve the individuals' chances of obtaining their intentions. Secondly, bungling actions, which deteriorate individuals' likelihood of obtaining their goals (Deutsch, 1949: 133-134; Deutsch, 1991: 3-4; Johnson & Johnson, 2006: 288-291).

David and Roger Johnson, who were also the students of Deutsch, broadened the spectrum of social interdependence, with regard to educational (academic) achievement, relationships, psychological health and social development (Deutsch, 1986: 3; Johnson & Johnson, 2006: 287).

David and Roger Johnson designed a model that could help student teams to achieve positive interdependence during their group tasks. This model indicates that there should be promotive interaction to support everyone's effort to achieve, encourage positive relationships among team members and to boost psychological adjustment for social competence of each group member (Johnson & Johnson, 2006: 305).

In the 1970s, the members of the International Association for the Study of Cooperative Education (IASCE) presented that cooperative learning reinforced positive integration of Black and White students (Sherman, Schmuck & Schmuck, 2004: 194).

Moreover, some of the members of the IASCE developed various techniques (methods) of cooperative learning. Elliot Aronson came up with jigsaw 1, Robert

Slavin developed team competition techniques, such as student teams' achievement divisions (STAD), team games tournament (TGT) jigsaw 2, teams accelerated instruction (TAI) and CIRC. Shlomo and Yael Sharan came up with the group investigation (GI) technique and Spenser Kagan developed coop-coop. Johnson and Johnson developed learning together (LT), creative conflict (CC); Donald Danseareau introduced scripted student dyads (SSD); Lawrence Sherman discovered student team project (STP) and dyadic essay confrontation (DEC); Elizabeth Cohen developed complex instruction (CI); John Fantuzzo introduced reciprocal peer tutoring (RPT) and lastly Emmy Pepitone developed co-action and co- labour (C&C) (Sherman, Schmuck & Schmuck, 2004: 195).

The summary of cooperative learning is illustrated in figure 3.1. This diagram shows the genealogy of Kurt Lewin's influence up to the present day gurus in cooperative learning. The illustration has been adapted from (Sherman, Schmuck & Schmuck, 2004: 195)

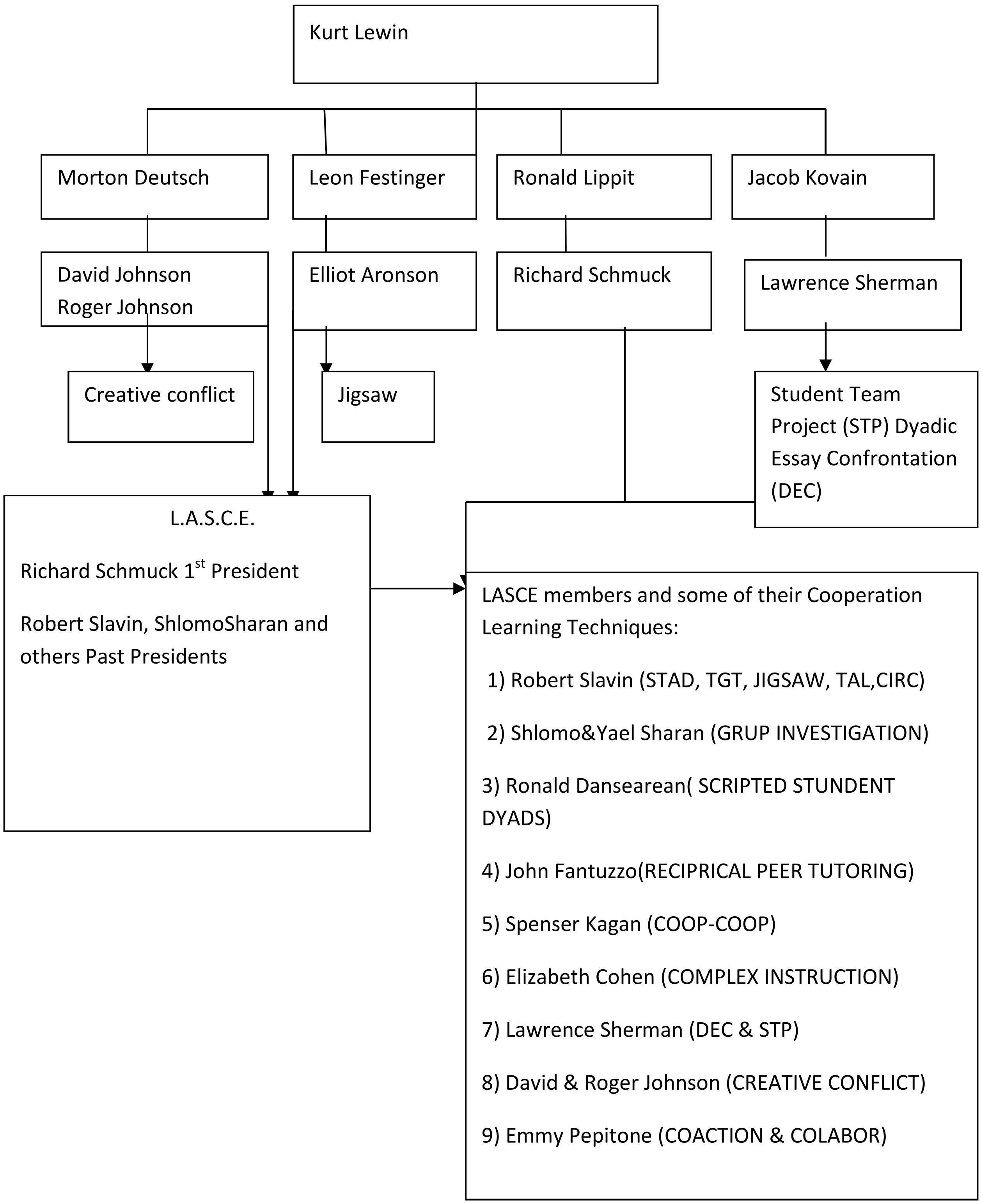


Figure 3.1 Cooperative Learning Lineages adapted from (Sherman, Schmuck & Schmuck, 2004: 195).

## 3.3. The definitions of cooperative learning

Cooperative learning has been interpreted as methods in which learners work in small heterogeneous learning teams to master academic material (Slavin & Oickle, 1981: 174; Johnson & Johnson, 2006: 327). Furthermore, they also indicate that cooperative learning has been reported in a series of studies to significantly improve learners' achievement, race relations and social skills. According to Slavin (1995: 1; 1996: 43), cooperative learning has been received as one of the greatest stories in the history of educational findings. Where learners organise tasks in groups to build positive interdependence, exercise accountability with regard to the team's work, develop acceptable social skills and conflict resolution (Van Wyk, 2007: 153).

Kohn in Mueller and Flaming (2001: 259) argue that cooperative learning is a form of pedagogy that brings classrooms and societies near to the ideal of social justice. Furthermore, cooperative learning is also a pedagogical practice that occurs when two or more learners work together to learn the same subject content (Sherman, Schmuck & Schmuck, 2004: 192).

Several scholars' cooperative learning methods have had a significant impact on academic achievement, namely; learning together, academic controversy, student teams achievement divisions, teams-games tournaments, group investigation, jigsaw, teams-assisted individualization and cooperative integrated reading composition (Johnson, Johnson & Stanne, 2001: 1; Sherman, Schmuck & Schmuck, 2004: 195). Moreover, some research studies also define cooperative learning as an example of an organized and managed group work, in which learners work cooperatively in small groups to maximize academic as well as affective and social goals (Lee, Ng & Jacobs, 1997: 1; Messerschmidt, 2003: 107; Swab, 2012: 11).

Bossert (1988: 225) describes cooperation as an imperative part of group life, which benefits from the ant telic quality of working with others on a shared task to its perceived function as the cornerstone of modern democracy. Therefore, according to the researcher, in the classroom cooperation is both a skill required for the accomplishment of learning activities and a norm to be learned. When working together on a task and interacting with peers to achieve group aims and personal goals, learners should implement the five primary elements of cooperative learning.

On the other hand, Attle and Baker (2007: 77) explain that cooperative learning as a teaching and learning approach in school is based on the theories of cognitive development, behavioural learning and social interdependence. Furthermore, Gillies (2003: 3) asserts that Vygotsky's theory proposed that children's knowledge, ideas, attitudes and values develop through interactions with others. These effects are more tangible during interactions with adults or more able peers. In this regard learning is mediated or unfolded to enable the completion of tasks that would be difficult for children to do by themselves. They further contend that Vygotsky's theory explains this state of a learner being able to successfully complete a task under the guidance of an adult or in collaboration with a more capable peer (s) as 'the zone of proximal development'. Hornby (1997: 448) supports Vygotsky's theory, that an individual cognitive system is a result of communication in social groups and cannot be separated from social life.

In the STAD technology classroom learners would be assigned to heterogeneous groups in terms of their academic capabilities and race and or ethnic background. Learners were further observed on the academic achievement improvement, race relations and social skills development with regard to small group interactions. The aim of the study is to inquire on the effects of STAD pertaining to the above mentioned variables.

### **3.4.** The nature of cooperative learning

Cooperative learning may be differentiated from traditional "direct transfer" models of instruction in which the teacher is the sole distributor of knowledge and skills (Johnson & Johnson, 2003: 786).

Cooperative learning is therefore well organised and structured group learning, where learners are accountable for their learning and dependent on social interaction with other learners (Hornby, 1997: 443; Johnson & Johnson, 2003: 786). Moreover, cooperative learning is a psychologically and socially based strategy that assists learners to work together to reach their learning objectives (Hornby, 1997: 443). In addition, Johnson and Johnson (1989: 7; 2003: 786) state that cooperative learning is the instructional use of small groups for learners to work together and maximize their own and each other's learning, to motivate and encourage one another to work their hardest.

Various studies on cooperative learning (Johnson & Johnson, 1995: 1018; Johnson & Johnson, 2003: 786; Hänze & Berger, 2007: 30) continue to strengthen the view that in a cooperative learning environment there is a positive interdependence among groups' goal achievement. Each member is aware that the only way to attain the learning goal is by the group reaching the learning goal. They further mentioned that there are four types of cooperative learning that may be used for Technology, namely formal cooperative learning, informal cooperative learning, cooperative base groups and academic controversy.

According to the explanation above, it can be understood that the teacher and learners have to be trained in the implementation of cooperative learning methods in order to achieve requirements, such as organisation and preparations to achieve expected processes and end results like positive interdependence and group goals.

### **3.4.1.** Formal cooperative learning

Research studies conducted on formal cooperative learning are well documented, arguing that when learners work together for one or several class sessions to reach a shared goal and in one accord complete a task at hand, it can be said to cooperative learning. These studies concurred that learners go through a full learning unit or project where they will make decisions, solve authentic problems, conduct research and compile a report (Johnson & Johnson, 1995: 1018; Johnson & Johnson, 2003: 788; Johnson, Johnson & Smith, 2004: 8). Therefore, when conducting a class using formal cooperative learning, a teacher has to specify plans for the lesson, make a number of pre-instructional decisions, monitor learners' progress and intervene within the groups and lastly evaluate learners' progress and process how well they functioned as a group (Johnson & Johnson, 1995: 1019; Johnson, Johnson & Smith, 2004: 14). The steps to administer formal cooperative learning are discussed below.

- *Specify the objectives for the lesson*. Every lesson should have an academic objective stipulating the concepts and strategies to be learned, social skills' objectives stating the interpersonal or small group skill to be used and mastered during the lesson.

- *Make a number of pre-instructional decisions*. Now a teacher should conclude on the groups' sizes, a way of assigning learners into groups and a role each member of a group will play. The instructor must prepare suitable learning material (worksheets) for a successful lesson and decide on classroom arrangement.
- *Explain the task and the positive interdependence*. The facilitator thoroughly explains the assignment and teaches the required concepts and strategies. Then the instructor specifies the positive interdependence and individual accountability. The criteria for success are then introduced and the expected social skills to be engaged in are also illustrated.
- *Monitor students' learning and intervene within the groups to provide assistance or increase learners' interpersonal and group skills.* An educator systematically observes and collects data on each group as it works. When help is needed, the teacher intervenes to assist learners in completing the task accurately and in working together effectively.
- *Evaluate students' learning and help learners' process how well their groups functioned.* The learning process is carefully assessed and learners' performances evaluated. Group members evaluate their effectiveness as a team (Johnson, Johnson and Smith, 1995:41; Smith et al. 2005: 94).

The five procedural steps indicated in the above paragraph gave clear guidance to the researcher when he employed STAD in the Technology classroom. As the teacher, the researcher thoroughly prepared the content to be taught and arranged the classroom accordingly to provide the atmosphere for cooperative groups. Proper preparations and organisation enabled the researcher to set clear objectives for the lessons and explain the material accurately for learners' understanding. It was also easier to and effective for the researcher during group interventions, to evaluate group processes.

### **3.4.2.** Informal cooperative learning

Informal cooperative learning groups are temporarily arranged when necessary during a lesson for few minutes or the whole class period. A teacher demonstration may be used to focus learners' attention toward the material to be learned, create a conducive environment for learning and set objectives of what will be covered during the lesson. The learners' cognitive processing of the taught materials should also be ensured (Johnson & Johnson, 1995:1019; Johnson, Johnson & Smith 1995: 43; Smith, Sherpard, Johnson & Johnson, 2005: 93).

During this direct teaching, the challenge for the teacher is to ensure that learners do the intellectual work of organizing material by explaining and summarizing it and integrating it into existing conceptual structures (*relating to the previous knowledge or experiences)*. Informal cooperative learning groups are often arranged so that learners engage in 3 to 5 minutes' turn-to-your-partner discussions, in between lecture demonstrations and closing instructions (Johnson & Johnson, 1995: 1019; Johnson, Johnson & Smith, 1995: 43; Johnson, Johnson & Smith, 2004: 8).

In the context of this study, informal cooperative learning was not applicable, since there were medium term groups where learners stayed in one team for the duration of the study.

### **3.4.3.** Cooperative base groups

Cooperative base groups are long term, heterogeneous learning groups with stable membership. The purposes of the base groups are to give the support, help, encouragement and assistance each member needs to make academic progress. Thus a member should attend classes, complete assignments and have ample time to learn. Base groups also help develop cognitively and socially in healthy ways (Johnson & Johnson, 1995: 10199; Johnson, Johnson & Smith 1995: 43; Streeter, 1999: 1; Johnson, Johnson & Smith 2004: 8).

Base groups meet on a daily basis in the primary school and twice a week in secondary school or whenever convenient, the group meets. They are permanent lasting from one to several years. This provides the long term caring peer relationships necessary to influence members consistently to work hard in school (Johnson & Johnson, 1995: 10199; Johnson, Johnson & Smith 1995: 44). They further contend that groups meet formally to discuss the academic progress of each member, provide help and assistance to one another and make certain that each member is completing tasks and progressing well through the term.

Base groups are not relevant for the present inquiry. After the learners, however, indicated their views on STAD in Technology lessons, it was concluded to keep the groups for following year or years for further investigation. This could be a study on whole school implementation of STAD or cooperative learning as teaching and learning strategy.

## **3.5.** Characteristics of cooperative learning

According to Slavin (1990: 12), cooperative learning methods could be classified within the six main characteristics, namely group goals, reward, where each member is made aware of the intended objectives of the group, such as completing tasks or rewards to be obtained for excellent work. Then there is individual accountability, which could be achieved in two ways. Each learner's scores contribute towards group scores or through specialized task for individual members.

Equal opportunities for success are another characteristic that ensures that all members contribute to their teams by using progression points. There is also team competition that helps to motivate teams to compete for a prize at the end of the task. Task specialization, is where each member has a unique task to complete toward contributing to the team's project. Lastly there is adaptation to individual needs, in which teams assist weaker members to comprehend the work assigned to the groups much better (Slavin, 1990: 12; Nejadghanbar & Mohammadpour, 2012: 23).

### **3.5.1.** Elements of cooperative learning

To make cooperative learning work in Technology classes, a teacher has to understand and master the basic elements that make cooperative learning work.

There are several essential elements of cooperative learning that should form the basis of every cooperative lesson (Johnson, Johnson & Holubec, 1994: 9; Johnson & Johnson, 2009: 366).

Firstly, positive interdependence is said to be the most important, the heart element of cooperative learning. Learners must be provided with clear task and group goals so that they know and understand that they sink or swim together. Group members must be aware that each individual's efforts are beneficial to group success. Through positive interdependence, commitment to other learners and own success is created as the heart of cooperative learning (Laing, 2002: 31; Johnson, Johnson & Tjosvold, 2012: 14). Therefore, STAD Technology tasks should be structured in a way that group members would be aware that they need each other towards achieving the group goals.

Individual and group accountability is the second valuable principle of cooperative learning. The whole group must be accountable for achieving its goal. Each member should be accountable through contributing a fair share of the work. Thus no 'free riders' should be allowed to depend on the efforts of others. The group has to be clear with its goals and should be able to measure its progress toward attaining them and the individual efforts of each member. Individual accountability is evident when each member's performance is assessed and the feedback and results are given back to the group and the individual. This is to enable the group to know which member needs more assistance, support and encouragement in completing the assignment, improving academically and in other important skills (Johnson & Johnson, 2006: 317; 2009: 368; World Education, 2009: 8).

During the discussions each member of the team should contribute by responding to given worksheets in order to assure the group that all members are acquainted with the material to be learned. The purpose would be to ensure that all group members have received assistance before taking the individual assessment. Thus the team should be confident that all members will do well to improve group points and individual average.

Thirdly, face to face promotive interaction is another essential element of cooperative learning where learners do real work together promoting each other's success by sharing resources and helping, supporting, encouraging and praising each other's efforts to learn. Cooperative learning becomes an academic support system and personal support system. Crucial cognitive developments and interpersonal dynamics occur only when learners help each other's learning by orally explaining how to solve problems, discussing concepts, contributing one's knowledge to enhance group mates and comparing the previous knowledge from past content and experiences with the new knowledge gained. Promotive interaction empowers learners to be committed to each other as well as their mutual goals (Johnson, 2003: 939).

The fourth important element of cooperative learning is teaching learners necessary interpersonal and small-group skills. Cooperative learning tends to be more complex compared to competitive individualistic learning, as learners do academic content as well as the interpersonal and small-group skills required to function well in a group. Each learner must know how to provide effective leadership, make correct decisions, build trust, communicate and manage conflict and be motivated to do so. Teamwork skills need to be taught as precise and purposeful as the academic skills. This is because when people work together (cooperation) conflicts arise and therefore procedures and skills to manage these situations constructively are very important for the success of the group (Johnson, 2003: 939; Johnson & Johnson, 2006: 320).

Lastly, the other essential principle of cooperative learning is group processing and can be achieved when members discuss how well they are achieving their goals and maintaining effective working relationships. Thus every member's actions need to be evaluated and be told which are helpful and destructive and decide on what behaviours to continue with or change. Careful and continuous analysis of how members are working together can improve effectiveness of the group (Johnson, 2003: 939; Johnson & Johnson, 2006: 321; Johnson, Johnson & Smith, 2007: 24).

These five basics are discipline that must be strongly applied to produce the conditions for effective cooperative actions. Therefore, learners should be oriented through all these phases to master cooperation. Therefore, one would not put students in groups and expect them to work cooperatively since they do not have the skills needed for the success of cooperative learning groups.

In Technology classes where STAD was administered, the researcher clarified the basic elements of cooperative learning and did drills to see that all the teams were acquainting themselves with these principles. Thus, there was a lesson on cooperative learning groups in order to obtain the intended outcomes by the various groups and for the researcher to be certain that groups were working according to the correct cooperative learning principles. When learners understood what was expected of them, it became easy to manage the class and the invited observers' duties were manageable.

Johnson and Johnson (1995: 1021) and Johnson, Johnson and Smith (1995: 13-21; 2007: 17), unfold on how to go about achieving positive interdependence in cooperative groups by outlining important factors that should take place. Firstly, giving and receiving help and assistance is important within most task situations. Productivity is advanced and reformed when members give each other relevant task related help and assistance. Consistency in helping and tutoring should be frequent and evident to minimize obstructive competition.

Exchanging resources and information without bias as a cognitive process brings about efficiency and effectiveness to group performance. This happens when members share their resources and knowledge fairly with group members to collectively share individual insights. That is adding value towards successful completion and production of good quality work. It further benefits the giver by improving cognitive organisation and processing, high level reasoning and personal commitment to achieving group's goal. The researcher is of the understanding that, 'blessed is the mind that contributes constructively towards team's goal' (Johnson, Johnson & Smith, 2007: 17; Johnson & Johnson, 2009: 368).

The researcher will encourage the learners in the STAD Technology classroom to be honest with each other among their groups by giving genuine assistance and support to others in order to build trust with their team members.

Giving and receiving feedback on task work and teamwork behaviours is another essential aspect. In cooperative groups members monitor each other's efforts, give immediate feedback on performance and help or assist each other when there is a need. It is also important for group members to give each other feedback on how they are fulfilling their responsibilities and contributions toward completing their task. Members should be honest to rid and cultivate unwanted behaviour and nurture helpful behaviour that improves the efficiency and effectiveness of the group.

Every member of the group is made aware that a group is a unit and therefore the competition is between groups not individuals within a group. They should know that any useful information acquired should be shared with the team. It is also important that each member updates the team about the progress of individual accountability (Finelly, Bergom & Mesa, 2011: 4; Zarei, 2012, 165).

Challenging each other's reasoning is also crucial to group discussions. Intellectual controversy promotes curiosity, motivation to learn, reconceptualization of acquired knowledge, high reasoning and cognitive development and conflict resolutions. Learners grow in constructively defending their opinions by providing a group with factual reasoning. This will help the group to make informed decisions by digging more into the material being discussed so as to improve the mastery and reconceptualization (Johnson, Johnson & Smith, 2007: 25).

As groups engage in discussions they need to be reminded of interpersonal and small group skills, to monitor the way they express their opinions. It should be in a manner that respects other members and their voices should also be low to avoid disrupting other groups in the class.

The fifth factor is promoting increased efforts to achieve or public advocacy, commitment and promotive interaction includes advocating that members amplify their endeavour to fulfil the group's objective, mutually committing to each other to do the same. Each member pledges to stand by the stipulated values of the team. All members should be prepared to invest time and personal glory into the task and embrace a positive attitude (Johnson & Johnson, 2009: 368; Choi, Johnson & Johnson, 2011: 978).

The researcher will also motivate all group members to work hard and to stay focused on the task at hand and adhere to group values to achieve the team goals.

Furthermore, achievement motivation through engaging in the interpersonal and small group skills needed for effective teamwork is a necessary feature. Motivation to achieve is shown by the efforts members display purposefully towards acquiring more knowledge and skills they perceive as meaningful and worthy to pursue. Interpersonal process through group interactions could help to catalyse motivation to achieve within and individually.

Johnson and Johnson (2009: 369) contend that, for effective cooperation to take place, learners should be taught the interpersonal and small group skills needed, such as trust, accurate communication, support, and conflict resolution. Untrained group members cannot cooperate effectively (Johnson, Johnson & Smith, 2007: 24-25). Moreover, fruitful teamwork is not just putting learners together with the same subject matter and expecting them to be cooperative. They should be made aware of the factors that make cooperation work for their cognitive and social development (Van den Bossche, Segers & Kirschmerl, 2006: 491).

Lastly, Interpersonal trust facilitated by processing the effectiveness of working together is an important aspect. Group members should develop a situation where each member feels safe to trust, trusted to disclose information and receive respectful attention. Therefore, the group should be trustworthy for members to take a risk to expect confirmation that builds confidence.

### **3.5.2.** Principles of cooperative learning

Johnson, Johnson and Smith (1995: 4) are of the opinion that cooperative learning can be used with some confidence at every grade level, in every subject and with my task. They further indicate diverse outcomes, such as academic achievement, higher level reasoning, retention, achievement motivation, intrinsic motivation, transfer of learning, extrinsic motivation, interpersonal attraction, social support, self-esteem, social competencies, psychological health and moral reasoning. These could be categorised into the broad spheres: effort to achieve; positive interpersonal relationships and psychological health.

Van Tassel-Baska in (Walker, Shore & French, 2011: 124), however, argues that conclusions made concerning the effectiveness of cooperative learning are based only on the above mentioned outcomes and are not focused on the understanding of the processes underway.

According to the aims and requirements of this study, processes during the employment of STAD in Technology lessons were observed and the findings thereof formed part of the conclusions.

#### 3.5.2.1. Social support as cooperative learning outcome

Johnson and Johnson (1995b: 108) defined social support as the presence and accessibility of people on whom one can rely for emotional, instrumental, informational and appraisal help. A cooperative group is a place where members should get thorough explanations that clarify processes that help them to reach their own individual solutions with cognition of the content (Veenman, Denessen, Van den Akker & Van der Tijtl, 2005: 117). This is helping a teammate to construct knowledge that remains with them. Social support also involves attachment, reassurance and sense to rely on a person and feel loved and cared for. Instrumental help includes tangible things, such as resources, information, such as facts or advice to solve a problem. Appraisal includes aspects, such as feedback and encouragement to maintain expected behavioural standards. Moreover, supportive members of a group promote greater efforts to achieve, productivity, long term retention, intrinsic motivation, achievement motivation, time on task, higher level reasoning and critical thinking (Johnson, Johnson & Holubec, 1994: 11).

#### 3.5.2.2. Psychological health

The researcher believes that working in cooperative groups could be challenging and stressful to individual learners. They are possibly assigned to work with people that are not close to them, who do not share the same beliefs and academic norms, values or goals. According to Van den Bossche (2006: 498), these conditions cause distrust and feeling unsafe in a group, which could also lead to a member being left out or blamed for every mistake a group makes. It is therefore, important to create a psychologically safe interpersonal context for productive learning behaviour.

Psychological health is to be able to differentiate inappropriate competitiveness that hinders an individual’s ability to develop and maintain cooperative relationships. Therefore, the ability to build, maintain and appropriately modify interdependence relationships with others to succeed in achieving goals, development of ego strength, social competencies and ability to cope with adversity and stress is important (Johnson, Johnson & Holubec, 1994: 12; Johnson & Johnson, 1995b: 110).

On the contrary, learners who are unable to develop psychological health tend to feel insecure, inadequate, and hopeless and cling to unproductive and ineffective ways of coping with adversity (Johnson & Johnson, 1995b: 110). The teacher should always be alert for such possible incidents within groups and resort to appropriate mechanisms to curb the situation, including retraining the group on correct interpersonal and small group skills.

#### **3.5.2.3.** Positive interpersonal relationships

Smith et al. (2005: 94) contend that learners should understand that they are linked to one another and that they cannot succeed unless all other members of the team succeed. Moreover, Johnson and Johnson (1995b: 98) state that long term, persistent efforts to achieve come from the heart not the head. Learners at secondary school are at the age where peer relationships are valuable. The relationships among the group members should, however, not get misused by executive help seeking (dependency syndrome) behaviours. Help should remain instrumental to promote one another's cognitive and proper social skills (Veenman et al. 2005: 118). Therefore, the degree of care and emotional bonding that learners have among them has a positive effect on the quality of work they produce. Learners also develop in socially healthy, psychologically healthy ways, which increase in spirit de corps, academic support and valuing of diversity and cohesion (Johnson, Johnson & Holubec, 1994: 12). Slavin (1990: 35) posits that cooperative learning strengthens cross-ethnic and cross-racial relationships by advocating equal status roles. This helps learners to befriend their peers from other races and ethnic groups and learn about one another as individuals.

The researcher argues that the role of establishing new group norms, values, beliefs and goals is essential in the formation of groups. Secondly, the activities should be formulated in a manner that would ensure the need for positive interdependence. Thus learners should realise it is either they swim or sink together.

#### 3.5.2.4. Interpersonal attraction

According to Slavin (1990: 35) and Van den Bossche et al. (2006: 499), it is evident that when individuals of different racial or ethnic groups work to achieve a common goal and have opportunities to get to know each other as individuals on an equal basis, they become friends and develop social cohesion.

Cooperative learning is an ideal solution to the problem of providing students of different races and ethnic backgrounds with opportunities of superficial, cooperative interaction. Cooperative learning methods also enhance group relations among learners in a culturally diverse classroom (Slavin, 1990: 35; Johnson and Johnson, 1995b: 101). Cooperative learning again promotes positive social relations among classmates through peer interaction and mutual assistance in small groups. It gives expression to the motivating effect of working together with others toward a common goal, free from competition and it cultivates learners' sense of acceptance on an equal stand with group members. It is therefore important to create a social context that nourishes the willingness to engage in the endeavour to develop and sustain mutually shared knowledge (Sharan and Shaulov, 1990: 174; Van den Bossche et al. 2006: 493).

On the other hand the cooperative relationships among learners are influenced by three main factors, namely pre-instruction attitude, physical proximity and actual interaction. Therefore, effective interaction in small teams requires the acquisition of basic teamwork and discussion skills (Sharan and Sharan, 1994: 99; Johnson and Johnson, 1995b: 101).

Pre-instruction attitudes influence interpersonal attraction and do not guarantee positive or negative relationships. Physical proximity is also a necessary factor, but not enough condition for formation of caring and committed relationships, but just an opportunity or starting point. Lastly, the nature of group interaction could be in a cooperative, competitive or individualistic context. A cooperative context encourages a process of acceptance, while competitive and individualistic foster a process of rejection. The latter two increase bias and inter-group boundaries, thereby scape-goating and singling out as responsible for failure (Hertz-Lazarowitz, Kirkus and Miller, 1992: 262; Johnson and Johnson, 1995b: 103).

#### 3.5.2.5. Motivation/effort to achieve

Motivational perspective on cooperative learning focuses primarily on the reward or goal structures under which learners operate (Slavin, 1990: 13). It has been found that in a cooperative classroom, learners try hard, feel that their group support encourages them to learn and their improved achievement helps them gain social status. By having learners work together toward one goal, they may be motivated to express standards favouring academic achievement, to support each other for academic efforts. Motivational theorists incorporate group reward for the effectiveness of groups' goals' achievement (Slavin, 1990: 14; Slavin, 1992: 159; Johnson & Johnson, 2008:15).

Motivation to achieve is echoed in the attempt individuals commit purposefully to strive to increase knowledge and skills they see as meaningful and worthwhile. Achievement motivation is mostly induced through interpersonal process, either through internalised relationships or current interaction patterns with the learning situation (Johnson, Johnson & Smith, 1995: 18). They further attest that cooperative learning promotes motivation systems, such as intrinsic motivation, high expectations for success, high incentive to achieve based on mutual benefit, high performance and high commitment to achieve (Johnson, Johnson & Smith, 1995: 18; Johnson, Johnson & Smith, 2007: 19; Onwueguzie, Collins & Jiao, 2009: 266).

#### 3.5.2.6. Critical thinking

Ferguson (1995: 57) stipulates conflicting definitions of critical thinking from behavioural and cognitive perspectives. Behaviourists hold that critical thinking is evidenced through behaviours that are learned by exposure to external stimuli provided in well structured, sequenced and incremental programs. On the other hand, cognitive psychology believes that critical thinking emerges as a product of the interactions, goals, ideas, memories and emotions which are actively used by the student to construct meaning from experience. Critical thinking can also be defined as "exploratory talk", where interactions that include explicit reasoning, hypotheses, arguments, challenges and justifications of facts are of paramount to the topic of discussion (Veenman et al. 2005: 119; Gillies, 2008: 330).

Some studies argue that critical thinking could be achieved by giving learners effective group cognitive activities. They further contend that higher-order thinking can be induced by thought provoking questions and activities of explaining concepts, to develop logical reasoning capacity of learners (King, 2008: 75; Lombard and Grosser, 2008: 563).

The researcher therefore understands critical thinking as the ability to process knowledge, experiences and environmental influences, to be able to use, expand, agree, defend, confirm and or disagree with the existing sequences and structures knowledge comes up in. Then, cooperative learning methods could be appropriate vehicles to transport or teach critical thinking in the classroom. Johnson, Johnson and Smith (1995: 25), and Gillies (2008: 330) define critical thinking as abilities of grasping information, examining it, evaluating it for soundness and applying it appropriately or ability to sort sense from nonsense.

Cooperative learning advocates greater use of higher level reasoning and critical thinking through learners' discussions, explicit emphasis on problem-solving procedures and methods, verbalisation of methods and strategies to encourage development of meta-cognition (Johnson, Johnson and Smith, 1995: 26). Cooperative teaching methods, such as constructive controversy and group investigation have shown greater improvements in learners' perspective-taking vis-à-vis adopting a perspective, advocating it and enlarging their view to include the opposing position (Ferguson, 1995: 63).

Bailin, Case, Coombs & Daniels, (as cited in Lombard and Grosser 2008: 564) assert that a critical thinker is distinguished by applying five types of highbrow resources. Starting with background knowledge as the primary resource, it pertains to the depth of knowledge, understanding and experiences that one can substantiate to indicate the extent and capability of thinking. Operational knowledge is another aspect that a critical thinker should acquire. It includes logical, intentional thinking and being able to set fact for arguments and inquiry and the ability to lay out a plan of action for future developments. Knowledge of key concepts enables the learner to distinguish between different kinds of academic end results, laws, rules and conclusions. The critical thinker must have heuristics, which includes following certain procedures of information verification before presenting it to other people, like double-checking and trimming a problem to a solvable state (simplification). Lastly, a learner who is a critical thinker ought to implement certain habits and follow principles of good thinking. A learner should be open-minded, reasonable to others in group work and their discovered truths. He should also respect legitimate authority, be an independent thinker and adhere to acceptable work ethic.

Learners in the Technology classroom would be provoked to think critically as the subject encourages creativity and problem solving skills through worksheets and group discussions. Their probing, inquiry competence, listening skills and critical thinking develop to give them confidence, thereby developing intrinsic motivation towards Technology (Trpovski, 2004: 2-3).

#### **3.5.2.7.** Self-esteem

Self-esteem is an essential psychological outcome of cooperative learning methods, in which students find themselves as valuable and important individuals. These beliefs are critical for learners to develop abilities to withstand disappointments, to be confident in making decisions and eventually becoming productive (Lazarowitz & Kersenty, 1990: 145; Slavin, 1990: 43). As people become conscious of self, they construct self-conceptions about self-worth. Thereby, self-esteem is how individuals view and perceive their worthiness, value and competences based on one's experiences with other people and internal judgement of self (Johnson & Johnson, 1995: 119). The researcher is of the same opinion that through supportive peer interactions, acceptance by team mates and improvement in academic achievement in a cooperative classroom, learners' self-esteem could be highly boosted.

#### **3.5.2.8.** Time-on-task

Time on task is the proportion of non-instrumental time learners spend engaged on their assigned work in class. Cooperative learning has been researched and found to increase time on task due to the social nature of the tasks (Slavin, 1990: 47). In a group set-up, individuals identify needs that become salient when group identity is secure. Therefore when a task is given each individual's unique contributions are identifiable, giving members a fulfilment as individuals and team for their accomplishment and success (Miller & Harrignton, 1990: 65).

#### **3.5.2.9.** Social skills

Johnson and Johnson (1990: 32) contend that placing socially unskilled students in a learning group, and telling them to cooperate, will obviously not be successful. Learners should be taught the interpersonal and small-group skills needed for high quality cooperation and be motivated to use them. These skills include building of trust among team members, appropriate decision making as a team, good communication ethics that show respect to others and managing of arising conflicts in a constructive and supportive manner (Smith et al. 2005: 95).

Miller and Harrington (1990: 53) mention two processes that are central to inter-group behaviour as perceptual or cognitive and motivational or affective. They continue to show that members of a group that portray certain similar traits tend to cling together and out group a member that seems different to their prominent characteristics. The researcher asserts that these dominant traits of acceptance have a positive or negative impact on the group behaviour depending on their nature. Sharan and Shaulov (1990: 176) describe this as social status which makes one to be liked, both academically and socially. Moreover, it is clear that learners need positive relations to function well at school.

Slavin (1990: 50) records that learners in a cooperative situation or environment tend to become more cooperative, altruistic or unselfish towards one another. Then, learners would be able to increase a positive effect among them.

As STAD is a cooperative learning method of teaching and learning technique, the researcher and the learners in technology classes would work together to strive to achieve the above mentioned cooperative learning outcomes within each group.

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## 3.6. Methods of cooperative learning

There are several methods of cooperative learning that have been developed by various proponents of cooperative learning. The cooperative learning advocates include Aronson, Johnson and Johnson, Slavin, Sharan and Sharan and Kagan. The cooperative learning methods are grouped into two categories: firstly, the student teams learning methods that consist of Student Teams-Achievement Divisions (STAD), Teams-Games-Tournament (TGT), Team Assisted Individualisation (TAI) and Cooperative Integrated Reading and Composition (CIRC); secondly, the task specialisation methods that include Jigsaw, Group Investigation (GI), Learning Together, Academic Controversy and Co-op Co-op.

### 3.6.1. Student team learning

According to Slavin (1990: 2), all cooperative learning methods promote the ideology of learners working together to learn and are responsible for their teammates' learning as well as themselves. In addition to the idea of cooperative work, student team learning methods emphasize or focus more on the use of team goals and team success, which can only be achieved if all team members learn the objectives being taught. Furthermore, three central concepts to student team learning methods are team rewards, individual accountability and equal opportunities for success (Slavin, 1990: 3).

#### 3.6.1.1. Student Teams-Achievement Divisions (STAD)

Knight and Bohlmeyer (1990: 4) state that an essential component of student teams-achievement divisions, developed by Slavin, is competition among groups. Learners work in their groups to drill and tutor one another to prepare for competition. This competition attribute is regarded as the part that facilitates peer support and group norms for achievement. Student teams-achievement division lessons can be defined as assigning students to four or five member learning teams that are mixed in performance level, sex and ethnicity or race. Then the teacher presents a content to be learned and hands out the material on which learners will work within their groups to ensure that every group member masters the material. Afterwards learners take the individual quizzes on the material during which they may not assist each other. Individual scores would then be used to make teams scores, the winning team gets a reward (Slavin, 1990: 3; Slavin & Madden, 1994: 4; Kuntz & McLaughlin, 2001: 42; Zakaria & Iksan, 2007: 37; Slavin, 2010: 3). For the purpose of this study, STAD was used.

#### **3.6.1.2.** Team Assisted Individualisation (TAI)

Slavin (1990: 4) discloses that team assisted individualisation also uses four or five member mixed ability learning teams and rewards for high achieving teams. Team assisted individualisation, however, fuses cooperative learning with individualised instruction. It is specifically designed to teach mathematics to learners in grades 3 to 6. Knight and Bohlmeyer (1990: 5) emphasize that the uniqueness of team assisted individualisation is based on individualised units of mathematics for each learner. Team members use answer sheets to check others worksheets and practice tests. Here, individuals are responsible to make sure their teammates are prepared to take the final test for each unit. Learners may only discuss in the case where one asked for assistance.

Individual accountability is ensured by using only final test scores as a measure for achievement. Learners have equal opportunities for success, because they are placed according to their level of prior knowledge (Knight & Bohlmeyer, 1990: 5; Slavin, 1990: 5; Kuntz & McLaughlin, 2001: 43; Slavin, 2010: 4).

#### **3.6.1.3.** Teams-Games-Tournament (TGT)

Teams-games-tournament was the first of the John Hopkins cooperative learning methods and is similar to student teams-achievement divisions. Teams-games-tournament, however, substitutes the quizzes with weekly tournaments in which learners compete with other teams towards earning points for their team scores. In this competition the high achievers of one team compete with those of other teams and low achievers with other low achievers from other teams, ensuring equal opportunities for success. On the other hand, individual accountability is ensured when competitors are not helped by their teammates (Knight & Bohlmeyer, 1990: 5; Slavin, 1990: 4; Kuntz & McLaughlin, 2001: 42; Zakaria & Iksan, 2007: 37; Slavin, 2010: 4).

#### **3.6.1.4.** Cooperative Integrated Reading and Composition (CIRC)

This is the newest of the student teams learning methods and is a universal or detailed programme for teaching reading and writing in the upper elementary grades (Slavin, 1990: 5).

The cooperative integrated reading composition consists of three principal elements: basal-related activities, direct instruction in reading comprehension and integrated language arts and writing, whereby learners work in heterogeneous learning teams. Learners are assigned to teams consisting of pairs of learners from different reading groups, while the teacher is working with one team, other teams work in pairs on a series of cognitive activities, including reading to each other, summarising, responding, speaking, vocabulary and deciding (Slavin, 1990: 5; Slavin & Madden, 1994: 25; Slavin, 2010: 5).

Procedures in cooperative integrated reading and composition activities follow a sequence of teacher instruction, team practice, team pre-assessments and quiz. Learners do not, however, take the quiz until their team mates indicate that they are ready and rewards are given to teams depending on their overall performance. Equal opportunities for success are obtained as learners work on material appropriate to their reading level. Individual accountability is ensured through quizzes which learners do independently to contribute toward group scores (Slavin, 1990:5; Slavin, 2010: 5).

According to Slavin and Madden (1994: 26) cooperative integrated reading and composition has nine principal features: reading groups, teams, partner checking, tests, direct instruction in reading, composition, independent reading, integrated language arts and writing and the involvement of special education resource teachers, reading teachers. It also has story–related activities, which include partner reading story structure, story related writing, saying words out aloud, word meaning, story retell and spelling.

### **3.6.2.** Task specialisation methods

Task specialisation methods of cooperative learning use techniques where learners are assigned an individual task on the section of the content that they need to thoroughly prepare for contact sessions with other group members. Therefore, individual members explain their sections of speciality to the other group members (Oakley, Felder, Brent & Elhajj, 2004: 12; Slavin, 2010: 7).

#### **3.6.2.1.** Jig-saw II

Jigsaw was designed by Elliot Aronson and his colleagues in the late 1970s. Clarke (1994: 35) defines jigsaw as a method where learners work together in small groups and must rely on each other. Each group member "specialises" in a specific part of content, which they will explain to their groups to enable the team to effectively cover the whole designated content or theme. Slavin (1990: 10) adds that each member meets with members of other teams that are learning the same section (expert groups) to discuss the material and then return to their teammates, who will have to listen carefully to learn and be able to ask questions after the expert has explained the content.

The procedures of jigsaw could be elaborated on as follows: the teacher assigning learners into heterogeneous groups (home base) introduces the material to be learned helping the class to understand the prior knowledge and the intended objectives of the text and distributes the material or notes to the home group. Secondly, learners are reorganised to form focus groups or preparation pairs with a member from another group with the same section of the content; study the material thoroughly and prepare to teach their groups. Thirdly, practice pairs in a different form are put together to discuss how best the material can be presented to the home groups. They incorporate their best ideas and go to base groups for presentation. Fourthly, experts report to their groups and members ask questions for clarity and synthesis of the content and then begin to reshape their understanding of the whole material or theme. Lastly, integration and evaluation is done, where learners are assessed individually or in their groups to find out the degree of mastering the learned material. The best groups to the set criterion of excellence will be rewarded (Clarke, 1994:36; Johnson, Johnson & Holubec, 1994:19; Zakaria & Iksan, 2007: 37; Slavin, 2010: 6). Therefore, in this way learners are entirely responsible to teach one another the material, since each member has a specialised section of the content to explain to the team.

In the mid-eighties Slavin and his colleague developed a modified jigsaw model named jigsaw II. In this model learners learnt the whole material, then members of the groups are given different topics from the content to master and become experts, as in the jigsaw I groups meet for thorough discussion. They then return to their main groups where they teach group members and then take individual quizzes that cover the whole topic. The improvement scoring is used to help low performers to make a good contribution to their group scores. The high performing team is rewarded (Clarke 1994:37; Slavin 1990:10).

#### **3.6.2.2.** Group Investigation (GI)

Sharon and Sharon (1994:98) describe GI to be based on the merging of four basic aspects, i.e. investigation, interaction, interpretation and intrinsic motivation. Investigation begins when a multi facet problem is presented to the class and inquiry communities (investigation groups) are formed. In the searching for answers to the problem at hand, pupils construct the knowledge they acquire and learner initiative is emphasised through their questioning. As they get formulation of answers they communicate. Secondly, interaction is where learners contact, talk, assist and support one another in their groups. They discuss their plan of inquiry, check various resources and sources of information and combine their findings and make a presentation to the class. To be effective groups, however, need to acquire basic teamwork and discussion skills (Hertz-Lazarowitz, 2008:41; Slavin, 2010: 7).

#### 3.6.2.3. Academic controversy

Johnson and Johnson (1994: 66) and Ferguson (1995:63) report that controversy exists when learners' ideas, views, information, decisions, theories and opinions are irreconcilable with those of another in the process of reaching consensus. Thus the group members are assigned a stand on a controversial issue during which two members of the group will advocate one side and another two the opposing side. Then they switch the sides of argument and synthesise the evidence in order to reach an acceptable conclusion about the issue at hand.

#### 3.6.2.4. Co-op Co-op

This is a seven step method with the DNA of various cooperative methods, such as Group Investigation, STAD, Jigsaw II and Jigsaw I. The learners will be given a learning unit whereby teams will choose subtopics from the unit different from others within the groups; members are assigned to mini topics, they will work on as their contribution to the group's subtopic. After the presentations and integration of Mimi topics, groups prepare their subtopic to be presented before the whole class (Slavin 1990: 102).

In the context of this study, only STAD would, however, be employed for the purpose of attaining the objectives of this investigation in Technology classes. STAD has been defined by research studies as the simplest cooperative learning method for a teacher who is a novice in cooperative learning and also easier for learners to understand and implement (Majoka, Dad & Manhood, 2010:17; Van Wyk, 2012: 262: Kordaki, Daradoumis, Frgidakis & Grigoriadou, 2012: 135).

## 3.7. Why implement cooperative learning approach to teaching and learning?

As different methods of cooperative learning have been discussed above, to be able to apply cooperative learning in the classroom a teacher gets a conviction from knowing and understanding the research and theory behind it. Using cooperative learning most of the time allows the teacher to change from a mass production model to a team-based, high performance model. It is a basic movement in organisational structure that affects all aspects of classroom life (Johnson, Johnson & Holubec, 1994: 13).

The above qualities can be achieved depending on the type of interdependence among learners. With a positive interdependence structure in place and instilled in the learners, it produces promotive interaction through learners encouraging and facilitating one another's effort to achieve. Learners have to be imparted with necessary skills to be able to focus on both their own improvement to achieve and that of other teammates. When learners are taught relevant skills, they build positive relationships that support group mates academically and emotionally. In boys only schools, like in this study, the emotional support might, however, be attained with difficulty due our social stereotype behaviours and beliefs that emotional support is regarded as feminine.

Negative interdependence normally results in oppositional interaction as pupils discourage and obstruct each other's effort to learn. In this situation, individuals focus on improving themselves and preventing others from achieving as high as they do by either not being willing to share the correct information or full information with teammates (Johnson, Johnson & Holubec, 1994: 12; Johnson, Johnson & Smith, 1995: 11; Sapon-Shevin, 2004:3). Therefore, if the teacher finds himself or herself facing a class with negative interdependence he/she would be able to teach learners proper skills with the knowledge and understanding of the principles that govern cooperative learning. Teed, McDaris and Roseth (2006: 1) have indicated reasons, such as learners would learn more significantly, remember work for a long period of time (good retention) and develop better critical thinking. Furthermore, learners would enjoy being active participants in the classroom. They would eventually be prepared for the corporate world, where teamwork is an essential ingredient.

The comparison among three methods of teaching, namely Traditional Lecture Method, Traditional Group-Work and Cooperative Learning Groups is illustrated in the table below in order to indicate the reasons the researcher chose to implement STAD as a cooperative learning method of teaching and learning technique. The table stipulates the differences among the three teaching methods by also indicating the importance of using cooperative learning methods of teaching (Laing, 2002: 18; Smith et al. 2005: 94; Van Wyk, 2007: 167).

**Comparison Table, 3.1**

| **Traditional Lecture Method** | **Traditional Group-Work** | **Cooperative Learning Groups** |
|---|---|---|
| There is no positive interdependence. | Low to no positive interdependence | High positive interdependence |
| Learners work individually in order to obtain personal goals. No one else matters. | Little or no focus to group goals. Individuals only look out for themselves. Only end product counts. | The focus is on achieving group goals and individual goals. Processes toward obtaining final result are important. |
| No team structures and each learner is his own leader. | Homogeneous ability and friendship grouping. No sharing of leadership. | Heterogeneous ability, race and gender grouping. Sharing of leadership is important. |
| A student's focus is only on himself and does not account to anyone but self. | Individual accountability is not aimed at the achievement of group goals. There is no group accountability. | Individual accountability is used so that each member can be held accountable toward group goals. Therefore accountable to group. |
| The task aim is achieved only to beat others. This could lead to feeding other classmates the wrong information. | The focus in getting the task done not committed to each other's learning. | The aim is to maximise each member's success by working together, assisting and supporting individual's effort to learn. |
| There are no working relationships. Every man for himself and God for us all. | Working relationships and skills are often ignored. The leader is chosen to direct participation to obtain end result. | Team work skills are essential. Members are taught and expected to use small groups and interpersonal skills. Leadership roles are exchanged among all members. |
| There are no group processing skills needed, since learners work individually. | There is no group processing to ensure the quality of its performance. Individual rewards are the main intentions. | Group processing is elementary to enable the group to assess the effectiveness of its workmanship. The evaluation helps to specify places that need improvement toward the attainment of the group goals and reward. |

| | | |
|---|---|---|
| The teacher only observes the individuals as they work. | There is very little if any observation is done by the teacher. | The teacher observes the group processes among the groups, and intervenes where necessary. |

## 3.8. Benefits of cooperative learning

Cooperative learning groups who have acquired the correct social and intergroup skills and have positive interdependence as explained previously, promote higher order thinking during discussions through summarising and synthesising information before making final decisions. Learners gain important interpersonal skills, such as working closely with others and become sensitive to differences. Cooperative learning administered well helps learners to share resources, information and ideas toward solving a problem. In order to achieve the decision making stage, students should learn to compromise and accept constructive criticism as it builds one's character. When group members have healthy relationships and genuinely support each other so that members trust and feel trusted by others, it would be easy to compromise and accept criticism with an open heart. Thus criticism would not appear to be an attack on one's ego or emotions, but rather as helping team members to attain the intended goals. Therefore, it is imperative that all members have a sense of trust and safety in the presence of others emotionally and physically (Gawe, 2001: 223; Murdoch & Wilson, 2008: 5).

The benefits are not only for students, as teachers also gain from implementing cooperative learning methods in their classrooms. Lesson planning is highlighted as one of the noticeable improvements that occur, secondly there is time to observe how learners interact and have an opportunity to assist individual groups, which in turn enables the teacher to attend to each learner in the classroom. Furthermore, the educator learns to also receive insight from learners and guide their understanding toward the content at hand in the correct context (Murdoch & Wilson, 2008: 7).

The figure below demonstrates the average retention rate of learners regarding the use of cooperative learning methods. Since cooperative learning class lessons in technology would include all the aspects of the table, retention of the learners is expected to range above 90% of the learned material.

Average Retention Rate

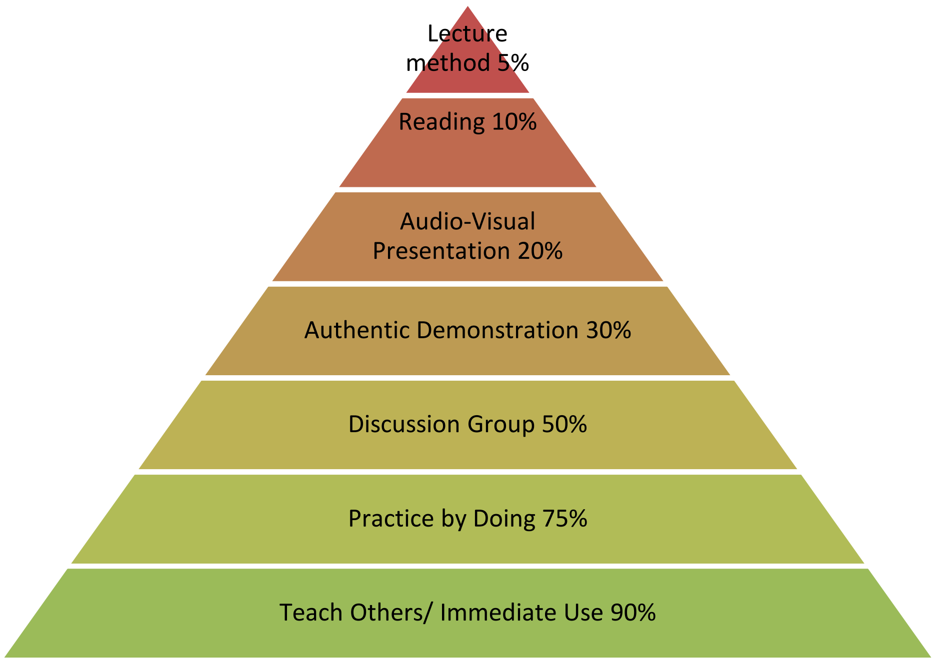



Figure 3.2 Learning Pyramid adapted from (Laing, 2002: 20)

## 3.9. Pitfalls of cooperative learning

Inadequate preparation and structuring of cooperative learning leads to the "free-rider" effect, whereby some members do not contribute to the group's achievement of group goals as there would be little or no evidence on assessing the individual's accountability. This could be evident in poorly structured projects where a group has to do one thing, such as building a model or answering a single worksheet as a group. To avoid this pitfall each member's role should be clearly stipulated, evident and assessable so that the educator can intervene appropriately in a helping and encouraging manner. The above scenario if not cultivated in time, could lead to undesired disruptive behaviour during the group sessions. Other members could decide to out-group a member who does not bring their part on board without informing the educator. In task specialisation cooperative learning methods, members are in danger of only understanding and acquainting themselves with the parts assigned to them only. Other members may not properly share their findings with the team or feed the group with wrong information (Slavin, 1990: 16).

## **3.10.** Conclusion

In this chapter, cooperative learning methods were broadly discussed and the background of cooperative learning was explained. Different aspects of cooperative learning, such as essential elements, principles, outcomes, benefits and pitfalls have been elaborated on in order to give a clear overview of cooperative learning. In the following chapter, Student Teams – Achievement Divisions as a cooperative leaning method will be expanded upon regarding its classroom implementation and the anticipated outcomes. The learning styles that learners need to know or acquire in order to benefit from this method of teaching will be dealt with. The importance of using student teams-achievement divisions in a multicultural or culturally diverse classroom will be included. The researcher will also outline how STAD is going to be administered during the investigation including the duration of the intervention.

# CHAPTER 4

# THE USE OF STAD IN THE TECHNOLOGY CLASSROOM

## **4.1.** Introduction

In the previous chapter the researcher elaborated on cooperative learning as a teaching approach in which learners work in groups. Each group should have goals for the group that must be achieved. It is expected from each team to strive to maintain or develop positive interdependence among themselves, whereby support is mutual and true, not deceptive. Each member of the team is required to play an active and responsible role in doing their individual parts or sections of work whole heartedly for the benefit of the whole group.

During group discussions, members need to contribute effectively and genuinely using acceptable methods of communication, such as clear and clean language when illustrating facts and demonstrating processes. Furthermore, it is essential to display appropriate behaviours and emotions while working together. Hostility should be dealt with immediately as it would hamper the group's process. Therefore, members are to respect one another, their group goals, individual goals and their workmanship by helping each other to improve and succeed.

At the end of the task, the group has to evaluate all the processes and stages faithfully without sparing the rod in order to assist them to work harder and improve their group process in the next task so as to also increase their group's achievement.

The researcher further discussed various cooperative learning methods of teaching and an overview on how they address the elements of cooperative learning was given. Berry (2008: 150) adds that active learning methods in their variety promote four elementary characteristics of cooperative learning encouraging learners and the educator to think critically when engaging in a task. Thus, learners are expected to use high order thinking and go beyond the prescribed content of the activity. The teacher is also required to critically think as he or she formulates and structures lesson presentations and activities that will be done in class. It would be crucial to do thorough research on the topic, as learners may come up with critical questions that would also help other groups in the class or perhaps another group may be able to respond to such questions appropriately.

Secondly, in active learning methods, learners take more responsibility towards their learning other than in the traditional teaching situation, where a learner would depend totally on the teacher’s expertise and miss out on acquiring help from peers, who could even explain concepts in a much easier and clearer manner. Thirdly, active learning provides a basis for open-ended discussions that could lead to questions that require high order thinking. At this stage learners would need to do more inquiry on the matter in order to solve the problem at hand correctly. Lastly, it is still an educator’s responsibility to organise the learning experiences to ensure that the class is not derailed from the work that is needed to be covered.

Furthermore it has been indicated in the previous chapter that STAD is also one of the cooperative learning and teaching techniques. Furthermore, in the preceding chapter studies have proven the cooperative learning approach as surviving the test of time bearing positive results in terms of achievement, attitudes and social skills development for learners (Agasha (2004) as cited in Muraya and Kamimo, 2011: 730; Wan Mohamed & Jaarfar, 2009: 3; Michael, 2006: 9; Oakley et al. 2004: 9).

Moreover, among the cooperative learning techniques STAD is reported to be researched most. The researcher assumed that the above notion resulted from the nature of STAD. STAD has been titled the simplest of the cooperative learning techniques. It could therefore as well be presumed that STAD is suitable to help both the learners and the teacher to learn how to use cooperative learning.

STAD as an active learning method should have the above mentioned characteristics. Thorough discussion on the nature and scope of STAD is going to be done in this chapter. The researcher would define STAD through its components as a cooperative learning method of teaching and how it addresses the basic elements of cooperative learning.

Then Technology as a subject in which STAD is going to be implemented will be explained according to its nature and scope. The reasons for employing STAD as a teaching method and learning technique in this study will be stipulated. Lastly, the connection between STAD and Technology as a subject will be stated.

## **4.2.** Student Teams Achievement Divisions

In this part of the study, the researcher elaborated on various aspects of STAD and its relevancy to the study. STAD as implemented in the Technology classroom formed the contextual basis for learning and teaching of Technology.

### **4.2.1.** Defining STAD

STAD has been developed by Robert Slavin and his colleagues at John Hopkins University in the USA. Moreover, STAD as a cooperative learning method of teaching and a team learning technique, developed by Robert Slavin was used to improve interpersonal and intercultural skills around the schools in the United States of America- this learning technique was administered for the purpose of content delivery and group learning in Grade 8 Technology (Cowie, Smith & Remalaver, 1994: 39; Scott, 1998:1; Schniedewind, 2004: 59; Abuseileek, 2007: 494; Coffey, 2008:1). It is explained as a cooperative method that has small heterogeneous groups and incorporates group study with rewards based on individual and group improvement levels (Hendrix, 1999: 59; Mille & Peterson, 2002: 2; Stockdale & Williams, 2004: 38; Taintong & Teemuangsai, 2013: 86).

Furthermore, STAD is regarded as the simplest of all the cooperative learning methods, whereby it would be advisable that a teacher who is beginning to use cooperative learning to start first by implementing STAD before intending to use other cooperative learning techniques that are more complicated, even for the learners. It would therefore be easier to teach learners how to use STAD as their learning technique (Slavin, 1990: 54; Scott, 1998: 1; Gaith, 2004: 282).

STAD can also be explained through its five essential components or stages. Learners are firstly assigned to heterogeneous groups based on varied levels of performance or ability, gender, race and ethnic groups. Then the educator presents a lesson in lecture format or power point to explain concepts and demonstrate procedures and processes to the class at large. Afterwards, teams study together through the presented material and then do worksheets to ascertain that each member of the group comprehends the work well. This is then followed by individual assessment that will be able to indicate how each group member understood the work by means of individual marks or points obtained. Improvement scores of group members are administered to recognise the team that has improved most (Slavin, 1990: 54; Scott, 1998: 1; Berry, 2008: 151; Tarim & Akdeniz, 2008: 79; Van Wyk, 2010: 84; Nejadghanbar & Mohammedpour, 2012: 23; Van Wyk, 2012: 262). Below each element of STAD will be expounded upon to stipulate what is expected to take place during each one of them.

### **4.2.2.** Theoretical foundations of STAD

STAD as a cooperative learning technique is fore-grounded in a social constructivist lens on students ways of learning and the manner in which teaching environment should be administered. Social constructivism argues that meaning or sense of reality and knowledge are constructed through interaction with others and the environment (Muraya & Kimamo, 2011: 729; Prince & Felder, 2006: 124).

In addition, STAD is informed by three theories:

- Social independent/ cohesion theory
- Motivational or behavioural theory
- Developmental cognitive and cognitive elaboration theory (Slavin, 1995: 1).

#### **4.2.2.1.** Social interdependence/ cohesion theory

Social cohesion stipulated that the togetherness of a team toward achieving its purposed goals is a major ingredient. Learners in a group should be able to help each other effectively with empathy and have positive association with all members (Slavin, Hurley & Chamberlain, 2003: 177).

Jensen, Moore and Hatch (2002: 32) further attest that cooperative learning is more productive in an informal and friendly classroom climate. Therefore, a homely environment cultivates social cohesion within the groups and also allows learners to explore, elaborate and argue their standpoints without fear of getting negative criticism from their peers in a group. Secondly, a teacher as well is expected to be flexible and dependable in terms of supporting learners in their various groups should there be a need for further clarity on the task at hand. Moreover, according to Johnson and Johnson (1995: 1020) the highlight of social interdependence in a cooperative group setting is sharing a universal or common goal. Therefore, the presence of social interdependence in a group would assist a group to achieve its goals. The absence of social cohesion would negatively influence the outcomes of the group, leading to failure to achieve intended aims. It is therefore important for group members to realise that their individual actions have a direct impact on the attainment of group goals.

#### **4.2.2.2.** Cognitive developmental perspective

Developmental cognitive theory was developed by Vygotsky and it articulated that knowledge is constructed through social interactions with others. It carried on by stating that levels of cognitive development occur at the "*Zone of Proximal Development*" (ZPD). The Zone of proximal development could be defined as the "distance between the actual development of a learner and his/her level of cognitive development as determined by independent problem solving". In addition the potential development level is determined through the process of problem solving under adult guidance or in collaboration with more capable peers (Li & Lam, 2005: 2; Slavin, Hurley & Chamberlain, 2003: 182).

Therefore, it can be extrapolated that actual learning and processing of information gained from the taught content happens when a learner attempts to figure out strategies to solve a problem founded from the content by him or herself. While higher order thinking to understand and apply the acquired knowledge is promoted by interacting with more knowledgeable peers and being practically involved in solving the problem at hand.

#### 4.2.2.3. Cognitive elaborations perspective

The above theory holds that, if learners have retained new content that relates to their prior knowledge, are able to commit to some kind of cognitive restructuring or elaboration. Prominent ways of elaborations would be the ability of learners to discuss and explain the information to others, taking into cognisance the main points of the learned content. These kinds of activities take place in cooperative learning groups as learners listen to other members' elaborations that enable them to recall content they learned. During these group sessions learners are afforded an opportunity to correct and or add important points that could be left out by the elaborator. This manner of learning has been proven to improve achievement, retention and other group processing skills (Slavin, Hurley & Chamberlain, 2003: 183; Slavin, 1995: 6).

The diagram below summarises the integration of the four theories to indicate the way cooperative learning takes place.

The process of cooperative learning

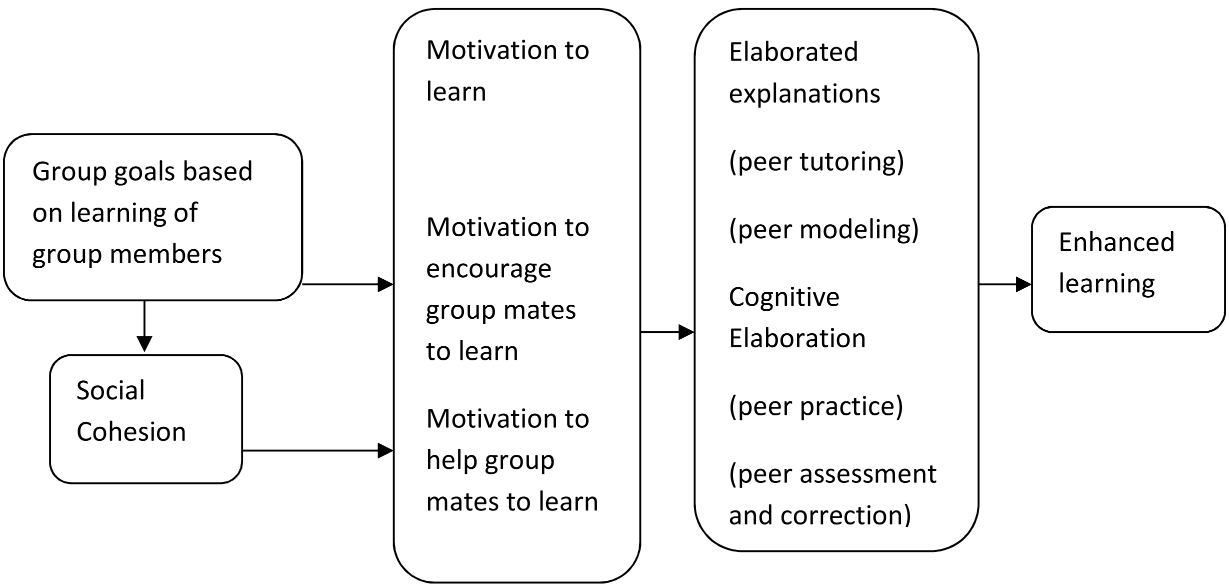



Figure 4.1 Adapted from (Slavin, 2010: 9)

The above diagram summarises theories underpinning STAD as a cooperative learning technique showing how (Slavin, 2010: 9; Slavin, Hurley & Chamberlain, 2003: 179; Slavin, 1995: 6) brought together their influence on implementing STAD in Technology classroom. They explained group goals as the core element that builds up the social independence in a cooperative learning group. Thus each member of a group works hard, focusing on achieving group goals with the assistance of others to eventually obtain individual aims. Once group cohesion is established, members become motivated to encourage and help other team members to learn. Then the group skills that are improved would motivate groups to maintain an environment that is conducive for peer tutoring, cognitive development and achieve improved learning.

#### **4.2.3.** Historical background to STAD

STAD was developed at John Hopkins University in the years 1977 and 1978 by Robert E Slavin and his team of researchers as an initiative to foster the way of achieving cooperative learning essential elements using team learning techniques. STAD was also formulated alongside Team-Games-Tournaments (TGT), Jigsaw II and Team Assisted Individualisation (TAI) (Nejadghambar & Mohammedpour, 2012: 23; Balfakih, 2003: 608).

Moreover, Slavin (1977: 8) declared that they (Slavin and his team) have done thorough research in the schools around the USA comparing team learning techniques with traditional methods of teaching pertaining to "*academic performance and social growth*". They obtained results proving that team learning techniques produced positive improvement compared to traditional methods.

Slavin (1977: 8) further explains that the initial purposes of team learning techniques, including STAD, were for accelerating learners' academic achievement and improving their social skills as well. For these to be achieved, the early STAD had several components the researcher managed to identify. They are as follows;

- Heterogeneous teams of four to five members that could comprise of learners with mixed abilities, different gender orientation and various ethnic or racial groups.
- Face-to-face sitting set-up in a classroom to make communication viable.
- Group goals encouraging learners to help each other learn through the use of worksheets.

- Teacher presentation of new material to the whole class before groups could engage on the worksheets.
- Individual accountability that is promoted when learners tackle individual quizzes.
- Individual scores were used to compare each learner's present performance with the previous one in order to determine achievement improvement per learner.
- Team scores that were obtained by means of achievement divisions. Achievements could, for example be divided into the following criteria of each member's improvement scores depending on the feasibility or size of the test or exam; 40% awarded eight (8) points, 30% - six (6) points, 20% - four (4) points and =<10% two (2) points. The points of all group members would be added to determine the team with highest improvement scores.

As changes and new developments, however, transform educational systems and classroom setups around the world, more aspects and challenges arose in schools all over the world. Then the researchers had to explore different ways in which they can implement STAD to address new variables. The researcher believes, that due to the nature of STAD being classified and explained as the simplest and easily adaptable cooperative learning technique, led to STAD being popular in terms of research.

Tarim and Akdeniz (2007: 78) and Slavin (2005: 14) agree that STAD is a more ideal cooperative learning technique that could be adjusted or modified according to the changing classroom dynamics and is adaptable to various subjects ranging from primary school (Foundation Phase and Intermediate Phase) to secondary school (Senior Phase and FET Phase) in the South African context.

Moving forward to employing STAD in the Technology classroom, Acikoz (1992 as cited in Nejadghanbar & Mohammedpour, 2012: 23) advised that the following seven components should be taken into consideration for the cooperative learning process.

- Group rewards are essential for group members to understand that individual success is dependent of the success of a group.
- Positive interdependence is an environment where mutual efforts are applied by individual members toward achieving team goals.
- Individual accountability refers to each member's contribution with the intention of obtaining the groups' success.

- Face-to-face promotive interaction where members motivate one another by encouragement or assistance to learn the content.
- Social skills have to be taught to learners in order to cultivate appropriate learning environment with groups.
- Group processing helps teams to identify behaviours that bring dysfunction and should be discarded or those that promote effectiveness and should be encouraged in a group.
- The opportunity for equal success is achieved when members of the group align their behaviours accordingly to allow fair opportunity for all members to learn.

Streeter (1999: 1) further mentioned the importance of other several aspects, such as providing ample time to nurture cooperative learning principles in learners. Teach them how to conduct group activities in an acceptable manner. Moreover, continuous monitoring of group interactions is necessary to ensure rich discussions that provide groups members with proper exchange of knowledge and feedback. The teacher should also afford groups enough time to work together through the worksheets and allow learning to take place. Therefore, these could be achieved with clear explanation and outlining of specific group goals.

Furthermore, Coffey (2008: 1) attests that the amount of time Slavin took to review the cooperative learning approach helped him to identify three elements that are prominent in STAD and crucial to students' learning techniques.

- Learners receive team recognition, but are graded as individuals.
- Team success is not based on the achievement of one learner, but mutual effort put into group discussions to help each other obtain group goals.
- All learners are expected to improve based on their prior performance, ensuring that all members are challenged to put in concerted effort and provide equal opportunity for success.

### **4.2.4.** The five essential elements of cooperative learning in STAD

The cooperative learning approach is known to uphold the following five characteristics: *positive interdependence, face-to-face promotive interaction, individual and group accountability, interpersonal and small-group skills and group processing.* These five elements define the type of group settings that are envisaged when employing cooperative learning techniques, such as in the context of the Technology classroom (Zarei, 2012: 162; Finelly, Bergom & Mesa, 2011: 2; Muraya & Kimamo, 2011: 731; Tanner, Chatman & Allen, 2003: 3). Furthermore, communities or groups of learning comprise of elements, such as cognitive, social and teaching presence. Therefore, when implementing STAD in the Technology classroom, the majority of the above mentioned characteristics are expected to be evident (Garrison & Kanuka, 2004: 97).

#### **4.2.4.1.** Positive interdependence

Positive interdependence is said to be noticeable when learners in the Technology STAD class realise that every member is putting in an expected amount of effort for the success of the team. Secondly, all teammates are working together in harmony toward set group goals, such as completing a task excellently and on time (Jalilifar, 2009: 97). Above all each member could only be able to achieve personal goals in the Technology STAD class if group goals are attained (Finelli, Bergom &Mesa, 2011: 2; Tanner, Chatman & Allen, 2003: 3; Jensen, Moore & Hatch, 2002: 29).

#### **4.2.4.2.** Face-to-face promotive interaction

These characteristics is resembled by members of a group sitting around a table, and are able to communicate with each other and interact at close range, allowing them to use acceptable voice levels in a classroom (Finelli, Bergom & Mesa, 2011: 2). Thereby learners in the Technology STAD class have the opportunity to share their opinions, give inputs and solve problems as a unit.

#### **4.2.4.3.** Individual and group accountability

In simple terms individual accountability could be explained as a state whereby each member of the group acts responsibly, taking the learning process seriously and earnestly putting in concerted effort for the group to obtain its goals. Whereas group accountability would be evident when all group mates exert expected effort and proportionally share group obligations. All members are expected to be faithful to the task entrusted to them by the team. It would also direct group energy in productive reporting and feedback other than wasting energy on negative situations (Finelli, Bergom and Mesa, 2011: 3; Muraya and Kimamo, 2011: 731).

#### **4.2.4.4.** Interpersonal and small-group skills

These skills could be explained as the use of appropriate communication ways and values when working with other people. Small-group skills include portraying acceptable behaviours and communication (verbal and nonverbal) cues, such as keeping eye contact when talking to others. Group members are also expected to be able to embrace other teammates' inputs and accept criticism and correction positively. Each member should actively take part in arriving at group decisions and conclusions (Muraya & Kimamo, 2011: 731; Tanner, Chatman & Allen, 2003: 3).

#### **4.2.4.5.** Group processing

At this level, group members are expected to have matured in a cooperative learning environment and are therefore able to assess the group proceeding constructively. Thus they should be able to indicate each member's contribution and dedication based on the quality of work produced by the respective member. Secondly, the team should also be in a state where they can confront unwanted behaviours and culprits must be willing to take the blame and accept correction. Thirdly the team should be able to identify their strong and weak points so that they can use their strong points more effectively in the future (Muraya & Kimamo, 2011: 731).

### **4.2.5.** The components of STAD

As these stages of administering STAD have only been mentioned above, in this section they are going to be explained.

#### **4.2.5.1.** Assigning learners to groups

In STAD learners are assigned to four or five member heterogeneous learning teams. Heterogeneity is determined by means of academic ability, racial background, ethnic group, language and gender (Maloof & White, 2005: 120; Berry, 2008: 151). With regard to assessing social skills, such as tolerance for others (positive interdependence, interpersonal and small group skills) in the Technology Class, this could be an important manner of grouping learners. In the context of this study, the gender category would, however, not be applicable, since it will be in a boys' only school. Groups would be formed based on academic performances of the June examinations' results as high, middle and low achievers. The groups would also be consisting of learners from different racial orientation to a certain extent (Gaith, 2004: 282; Tarim & Akdeniz, 2007: 80). This level already encourages the learners to promote positive interdependence, learn interpersonal and small group skills and organisation of the group process.

#### **4.2.5.2.** Teacher presentation

At this second stage as the educator, the researcher presents the content that is to be covered in a precise way to the whole class. The presentation could be done by a traditional lecture method, lecture-discussion type of lesson, demonstrations or by means of audio visual presentations. During this session, the teacher explains the content to the learners thoroughly and allows them to ask questions for clarity before commencing with group discussions (Slavin 1990: 54; Hendrix, 1999: 59; Stockdale and Williams, 2004: 38; Berry, 2008: 151; Chung, lo, Hsieh, Chang & Hu, 2010: 290; Tiantong & Teemuangsai, 2013: 86). I will be presenting a lesson on mechanical systems and control which includes levers and gear systems. The lesson would also indicate the importance of identifying real life applications, stipulate the objectives and promote interaction by asking thought provoking questions. While learners are asking clarity seeking questions and listening attentively, individual accountability is intrigued.

#### **4.2.5.3.** Team study

Then the teacher distributes the worksheets of the material he taught to the different groups. Each group should then go through this content making sure that all members understand the work (Chen, 1997: 73; Van Wyk, 2010: 84). The teams work together over the given study notes and complete worksheets that assist them to comprehend the content thoroughly (Maloof & White, 2005: 121; Slavin, 2005: 14). Learners, as they work with their teammates, should ascertain that all members of the team are conversant with the subject matter before they could take the individual quizzes. Therefore, they should effectively execute the problems on the worksheets and check everyone’s written and verbal responses and do corrections together (Scott 1998: 1; Kuntz & McLaughlin, 2001: 42; Berry, 2008: 151; Chung et al. 2010: 290; Van Wyk, 2010: 84).

#### **4.2.5.4.** Individual quizzes

After a period of group learning has ended every member in each team is expected to have mastered the given subject matter. The teacher would then administer the individual quizzes. The quizzes are on the material learners have learned and they may not help one another during this period (Hendrix, 1999: 59; Balfakih, 2003: 608). When the learners complete the quizzes, the teacher collects and marks them to allocate grades for each individual. The grades obtained by each team member would then be added to other group members’ grades to calculate group scores (Miller and Peterson, 2002: 2; Gaith, 2003: 453; Gaith, 2004: 282; Dikici & Yavuzer, 2006: 37; Tarim & Akdeniz, 2007: 82). At this stage of STAD individual accountability, as one of the essential elements of cooperative learning, would be achieved. Another important aspect of this stage is that individual scores are compared to the previous ones to assess the improvement with regard to academic achievement (Ningrum, 2011: 26).

#### 4.2.5.5. Team rewards

According to Slavin (1977: 12), scores of students are summed and compared to other members of their division with equal abilities from other teams. The high achiever's scores from one team would, for example be compared to other high achievers in other groups. The highest scorer in the category earns eight points for his team; the second highest scorer earns six points, the third highest scorer four points and all others only score two points. Then the highest score in each division or ability level is promoted to compete on the next higher level.

Based on the initial explanation during the development of STAD as explained above by the developer of this technique, it can serve as a tool for instilling intrinsic motivation among learners. Various studies indicate that the winning team, by means of more team scores, would be awarded a reward of some sort, such as team's certificate, rotating trophy or publication in school's newsletter (Slavin, 1980: 254; Slavin, 1990: 56; Maloof & White, 2005: 121; Dikici and Yavuzer, 2006: 37; Berry, 2008: 151; Van Wyk, 2010: 84; Tiantong & Teemuangsai, 2013: 86). Group goal as another important component of cooperative learning would be addressed to see if teams have reached their intended goal.

## 4.3. Technology as a school subject

In the previous section the researcher expatiated on the nature of STAD as a cooperative learning teaching method and a learning technique. In this part of the chapter the nature and the scope of Technology are going to be discussed. Technology and Technology Education would be used interchangeably in this chapter.

### 4.3.1. Defining Technology as a school subject

The definitions in this study range from the historical background of inclusion of Industrial Art in the school curriculum, Handcraft, Technical Education to present the time of Technology. Secondly, technology as a term is broad, for example encompassing computers, machines, buildings, clothing production, furniture making and media devices. In this context the definitions focus only on technology as a school subject.

Wilber in the late 1940s and Maley in the early 1970s broadly defined Industrial Art as: “those phases of general education which deal with technology, its evolution, utilisation, and significance; with industry, its organisation, materials, occupations, processes, and products; with the problems and benefits resulting from the technological nature of society”. In the early 80s Jackson Mill in his definition substituted ‘those phases of general education’ with ‘comprehensive study’ (Foster, 1994:3).

Foster (1994: 5) further indicates that in the mid-eighties when the American education changed from the Industrial Arts to Technology Education, the American Industrial Arts Association defined Technology as: “a comprehensive, action-based educational program concerned with technical means, their evolution, utilisation, and significance; with industry, its organisation, personal systems, techniques, resources, and products, and their socio-cultural impact”.

According to Herschbach (1995: 2), “Technological knowledge emanates from and is embedded in human activity, in contrast to scientific knowledge; and implies a high degree of intellectual sophistication applied to the arts and craft”.

Walmsley (2003: 1) is of the opinion that Technological Education is the subject that affects the individual learner’s potential to solve authentic problems by relating the acquired knowledge content to technological process and systems.

Vẻrillon (2004: 1) believes that “Technology Education aims at forming knowledgeable adults, responsible citizens and capable professionals”.

Koehler and Mishra (2005: 94-95) view Technology as a product that is self-contained that requires a learning of basic skills to unlock its potential. On the contrary, they refer to design process as “messy and complex that seeks to find solutions through active engagement with relevant materials, artifacts, tools, and ideas”. Furthermore design is a discourse between beliefs and reality, concepts and their utilization, utensils as aims.

Stein, Ginns and McDonald (2006: 180) adopted the description that Technology involves, “envisioning and developing products that meet human needs and wants, capitalise on opportunities and extend human capabilities”.

Hickman ( as cited in Ameil & Reeves, 2008: 32), refers to Technology as a process that includes; “the invention, development, and cognitive deployment of tools and other artefacts brought to bear on raw materials and intermediate stock parts, with a view to the resolution of perceived problems”.

In the South African context, the National Department of Education (NDE) (2002: 4) describes Technology as the “use of combination of knowledge, skills and available resources to develop solutions that meet the daily needs and wants”. The latest definition by the Department of Basic Education (DBE) in the new Curriculum and Assessment Policy Statement (CAPS) (2012: 8) states that Technology is *“the use of knowledge, skills, values and resources to meet people’s needs and wants by developing practical solutions to problems, taking social and environmental factors into consideration”.*

Therefore according to the researcher, Technology as a subject requires learners to be taught concepts, core knowledge, skills and values that would enable them to attend to authentic problems. Moreover, learners need not only to memorise the acquired content materials, but be able to use it appropriately to resolve societal problems, employing correct skills and values of Technology. The learners’ decisions should also consider how the resources used could suit the solution based on properties that can be affected by external conditions. The understanding of materials plays an important role that would help learners to bear in mind the environmental impact of the chosen materials for the solution.

### **4.3.2.** The nature of Technology

Emanating from the various definitions of Technology above, the general view is that Technology is the use of knowledge, skills and resources to solve problems to meet the needs and wants of the people and taking advantage of the opportunities identified. It is also clear that Technology is as old as the existence of humankind, because it is part of life to have needs and wants. Furthermore, it is human nature to think and come up with ways that could make things or life easier and better for themselves and to survive. The human needs and wants have been evolving throughout the years since the prehistoric times to the present day so has Technology to keep up with the arising demands. Stables (1997: 1) and Jarvinen (2001: 3) concur that Technology is a fundamental division of human culture.

The scope of this study guides the discussion of the nature of Technology regarding the type of knowledge people acquired or created and the skills and resources involved or they use to meet their needs and wants; and how that knowledge and skills are imparted or taught to the following generations. According to Jarvinen (2001: 24), etymology indicates that Technology is made up of two words from the Greek origin, techne and logos. Techne includes art, skills and technique and logos refers to words, speech, discourse, knowledge and thought.

Moreover, Technology in nature is a broad concept that cannot be limited to engineering, sciences, handcraft or industrial arts, but almost every human activity that strives to meet the needs and wants of the society by providing practical solutions, including the use of high tech computing (Jarvinen, 2001: 31; Wonacott, 2001: 1; DBE, 2012: 8).

De Vries (1996: 3) and Zuga (1999: 6) regard technological innovations as ranging from scientific applications, economical influence, political dominance, legal considerations to an artistic perspective. This definition could be regarded or interpreted as viewing Technology in a holistic way, due to being prompted by an intrinsic humanistic movement towards improving societal life. Another view is that technological innovations emanated from cultural influences, knowledge and human interactions with the environment and social interactions in planning and inquiring ways of survival (Petrina, 1992: 3). It can therefore be attested that Technology encompasses a wide range of subject content that integrates with other subject matter, such as Science, Engineering, Home Economics, Math and Physics (Lewis, 1999: 6; Dyer, Reed & Berry, 2006: 1).

### **4.3.3.** Philosophical background of Technology Education

According to Forster (1995: 2), the proponents of Industrial Arts Education, namely Russell and Bouser, in the early 1900s criticised the then school curriculum as “culpably bookish” and further classified school subjects as “humanistic and scientific”. They then proposed third phase or identity in the curriculum as the inclusion of “industrial”. They further postulated this third fold as fundamental to the social and political well-being of democracy.

The above argument gave birth to what they (Russell and Bouser) said is the Industrial-Social Theory. The ideology behind the introduction of Industrial Education was to “develop knowledge and understanding of social and economic relationships essential to every child’ according to Bouser (as cited in Foster, 1995:3).

Mossman further expanded the idea of Industrial Education by singling out various aspects that should be included, such as “food, clothing, shelter, records of human experience, containers to hold one’s possessions, and tools and machines” (Foster, 1995: 4). Therefore the researcher further adds that Technology, Technology Education or Design and Technology continued to show its holistic nature from its inception and now it incorporates information and communication, electrical and electronics, mechanical and civil, food and material, environmental and medical technologies (Householder, 2012: 117-120).

Yawson (2012: 300) and Hong, Hwang, Wong, Lin and Yau, (2012: 452) mention various philosophical meanings of Technology that support the notion that Technology “is pervasive and includes a countless number of devices, systems and modifications that greatly affect every individual in the society”. Due to this holistic nature, the nature of technological knowledge is also influenced. Milne and Edwards (2013: 13) indicate proponents of Technology Education, such as McCormick and de Vries to have come up with types of knowledge, like conceptual knowledge, procedural knowledge, physical nature knowledge, functional nature knowledge; means ends knowledge and action knowledge.

In the next section of this chapter the researcher contextualises Technology Education to the South African perspective as defined and elaborated in the national curriculum documents.

### **4.3.4.** The South African context of Technology

According to NDE (2002: 4) and DBE (2011: 8) the definition is brief: *Technology is the use of knowledge, skills, values and resources to meet people's needs and wants by developing practical solutions to problems, taking into consideration the social and environmental factors*. From the definition above it can be deduced that the South African curriculum is using the holistic and dynamic natures of Technology and the pedagogical practices emanate from the constructivist perspective.

The curriculum expects learners to be able to analyse the societal needs and come up with working solutions. That means they should have acquired a holistic type of knowledge that would broaden the thinking and creativity spheres. Secondly, for learners to be aware of social needs and consider social and environmental issues in developing practical solutions, they should have interaction with the society and the environment as the constructivist view states. The teaching of indigenous Technology shows the changes in societal needs over the years of human existence and modification of methods of meeting consistent needs in dynamic approach.

#### **4.3.4.1.** Content knowledge

The core content knowledge is developed around structures, processing of materials, mechanical systems and control and electrical (electronic) systems and control (DBE, 2011: 10; NDE, 2002: 8). It could therefore be assumed that it includes conceptual, physical nature, functional nature and action knowledge.

In structures learners are introduced to different kinds, such as those that are man-made and those that are natural. Learners study how these types of structures are formed, used, strengthened and stabilised for the benefit of the society and the environment. Secondly learners should be able to differentiate between various structures by means of definition and function.

Processing of materials covers a wide range of knowledge with regard to properties or characteristics that help the technologists to choose the correct material for the purpose of the design. The content matter includes metals, plastics, paper, polystyrene, cloths (cotton, silk, viscose, wool), and wood. Students further learn how to treat or improve the qualities and lifespan of the various materials and ways of minimising the negative impact on the society and the environment.

Within the mechanical systems and control, learners are taught and encouraged to investigate how different machines work to make work easier and lighter for people. The content knowledge in this section ranges from levers, cams, gears, gear trains, pulleys, hydraulic systems and pneumatic systems. The control part covers the safety measures by means of control systems or mechanisms, such as cleats, and ratchet and pawl that can be put in place to ensure safe operation of the machine. That is to curb reverse movements and slip and the control direction of movement, start and stop function.

In electrical systems and control, learners learn about electrical circuits, operations including, components, sources of energy, electrochemical cells, production of large amounts of electricity, electronic systems and control devices, such as switches and gates.

#### **4.3.4.2.** The design process

NDE (2002: 6) explains the technological process skill or the design process skills as the backbone of Technology Education. It is a more procedural kind of knowledge. This is where learners creatively and interactively develop solutions to problems identified or societal needs that should be met. The skills that are essential in this case are investigation, design, making, and evaluation and communication skills.

Thus the design process should be employed as a framework for teaching all learning objectives as interactive steps or stages that should always be followed by learners when developing practical solutions to real life needs, problems or opportunities that are discovered (Rauscher, 2010: 295, DBE 2011: 12).

The researcher believes that the design process as mentioned above covers a wide spectrum of knowledge frameworks developed by the proponents of Technology Education, such as Vincenti, Ropohl, de Vries and Bayazit emanating from their various backgrounds of specialisation fields of aero nautical engineering, structural engineering, silicon technology and design respectively (Rausher, 2010: 293).

### 4.3.5. The structure of Technology

According to the researcher, the structure of Technology can be described as the relationship between the content matter, knowledge, skills, values and attitudes or the route of teaching learners towards application of acquired knowledge, skills, values and attitude when solving problem, meeting the need or opportunity.

#### 4.3.5.1. Reddy, Ankiewicz, De Swardt and Gross' illustration of structure

Reddy, Ankiewicz, Deswardt and Gross (2003: 3) illustrates the structure of the content of Technology as divided or categorised into three main levels in their interpretation of the National Curriculum Statement. The levels are the content dimension that produces the components of knowledge, skills, values and attitudes and technological capability. In the third dimension, the knowledge acquired can be general or specialist, skills that are obtained here are separated from the design process skills and they include cognitive, psychomotor and other related skills. Values and attitudes do not proceed to the third domain. Lastly the technological capability expected end result would be for learners to master technological process, as a routine of design stages.

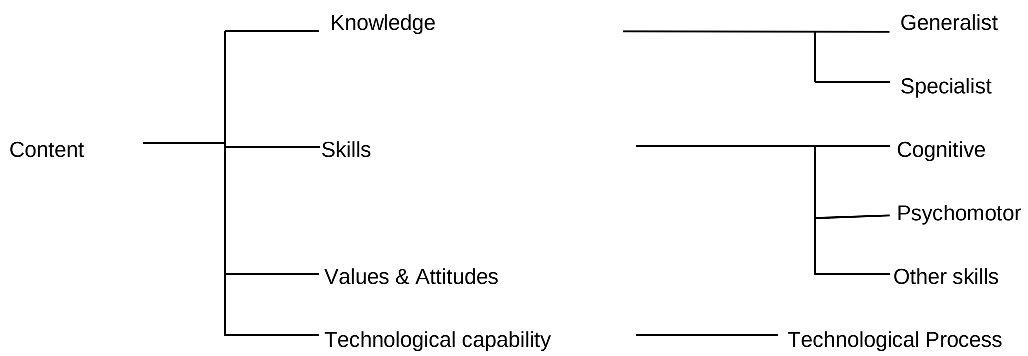



Figure 4.2 Adapted from Reddy et al. (2003: 30)

#### **4.3.5.2.** The structure of Technology derived from CAPS

It has been mentioned earlier in this section under the contextual definition of Technology that there are four main strands of content areas to be covered each year through the Senior Phase Band (Grades 7-9) (DBE, 2011b: 10).

The researcher understands that, unlike in the present outgoing National Curriculum Statement that underpinned a broader learner centred approach' the incoming Curriculum and Assessment Policy Statement takes a more content-based approach by detailing the specifics of what subject matter should be taught per grade per term.

In the National Curriculum Statement, according to the researcher, the four content areas stated earlier were placed under one Learning Outcome 2 and the teachers were guided by the Assessment Standards to determine the specific content material that would meet the required level (NDE, 2002: 34-51). Moreover, there was a high possibility that an educator could do only the subject matter he or she feels comfortable to teach. One may for example prefer food processing to material processing or choose to do electrical systems and control compared to mechanical systems and control. The other concern for the researcher would be a high probability of lack of progression in terms of taught subject matter from one grade to the next, or the specific content could be congested into one grade, for instance one would do the structures in Grade 7 and systems and control in Grade 8 and processing in Grade 9.

In the Curriculum and Assessment Policy Statement, the above concerns are, however, responded to in a way that every content area is spread through the three grades with stipulation of topics that resemble progression in subject matter to the next grade. This new curriculum also ensures equality among schools in terms of work that needs to be taught (DBE, 2011b: 14-36).

Due to the above mentioned structuring of Technology, the researcher is of the opinion that equality in education would be achieved. Secondly, teachers would know exactly what to teach and perhaps be able to identify key content areas that may be problematic in terms of delivery in the classroom and seek help from the colleagues or Subject Adviser. In the next paragraph the researcher is going to elaborate on Technology content areas as shown in the curriculum document to support the above stipulations.

The content area of structures at Grade 7 level includes types of structures, how structures can be reinforced or stiffened and learners should be able to label and explain the components of structures. In Grade 8 the content gets more sophisticated as learners explain members of frame structures, materials mostly used to make frame structures, types of bridges, functions of arches in structures and structural failures and their causes. The subject matter further encompasses forces that act on structures and how materials can be adapted to withstand these forces. In Grade 9, learners focus on kinds of forces in terms stationary and moving, even and uneven loads and ways of strengthening materials to resist the act of forces. Furthermore, learners learn more about properties of different construction material and how or why they can best suit their roles or functions in structures (DBE, 2011b: 14-30).

Under processing, Grade 7 topics cover the investigation of clothing materials used for various dangerous occupations or professions. The learners also find out about indigenous building materials in rural South Africa and informal settlements, including their building techniques. At the Grade 8 level, learners investigate how different packaging materials (plastic, paper, cardboard, polystyrene) impact the society and the environment. In Grade 9 the spectrum is broadened from metal preservation techniques, food preservation methods to types of plastics and their assorted functions. Pertaining to society and the environment learners investigate how to reduce, reuse, and recycle (DBE, 2011b: 20-36).

Within the mechanical systems and control, learners in Grade 7 are taught simple mechanisms, such as levers, their classification and how to calculate their mechanical advantage. Learners are further introduced to operation principles of pneumatics and hydraulics, cranks and pulleys. In Grade 8 learners are introduced to wedges, the wheel and axle, the types of gears and their effects on gear trains. Learners also learn how cranks and cams transfer motion. For more complexity, they learn to calculate mechanical advantage in gear trains using gear ratios, such as number of teeth ratio, wheel/gear diameters and velocity ratios. At the Grade 9 level, learners do the effects of diverse gear types and combinations to transfer movement, speed and power. They then learn how different control systems (cleats, ratchet & pawl) work in mechanical systems (DBE, 2011b: 14-32).

In electrical systems and control at the Grade 7 stage, learners do magnetism pertaining to its definition, types, shapes and the magnetic field. Moreover, learners investigate materials that can be attracted by magnets. They then do simple electrical circuits. In Grade 8, the content advances to categorising of circuit components into input, process, output and control devices. Learners further learn about electrochemical cells, photovoltaic cells and various methods that can be used to generate large quantities of electricity for supplying a country. With regard to society and the environment, learners investigate heating, cooking and lighting energies used in rural and informal settlements **(See CAPS document, annexure 14).** Learners in Grade 9 are introduced to electronic gates and types of electrical circuits. They further do Ohm's Law and learn how to apply it in a circuit and how to calculate variables, such as voltage, resistance and current using Ohm's Triangle. Learners are also taught how to determine the values of resistors by using resistor colour codes. They are further introduced to electronic control devices, such as light emitting diode (LED), sensors, light dependent resistors (LDR), thermostat and touch or moisture detector (DBE, 2011b: 18-34).

With all these content areas, the design (technological) process skills have to be covered in a case study and through a mini practical assessment task (mini-PAT) not forgetting to include the bias and the impact on the society and the environment. According to DBE (2011b: 10), evaluation skill is the heartbeat of the design process, because the process in nonlinear and all steps interact through evaluation. The researcher, however, believes that the model has to display a continuous interaction among the different design process stages to indicate that even the stages shown on the peripheral also interact directly with each other. Hence the researcher modified the design process model in figure 4.2.

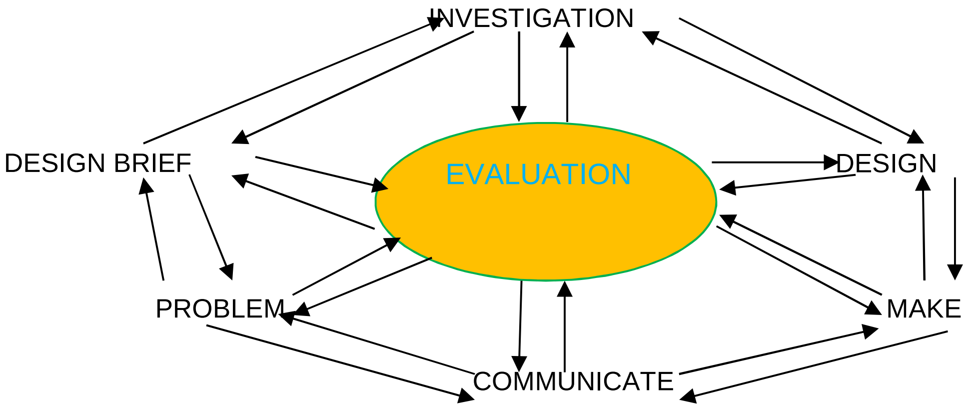



Figure 4.3 adapted from DBE (2011b: 10).A modified design process

Referring back to the prior postulations on the content areas, the researcher interpreted the structure of Technology in the Curriculum and Assessment Policy Statement in figure 4.3 as illustrated below based on Reddy et al. (2003).

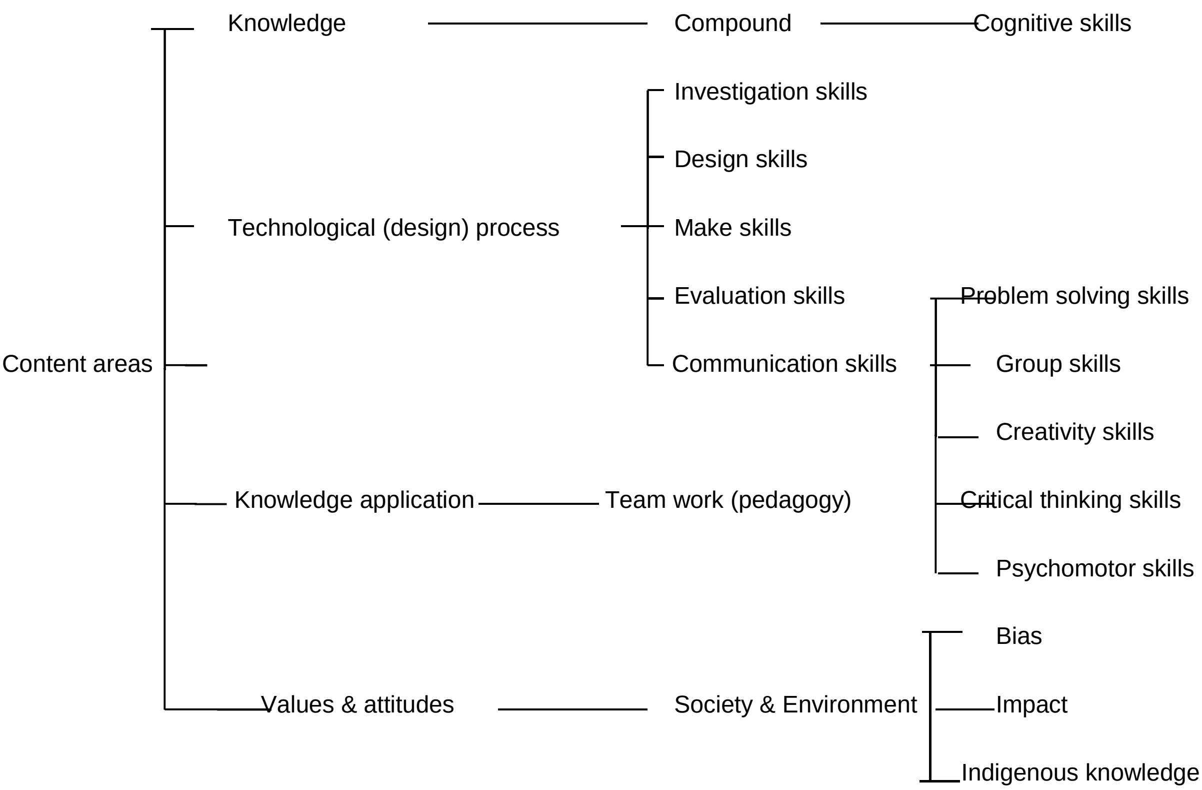



Figure 4.4 Technology Education Structure as modified by the researcher

#### **4.3.5.3.** Pedagogy in Technology

The classroom approach to teaching Technology in South Africa is project-based with the emphasis on learner-centeredness to inculcate active participation of learners. Learners work in teams to do the projects that solve real life context problems or meet the need or opportunity arising. Therefore acquired knowledge is complemented by practical work that needs the implementation of the knowledge obtained (NDE, 2002: 4; NDE, 2003: 2; Rauscher, 2010: 296; Rohaan, Taconis & Jochems, 2010: 272; DBE, 2011b: 10; Hong et al. 2011: 474). The researcher, however, asserts that for learners to be able to master team work during the practical assessment tasks, they need to be taught how to work in teams by means of employing STAD during the delivery of Technology theory or content matter. If this is done from the start with the subject matter, learners would have learned group skills and therefore become comfortable to do projects in groups and embrace team goals and assist each other for the success of the group.

Due to the very same nature of Technology as in South Africa, New Zealand's curriculum employs an authenticity-based kind of teaching technology which also supports constructivists' ways of education engagement in Technology Education (Petrina, 2003: 5; Snape & Fox-Turnbull, 2011: 5-12). Learners are given an opportunity to develop curiosity, critical and ethical thinking and improve on their social competence and self-confidence in the Technology classroom (Turja, Endepohls-Ulpe & Chatoney, 2009: 357; Williams, 2011: 9).

Secondly, a Technology educator is expected to display the following four types of knowledge categories: (1) subject matter knowledge which is about conceptual, procedural knowledge, the content that needs to be taught to learners and also the understanding of the nature of Technology as a school subject. (2) The general pedagogical knowledge that includes various methods of teaching and learning techniques. (3) The knowledge of the context, being able to interpret the curriculum documents of the country. Lastly, the pedagogical content knowledge is a broad and integrative domain, where a teacher should know pupil's views and perceptions and misconceptions of Technology. The teacher should also comprehend the nature and purpose of Technology Education as stipulated in the Curriculum and Assessment Policy Statement. Then the Technology educator should have the insight regarding pedagogical approaches and teaching strategies applicable to teaching Technology (Rohaan, Taconis & Jochems, 2010: 272-273; Hynes, 2012: 348).

Therefore in addition, the Technology teacher should be well conversant with the technological (design) process and how to use it in teaching diverse content areas, since it forms the backbone of Technology Education in South Africa (DBE, 2011b: 10).

The design process has few stages or components that are employed towards problem formulation and resolution. Learners work through these steps as active participants together in their teams (Hong, Chen, Wong, Hsu, & Peng, 2012b: 475; Hong et al. 2012: 456).

The design process can be defined as a complex and diverse non-linear type of procedure. Learners should, however, be taught to identify the problem, need or opportunity from a real life context, supported by McCormick's definition of the design process as the implementation of a problem solving process that can be viewed as a cognitively developing exercise (Warner & Morford, 2004: 2; Potter, 2011: 6-7; Williams, 2011: 11; Wong & Siu, 2012: 442).

Van Niekerk, Ankiewicz and Swardt (2010: 195) expand the five stages of technological process in the National Curriculum Statement into ten stages in order to simplify and make it more detailed for the purpose of teacher explanation to learners. The steps basically show sub-stages that are carried out in each step of the design process. The layout of the steps include problem statement, design brief, investigation, proposal, generation of ideas, deciding on final idea, developing final ideas, planning, making and evaluation. The researcher agrees that this expansion would be helpful to teachers and learners to develop and nurture various skills needed in the design process. This model is also similar to the Massachusetts' and Labrador Departments of Education illustrated in (Hynes, 2012: 347-348).

#### **4.3.5.4.** Assessment in Technology

Assessment in Technology is not only based on the final product, such as test or project done somewhere and handed in, but the whole process of designing has to be addressed so that learners understand its importance. Values and attitudes that lead to proper decision making in choosing appropriate designs to solve the problem, meet the need or opportunity are also an essential part of assessment (Van Niekerk, Ankiewicz & Swardt, 2010: 192).

DBE (2011b: 38) suggests that assessment in Technology should be informal (as learners work through the worksheets or projects) and formal (where learners do their individual quizzes, test and projects) for the purpose of recording and reporting.

Informal assessment entails daily progress evaluation during group discussions and project building and teacher presentations. It includes baseline and formative assessments due to its purpose of informing the teacher and learners about the present progress and they reflect on the learners' results. If the need arises, then the teacher would opt for diagnostic assessment in order to remedy the situation and assist learners to understand the material clearly (NDE, 2003: 2-7; DBE, 2011b: 39).

Formal assessment provides feedback through formal tests and projects. The results obtained from these assessments are recorded for grade progression and certification purposes. According to DBE (2011: 39), formal assessment in Technology consists of the mini-practical assessment tasks (mini-PAT) per term and a minimum of one pen and paper test each term for three terms and an examination at the end of the year. Teachers are therefore encouraged to structure tests and examination papers to meet the Bloom's Taxonomy requirements of cognitive levels. Thus a question paper should be formed out of 30% of low order questions (recall), 40% of middle order (understanding and application) and 20% of high order (analyses and synthesis) questions. The project design (capability task) should also include 30% low order (routine), 40% middle order (diagnostic and strategic) and high order (interpret, create and evaluate) questions, influenced by Plant et al. as Problem Solving Taxonomy. Furthermore, test weighing is divided into 50% design process skills, 30% knowledge and 20% values and attitudes (indigenous, impact, bias) (DBE, 2011b: 41). Below are the taxonomies of Bloom and Plants, Dean, Sears, and Venable; problem solving taxonomy (1980: 3) to explain the above paragraph.

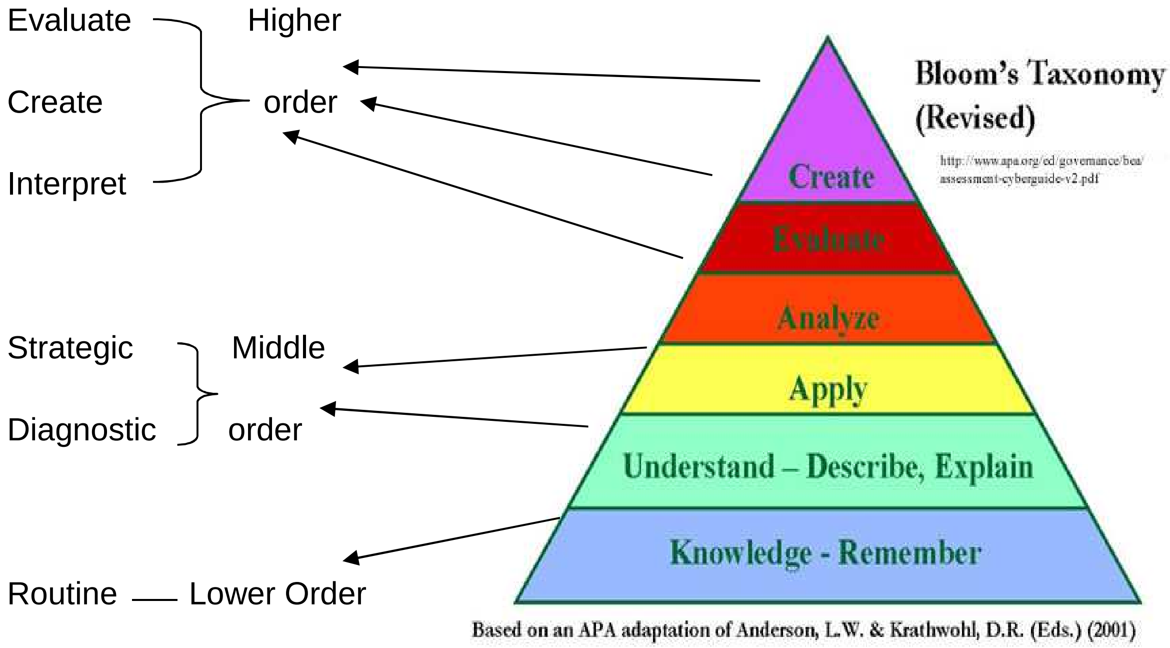



Figure 4.5 Plant et al.

Problem Solving Taxonomy compared to Bloom's Taxonomy

### **4.3.5.5.** Purposes of Technology Education

Ritz (2009: 8) in his article recommends manifold goal statements or purposes of Technology which teachers need to constantly bear in mind when teaching Technology. These purposes were indicated as "must have" by 80% of the research participants who hold high positions in education administration. The goal statements are listed below in order of their high to low preference according to percentages ranging from 93.3% to 53.3% (Ritz, 2009: 8).

Table 4.1 Must have Goals

| **"Must have" Goal Statements** |
|---|
| Describe social ethical and environmental impacts associated with the use of technology. |
| Become educated consumers of technology for personal professional and societal use. |
| Apply design principles that solve engineering and technological problems. |
| Use technological systems and devices. |
| Use technology to solve problems. |
| Describe relationships between technology and other areas of knowledge. |
| Develop abilities to live in a technological world. |
| Develop and appreciation for the role technology plays in the design world. |
| Troubleshoot and repair technological systems and devices. |
| Make informed career choices related to the design world. |
| Describe the nature of technology. |
| Extend creative abilities using technology. |

The above mentioned goal statements emanate from the ones formulated by Sanders (2001: 10) earlier in the last decade. They are then improved to match the nature of the present time Technology Education that is no longer based on demonstrated vocational skills that students had to emulate. Rasinen (2003: 1-7) evaluated the Technology Education Curriculum of six different counties: Australia, England, France, Netherlands, Sweden and the United States. In general they also share most of these purposes in the table above.

The introduction of Technology Education in the South African curriculum is an attempt to produce engineers, technicians and artisans for modern society and also to foster a technologically literate nation for the modern world. The subject is intended to inspire learners to be experimental and nurture their creative and critical thinking skills. Technology as a subject aims at affording learners opportunities to:

develop and apply specific design skills to solve technological problems; secondly, to comprehend the concepts and knowledge employed in Technology Education and implement them responsibly and purposefully; lastly, treasure the reciprocal effect between people's values and attitudes, technology, society and the environment (DBE, 2011b: 8). These goals also form part of the recommended list above to show that the South African curriculum is aiming at the same outcomes as other countries.

## **4.4.** The scope of Technology in South African Schools

In South Africa, Technology Education starts in the Intermediate Phase (Grade 4-6) as Science and Technology and continues through the Senior Phase (Grades 7-9) as the independent subject, Technology. At the FET Phase (Grades 10-12) there are various specialisation fields of study branching from Technology, such as Civil, Mechanical and Electrical Technologies, Engineering Graphics and Design, Design and Physical Sciences. A learner can also proceed to the tertiary level to get qualifications as Engineers, Artisans, Technicians, Quantity Surveyors or Architects (DBE, 2011b: 9).

## **4.5.** Conclusion

In the first section of this chapter the researcher looked into the various definitions of STAD and the theoretical perspective that foreground STAD as a cooperative learning technique have been extrapolated. The four theoretical perspectives were explained and reconciled to show how they influence the process of a cooperative learning classroom.

The researcher also touched on the historical background of STAD and showed how research describes STAD as a dynamic cooperative learning technique that is flexible to adapt to various situations and subjects hence its popularity in research studies all over the world.

Moreover, the five essential aspects of cooperative learning were also discussed in order to bring their application into the context of the Technology STAD class. Then moved on to the components of STAD and how they would be implemented in the Technology STAD class.

In the second section of the chapter, Technology as a school subject was defined, showing developments and changes that took place as years went by from vocational description to the present definition that states the purpose of Technology.

The researcher further discussed the nature of Technology as a school subject and its relationship with other related subjects in the fields of science, engineering and technical education. The philosophy behind the teaching of Technology as a subject that evolved was discussed from being mainly practical to being content and process based and instilling critical thinking in our learners.

Furthermore, the description was brought home by explaining technology according to the South African Department of Basic Education. There the researcher focused on the pedagogy or teaching of Technology, assessment of the subject and the type of learner who is expected to be produced. The researcher also expanded on the purposes and the scope of technology.

In the following chapter, research methodologies and designs that apply to this study are explained. The chapter states how the research proceedings took place and how data was collected.

# CHAPTER 5

# RESEARCH DESIGN AND METHODOLOGY

## 5.1. Introduction

In the previous chapter the researcher in brief discussed the nature and scope of Technology as a school subject in South African education. Technology is generally perceived as more vocationally or practically orientated by people who do not teach the subject. This holds true for expectations of the learners as well. On the contrary there is more theory or in other words conceptual, social and procedural knowledge that needs to be acquired by the learners in order to assist them exercise their creative skills based on knowledge.

Procedurally learners should be able to apply the technological or design process correctly and thoroughly with understanding when coming up with solutions to problems or to meet societal needs and wants which have emerged. Conceptually learners need to understand the properties of various materials used to manufacture machinery and other products that have been used as solutions to various contextual problems or to meet the needs and wants of the community. Secondly, they need to know how different aspects of the content, such as structures, mechanical and electrical systems and processing of materials contribute to their pool of knowledge. In all these, learners have to consider social and environmental issues to avoid or minimise the negative impact or harm to the society and their environment.

In this chapter the researcher elaborates on the mixed methods research methodology including the design and methods that were implemented for the purpose of this study. The researcher also stated the outline of field work proceedings since the study is twofold. The one part of the research focused on the effects of STAD on learners while the other part concentrated on the researcher's praxis. Another section which will employ ethnographic and phenomenological designs of qualitative research focuses on learners as they work in their various STAD teams to achieve group goals.

The chart below shows the paradigmatic alignment of this study.

Figure 5.1 Paradigm Guide

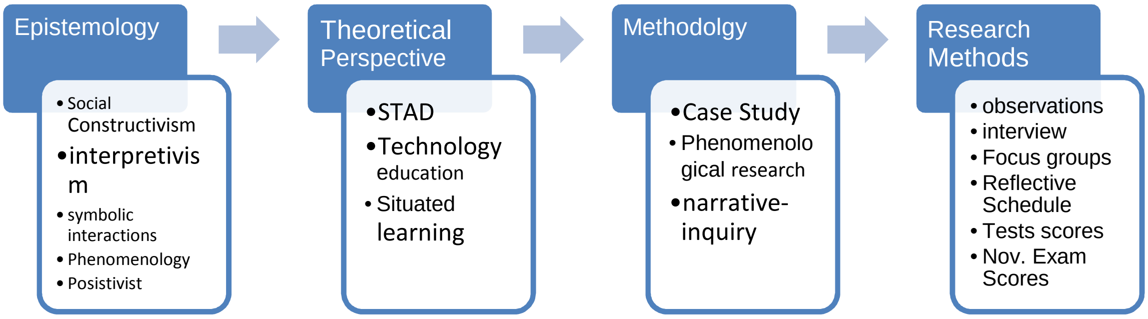



Figure 5.1 Paradigm Guide as adjusted by the researcher

## 5.2. Research paradigm for this study

This study has employed a naturalistic, interpretivist and constructivist qualitative research designs for thorough explanation of the phenomenon (Technology classes where STAD is administered) and the effects thereof on the learners and the researcher. The use of bricolage designs was inspired by its flexibility to allow the application of both qualitative and quantitative methods of collecting and analysing data in a single study (Creswell, 2012: 535; McMillan & Schumacher, 2010: 396; Gray, 2009: 204; Denzin & Lincoln, 2009: 6; Creswell, 2006: 10).

Moreover, based on the main research question, the effects of STAD on the academic performance and content retention could best be clarified by analysis of tests and examinations scores of learners. This data is quantitative in nature as they involve numbers that would need descriptive analysis (Creswell, 2012: 545; Creswell, Klassen & Plano-Clark, 2011: 8).

Furthermore the epistemological position of bricolage designs allow the multi-paradigm stance. Whereby one set of data could be guided by the constructivist paradigm that constitutes truth and meaning as human constructions and the interpretation of the phenomena depends highly on participants' interpretations of their experiences. The other set of data could emanate from objectivists' (positivists') perspective, which holds that reality is single and independent from the researcher (Creswell, Klassen & Plano-Clark, 2011: 4; Gray, 2009: 201). Since constructivism as a research paradigm acknowledges that knowledge could be socially constructed and that reality is of this world is associated with bricolage of research instruments (Creswell et al. 2011: 4; Gray 2009: 204). Moreover, pragmatism believes that the combination of research methods works better than a single method and further gives the research question presidence over philosophical and paradigmic premises (Zandvanian & Daryapoor, 2013: 528; Wahyuni, 2012: 71; Morgan, 2007: 71).

The researcher is, however, of the belief that the qualitative and quantitative methods of collecting and analysing data for this research should be guided by their individual paradigms and philosophical assumptions. The researcher further believes that by honouring qualitative and quantitative paradigms, reconciliation of the two controversial stances would be noticeable so that data may be used to strengthen the weaknesses of one method by the other (Cameron, 2011: 102; Morris & Burkett, 2011: 28).

For the purpose of strengthening the position of this study, Cameron (2011: 101) tabled various paradigmic stances in mixed methods research as follows:
Multi-paradigm stance guided this study toward employing embedded mixed methods designs for the purpose of explaining the relationship between the academic performance of learners and the implementation of STAD and retention of taught material by learners and the use of STAD. Thus, it is the interpretation of the experiences of participants in relation to the numerical effects of employing STAD in Technology.

Moreover, in this study qualitative research methods of data collection and analysis take priority over the quantitative methods. The reason being, that the statistical data is used to complement the qualitative data and to add extra information for clearer explanations of the phenomenon.

Therefore in the next section the researcher has expatiated on the definitions of research, paradigm and major paradigms that influenced the collection and analysis of data for this study.

### **5.2.1.** Definitions of research

Research has been defined as a chronological order of inquiry where data is gathered, analysed and construed in a manner that would help the researcher to comprehend, expound, predict or control an educational phenomenon to empower other researchers in the field and contribute to the body of knowledge (Mertens, 2010: 2; Mackenzie & Knipe, 2006: 2).

Secondly, Creswell (2012: 3) supported the notion that research is a process or series of steps that are employed to collect and analyse data that would increase our knowledge and understanding of a topic or phenomenon under study.

### **5.2.2.** Clarifying paradigm in research

In some instances or studies, theoretical frameworks are considered as paradigms, due to their influence regarding the course to gain understanding and acquiring of knowledge (Mackenzie & Knipe, 2006: 2).

Paradigm is, however, defined as "*a loose collection of logically related assumptions, concepts or propositions that orient thinking*" or philosophical intent or motivation for undertaking a study (Bogdan & Biklen, (1998); Cohen & Manion (1994) as cited in Mackenzie & Knipe, 2006: 2).

Moreover, Denzin and Lincoln (2010: 5) describe paradigm as "*belief systems that attach the user to a particular world view*". Furthermore, Guba and Lincoln (1994: 105) also describe paradigm as "*basic belief system or worldview that guides the investigator, not only in choices of methods but in ontologically and epistemologically ways*".

In agreement with the above descriptions, Hammersley (2012: 3) delineates paradigm as "*a set of philosophical assumptions about the phenomena to be studied, about how these phenomena can be understood and even about the proper purpose and product of research*".

Chalmers (1982) as cited by Willis (2007: 8) concurs by modifying the definition of paradigm as "*made up of the general theoretical assumptions, laws and techniques for their application that the members of a particular scientific community adopt*".

It can therefore, be deduced from the above definitions that paradigm is a basic belief system or conviction of the researcher. It serves as the manuscript (constitution) of principles, values and norm in which the believer (researcher) should uphold and apply in order to reach the expected end of the investigation or inquiry.

### **5.2.3.** Major paradigms

There are several paradigms that are used in research, such as *Positivism/Post-Positivism, Interpretivism/Constructivism, Critical Research/Transformational* and *Pragmatism*. In this study only the first two will, however, be elaborated on in order to help clarify the origin of the paradigm that underpinned this investigation.

Denzin and Lincoln (2010: 1-2) attest that there has been a long battle between the positivists' and interprivists' paradigms that lasted over two centuries. They further contend that the early paradigm only accepted objective, value-free and controlled scientific observations' results and could not accept the notion that knowledge can be generated subjectively in social contexts.

Therefore, it is important for a researcher to determine a stand in terms of the paradigm that would direct the intentions and carrying out of the research processes. Without a paradigm a researcher has no foundation in employing particular research methodology, methods and designs (Denzin & Lincoln, 2010: 5; Mackenzie & Knipe, 2006: 2).

Mertens (2010: 8), and Guba and Lincoln (1994: 105) assert that these major paradigms are contesting for acceptance to inform qualitative inquiry, which is the method of research used in this study.

#### **5.2.3.1.** Positivism/post-positivism

Guba and Lincoln (1994: 105) describe positivism as the "*received view*" that ruled and reigned over formal processes in research for more than four centuries.

Mertens (2010: 10) is also in accord that positivism is founded on the rationalistic empiricist philosophy that was developed by Aristotle, Francis Bacon, John Locke, Auguste Comte and Immanuel Kant.

The positivists believe that the social world can be studied in the same manner as the natural world. In natural sciences, reality of knowledge is founded only on scientific methods of experimentation and measurements that could be observed with the intention to discover and describe constant relationships between variables (Cohen, Manion and Morrison, 2007: 11). Positivism further argued that "*scientific knowledge is valid, certain and accurate*" (Crotty (1988) as cited by Mertens (2010: 11).

Cohen, Manion and Morris (2007: 11), however, point out the short fall of positivism with regard to its application in human behaviour due to the complexity of human nature. Moreover, there is a lot that is not easy to observe scientifically as this paradigm suggested including feelings and thoughts (Mertens, 2010: 11). Comte, as the founder of positivism, highlighted three stages of explanation of reality as the theological explanation, metaphysical or philosophical explanations and positivism which is the pure scientific explanations. He further contended his stance that human sciences should 'follow suit' of the natural sciences by implementing scientific methods to validate theories of human behaviours (Mack, 2010: 6; Willis, 2007: 12).

Furthermore, Mack (2010: 6), McGregor and Murnane (2010: 5) substantiate the purpose of positivism in research as prominently using standardised scientific methods and statistical analysis that would be able to generalise the findings to either support or disapprove a hypothesis. Positivism further posited that a researcher (scientist) is the objective observer of reality with no bias and data can only be quantified. It is, however, arguable to what extent quantitative research adheres to the premise of positivism (Ormston, Spencer, Barnard & Snape, 2013: 9).

Kraus (2005: 760), Steenhuis and de Bruijn (2005: 2) endorse the aim of positivism as seeking to comprehend reality by employing methods of data collection that are objective and unbiased. These methods have to be validated and proven to be reliable to draw scientific conclusions from their data analysis using established tools. This is done to confirm that the same findings would be achieved in another research that employed the same methods.

This extreme and concrete stance of positivism, led to the emerging of a more polite version of positivism that accommodated inductive ways of generating knowledge.

#### **5.2.3.2.** Positivism paradigm for quantitative research methods

Though the post-positivism still believes in generalisation, it repudiated the notion of pure deductive ways of developing and acquiring knowledge, as well as achieving absolute truth when it comes to human behaviours (Wahyuni, 2012: 71) though it accepts the  believed that knowledge can be socially constructed (O'Leary (2004) as cited in Mackenzie & Knipe, 2006: 3).

Moreover, Mertens (2010: 12) concurs that post-positivism modified the view of basic positivism to accept uncertainty of claims or conclusions drawn by researchers.

The two paradigms are regarded as one in the modern world of Technology research to permit subjective interpretation of a social setting for purposes of triangulation (Hammersley, 2012: 21; Mertens, 2010: 12). Therefore, acknowledging inductive dialogue to generate knowledge pertaining to the uniqueness and complexity of social context as support to scientific methods (McGregor & Murnane, 2010: 5).

#### **5.2.3.3.** Ontology and Epistemology in Positivism

Table 5.1 on the following page gives an overview of the ontological and epistemological assumptions that dictate positivists' researchers.

**Table 5.1 (Positivism)**

| Ontological Assumptions | Epistemological Assumptions |
|---|---|
| ➢ Reality is external to the researcher and represented by objects in space.<br>➢ Objects have meaning independently of any consciousness of them.<br>➢ Reality can be captured by our senses and predicted. | ➢ The methodology of the natural sciences should be employed to study social reality.<br>➢ Truth can be attained because knowledge rests on a set of firm, unquestionable, indisputable truths from which our beliefs may be deduced.<br>➢ Knowledge is generated deductively from a theory of hypotheses.<br>➢ Knowledge is objective. |

The table above is adapted from (Mack, 2010: 7)

The post-positivism's belief that reality can be constructed in social settings provided a platform for the development of another paradigm that promoted and advocated the subjective interpretive approach to describe social contexts.

#### **5.2.3.4.** Interpritivism/constructivism

Interpritivism emerged as rival to positivism for over 200 years and their dispute embarked influence on the education fraternity less than a century ago.

Interprivism/constructivism opposed positivism on the bases that we cannot understand social contexts simply by experimental observations done in laboratories without the interpretation of the phenomena by those involved (Hammersley, 2012: 22).

Moreover, constructivism assumptions substantiated that knowledge is socially constructed by society while interacting with their environment (Mertens, 2010: 16).

Mertens (2010: 16), and Mackenzie and Knipe (2006: 3) attest that constructivism evolved from the philosophy of Edmund Husserls' phenomenology and Wilhalm Dilthey's interpretive understanding, called 'hermeneutics'. Therefore, hermeneutics is defined as the study of meaning or interpretive understanding of social and cultural contexts from texts from the authors' perspective. On the other hand, henomenology promotes the necessity to apprehend and condone subjective interpretation of phenomena by people's perception of their world (Hammersley, 2012: 22; Mack, 2010: 7; Mertens, 2010: 16).

In the next section of this chapter the researcher discusses philosophical elements of qualitative methods employed in the study.

#### **5.2.3.5.** Constructivism Paradigm for Qualitative Methods

Constructivism seeks to build or develop theory through inductive methods of collecting and analysing data in order to understand phenomena (McGregor & Murnane, 2011: 5; Mackenzie & Knipe, 2006: 3; Steenhuis & De Bruijn, 2005: 5). Secondly, constructivist researchers strive to understand, explain and disseminate knowledge about a social context, such as the Technology STAD classroom environment through the interpretation of research objects (Mack, 2010: 8; Mertens, 2010: 16).

#### **5.2.3.6.** Ontology in constructivism

Ontology refers to the concern of reality, being and nature of existence. A researcher may, for example wonder whether social reality exists independently to human conceptions and interpretations or if there is a shared reality or being could be multi-faced depending on the nature of context (Ormston et al. 2013: 5-6; Hammersley, 2012: 8-9).

The ontological understanding of the world view or the epistemology that guides this study states that knowledge is constructed by people on how they interpret their interaction with their environment and others. Therefore, it is not practical to detach factual knowledge from values, attitudes, beliefs, intentions and assumptions that govern people in a specific phenomenon (Arthur et al. 2012: 17; Nieuwenhuis, 2010: 53; Trede & Higgs, 2009: 18; Kraus, 2005:761). Constructivism is the paradigm which suggests that reality has multiple realities and is constructed socially through experiences, since each phenomenon is unique from the other. That is the reason this inquiry aims at understanding the phenomenon in its natural context (Koro-

Ljungberg et al. 2009: 689; Richards, 2009: 148; Baxter & Jack, 2008: 545; Mangan, Lalwani & Gardner, 2004: 2). Moreover, constructivism emphasises that reality exists within social interaction and societal interaction with the environment (Allen-Collinson, 2012: 1; Bisman, 2012: 4; Mills, Bonner and Francis, 2006: 2).

Furthermore, Heidegger as cited in Conroy (2003: 7) classifies existence in the world as authentic (real), inauthentic (counterfeit) or undifferentiated (orthodox). The first mode of existence is resembled by original and consistent thought patterns showing interaction with the environment as drawing knowledge and learning from that context. The second mode of existence is indicated by counterfeit or synthetic actions that are not directly correlated to the persons, therefore distancing knowledge acquisition from the social context. The third mode of undifferentiated existence is seen as orthodoxy by just conforming to the prominent social habits and beliefs without making own sense of these habits.

In support of the above proclamations the authors mentioned here (Allen-Collinson, 2012: 1; Mills, Bonner and Francis, 2006: 2; Guba & Lincoln, 1994: 111) attest that multiple truths also exist and that universal and pure objective truth about reality does not exist. Their reason being, people in different societal environments hold un-equated truths interpreted by their varied interaction with the world.

Heidegger as cited in Wright and Losekoot (2010: 420) further argues that if we can't make an effort to understand ourselves, our being 'Dasein" as deeply entrenched in our social context it would therefore be impossible to understand ourselves without knowing the phenomena of social context. Likewise, it would also be difficult to understand the world if our being is excluded.

The phenomenography as the knowledge acquisition in various directions in which people perceive, understand and interpret unique phenomena in different aspects of the world, support the constructivist perspective on methods of data gathering and analysis (Van Wyk, 2013: 127; Arthur et al. 2012: 18; Nieuwenhuis, 2010: 57; Creswell, 2009: 8).

Epistemology seeks to identify ways of gaining knowledge regarding the ontological stance of the constructivist paradigm.

#### 5.2.3.7. Epistemology in constructivism

Epistemology could be explained as the manner of thinking and knowledge acquisition and interpretation that helps to determine research methodology (Carter & Little, 2007:1317). Moreover, epistemology is concerned with strategies that assist the researcher with the ways of constructing knowledge about being and that which is regarded as knowledge (Ormston et al. 2013: 5-6; Hammersley, 2012: 8-9).

The epistemological perspective of interpretivism holds that the researcher and the participants cannot be totally detached and therefore the investigator is interactively connected to the proceedings of the inquiry. Thus the researcher would correctly interpret the phenomena from within, interacting with the participants. In support of this notion, the phenomenological paradigm also suggests that the observer is in alliance with the observed phenomenon in order to try to interpret and understand what is taking place in the social world (Arthur et al. 2012: 17; Nieuwenhuis, 2010: 59; Gray, 2009: 23; Kraus, 2005: 759). Most importantly, the researcher should be able to develop understanding of the social context through the eye of the researched (Krauss, 2005: 765).

Since people are born into the world with meaning embedded in their cultural contexts, the constructivist researcher pursues the understanding of the context as the natural setting of the research participants. In this way knowledge would be socially constructed in that particular setting (Wahyuni, 2012: 71; Denzin & Lincoln, 2010: 5; Creswell, 2000: 9).

Since the study is dual in nature with its second portion of the investigation focused on the researcher's practice - pragmatism as a paradigm also holds that world view emanates from actions, settings and effects. Moreover, pragmatism agrees to the constructivists' assertions that research takes place in natural social settings (McMillan & Schumacher, 2010: 445; Creswell, 2009: 11).

The diagram on the next page summarises, indicates and explains the association amongst Epistemology, Methodology and Method towards the production of data, its analysis and validation of knowledge.

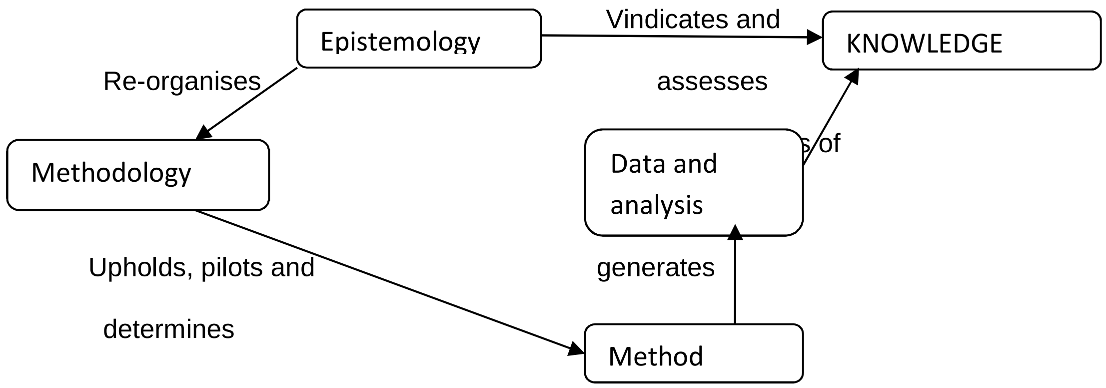



Figure 5.2 Epistemology Adapted from Carter and Little (2007: 1317)

### **5.2.3.8.** Axiology in constructivism

Axiology refers to the ethics and values of the research paradigm from which the researcher is empowered to adhere during field work. Constructivist researchers should, for example avoid pre-conceptualised understanding of the phenomena as the knowledge in this paradigm unfolds inductively from the data. Secondly, the researcher should clearly understand the code of researcher and object relationship. Thirdly, the research must be trustworthy, fair and aligned with the ontological and epistemological authenticity of constructivism. Lastly, a constructivist 'bricoleur' adheres to the principles of social justice in a caring and respectful manner (Allen-Collinson, 2012: 1; Mertens, 2010: 18; Christie et al. 2000: 7).

### **5.2.3.9.** Approaches to constructivism

Approaches to constructivist research are mentioned to dual the symbolic interaction and hermeneutics (Mead as cited in Wright & Losekoot, 2010: 418).

#### **5.2.3.9.1.** Symbolic interaction

Moreover, Mead as cited in Wright and Losekoot (2010: 418) defines symbolic interaction as a way of communicating with one another using gestures. Meaning could only be derived if the sender and the recipient understand each other.

Therefore, a constructivist investigator should engage in understanding the interaction between the objects and their environment. Moreover, perceive both the participants and context as dynamic in order to accept the interpretation of the involved objects about their experiences in their social context.

**5.2.3.9.2.** Phenomenology – Hermeneutics

Hermeneutics originally was the study of interpreting ancient historical texts seeking to understand the social context at the time from the authors' point of view (Wright & Losekoot, 2010: 419). Therefore, inquiry is naturalistic to enable a researcher to explore the features of social context that could not be analysed by scientific methods. The reasoning thereof, revolves around the contrasts and the similarities of the different ways knowledge has been constructed by various stakeholders in the phenomena (Bisman, 2012: 6).

**5.2.4.** Motivating the choice of paradigm

Mills, Bonner and Francis (2006: 2) theorise that researchers have to choose a stance with the paradigm that best suits their beliefs concerning reality in their fields of study. Thus, the chosen paradigm forms the basis of guidance to the inquiry, methodology and selection of methods for data collection. Moreover, constructivism permits the researcher to give meaning and understanding to the context as it is in conjunction with the participants involved. The researcher can also include other complex attributes that are unique to that specific phenomenon (Bisman, 2012: 5).

Therefore, the researcher chose a multi-paradigm stance that includes constructivism as a research paradigm for this study, because the study seeks to understand the effects of STAD on learners regarding social skills, attitudes, cultural diversity as well as the teacher's praxis in the Technology classroom. The positivist perspective was required for quantitative data on the academic performance of learners.

STAD as a cooperative learning technique promotes social interaction among learners within the STAD teams in the classroom. This cooperative learning technique allows the researcher to passionately participate in the research when teaching learners in the STAD Technology class. The use of STAD will be unique to the Grade 8 Technology classes in the school qualifying the context to be distinguished. Lastly, the constructivist paradigm supports the use of qualitative research methods seeing to it that the sample for this study cannot be used for generalisation of the findings.

### **5.2.5.** Research methodology

The study is mostly qualitative supplemented by quantitative data where the researcher attempts to conduct an authentic study that would produce results that are dependable and trustworthy within the classroom context (Gray, 2009: 164-165; Richards, 2009: 148-149). The researcher, who as teacher, is actively involved in this classroom environment tried to  remain subjective and critically examine his role throughout the research as directed by ethnographic and phenomenological designs, principles and values (McMillan & Schumacher, 2010: 12; Richards, 2009: 149).

Moreover, qualitative research is characterised by nine aspects mentioned in this paragraph: natural setting, context sensitivity, direct data collection, rich narrative descriptions, process oriented, inductive data analysis, participant perspectives, emergent design and complex understanding and explanation (McMillan & Schumacher, 2010: 13).

### **5.2.6.** Characteristics of qualitative methods

The characteristics have already been listed in the previous paragraph. In this section of the chapter, the researcher briefly discussed the mentioned characteristics and elaborated on how they would be applied and implemented in this study.

Regarding the natural settings, as term states, the inquiry took place at the environment that is natural to the participants or where participants spend most of their time on a daily basis. In this case the natural set-up was the school where they attend and the classroom in which they are taught Technology. The researcher regards the environment natural to the participants, because it is the place where they spend most of their life time during school seasons. They therefore would feel comfortable and safe (McMillan & Schumacher, 2010: 321; Gray, 2009: 166). Secondly, the teacher as the researcher and the researched work in the same natural setting of the learners and teaches the same grades where STAD was employed. Due to these facts, the external limitations and controls were minimised.

Pertaining to contextual sensitivity, the researcher as the key instrument in gathering data, it would be imperative to understand how situational context affects the behaviour of participants in order to interpret correctly and effectively considering the relevant factors (McMillan & Schumacher, 2010: 322; Creswell & Miller, 2010: 125; Creswell, 2009: 175; Onwuegbuzie & Leech, 2007:240).

Direct data collection indicates that qualitative researchers act as observers in the inquired setting, taking an acceptable length of time in direct interaction with the environment and participants. Therefore, during fieldwork the researcher was collecting data in the natural environment of learners where he spent long enough time using various methods, such as classroom observation schedules, video recordings, reflective diary and focus groups interview schedules in order to get a rich understanding of the data collected (McMillan & Schumacher, 2010: 322; Higgs & Cherry, 2009: 9).

It is therefore important that descriptions in whatever form of observations should not exclude even the actions or sayings that may be regarded as insignificant. Each action helps the researcher to accurately understand, interpret and judge the complex human behaviour. For best accumulation of data it is advisable to take some time to allow the participants to forget about the presence of external factors, such as video cameras, voice recorders and other observers and be comfortable in their environment. This would allow the researcher to observe and gather rich data of participants' behaviour. Therefore regarding this matter the duration of or field span would take the whole of the third term (about three months) so that learners are comfortable with the presence of observing devices and human observers in their environment (McMillan & Schumacher, 2010: 322; Higgs & Cherry, 2009: 5).

Qualitative research is also process oriented in exploring the how and why certain behaviours take place in other environmental set-ups. The researcher, as the teacher has expectations on how the implementation of STAD in the Technology classroom would affect the academic achievement, social skills development and attitudes and self-determination. Also for them to develop intrinsic motivation to learn and aim at achieving higher than they normally do. Secondly, how the employment of STAD in teaching Technology would impact the researcher's praxis as a teacher to assist learners reach the expected outcomes (Macfarlane, 2010: 20; McMillan & Schumacher, 2010: 323; Higgs & Cherry, 2009: 8).

Furthermore, qualitative study promotes inductive reasoning, whereby as the process of collecting data continues, new things or behaviours are gathered shedding more light and helping the researcher to identify and draw specific conclusions (McMillan and Schumacher, 2010: 323; Higgs and Cherry, 2009: 10).

Qualitative researchers construct knowledge and understanding of behaviours from the participants' perspective as stated above. The researcher therefore used group interviews to hear how they experienced cooperative learning groups (STAD teams) and discussed how they processed their group discussions. The group interviews were used as a means of enabling the researcher to correctly hear how learners interpret aspects such as social skills, high academic achievement and motivation to achieve higher (McMillan and Schumacher, 2010: 323; Macfarlane, 2010: 20).

Another characteristic of qualitative research is the emergent design that evolves during the fieldwork process, effecting changes in the questions asked and documentations that might need to be reviewed. It is thus complex to understand and explain behaviour which will then need various perspectives to help direct the researcher to account for or reflect on certain behaviours concerning the study.

### **5.2.7.** Research design

Under this section the research design that guided the use of various tools for collecting data and methods of data analysis is discussed on the next page.

#### 5.2.7.1. Conceptualised and contextualized “bricolage”

Levi-Strauss (1966: 5) employed the concept of bricolage as a metaphor in his search for underlying structures that govern human meaning-making. According to Levi-Strauss (1966: ) this concept of bricolage was fashioned into projects whereby bricoleurs use only the tools and materials “at-hand” to design a new piece of art. Furthermore, Levi-Strauss used the bricolage metaphor as a part of a structuralism project. His work expanded by articulating beyond structuralism circles into other social inquiries. Several scholars borrowed the concept “bricolage as research approach” and conceptualized it as a critical, multi-perspective, multi-theoretical and multi-methodological approach to inquiry (Denzin & Lincoln 1999: 5; Kincheloe 2001; Berry 2006). In this study, bricolageas research methodology was used, because several tools and materials were employed “at-hand” to design new findings from the data process. To employ the bricolage design, quantitative data to complement the qualitative data and other additional information was used to collect data for the purpose of this thesis.

#### 5.2.7.2. Bricolage as research design

Scholars are of the view that adopting a bricolage approach, the researcher needs to understand and respect the complexity of meaning-making processes and the contradictions of the lived world (Denzin & Lincoln 1999: 6; Kincheloe 2001; Berry 2006). According to Denzin and Lincoln (1999: 6) *“the combination of multiple methodological practices, and empirical materials, perspectives and observers in a single study is best understood, as a strategy that adds rigor, breadth, complexity, richness, and depth to any inquiry”.*

Emanating from the latter statement, Denzin and Lincoln (1999: 6) provided five types of bricoleurs:

- Interpretive bricoleur
- Methodological bricoleur,
- Theoretical bricoleur,
- Political bricoleur, and
- Narrative bricoleur.

#### **5.2.7.2.1.** Interpretive bricolage design

Adopting an interpretive bricolage approach, for Denzin and Lincoln (1999: 6), means embracing the belief that "there is no one correct telling [of an] . . . event. Each telling, like light hitting a crystal, reflects a different perspective on [an] . . . incident". An interpretive bricoleur is therefore a researcher who “understands that research is an interactive process, shaped by his or her own personal history, biography, gender, social class, race and ethnicity and by those of the people in the setting” (Denzin & Lincoln (1999: 6). Adopting post-positivist epistemologies, interpretive bricoleurs recognize that knowledge is never free from subjective positioning or political interpretations.

#### **5.2.7.2.2.** Methodological bricolage design

Adopting the methodological bricoleur approach, a researcher is someone who combines multiple research tools to accomplish a meaning-making task. This means that a methodological bricoleur engages in fluid, eclectic and creative approaches to the inquiry. Denzin and Lincoln (1999: 4) explain that: “the qualitative researcher as bricoleur, or maker of quilts, uses the aesthetic and material tools of his or her craft, developing whatever strategies, methods, and empirical materials are at hand”. A methodological bricoleur could, for example be a researcher who begins an inquiry process with a case study research approach (grade 8 Technology class) and then realizes that discourse analysis could help develop a more complex portrait of a phenomenon.

#### **5.2.7.2.3.** Theoretical bricolage design

Theoretical bricoleurs, for Denzin and Lincoln (1999: 6), work through, and between, multiple theoretical paradigms: “the theoretical bricoleur reads widely and is knowledgeable about the many interpretive paradigms (e.g., feminism, marxism, cultural studies, constructivism, queer theory) that can be brought to any particular problem”

**5.2.7.2.4.** Political bricolage design

For Denzin and Lincoln (1999: 6) political bricoleurs are researchers who are aware of how knowledge and power are connected. They explain: “The political bricoleur is aware that science is power, for all research findings have political implications. There is no value free science".  Embracing this understanding, like those educators who adopt critical pedagogies, political bricoleurs develop counter-hegemonic forms of inquiry that rally against oppressive social constructs and injustices.

**5.2.7.2.5.** Narrative bricolage design

For Denzin and Lincoln (1999; 5), narrative bricoleurs appreciate that inquiry is a representation (i.e., a narrative), because objective reality can never be “captured”. Research texts can only represent specific interpretations of a phenomenon. Narrative bricoleurs appreciate how ideologies and discourses shape how knowledge is produced. Instead of taking these ideologies and discourses for granted, they seek to understand their influence on research processes and texts. This means that narrative bricoleurs draw their techniques from multiple perspectives, voices and sources.

This study is guided by the interpretive and methodological bricolage designs during the fieldwork for collection of data and data analysis. Data was collected on learners working in STAD cooperative learning groups. The data was gathered at school as a social and cultural setting where learners are taught to adapt to particular traditions and social interactions intended to impact positively on their social skills, attitudes, academics and motivation levels. The researcher observed groups’ interactions, processes and how learners communicate with each other amongst their groups. The researcher will also get the quotes of groups’ conversations in their own words to determine time on task and conflict management strategies (Arthur, et al. 2012: 166; Gray, 2010: 170-171; McMillan & Schumacher, 2010: 24-25; Venegas & Huerta, 2010: 156; Creswell, 2009: 177).

My role as a researcher in this study was that of a complete insider. It was stated previously that the researcher was going to investigate a cooperative learning method which the researcher was part of as the teacher and facilitator of the proceedings to help learners' groups develop to cooperative ones. Culturally or traditionally learners here are mostly exposed to sitting individually one behind the other in rows in almost all the classes they attend. Cooperative learning is a new classroom and learning culture in the school that allows learners to interact with each other sitting in a face-to-face set-up, working together to comprehend the subject matter (Nieuwenhuis, 2010b: 76-77; Savin-Baden, Gourlay & Tombs, 2010: 167).

### **5.2.8.** Case study as the research design

Case study can be defined in different ways due to its versatility in both the qualitative and quantitative research methods.

Christie et al. (2000: 13) described case study as a qualitative research design that observes to comprehend the underlying forces in the Technology classroom where STAD is implemented as a teaching and learning technique.

Case study is considered a qualitative research design that allows the researcher to engender various complexities in social context through the use of multiple data collection instruments. Furthermore, case study acknowledges the amalgamation and contrasting of diverse perspectives to develop rich and elaborative understanding of a social context in the Technology STAD class (Gray 2009: 13).

Moreover, McMillan and Shumacher (2010: 344) refer to case study as an extensive explanation of a "bounded system" regarding characteristics of participants and environmental context.

Andrade (2009: 44) defines case study as an empirical investigation of phenomena within their everyday life settings to assist the researcher to obtain all-inclusive understanding and interpretation of the phenomena being researched.

#### 5.2.8.1. Application of case study in the Technology classroom (unit of analysis)

This study employed case study design as guided by the constructivist paradigm. The inquiry tried to holistically understand the in-depth effects of STAD on learners' social skills, attitudes, academic achievement and the teacher's praxis.

Moreover, the researcher strove to explore the in-depth knowledge on the above mentioned variables within this unique teaching and learning setting.

The study was done in a public school in the city of Bloemfontein and is situated in an urban affluent residential area. Moreover, the school has a long history of existence with over hundred and fifty years practicing and embracing the English culture, tradition and ethos. Apart from the above, the school has established a strong bond with the church, thereby observing and inculcating Christian (Biblical) values and principles amongst its learners throughout the years. It is also a well-resourced school, fee paying educational institution that manages to sustain its expenses. The learners in this school are boys emanating from various cultures within South Africa and across the borders starting from Grade RR to Grade 12.

STAD was implemented in Grade 8 classes that consist of more or less thirty learners per class. According to the South African admission to school, learners begin Grade One when they are seven years old, which brings the majority age group in Grade Eight to be fourteen years (adolescent stage).

Learners in the STAD classes were grouped into teams of four to five members sitting around a table. The groups were formed according to academic performance during the second term of the year. Each group had at least one high achiever, two medium achievers and one low achiever. The researcher also included various race groups in a team to the best of his ability, because the demographics vary in each class. The one class has more non-African indigenous language speakers and the other has more African native language speakers, because they are influenced by grouping according to the First Additional Language each learner takes. Those who chose Afrikaans as their First Additional Language would be in the one class and those who chose Sesotho as their First Additional language in the other class with addition of some learners that took Afrikaans. These divisions are made to simplify the school's class timetable to allow subjects to get their designated time allocations according to the Curriculum and Assessment Policy Statement for schools. The teacher presented new content in a form of a lecture or question and answer method of teaching. After all the explanations had been done the teacher assigned the teams with worksheets from which they worked as team members helping each other to improve their understanding of the work. The worksheet exercise was preparing learners for individual tests to determine their progress in terms of academic performance of each learner. The team scores were calculated using a point system based on the level of improvement. Then the most improved group was awarded certificates of achievement for each member.

The case study design was also employed to allow the researcher to become an active participant with the learners, but still upholding expected research ethics. Therefore, case study design was a vehicle helping the researcher to build theory that was close to empirical reality as defined by the positivist perspective (Andrade, 2009: 44).

Furthermore, inductive processes were of greater importance than outcomes. The findings thereof were not generalizable as the inquiry was bound and therefore, thorough and contributing knowledge pertaining to the social context had to be developed (Brown, 2008: 3-9).

#### **5.2.8.2.** Types of case study design

Stol and Fitzgerald (2014: 1-2) classify case study into single case study and multiple (collective) case studies. They could be employed in a holistic way, meaning in depth study of a unit of analysis or in an embedded manner, referring to use of various units of analysis. A unit of analysis is explained as individuals, class, organisation, documents, community or site where data is collected. According to the above description, I could classify this study as an *embedded single case study* because the two Grade eight classes were regarded as two different units of analysis (McMillan & Schumacher, 2010: 128).

In addition Stake (2008) as cited in McMillan and Schumacher (2010: 345) differentiates case study types as intrinsic and instrumental cases. The former mainly focuses on rare cases and the latter is theme or trend based (Zucker, 2009: 2; Brereton, Kitchenman, Budgen & Li, 2008: 2).

Furthermore, Guba and Lincoln (1981) as cited in Zucker (2009: 3) suggested another three types of case study as factual, interpretative and evaluative. Firstly, it could be a case or inquiry where a researcher produces a profile of facts, secondly interpreting and constructing insight or assessing the phenomenon to build a theory.

Baxter and Jack (2008: 547-549) also added exploratory, descriptive and explanatory as types of case study design in relation to their application. The first type is used to explore phenomenon with no clear single customary or established outcomes. The second one is employed to describe a phenomenon and its real-life occurrence. The last type is preferred for more complex situations that could not be verified or supplemented by surveys or experiments (Stol & Fitzgerald, 2014: 2).

#### **5.2.8.3.** Characteristics of a case study

Characteristics or design features of a case study are found in various definitions that were stipulated earlier in this chapter, including the one below describing case study as:;

"Systematic inquiry into an event or a set of related events which aims to describe and explain the phenomenon of interest" (Bromley (1986) as cited in Zucker, 2001: 1)

Brown (2008: 2) referred to a case study as a multifunctional qualitative strategy that is accommodative and adaptable to all other designs of qualitative inquiry, though it is bound. Moreover, (Van Wynsberghe & Khan, 2007: 2) characterised case study as trans-paradigmatic, depicting that it could be applied despite the paradigm inclination of the study. They further stressed that case study is trans-disciplinary, meaning it is employable across the pool of studies in different faculties of body of knowledge.

Johansson (2003: 2) specified the main purpose of case study as triangulation to validate the inquiry, due to its accommodating characteristic that allows the use of various techniques, strategies, methods and theories. In addition, Andrade (2009: 44), Stol and Fitzgerald (2014: 1) attested that case study research seeks to answer the “how” and “why” questions. This study as well sought to answer “how STAD affects the academic performance, retention, social skills and attitudes of learners and on the praxis of the researcher?” Therefore, case study is a suitable research design for this study.

Various definitions of case study that are stated in this chapter include the following terms; sequential, systematic, procedural and process based and others use protocol. These terms suggest that case study has chronological stages and guidelines that govern its use. The researcher using the qualitative research exploiting case study should be acquainted with these rules and adheres to them. Miambo and Pervan (2004: 1282) explained that case ‘study protocol’ instils “uniformity in data collection and analysis” to enable transferability of the inquiry to other similar settings.

Moreover, Brereton et al. (2008: 5) emphasise triangulation and trail check as valuable benefits of case study. They allow the researcher to compare and consolidate data from various sources and to trace back the relationship between data and research questions.

Zucker (2009: 2, 2001: 1) and Brown (2008: 4) iterate five components of case study as formulated by Yin (2003), they are;

- Formulation of research questions
- Submission which emulates on a theoretical case
- Unit of analysis
- Reasonable relationship between data and the propositions
- Criteria for interpreting the findings

Zucker (2009: 1-11) stipulates a list of case study protocol stages that researchers should consider in their inquiries, they are:

- ➢ Preparation
- ➢ Prior to beginning
- ➢ Strategies for collecting data
- ➢ Methods of analysis
- ➢ Stages of analysis below

- Describing experience – stage 1
- Describing meaning – stage 2
- Focus of the analysis – stage 3
- Examining rigour – stage 4
- Writing up the case – stage 5

#### **5.2.8.4.** Strengths and weaknesses of case study

Lauckner, Patterson and Krupa (2012: 4) tabulate the strengths and weaknesses of case study from case study gurus, such as Yin and Stake, as follows:

##### **5.2.8.4.1.** Strengths of case study

Case study enables the researchers to examine "a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident", as in the Technology STAD class, where the context of using STAD could not be separated from the classroom and the school. Secondly, case study allows use of multiple methods for collecting data in complex settings, like they have been employed in this study. Thirdly, it helps with the evaluation of processes to answer the "how" question as in this study's research question to examine the processes of STAD and the effects. Multiple case studies provide richness and the depth of understanding the phenomenon. Though this study is a single case, there is a possibility of extension in another similar setting. Lastly, case study offers different types to suit various requirements of qualitative studies.

##### **5.2.8.4.2.** Weaknesses of case study

Poor description of processes and methods of analysing data could impact negatively on the research findings. The on-going arguments regarding the descriptions of methods that constitute how the case study has been tackled could affect rigour of study.

### **5.2.9.** Sampling of research participants

This study used the site selection strategy that would then provide convenient sampling. The reason being, the inquiry is on teaching method and its effects on learners and impact on the teacher's praxis and it therefore should take place in the classroom. The site for study would be the Technology classroom and a sample will be Grade 8 learners in two classes. The sample will consist of boys only aged between 13 and 15, since the school type is for boys only. Secondly, the learners come from different cultural backgrounds as the school is multiracial.

### **5.2.10.** Methods of collecting data

Under this section the researcher has expounded on various methods of collecting data for the purpose of fulfilling the aims and answering the research questions.

#### **5.2.10.1.** Learner classroom observation

It has been mention previously on numerous occasions in this study that observations (classroom observations) are an essential part of collecting data. The researcher therefore employed two types of observations; the unobtrusive or non-reactive were done by external observers, such as my supervisors, and numerous colleagues distancing themselves from being involved. Secondly, the reactive observation by the researcher, because he wouldn't be part of learners' groups, but from time to time he would need to do some interventions amongst the groups, to help and guide toward reaching their group goals (Arthur et al. 2012: 166).

Observations are also regarded as one of the most popular methods of collecting data in educational settings. For the purpose of this study, observations were used to investigate the effectiveness of the STAD as cooperative learning technique and a teaching method toward the improvement of learners' academic achievements, social skills, attitudes and the intrinsic motivation in the Technology classroom. The second focus was observing the instructional processes of the teacher (researcher) with the aim of effecting positive change or improvement in praxis through the use of STAD. These classroom observations progressed through various phases. The preliminary level would be to describe the nature of the physical and social setting. Then followed by directing focus on occurring patterns and behaviour that was observed, covering general learners' behaviour patterns within the phenomenon, which in this case would be the Technology classroom where STAD is implemented. The next phase of observations began and was more selective toward responding to the pointed or research question variables pertaining to learners and the researcher. Once the findings on the previous stage replicated themselves regularly, it would a saturation or expiry point where analysis of data had to begin (Nieuwenhuis, 2010b: 84-85).

Moreover, a tool of collecting data during STAD group discussions was a learner classroom observation schedule (Appendix 2). About ten of my teacher colleagues were invited to observe procedures and processes in Technology STAD classes. The researcher did not have specific criteria for choosing the observers. He, however, tried to have a variety that included inexperienced or novice teachers, those with a few years of teaching experience and the veterans with many years of experience. The researcher further had a mixture of Intermediate Phase, Senior Phase and FET Phase teachers to do observation..

#### **5.2.10.2.** Teacher classroom observations

Teacher classroom observations are like the above learner classroom observations except that here the main focus of observation schedules and data collection was on the teacher's praxis specifically. The collection of data, for instance began with general observations of the research phenomenon, such as neatness, classroom sitting arrangement, general behaviours portrayed by learners and the teacher. Furthermore, the observations took a turn in becoming more specific on the researcher's teaching praxis, which included punctuality, appearance, lesson preparation, preparedness and classroom management strategies. It was crucial that for every completed research cycle, that the researcher sat down with his observers (supervisors) to evaluate how he had been doing, where the dark and blind spots were? What kinds of changes were needed? How was that going to be implemented? From the second cycle onward we reflected on implemented changes if they had effected some improvement.

Other than meetings with supervisors, the researcher also used a Teacher Observation Schedule (Appendix 1) on which the various observers identified in the previous section were jotting down their comments. These schedules were designed to collect data regarding the researcher's classroom practices during STAD lessons, whether it was during the period of teacher content delivery or STAD teams' activities. The schedule was designed to encompass all necessary aspects of classroom administration.

#### **5.2.10.3.** Group interviews

De Lyser and Sui (2013: 2) are of the opinion that interviews are the integral part of qualitative research (Kanuka, 2010: 101) that is intimate to finding beliefs, values, and attitudes of subjects. Therefore group interviews as arranged discussions with certain chosen groups of individuals in order to obtain corporate views about the research topic or phenomenon would be employed in this inquiry. Since the explored teaching method for this study uses cooperative learning groups, the researcher attempted at giving each group an opportunity to be interviewed in order to gather more insight about how they experienced and interpreted the phenomenon. As the classes' content is multicultural and groups are also formed by members emanating from different cultural backgrounds, it was good to have groups based on cultural differences to gain more knowledge from learners' cultural perspective on the phenomenon (Arthur et al. 2012: 186). The interviews used semi-structured questions (See Appendix 3) though the interviewees were allowed full expression of their experiences during this period of STAD as compared to their traditional classroom set-up and teaching methods (Turner, 2010: 756; DiCicco-Bloom and Crabtree, 2006: 315).

##### **5.2.10.3.1.** Limitations to the group interviews

Varying the types of groups could serve as strength of using this method to help the researcher get collective perspectives and perhaps validation of ideas and concepts. The researcher, however, applied caution and developed structured plans on how to run these group interviews and manage interaction properly to avoid complex verbal and nonverbal cues from participants that would in turn complicate the interpretation and analysis of processes (Arthur et al. 2012: 187). Another benefit could be reflecting positive change on cooperative groups to revisit their group processing skills and methods and try to improve on them. A second challenge of group interviews was, however, finding time that suited all members of the group due to our tight schedule of extracurricular activities. The researcher thought that could be overcome by short sessions of group interviews.

#### **5.2.10.4.** Video recordings schedules

Video recordings can be classified under visual methodologies or techniques. The researcher's definition of audio-visual methodology is using digital technology that is able to capture pictures that show movement, actions, nonverbal communication or behaviour including verbatim conversations from participants. The purpose of using this technique was to enable the researcher and the external observers to refer back to the actions as they occurred during the class sessions. This assisted the researcher with an accurate description of the phenomenon and analysis of data. The challenge, however, was the consideration of ethical issues as this was a sensitive situation regarding participants' identity disclosure. The researcher took extra caution finding proper storage for the recordings. The recordings should be accessible to the researcher for analysis purposes and to the supervisors for assessment purposes. It is important that no one else should have access to these recordings, as learners could be identified on them (Arthur et al. 2012: 94; McMillan & Schumacher, 2010:63**.** Furthermore, these recordings will be stored in a lockable cupboard in the researcher's study office for a period of not more than two years. Where would you store the data and for how long, how will you eventually get rid of the data? Moreover, the researcher developed a Video Recording Observations Schedule (See Appendix 4). The purpose was for the researcher to have time to thoroughly observe the proceedings in the Technology STAD classes exclusively during the group activities.

#### 5.2.10.5. Learners assessment scores

Furthermore, for the purpose of determining the academic performance of learners, the researcher administered two class tests during the period of implementing STAD in the two Grade 8 Technology classes. The tests results were used to examine if the learners in the Technology classes where STAD had been employed, had shown any improvement or not regarding academic achievement. Moreover, the two tests were not exactly the same, but the second test was used to build up on the material that was assessed in the first test (See Appendixes 7 and 8 respectively).

In addition, the moderated November examination results were used to determine the learners' retention of the content that had been taught during the implementation of STAD.

## 5.3. Quantitative methods

For the purpose of answering the research question regarding academic performance and retention of learned material, class tests and examinations scores were used as quantitative data. Furthermore, non-probability, convenience sampling was used on the basis that this study was experimental in nature. The researcher employed STAD as a cooperative learning technique and a teaching method in two Grade 8 Technology classes. Each of these classes had thirty learners.

The study was done at the researcher's school where he teaches Technology as a General education and Training Phase subject. Therefore, the tests scores and examinations scores were used to determine the relationships between the use of STAD in Technology and learners' academic performance; as well as between the administration of STAD in Technology and learners' retention of the taught content (McMillan & Schumacher, 2010: 139; Gray, 2009: 153).

Since the school is a culturally diverse, boys-only school that is situated in an affluent suburb in Bloemfontein, **t**he findings of this study are applicable for generalisation within the classes where STAD was used. Moreover, the results could be generalised to similar types of schools. The quantitative data was analysed using descriptive statistics, as explained in the next part of this chapter.

### **5.3.1.** Analysis of quantitative data

The Technology class tests scores and examinations scores were analysed by means of employing descriptive statistics for the purpose of describing and comparing these scores. Moreover, descriptive statistics do not seek to make predictions or broad generalisation of the community, but instead focus on summarising data of sample studied (McMillan & Schumacher, 2010: 149; Gray, 2009: 458).

The two class tests scores for both Grades 8X and 8Y were captured to compare the differences in academic achievements within each class and between the two classes. The November examination scores that were used to determine the retention of the taught materials were also included in the mark sheets (See Tables 6.9 and 6.10 respectively).

Furthermore, **bivariate** design was used to compare the academic performance of learners in both Grades 8X and 8Y in relation to the implementation of STAD in the Technology classes.

## **5.4.** Qualitative methods of data analysis

According to Nieuwenhuis (2010b: 99), qualitative data analysis is established on an interpretivist epistemology that targets construction of knowledge by understanding the phenomenon through analysing participants' perspectives regarding the phenomenon. The researcher had to interpret how the participants created knowledge of understanding the situation including their attitudes, values, beliefs and experiences. Therefore, inductive process of qualitative data analysis was the one that allowed findings to appear from frequently recurring themes on the raw data.

Furthermore, qualitative data analysis is a non-sequential process as it combines the various phases together. Thus, it happens from data collection stage to reporting phase. Secondly, the purpose of analysing qualitative data is to interpret the words spoken in conversations and interviews, also behaviours that could not be represented by numbers or statistical calculations. Therefore, that is the reason analysis takes on an ongoing nature through all the phases (Nieuwenhuis, 2010b: 100; Creswel, 2009: 183).

The interpretivist perspective holds that analysis of data should give full details or information pertaining to the manner in which participants construct knowledge regarding the phenomenon they find themselves in. It therefore requires rich descriptions to be produced to provide understanding and the uniqueness of the phenomenon. For the purpose of this study, data analysis was guided by ethnographic and phenomenological ways of analysing data. In ethnographic methods, data is sorted by coding and put together according to themes to enable the researcher to arrange his summary orderly and coherently while giving a rich description of the phenomenon **(**Elo & Kyngäs, 2007: 109; Williams, 2007: 1 Pope, Van Rooyen & Baker, 2002: 149; Connor & Gibson, 1998: 65).

The phenomenological analysis of data took significant utterances to generate knowledge and understanding. The researcher transcribed all the raw data from video recordings word for word including non-verbal behaviours. After all the data was transcribed, the researcher typed it for easy reading during the coding process that followed. Secondly, the researcher coded data collected by carefully reading through the raw data and coding unique meaningful segments in a way that enabled him to identify the different codes. When the coding of all the transcribed data was completed, the researcher reads through the coded data to identify agreeing and contradictory codes. Once this was done, data was categorised into themes and related codes were placed in one folder. Therefore, various categories were placed in different folders or boxes and given identifying labels. The researcher verified the themes by reading through the transcribed data again as to establish any emergent themes which followed and these themes were then placed in different folders. After analysing the data, the researcher arranged the themes according to their relationship in order to make links that assisted with the interpretation more efficiently and coherently. At the next phase of data interpretation, the researcher would give descriptive summaries of participants' perspectives and then moved to the analytic level that describes the reason for the way findings were (McMillan & Schumacher, 2010: 370; Nieuwenhuis, 2010b: 112; Creswel, 2009: 185).

### 5.4.1. Content analysis

Content analysis has been previously used in manifest content of communication only and has expanded even to latent content interpretations. Whereby content analysis was only applicable to the review of research articles and books, now it encompassed the interpretation of reality based on the researcher's and participants' perspective (Moretti, Van Vliet, Bensing, Deledda, Mazzi, Rimondini, Zimmermann, & Fletcher, 2011: 420; Elo & Kyngäs, 2007: 108; Graneheim & Lundman, 2004: 105-106).

As mentioned above, manifest content refers to evident and conspicuous aspects of content, whereas latent content pertains to the interpretation of deeply hidden, underlying and subjective messages of the text (Graneheim & Lundman, 2004: 105). Moreover, Zhang and Wildemuth, (2008: 2) and Burnard, Gill, Stewart, Treasure and Chadwick (2008: 429) add that qualitative content analysis also includes deductive inferences based on the literature review.

#### 5.4.1.1. Inductive description

Inductive content analysis is a sequential process of analysing qualitative data based on specific aims, such as the research questions, whereby its paramount intent is allowing preliminary themes to surface from the raw data (Burnard et al. 2008: 429; Zhang & Wildemuth, 2008: 2; Thomas, 2003: 2; Pope, van Rooyen & Baker, 2002: 149; Backman and Kyngäs, 1999: 149). Furthermore, the inductive approach is mostly used where little or nothing is known about the inquiry phenomenon, in order to make concrete and acceptable extrapolations from data for the purpose of developing new knowledge or theory (Burnard et al. 2008: 429; Elo & Kyngäs, 2007: 1008).

#### 5.4.1.2. Inductive analysis process

Raw data has to be organised, recorded data is transcribed verbatim and the transcripts are read through repeatedly to enable coding and development of themes and categories (O'Connor & Gibson, 1998: 65; Thomas, 2003: 3; Williams, 2007:1).

In the paragraphs that follow, various stages of analysing qualitative data will be briefly discussed.

**5.4.1.2.1.** Organising data

Data can be arranged in accordance to research questions and therefore it is important to go back to the research questions. Secondly, interview data can be grouped according to the similarity of questions and follow up questions (Connor & Gibson, 1998: 65; Pope, van Rooyen & Baker, 2002: 149; Elo & Kyngäs, 2007: 109; Williams, 2007: 1).

**5.4.1.2.2.** Coding

During the process of repeated reading, notes and headings are highlighted or written, known as open coding (Elo & Kyngäs, 2007: 109; Moretti et al. 2011: 422). Furthermore coding can be classified as an unabridged thought or remark by a single participant without a halt caused by another speaker according to Burla, Knierim, Barth, Liewald, Duetz and Abel (2008: 114), Roter and Larson, (2002) as cited in Moretti et al. ( 2011: 424). Burla et al. (2008: 113) further state that consistency in coding is of paramount to qualitative data quantifying. It is therefore also important to clearly explain the coding units beforehand (Zhang & Wildemuth, 2008: 3).

**5.4.1.2.3.** Themes and categories

The table on the next page illustrates the comparison of inductive and deductive data analysis of qualitative data indicating the processes that take place in each case. Furthermore, the third part of the diagram indicates the incorporation of both methods during data analysis to assist novice researchers or studies that emanate from the literature review of this study.

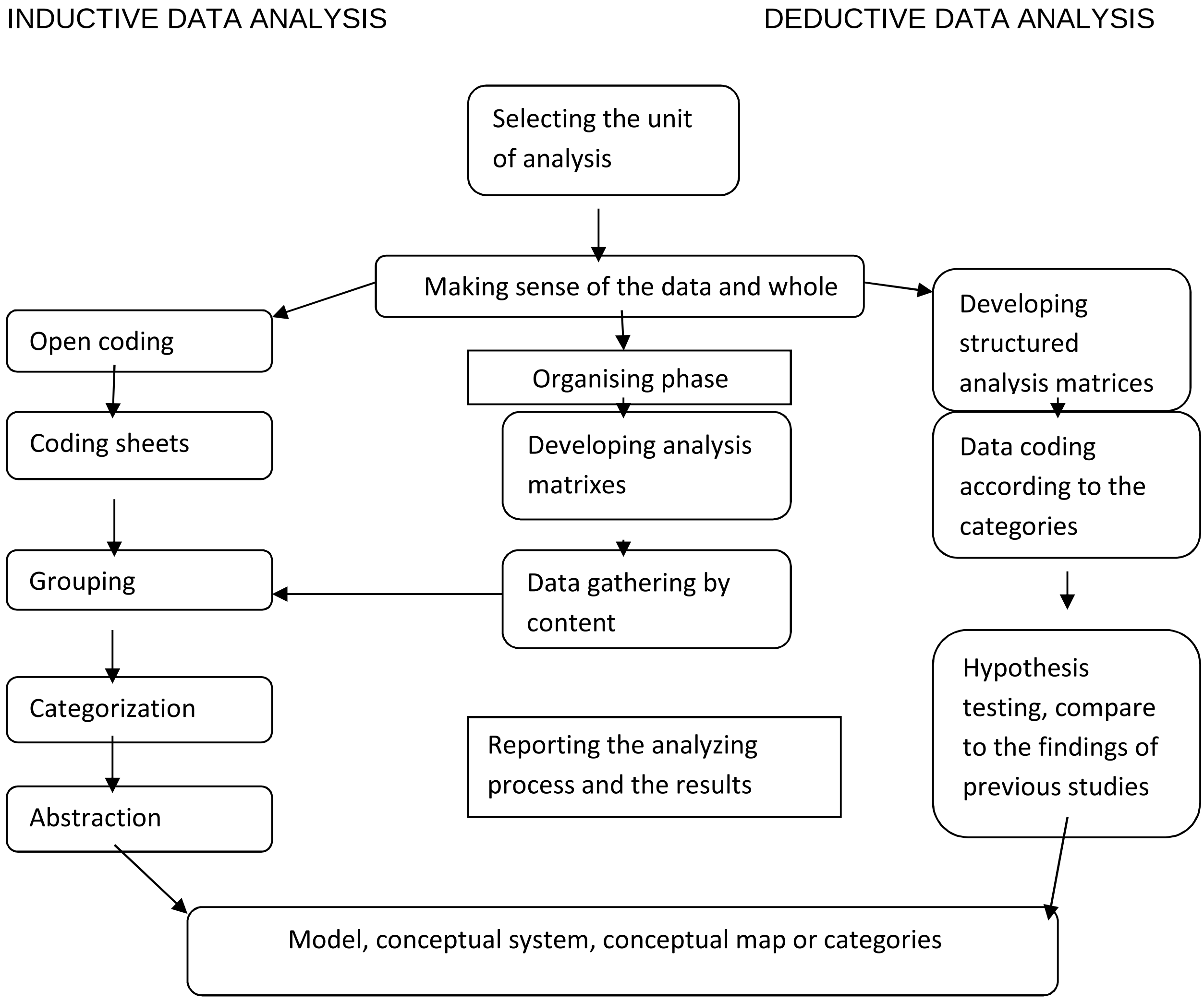



Figure 5.3 Adapted from Elo and Kyngäs (2007: 110**)**

## **5.5.** Validity and reliability

Under this part of the study, the researcher has explained the meanings of validity and reliability and their significant roles in this research.

### **5.5.1.** Validity

Validity refers to the degree of similarity or correspondence between the explanations of the phenomenon and reality. In qualitative research it is the extent to how indistinguishable the interpretations of the researcher and the participants about the phenomenon are. Furthermore, the validity of the instrument is guaranteed when it assesses what it is purposed to assess. Therefore questions asked in an interview schedule and the components of the observation schedules should strive to measure what the researcher is aiming to find out. (McMillan & Schumacher, 2010: 330).

According to Gray (2009: 155) and McMillan and Schumacher (2010: 109), there are several types of validity; they include internal validity, external validity, criterion validity, construct validity, content validity, predictive validity and statistical validity.

Therefore, for the purpose of obtaining validity of findings in this study, various tools of collecting data were used in order to be triangulated.

#### **5.5.1.1.** Internal validity

Internal validity refers to corresponding questions and to the extent to which correct conclusions can be made. There are also threats to internal validity. Therefore, for the purpose of this study the internal validity was to be achieved in a sense that participants were all between the ages of 12 and 14 and were on the same level of education as in this case Grade 8 classes and they both were following the same research programme. Learners in both classes were put into groups of four to five members, each group consisting of at least three different levels of achievements according to the June examinations results and had two racial or cultural groups at the minimum. The above classification could, however, also be a threat as the academic excellence did not always imply excellence in leadership, interpersonal and social skills. The reason being that at the beginning of working in groups, the learner with highest June results would be made the leader of group discussions, as he would be expected to have more input pertaining to the explanations of concepts to his team mates. Secondly, the long focus group interview questions could also be a threat due to the intensity of discussions that could result in different questions responded to in the same answer. Thirdly, the terminology used in the interview schedules should not need the researcher to divulge in a way that would make him guide the responses from participants. Lastly, the researcher’s bias could be a threat and should be avoided by all costs, thus the researcher should act and react consistently in all interviews (Gray, 2009: 155; McMillan & Schumacher 2010: 109).

#### **5.5.1.2.** External validity

External validity refers to the ability of generalising the findings of the study to a larger population of the same category or specific setting. These categories are also known as population external validity and ecological external validity. In population external validity, the characteristics used to describe the subjects or participants with regard to variables are those, such as age, race, gender, ability and educational level. The results of such study can be generalised to the larger population that share the same qualities as the research participants. On the other hand, ecological external validity alludes to the conditions in which the study is done whereby participants are expected or can behave in a certain way just because they realise they are in a research environment (Hawthorn effect). It can also include conditions, such as time of day, physical surroundings, pre-test and post-test effects (Christie, Rowe, Perry & Chamard, 2000: 16; Pietersen & Maree, 2010: 217) .

Moreover, in this study due to the size of the sample, ecological external validity would be applicable so that the results could be generalised to a population with the same study setting. The setting of the research was a cooperative classroom set-up where STAD was employed as a method of teaching and learning strategy and learners were expected to work cooperatively in their respective groups and display certain behaviours and skills.

#### **5.5.1.3.** Criterion validity

Criterion validity is the correlation of findings or results between the new instrument and the old or established instrument. The problem could, however, be to compare these instruments as some concepts do not have established measures against which to evaluate. In qualitative research such as this study, the researcher developed his own data gathering tools, such as observation schedules (Cf. Appendixes 1 and 2) and group interview schedules (Cf .Appendix 3) from the literature review (Gray, 2009: 157; Pietersen & Maree, 2010: 217).

#### **5.5.1.4.** Construct validity

Construct validity is based on the measuring of abstract concepts and traits, such as attitudes, ability and behaviour. These concepts have to be adequately defined in order to understand their meanings in the context of the given research. Adequate description of concepts also does not refer to a single meaning, but rather various meanings in which the concepts are applied in the research. Thirdly, to maintain construct validity, various methods of collecting data should be employed (Gray, 2009: 157; McMillan & Schumacher, 2010: 115).

#### **5.5.1.5.** Content validity

Content validity is concerned with validating the content of the measuring instruments, such as questionnaires, observation and focus group interview schedules. Thus the content of the measurements should be correlated and cover the range of the literature review (Gray, 2009: 157; Pietersen & Maree, 2010: 216).

Therefore, with regard to obtaining the above kinds of validity and reliability, qualitative research methods make mention of the trustworthiness and credibility of the research findings. The researcher expanded further on these factors that affect the quality of the results in the paragraphs that follow.

According to Niewenhuis (2010: 80) and Bazeley (2013: 55), trustworthiness of the qualitative study can be reached by employing various methods of collecting data, such as observations, interviews, document analysis and the involvement of other researchers, like colleagues whom assisted with the interpretation of the data. Secondly, triangulation according to quantitative studies or crystallisation in qualitative inquiries since the qualitative spectrum is broader than three sides. Thus, it gives a more complex and deeper comprehension of the phenomenon under investigation.

Hessie-Biber and Leavy (2011: 48-51) indicate that there are three criteria of validating a qualitative inquiry; validity based on the quality of craftsman, communicative validity and pragmatic validity. Therefore, validity as craftsmanship seeks to identify the credibility of the researcher and the study pertaining to the procedures and processes employed during the collection of data. Secondly, communicative validity refers to openness of findings and interpretations to a broader researchers' society. Lastly, pragmatic validity seeks to understand the impact of the research on the participants and the changes that took place in the context of the investigation. Pragmatic validity is also interested in exploring the impact on the researcher in the case of action research, where the aim is to effect practical change.

Furthermore, naturalistic custom contends that trustworthiness is more fundamental than a consideration on validity or reliability. As stated earlier, trustworthiness pertains to: the transferability which alludes to the extent to which the results, especially with purposive sampling, such as in this study, can be applicable if the inquiry is done at another similar environment with the group that share the same qualities or description as the ones in the study; dependability refers to the degree of data audit trials and changes of decisions during the analysis procedures; confirmability refers to rechecking and assessing the extent to which research steps can be followed and justified or endorsed and lastly, credibility of the findings seeks to understand how well the themes and categories comprise the data and consistency of instruments and data triangulation (Graneheim & Lundman, 2003: 110; Gray, 2009: 194).

In order to improve the validity of the study the researcher used various strategies of collecting data to allow triangulation of data across inquiry techniques. I would collect data by means of observation schedules, video recordings, voice recordings and interview schedules. During observations it was essential to capture literal comments or utterances of participants verbatim during discussions in the classroom. The observation data also verified the data collected through other observers (McMillan & Schumacher, 2010: 332).

The researcher also applied aspects of reflectivity to examine his actions during field work to minimise subjectivity and improve objectivity on participants' behaviours. Therefore, the researcher maintained trust and respected participants' perspectives of the phenomenon. To enhance reflexivity, the researcher used reflective (field) journal to record decisions and changes made during the field period (Cf. Appendix 6). The study supervisors acted as observers and peer educators, especially where the researcher experienced conflicting values in the collection and analysis of own praxis.

### **5.5.2.** Reliability

According to Creswell (2009: 190), qualitative reliability shows that the researcher's instruments are consistent across various researches and studies. To ensure reliability, the researcher has recorded procedures of the inquiry accurately and also recorded as many steps as possible such as:

- Ensuring that transcripts do not have notable faults made when transcribing.
- Ascertain that there is no change in defining codes and making regular comparisons of data with codes and keeping written memos on code's definitions.
- Meetings with members of the research team to share analysis should be held regularly.
- Cross-check codes developed by different researchers and compare how results are independently derived.

The study made use of several observers with varying teaching experiences in different phases of basic education, namely: Intermediate, Senior and FET Phases to increase the reliability of the findings.

## **5.6.** Trustworthiness or rigour for this study

Morrow (2005: 251) suggested that qualitative researchers should align themselves with the paradigm guidelines of the investigation in order to improve rigour of the study. Moreover, as stated in the previous section of this chapter, judgement of trustworthiness in qualitative research is based on credibility, dependability, transferability and confirmability (Lauckner, Patterson & Krupa, 2012: 14; Coll & Chapman, 2000: 4). In addition, Carter and Little (2007: 1319) further attest on the importance of reflexivity of a qualitative researcher to actively engage epistemological underpinnings in the research processes. Furthermore, Lacey and

Luff (2001: 24) emphasised that reliability and validity are critical aspects in all research to ensure rigour of the analysis and research processes.

Christie et al. (2000: 16) further accentuate that the integrity of case study research is determined by means of reliability and validity. They continued to give prominence to construct validity, credibility/internal validity, transferability/external validity, dependability/reliability and confirmability/objectivity as the main approaches to attaining trustworthiness. Maimbo and Perven (2004: 1290) also assert that quality in conducting a research inquiry has been an alarming issue. Therefore, as a qualitative researcher, the researcher put measures in place to ensure validity and reliability in the processes of this study.

Moreover, for the purpose of improving rigour for this inquiry, the researcher stipulated the philosophical and paradigm guidelines that governed the processes thereof. Thus the study could be assessed by means of aligning its processes with the requirements of case study protocol.

### **5.6.1.** Construct validity

Case study design encourages researchers to use a protocol that clearly defines various stages of the study “case study protocol” to enable the reader to follow the study without doubt (Maimbo & Pervan, 2004: 1282). Moreover, case study allows the researcher to employ various methods of gathering data, such as observations, recordings, as well as keeping a close watch during the phase of collecting data.

In this study, the different stages of case study processes are evident from the previous chapters. A thorough discussion of paradigm inclination has been stipulated, with the ontological and epistemological guidelines being followed.

Secondly this study employed various methods of data collection, primarily being video recordings that were used as observation media for learners’ group work and teacher presentations in Technology STAD classes. Observation schedules were also used by the researcher and colleagues in order to strengthen the interpretations and provide rich description of the phenomenon. Lastly, focus group interviews were employed to get feedback from the learners regarding their experiences and interpretation of the phenomenon.

Silverman (2005) as cited in Gibbert and Ruigrok (2010: 8), however, disputes the construct validity as one of the measurements for rigour in qualitative research, asserting that construct validity is more criterion referenced and qualitative instruments or methods of collecting data are mostly not compatible to this criteria. On the other hand, research on case study emphasised triangulation of various types of data including a literature review to meet these requirements (Christie et al. 2000: 16).

### **5.6.2.** Credibility or Internal validity

Hoepfl (1997: 50) explains credibility of qualitative research as the ability to prove to the reader that data was handled appropriately, following correct methods of data analysis and reporting of the research findings. Moreover, credibility of qualitative research is regarded as a burning issue where researchers have to meet various requirements to boost confidence in the study, because prominent researchers have developed strategies to assist novice researchers.

Shenton (2004: 64) has provided a list of fourteen of these requirements that qualitative researchers should bear in mind during the process of their investigations.

1. The adoption of research methods that are well established by qualitative researchers.
2. The researchers should familiarise themselves with the culture of participating communities.
3. The qualitative researchers should adopt the most appropriate sampling strategies for their kind of inquiries.
4. The researchers are encouraged to use different methods of gathering data with the intention of triangulating data from those sources.
5. The qualitative researchers must follow strategies that would provide assurance for honesty by participants.
6. The researchers may use recapitulative or reiterative questioning.

7. Negative case analysis, where a researcher would find it appropriate to adjust or rephrase research questions to suit the collected data.
8. It is necessary whenever possible for the researcher to have continuous debriefing sessions with study supervisors in order to broaden his or her spectrum. These meetings help the researcher to draw knowledge, understanding and improve interpretations of the phenomenon from the experienced others (Coll & Chapman, 2000: 4).
9. Peer scrutiny is another type of requirement when peer suggestions and clarity seeking questions would enable the researcher to enhance his strategies.
10. Researchers are also encouraged to reflect on their research processes and evaluate how patterns emerge in gathered data and generation of knowledge.
11. The experience of the researcher could be used to measure the credibility of the findings.
12. Another provision is member checking to verify with the research participants that the information provided by the researcher match their exact views and utterances (Lacey & Luff, 2001: 23; Morrow, 2005: 252).
13. A broad and in-depth explanation of the phenomenon to enable the reader to be acquainted with the context of the study in question.
14. The researchers should be able to compare their findings with other studies addressing similar issues.

Moreover, Stol and Fitzgerald (2014) are of the opinion that credibility is measured by the degree to which the findings are regarded believable or acceptable by the reader.

"*Credibility refers to the truth as known, experienced, or deeply felt by the people being studied and interpreted from the findings with co-participant evidences as the 'real world' or the truth of reality*" (Leininger (1994) as cited in Stol and Fitzgerald 2014: 5).

Lauckner, Patterson and Krupe (2012: 14) add other important requirements to ensure credibility as prolonged engagement in the field, reflexivity of the researcher and case study protocol.

The former criteria, is being on site as a participant and or observer for a long period exceeding four weeks. In this study the researcher was on site for over three months to ensure consistency of data collection. Moreover, prolonged field or site engagements with peer teachers (my colleagues) helped the participants to be comfortable with the presence of video camera on site. It also enabled the researcher to overcome effects of distrust and provision of distorted and fallacious information (Coll & Chapman, 2000: 4).

The second prerequisite pertains to the researcher's praxis, whereby the researcher, took and implemented the advices and suggestions from the study supervisors and peer teachers.

The later constraint is the ability to develop an audit trial that would assist others to confirm that the study was carried out according to provided guidelines (Gibbert & Ruigrok, 2010: 10; Morrow, 2005: 252). Thus it is to ascertain that the arguments or claims could be confirmed as plausible construction of knowledge. These case study protocols include data collecting instruments, procedures and rules that administer the actions and behaviours of the researcher (Miambo & Pervan, 2004: 1282).

Regarding reflexivity of the researcher, constructivists acknowledge the position of the researcher as a co-constructor of deep meaning and interpretation of data. The researcher should, however, be aware of personal experiences and prior literature knowledge and predictions that could have inordinate manipulations over the study (Morrow, 2005: 254).

### **5.6.3.** Transferability or external validity

External validity is regarded by the positivists' paradigm as the ability of the research results to be generalised across the population being studied. Constructivist researchers should, however, provide a detailed contextual explanation of the phenomenon under study to assist the reader to acknowledge the choice of the researcher's sampling methods (Andrade, 2009: 49; Gibbert, Ruigrok & Wicki, 2008: 4; Shenton, 2004:69; Christie et al. 2000: 18). Fully explained contextual dimensions could be beneficial and constructive to other settings in future case studies to enhance generalizability.

Morrow (2005: 252), Coll and Chapman (2000: 5) attested that transferability enables the reader to generalise the research findings to his or her own context to approve or discard the extent to which theoretical claims of generalisation could be taken. They further added that the research should provide a full account on “the research context, participants, processes and researcher-participant relationship”.

In addition, Gibbert and Ruigrok (2010: 12) argue that numerical or statistical generalisation emanates from observing a portion of the community and generalising results across that community, whereas, analytical (case study) generalisation refers to the acceptance of the processes involved or ‘audit trial’ of the case study protocol and corroboration of findings (Christie et al. 2000: 18).

Moreover, Lauckner, Patterson and Krupa (2012: 16) stipulate that methodological rigour refers to adhering to the study processes, use of appropriate data collecting instruments and correct selection of analysis methods and plausible interpretations.

Stol and Fitzgerald (2014: 16) allude that a single case study as this one could not be generalised across the population. Generalizability could, however, be achieved in terms of the development of concepts, construction of theory, raising certain insinuations of hidden meaning and contribution of rich contextual knowledge.

Shenton (2004: 7) further argues that understanding of the phenomenon is acquired progressively using a number of studies rather than a single key project done exclusively. Secondly, even if few more case studies may produce varying results that does not mean the one is untrustworthy.

In order to enable other researchers to be able to transfer the findings of this study to their own context, a clear contextual setting has been explained in this regard. Thus if other researchers are interested in doing similar studies in comparable phenomenological settings for the purpose of improving the generalisation of the findings, he or she would be able to do so.

#### **5.6.4.** Dependability or reliability

According to Gray (2009: 158), reliability is reflected by consistence of measurement results provided by the use of an instrument on different occasions or the employment of the same instrument by another researcher is expected to yield the same findings. In addition Gray (2009: 159) and Hoepfl (1997: 59) indicate that reliability can be measured or tested in several ways, according to positivists' paradigm including: stability, equivalence, internal consistency, inter-judge reliability and intra-judge reliability. Therefore, the test papers for technology were set according to the content that was taught and thus were expected to yield reliable results of learners' scores (Cf. Appendixes 7 and 8).

Stability is determined by correlating results of the same instrument administered in different situations and timeframe and results prove to be the same, the instrument is stable of consistent over time.  Equivalence refers to the consistency of a new form of instrument that can produce the same findings as the existing measure. Internal consistence pertains to the ability of the instrument to be standardised and regulated. Inter-judge reliability could be determined by matching observations scores of various adjudicators reviewing the situation or performance of a person. Lastly, intra-judge reliability is established by reviewing the consistency of data collected over time and randomly taking samples for evaluation (McMillan & Schumacher, 2010: 180,181; Gray, 2009: 159). These types of reliability were obtained by comparison of various responses and comments that peer educators mentioned on the learners' observation schedules as well as on the teacher observation schedules. Moreover, the above mentioned data was not collected at once, but over a period of three to four months.

Shenton (2004: 71), Lincoln and Guba (1985) as cited in Hoepfl (1997: 60) suggest a measure for dependability by use of "inquiry audit" that evaluates the research analysis process and the research results correlation in qualitative studies. Therefore, research processes need to be outlined thoroughly to enable another researcher to follow and apply in his or her similar case study, even if results may vary (Lacey and Luff, 2001: 22; Christie et al. 2000: 19).

Moreover, Stol and Fitzgerald (2014: 6) stress that dependability refers to the degree to which the researcher and the reader could depend on the truthfulness of the findings. Furthermore, Gibbert and Ruigrok (2010: 13) and Christie et al. (2000: 18) supplemented the definition with the ability of the researcher to follow the process and execute a similar inquiry and achieve corresponding results. Thus, this study should portray consistency through time investigators and analysis techniques (Morrow, 2005: 252). As stated earlier, the processes of data collection and analysis were based on the case study protocol as guideline. Therefore, the other researchers could also follow the same case study protocol at different times.

Andrade (2009: 50) conclude that the interpretive approach does not guarantee the similarity of findings, should the second researcher follow the same case study protocol.

### **5.6.5.** Confirmability or Objectivity

Confirmability acknowledges the fact that qualitative research should indicate human flaws that may have an influence on the research findings. Shenton (2004: 72) emphasises the issue of researchers' admittance of the biasness that may affect the research results. Although positivism promotes the objectivity of the researcher, interpretivism upholds the concept of striving for neutrality on the research site and interpretation of results (Hoepfl, 1997: 60).

Therefore, member checking would be more helpful if regarded as unearthing of new themes from the data and enhancing the research findings (Morrow, 2005: 252). Furthermore, confirmability could refer to the ability of the research process and analysis of data to be verified by others and to approve of proper observation of guidelines (Christie et al. 2000: 17). Therefore, due to varied experiences of participant's findings may produce 'multiple realities' that could lead to other similar case studies yielding different results (Stol and Fitzgerald, 2014: 6). Moreover, the researcher outlined the processes of data collection and analysis in a flow chart format to assist the reader to verify the processes taken through the inquiry (Cf. fig. 5.1; 6.1).

### **5.6.6.** Triangulation

Gibbert and Ruigrok (2010: 9), and Shenton (2004: 65) define triangulation as the use of various methods to assist the researcher in gathering data in a way of limiting the researcher's bias and enhancing truthfulness of the findings. In addition, Lacey and Luff (2001: 23) emphasise the concept of analysing data from various sources to display a deeper insight about the phenomenon. Furthermore, the research should be able to acknowledge any contradictions that may arise from different sources (Coll and Chapman, 2000: 5). Above this, Andrade (2009: 48) and Christie et al. (2000: 16) assert that triangulation permits robust authentication regarding the construction of knowledge and interpretation of the phenomenon. Furthermore, Morrow (2005: 253) adds that triangulation improves a researcher's reflexivity to understand causal effects that could affect his or her praxis pertaining to the inquiry.. In this study the researcher used multiple tools of data collection from which data was analysed and triangulated, comparing the findings thereof.

## **5.7.** Ethical clearance

This study took place in an educational institution in the Technology classroom where learners, who are minors, were involved. A researcher should be accountable for protecting the rights, well-being and interests of the learners involved in the researcher's classroom as subjects in this study (McMillan & Schumacher, 2010: 15).

As a qualitative researcher, it is required of the researcher to obtain permission to access the participants. The researcher first submitted the ethical clearance form to the Ethics Office of the Faculty of Education at the University of the Free State where he obtained approval to acquire permission from other stakeholders. The researcher then submitted an application letter to access the school to the Free State Department of Education to access the school (Cf. Appendix 12A) and permission was granted (Cf. Appendix 12 B.). Lastly, a letter was submitted to the school's principal requesting permission to do his research at the school and to get parental consent (Cf. Appendix 13). When submitting a separate letter for parental consent since minors were involved, the principal indicated that it is invested upon every school principal by the South African Education Act that during school hours and extra-curricular activities to act as parental proxy. Due to the power and authority given by the law; the principal signed on behalf of parents as well as the school management body (Cf. Appendix 14).The permission was also granted to carry on with the research (Duncan & Watson, 2010: 54; Venegas & Huerta, 2010: 156).

The letters stated clearly that no harm would come to the learners and that their confidentiality and that of the school will be kept anonymous. Secondly, that a video camera would be used for the purpose of gathering data and recordings were kept safe, only accessible to the researcher. Assurance was given by the researcher as the teacher at the same school, that these learners' academic obligations would not be negatively affected by the research proceedings.

Highlighting the above proceedings, the learners of today are well acquainted with their rights and are free to ask questions when they were concerned. Once they saw a video camera placed in the classroom, they questioned its presence. The researcher then explained to both classes that permission had been granted and the principal was aware of what was taking place in the Technology classroom. The researcher further assured them that recordings thereof were only accessible to me and may not in any way be used against them regarding behaviour or misconduct. The researcher then reminded them of such incidents or purposes that the school has its own surveillance system installed.

On some occasions the researcher managed to secure some peer educators to assist with the recording of lessons. If the researcher could not get any help, he put the camera on the stand and placed it at different locations where it was able to cover much of the class view. The researcher would then change the position of the video camera after some time.

## **5.8.** Conclusion

In this chapter the researcher referred to two main paradigms, positivism and interpretivism/ constructivism that he believed to have an influence on this study. The reason being the former had been explained as the initial paradigm that governed scientific researches for centuries. The latter, which was the one that constituted this study arose as the rival to positivism, because constructivism believes there are 'multiple realities' or existence, whereas positivism is of the belief that there is only 'one reality'.

The chapter further outlined various differences between the two paradigms which made it difficult for the constructivists to prove their findings to be acceptable to the positivist. Although constructivism allows researchers to be part of the research context and co-producers of knowledge, positivism, on the other hand, supports objectivity to minimise the researcher's bias in the research results.

Moreover, the epistemological guidelines of constructivism were also explained in order to assist the researcher to abide by them during the research processes. The epistemology dictated the use of qualitative methods of inquiry based on the size of the sample and the context of the study.

Qualitative inquiry allows the researcher to work with a small sample to generate theory based on various methods of collecting data. Therefore, case study was chosen to be the most applicable design for this study, since it acknowledges the use of different methods to collect data that would best assist the researcher to develop rich and in-depth knowledge about the phenomenon under study.

Trustworthiness is the other important aspect of qualitative studies. The researcher elaborated on how it would be achieved in this study to produce findings that are acceptable to the reader.

Finally the researcher explained the ethical procedures that I followed in order to have this study authenticated and acceptable to the body of knowledge. In the following chapter, the researcher will explain the processes of analysing data to obtain a rich and in-depth description of the phenomenon.

# CHAPTER 6

# DATA PRESENTATION AND ANALYSIS

## 6.1. Introduction

In the previous chapter the researcher explained the research data analysis methodology that would be employed in this study. Due to the fact that themes emerge from the literature and data, both the deductive and the inductive content analysis methods will be used.

Therefore, the investigation used a modified student teams-achievement divisions (STAD) as a cooperative learning method of teaching in order to seek to improve the overall academic achievement of the classes in Technology. This was by trying to help weaker learners to develop intrinsic motivation and to aim higher academically and improving their attitude toward the subject. The intention was also to assist learners to have a better retention of the material learned in class. Furthermore, the other leg of the investigation was to explore the impact of STAD as cooperative teaching technique on the researcher's praxis.

In order to obtain the aspects mentioned above, STAD was introduced to both Grade 8 classes referred to as X and Y classes. The technology lessons where STAD was employed began towards the end of the second term as a way of acquainting learners on what to expect the following term just using another sitting arrangement.

In the third term the sitting arrangement was re-organised according to STAD requirements and principles. The researcher used the second term results to sort the STAD teams, and placed learners according to their academic ability as reflected by the Term 2 Technology mark. The researcher ensured balanced teams with one capable learner, two learners on levels 2 and or 3 and 1 learner on level 4. The levels were classified as follows: level 1 was learners with an aggregate of 74% to 100 %, level 2 was learners who obtained between 65% and 73%, level 3, learners who had a term score of 52% to 64% and level 4 was the lowest with scores ranging from 23% to 51%. the score levels were based on the class results of the second term.. Groups of four to five members were established in each class.

Once the teams were formed, the researcher started the third term by teaching learners in both classes using STAD and explaining the essential elements of cooperative learning that the researcher expected to see developing in each group. The process extended for a period of four weeks in order to establish groups' confidence and making sure that learners understood how to work in STAD teams before beginning to collect data. For the first week of collecting data, the researcher depended entirely on the journal **to** help them to settle down and be free when the researcher took notes. On the second week of data collection the researcher introduced a video camera observing the group processes from a specific position at the back of the class and the position would be changed after some time during the lesson. Moreover, whenever the researcher secured a camera attendant from peer teachers, they would then come and record the proceedings. In order to differentiate between the various groups, the researcher assigned a number to each group according to their tables from 1 to 8 in a clockwise arrangement.

The picture below shows the sitting arrangements for STAD groups. The tables were able to accommodate four to five group members of STAD teams.

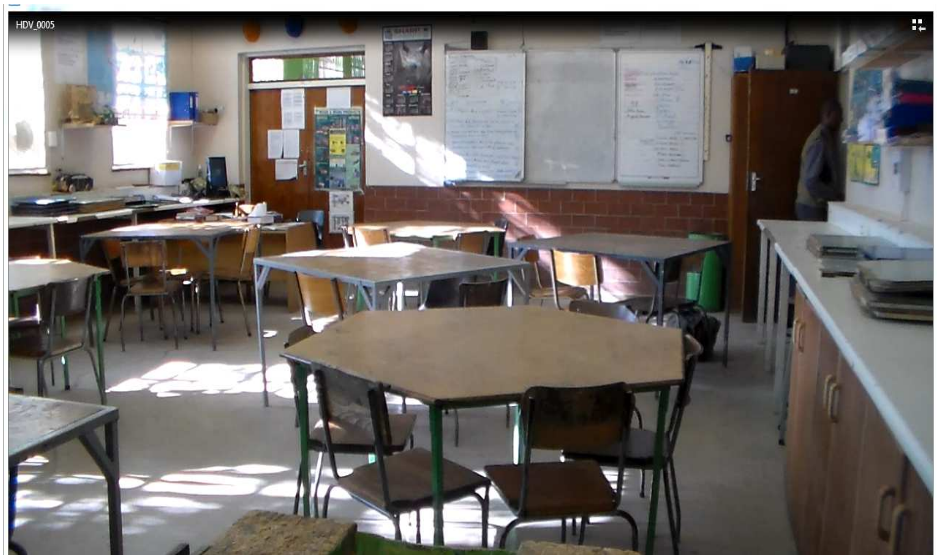



Figure 6.1 Classroom set-up

6.1.1. Training learners in STAD

The video recordings commenced after a period of over a month during which the researcher was teaching learners how to work in cooperative learning groups. The researcher instilled the importance of all the cooperative learning essential elements in them so that they could be able to see if their group was off or on the track, and so that they would be able to evaluate their group's process correctly.

The researcher started teaching learners how to work in STAD teams in the middle of the second term (quarter) of the academic calendar for a month (four weeks) and continued in the first three weeks of the third school term. The reason for teaching learners how to work in STAD teams was based on the literature notion that '*one cannot put learners in groups and expect them to work cooperatively"* (cf.3.4;; 3.5.1). Furthermore, literature revealed that groups went through various stages before they could work effectively and cooperatively (cf. 3.7; 4.2.2.3).

In the third school term, the researcher and learners were working on the last part and revision of the earlier section of mechanical systems and control and electrical systems and control. These topics entailed the understanding of concepts, calculations, sketches and application of knowledge that learners had acquired. Due to this type of content, the researcher had to modify worksheets from being quizzes into various cognitive levels type of worksheets. Also the question papers for the class tests had to be set in the same manner as the worksheets and adding little difficulty to some questions to see if learners were able take their knowledge a bit further (cf. Appendix 7A)

When recordings began, the researcher observed how the learners interacted with one another within their groups to achieve their groups' and individual goals. The researcher gave learners worksheets that they worked on as teams and at a later stage they had to present their work to the whole class. The focus was on the group process to get to the common goal and the group presentations where learners displayed how they worked together to achieve their goals (cf. 3.4.1; 3.5; 4.2.2.1). The researcher looked into the two themes he had stated above and the sub-themes were developed from the data. The researcher also reflected on the group processes to inspect if he had taught learners proper cooperative learning group work (cf. 3.4.1; 3.5.1; 4.2.4.5).

## 6.2. Presentation and analyses of qualitative data

Under this section various qualitative data sets that were gathered through the implementation of different tools has been presented. The data sets include reflective journal data that the researcher used for evaluating his praxis, learners' classroom observation's schedules that were filled in by peer teachers for commenting on STAD groups processes; Group interview schedules were completed by the researcher as group members interpreted their experiences regarding STAD and the teacher observation schedules that were done by peer educators noting the role of the teacher during group discussions, lesson presentations and praxis in general.

### 6.2.1. Reflective Journal: researcher's reflection on lesson presentations (Data – RJT)

Data – RJT were data gathered using a reflective journal during the STAD lessons in Technology classroom. Various aspects that the researcher regarded as essential elements of good classroom praxis were identified (cf. table 6.1) using set criteria. (cf. Appendix 4).

The researcher looked into lesson planning because he believed as a teacher he should enter a classroom well prepared for the lessons to show respect and honour toward his profession and the learners (cf. 4.2.5.2). Furthermore, lesson planning would also help the researcher to allocate time fairly to different classroom activities, such as lesson presentation and group discussions.

Moreover, the researcher further looked into time management, because teaching periods are scheduled based on time allocation. Therefore, adequate or effective distribution of time during Technology lessons would assist the researcher as a teacher to identify any hick-ups that might have occurred during class. Moreover, good management of time allocated to Technology would also help me to teach enough content at a time and be able to cover all work scheduled for the term, semester or year as recommended by the Curriculum and Assessment Policy Statement for Technology (cf. Appendix 16).

Thirdly, the researcher looked into class control and discipline as some of the important aspects of a teaching period. He believes in a lesson to run smoothly and for learners to learn effectively, the environment in the classroom should be conducive for teaching and learning (Cf. 4.3.5.3). Therefore the researcher also believes that there should be a particular routine that e teacher employs in a classroom in order to obtain full control over learners' behaviour and conduct during teaching period. There should also be measures that a teacher should take to promote expected behaviours in a learning environment (Rohaan, Taconis & Jochems, 2010: 272; Hynes, 2012: 348).

Table 6.1 Reflective Criteria

| MAIN CRITERIA | SUB-CRITERIA |
|---|---|
| **Lesson Planning** | Lesson Content Structuring |
| **Class Presentations** | Preparedness |
| | Diagnostic |
| **Time Management** | Teacher-Learner Interaction |
| | Productivity |
| **Class Control and Discipline** | Managing Time Wastage |
| | Hand-outs Period |
| | Keeping Learners Focused |

6.2.1.1. Criteria: Lesson planning

The researcher regarded lesson planning as the overall administration of the lesson in the Technology classroom (Cf. Appendix 10). It began with the actual planning on the topic that was going to be taught, how long it was going to take to explain the work to learners until they comprehended the work. Moreover, it encompassed the structure, quality and length of group activities to allow proper dissemination of information and knowledge among the team members. Lastly, the researcher had to look into the strategies that he had to employ to ensure proper cooperation within the groups and minimise disruptions as much as he could (cf. 3.4.1; 3.8).

Furthermore, Johnson and Johnson (1995: 1019), Johnson, Johnson and Smith (2004: 14) attest that a teacher needed to plan and make pre-instructional decisions that would assist in monitoring the progress of learners in STAD teams.

In the following section the researcher expounded on the sub-criteria stating the structuring of lesson content that supports good planning of lessons.

#### 6.2.1.1.1. Sub-criteria: Lesson content structuring

As a Technology teacher, the researcher focussed more on the thorough preparation for excellent delivery of the material to be taught (cf. 4.2.5.2; 4.3.4.1). In most of the lesson preparations he realised to have over prepared or arranged more content than learners could contain in one period or contact session. This caused the researcher to rush through the explanations of concepts and processes, also allowing too little time for learners to ask questions. Secondly, the worksheets were too long as well and dragged over two periods at some stage. When corrections of worksheets were done, the researcher realised that the learners were unable to correlate the relationship between certain formulas and the theory they have learned (cf. 3.4.1).

The researcher further realised that he should prepare enough content that learners would be able to comprehend and have time to digest. It would also help him to go at a learners' pace and show them how the new content related to the previous work (cf. 2.3.2), as some learners tended to separate the work that was taught in different lessons, days or even weeks and did not consider it as building up on the already acquired knowledge. In the lessons that followed thereafter the researcher rectified the concerns raised above. Therefore, the researcher prepared content enough for one contact session allowing it to sink into learners' minds. Secondly, he shortened the worksheets for learners to be able to complete in the same period during the second half of the one hour period, so that corrections could be done in the next period. Thirdly, the researcher always had to recap by asking learners questions on the work we did in the previous lessons and then showed them how that knowledge was related to the new topic to assist them to build on (cf. 3.4.1; 2.3).

Lastly, the researcher also had to confront the issue of setting apart theory from calculation formulas, whereby he needed to explain to the learners how a particular formula had been derived from the theoretical definitions. This helped them to understand case study types of questions because they were able to create or derive formulas from the case study content (cf. Appendixes 7A and 7B).

Moreover, Mishra and Koehler (2006: 1025-1027) indicate that the pedagogical knowledge of the teacher encompasses the representation and invention of concepts, pedagogical techniques and insight regarding causes of comprehension difficulties. The teacher should have the ability to reflect on knowledge dissemination to learners and to employ relevant strategies and teaching methods to remedy the situation.

#### 6.2.1.2. Criteria: Class presentations

Class presentations in this study referred to the actual content delivery by the teacher where the researcher had to introduce new work and explain the technological concepts in that context. He also had to assess the prior knowledge of the class, build on it and incorporate it with the new content that was introduced, so that learners could notice the relationship and progression of their work. Research stated that during lesson presentations the teacher should thoroughly explain the subject matter to the learners and provide the opportunity for learners to pose probes to ensure understanding before engaging in group activities (Slavin, 1990: 54; Hendrix, 199: 59; Stockdale & Williams, 2004: 38; Berry, 2008: 151).

##### 6.2.1.2.1. Sub- criteria: Preparedness

The researcher portrayed to be well prepared for the lessons. Since he was well prepared for the lessons his confidence appeared to have been boosted during the class presentations (cf. 4.3.5.3).

The researcher was also able to structure his lessons in an order that formed a build up from prior knowledge and followed a proper sequence of knowledge progression. He projected a voice in such a way that even those learners at the back of class could hear clearly. It was therefore easier for the researcher to respond properly to learners' probes (cf. 2.3.1; 2.2), because he was prepared for the lessons. Moreover, learners responded well to the presentation by paying attention to receive the knowledge of the content that was being delivered.

Even though the researcher experienced a minor hiccup, such as printing copies of notes and worksheets, he was able to give the class some work on the board to do in the meantime. Preparation assisted him to be able to formulate activity for learners without them realising that he had a printer's challenge. It was therefore very important for the researcher to prepare lessons in advance, so that he could foresee problematic situations and rectify them to have a smooth running of class processes. Danielson (1996: 1) in her framework for professional practice and OECD (2009: 13) in the teacher evaluation framework propose that preparation should demonstrate the teacher's knowledge of his learners through assessment strategies and use of appropriate pedagogy.

#### 6.2.1.2.2. Sub-criteria: Diagnostic

During class presentations the researcher was also able to detect and realise if some learners could not understand the content he presented. He could further recognise this lack of understanding when asking learners some questions (cf. 2.3.3; 2.4). Their responses were able to help diagnose the situation and their level of understanding in certain parts of the content. Therefore, the researcher was able to remedy the situation by addressing the areas where learners showed lack of comprehension. The questions that were posed by learners gave the researcher an idea of where to exert extra effort before proceeding to the next section of work (cf. 3.4.1).

Because of being well prepared, the researcher used his class time wisely, avoiding unnecessary disruptions that could be made by a noisy class due to idling caused by inadequate class work. When presenting, the researcher went straight to the point by explaining the content and making appropriate examples that helped learners to understand. When learners also projected their questions to him, he was able to respond correctly and confidently (cf. 4.3.5.3; 4.3.5.4). It allowed the researcher to divert the questions to the class forming a general class discussion. In this way I was able to obtain a general evaluation of where the class was in terms of understanding the work (cf. 2.3.; 2.3.1; 2.3.2). Therefore, the benefits of cooperative learning are not only for students as teachers also gain from implementing cooperative learning methods in their classrooms (cf. 3.8).

Moreover, lesson planning was highlighted as one of the noticeable improvements that occur, secondly there was time to observe how learners interacted and had an opportunity to assist individual groups which in turn enabled the teacher to attend to each learner in the classroom (cf. 3.4.1). Furthermore, the educator learned to also receive insight from learners and guided their understanding toward the content at hand in the correct context (Murdoch & Wilson, 2008: 7).

#### 6.2.1.3. Criteria: Time management

The researcher realised that he needed to improve the flexibility of giving each learner attention at some stage during the class contact sessions for them to feel recognised and appreciated as members of the larger class community (Danielson, 1996: 4).

During his preparations the researcher structured the running of the lesson from the beginning to the end and was therefore able to manage each part of the lesson and allocate an appropriate amount of time to it (cf. 3.4.1).

In a one hour period the researcher would allocate a presentation for twenty minutes and gave five minutes to questions and answer time and then assigned the next thirty-five minutes to learners' activity, such as teams working through the worksheets.

Due to class sizes, it was more practical for the researcher to interact with individual groups when learners were working on the worksheets in their groups (3.4.1). The researcher would then walk around to each group to see how they were working and coping with the work, group relationships and group processes (cf. 4.2.5.2).

#### 6.2.1.3.1. Sub-criteria: Teacher learner interaction

The kind of time allocation mentioned above enabled the researcher to have time for one on one contact sessions with his learners within their respective groups (Furtwengler, 1992: 61). It was therefore important, for the researcher as the teacher to go around to the various groups in the class during groups' activities in order to attend to their grievances. The teacher was able to explain concepts, processes and procedures to a smaller number of learners at a time where each group member could freely ask questions or raise points of concern (cf. 3.4.1; 4.3.5.4).

Secondly, during the group work session, the teacher was also able to assess the progress made by each group and clarify concepts where necessary in a more intimate environment. The concerns or misunderstandings raised by group members were also handled at a group level where the researcher would help them to resolve any outstanding issues more especially inculcating the understanding of cooperative learning's essential elements (cf. 3.4.1; 4.3.5.3; 4.3.5.4)).

#### 6.2.1.3.2. Sub-criteria: Productivity/ effectiveness

Furthermore, the researcher could also evaluate and see if the whole period was used effectively and if activities were distributed evenly across the time to curb idling and unnecessary disruptions. Being well prepared for the lessons helped the researcher to be able to align his presentations and activities sequentially (cf. 3.4.1; 4.3.5.3). Thus, he could do the baseline assessment at the beginning of the lesson to observe the state of the class knowledge, and then move on to the content of the day and afterwards continue with the group worksheets (cf. 4.3.5.4; 3.4.1). Sometimes after the baseline assessment he would realise that his preparation was way beyond learners' comprehension and therefore he would have to trim or tone it down to their level of understanding first. At other times, the researcher found out that they were more knowledgeable than the content prepared and would then build on their existing knowledge and go deeper into the topic (cf. 4.3.5.4; 3.5.2.6; 3.5.2.5).

It was therefore a crucial exercise to always be prepared for lessons as it helped the researcher to keep focused and not be taken astray by learners' questions. Learners sometimes just feel like not doing work or are mentally tired especially in the last periods of the day. They would ask all sorts of questions that could make the researcher deviate from his lesson easily if he was not prepared. It was also helpful in a way that he was able to assist learners to focus on the task at hand even though they might have felt like lazing around (cf. 4.3.4.1; 4.2.2.2; 4.2.2.3).

Furthermore, Mctighe and Wiggins (2012: 6) indicate that teachers prepare appropriate lessons and exercises that address the transfer of knowledge by the educator, construction of knowledge by learners and application of knowledge.

#### 6.2.1.4. Criteria: Class control and discipline

Moreover, being well prepared for lessons made it easy for the researcher to pick up time wasting behaviours and when they mostly took place and how they happened. The researcher realised that class control and discipline began when learners left their previous class up to the end of the Technology lesson. Once learners were aware that the time between periods was not for other agendas, but to rush to the next class, they got used to the routine and respected that time interval (cf. 3.5.2.7).

##### 6.2.1.4.1. Sub-criteria: Managing time wastage

The Technology class in the researcher's school is about a hundred metres away from the block of classes where Grade 8s took most of their subjects. One could imagine what happened in that distance. The reason being, that the researcher would find learners strolling, chatting and binging on their lunch boxes on their way to class. These patterns of behaviours caused learners to arrive late at the Technology class and also in a loud and chatting mode, which took a long time for them to settle into the class mode and be settled. This was the case in most instances due to the researcher's congested timetable, as he had to clear the board and prepare the classroom for the upcoming class (cf. 2.4.2; 2.4.3).

The researcher therefore realised that in this instance lesson preparation was not only supposed to be based on the content, but on other contributing proceedings that took place during the teacher learner contact session . The first issue was learners strolling down to class, as the researcher indicated earlier, that they had to walk a distance of about hundred metres between the class blocks. The researcher had to communicate to the learners regarding the amount of time that was wasted when they walked slowly to class (cf. 3.5.2.8; 3.5.2.9). They had to rush to class as that strolling was unacceptable behaviour and those who did not comply would face the consequences for their actions. Secondly the chatting mode created by strolling would be minimised as well when learners began to be conscious of the repercussions of time wasting behaviours. These time wasting behaviours included taking out lunch boxes and binging, strolling and conversing on the way to class. At times, if possible, the teacher would wait for them at the entrance of the block so that they could run to class and showed them how to walk responsibly and quietly in the corridor, showing respect for other classes. Because of their chatting mode and coming in groups, the researcher had to make them line up outside the class and be quiet and enter the class in an orderly fashion without poking or pushing each other and remain standing at their desks until they were ordered to sit (cf. 3.7; 3.8).

This also meant that the teacher had to always be at class before learners arrived in order to administer the process properly.

The researcher therefore learned that the beginning of the period needed more attention in terms of controlling the learners' behaviour, because if they were allowed to enter the classroom in that state they would just carry on non-stop (cf.3.5.2.8).

6.2.1.4.2. Sub-criteria: Hand-outs period

Secondly, another issue was the time of handing out notes or worksheets to the learners, where they would have to cut or trim the papers to size and then paste them into their workbooks. Learners tended to take an advantage of this process by elongating it and starting to talk to one another in the name of borrowing or lending apparatuses and resources, such as scissors. Others would want to throw away their individual off-cuts just to create unnecessary movement in class that could end up in poking and pushing each other due to the little spaces between the tables. The teacher had to develop a strategy to guillotine their papers (notes or worksheets) beforehand to minimise unnecessary waste of time that shortened time-on-task. Regarding any off-cuts that might have come up, the teacher advised learners to put them at the centre of their table for collection by myself or one appointed learner (cf. 3.5.2.8).

6.2.1.4.3. Sub-criteria: Keeping learners focused

Thirdly, if the researcher was not well prepared for his lessons he would have found himself swayed from the subject matter in discussion during the time of learners' questions. Learners could get very excited by certain topics and asked all sorts of questions that could lead a class to talk about anything but work to be learned. The researcher had observed this behaviour for some years since he had been teaching (cf. 3.5.2.8; 3.5.2.2).

Therefore, it was not easy for the above mentioned unwanted activities to happen, because the researcher was prepared for every lesson and could identify any mishaps. The researcher believes learners do not do all these things because they are ill-mannered or disrespectful, but just being adolescents. He has also observed that teenage boys are always looking for a loophole or a slight chance to play rough, either by tackling or poking each other. It was therefore important to bear in mind what to do during these sections of the lesson and put precautionary measures into place beforehand. If the researcher was always well prepared for lessons and had properly structured presentations of the content, learners would automatically get tuned to asking proper and appropriate questions based on the taught topic. Preparation helped him to maintain good behaviour and focus on the learners (cf. 3.5.2.8; 3.4.1).

### 6.2.2. Analysis of video recordings on STAD groups interactions (Data – VL)

In this section the researcher elaborates on the data that was gathered through video recordings during group interactions. The researcher had requested some of his peer teachers to assist him by recording the processes during Technology lessons where STAD was implemented. The recordings helped to analyse the various effects of STAD on learners

#### 6.2.2.1. Themes and subthemes that emerged from recordings (Data – VL)

The researcher has already stated earlier in this chapter, that the purpose of this study was to explore the effects of modified STAD on learners in the Technology classroom. The aim was to investigate how the attitude of learners towards the subject and STAD would be affected. Secondly, enquiring on the development of social skills and cultural tolerance within the STAD teams. Thirdly, it was to investigate the development of intrinsic motivation among low achieving learners and the retention ability during class tests.

The themes and subthemes that emerged from these data that were gathered by video recording the STAD groups are outlined in table 6.2; the main themes are group processing and group presentations.

Table 6.2 Recorded Group Themes

| MAIN THEMES | SUB-THEMES |
|---|---|
| Group Processing | Noise Levels |
| | Communication |
| | Facilitator Intervention |
| | Group Interactions |
| | Disruptive Behaviours |
| | Team Work |
| | Seeking Help causing Disturbances |
| | Positive Interdependence |
| Group Presentations | Team Work |
| | Sharing of Responsibilities |
| | Facilitator Intervention |
| | Self-Determination |
| | Confidence and Excitement |
| | Positive Interdependence |
| | Domination of Discussions |
| | |

6.2.2.1.1. Theme: Group processing

At the beginning of the recordings the camera was placed at different angles in the class in order to capture certain groups for some time so that the researcher could have a better idea of how different teams were working without their focus being on the camera. That also made it easy for him to walk around the class and assist the various groups where necessary. The recordings started with Class Y working on the worksheets.

Learners in Class Y were working in their teams in four to five member groups allowing members of the groups to engage in discussions around the tables (cf.3.5.1; 4.2.4).

###### 6.2.2.1.1.1. Subtheme: Noise levels

Towards the middle of the lesson some groups tended to raise their voices and the researcher reminded them to look on the wall and read the type of voices encouraged in cooperative learning groups. Then the voices would go back to silent voices.

As the researcher moved around assessing the progress of various groups some teams would send their members to seek assistance where he was, helping the other team. The researcher would then explain to them that it was better for him to explain concepts to the whole group rather than an individual (cf. 3.5.2.9; 3.5.2.4). On his trips through the class the researcher would turn the camera to focus on certain tables so that he could have a clear idea of how they worked. Therefore, when conducting a class using formal cooperative learning, a teacher has to specify plans for the lesson, make a number of pre-instructional decisions, monitor learners' progress and intervene within the groups and lastly evaluate learners' and help the process as to how well they functioned as a group (Johnson & Johnson, 1995: 1019; Johnson, Johnson & Smith, 2004: 14).

###### 6.2.2.1.1.2. Subtheme: Communication

The researcher discovered that Group 1Y had minimal communication and members were moving their leader's book around copying the work from it. When the researcher asked: "*why do you copy from a leader's book*?" One of the members replied: "*it is because we discussed them togethe*r". The researcher further explained to them that, copying from the other person's book would not help (cf. 3.9; 3.5.2.9; 3.5.2.8; 3.5.2.5). Instead it made things worse, because other members copied without understanding the work. Therefore, it was better that as they agreed on responses, every member wrote in his book at the same time. That would help individuals to digest the answer immediately when they wrote, so that they could ask if they did not understand. Cooperative learning was therefore well organised and structured group learning, where learners were accountable for their learning and dependent on social interaction with other learners (Oxford, 1997: 443; Johnson & Johnson, 2003: 786). Moreover, cooperative learning is a psychologically and socially based strategy that assists learners to work together to reach their learning objectives (Oxford, 1997: 443).

#### 6.2.2.1.1.3. Subtheme: Group interactions

Group 8Y seemed to be enjoying themselves as they worked and others adding some humour to their discussions. Other members were hunching over the table for clearer and quieter discussions as well. Group 3Y also appeared to be focused on their discussions with one member on his feet bending over to get closer to the other group members. The rest of the groups: 2Y, 7Y, 6Y and 4Y also looked to be consumed by their work, engaging interactively and allowing individual members to participate (cf. 3.5.2.3; 3.5.1).

At the end of the period some groups, which were not finished with their worksheets, stayed behind for a few minutes to complete their tasks as it was the last period of the day.

In the next class session the researcher had Class X and dynamics of some groups were somehow challenging. This was because there were some elements of disruptions between two groups. Secondly, other groups showed little interaction among members such as groups 4X and 6X. The researcher had to intervene and explain to the groups the kind of engagement required from each member for the team’s success. Research studies conducted on formal cooperative learning are well documented arguing that when learners work together for one or several class sessions to reach a shared goal and in one accord complete a task at hand. These studies concurred that learners go through a full learning unit or project where they will make decisions, solve authentic problems, conduct research and compile a report (Johnson & Johnson 1995:1018; Johnson & Johnson, 2003: 788; Johnson, Johnson & Smith, 2004: 8).

6.2.2.1.1.4. Subtheme: Facilitator intervention

Group 4X were doing work individually at first and then tried to correct each other, and this led to low achieving learners feeling singled out. The researcher assisted them by saying that as a team, you first discuss the task as a team, agree on the correct method or formula to use while you all write the consensus stages in your workbooks. This would help the group members to have the same understanding of the work. Moreover, to make cooperative learning work in Technology classes, a teacher has to understand and master the basic elements that make cooperative learning work. Then the teacher should instil these essential elements of cooperative learning in learners in every cooperative lesson (Johnson, Johnson & Holubec, 1994: 9; Johnson & Johnson, 2009: 366).

The researcher realised that there was a need to speak to the whole class, because most groups showed lack of interaction. Those who understood his explanation of concepts and use of formulas would work quickly on their own and wait for others to do the questions individually as well. This behaviour caused a lack of discussions towards understanding the processes and procedures through the questions. The low achieving learners became disruptive as they felt left out, because they could not comprehend the work (cf. 3.4.1; 3.7).

The researcher therefore addressed the issue with the group that; "*no one works alone, work as a team*". Later during the lesson when the researcher got back to Group 6X, he found that the team was struggling to build up a working relationship, because some members resented others. The researcher, however, assured them they should work slowly on building up this working relationship, as it is not an easy process. Eventually it would work out well. The researcher just helped the group to be patient with one another and support each other. He further helped learners understand that positive interdependence is said to be the most important, the heart element of cooperative learning. Learners must be provided with clear task and group goals so that they know and understand that they sink or swim together. Group members must be aware that each individual's efforts are beneficial to group success. Through positive interdependence, commitment to other learners and own success is created as the heart of cooperative learning (Laing, 2002: 31; Johnson, Johnson & Tjosvold, 2012: 14).

After our discussions the groups began to interact and maximised their time productively and resolved any disagreements to the benefit of the whole team, excluding no one. Most teams improved on their focus on the task, members were getting actively involved and their communication increased as well. Group 7X showed excellent progress of working harmoniously as a team not as pairs and the leader was free to take charge of the group discussions (cf. 3.5.2.5; 3.4.1; 3.5.1).

Group 8X was the one that was interactive and focussed, working together through the tasks all along. After the researcher's explanation of the cooperative learning principles to the whole class, all other groups began to communicate constructively helping each other through the exercises.

#### 6.2.2.1.1.5. Subtheme: Disruptive behaviours

Between groups 2X and 3X there were, however, individuals who were disrupting one another by poking each other in the back. The same kind of disruption was taking place between Group 8X and Group1X members. The researcher told group leaders to ascertain that their members were all participating, and were committed to group work (cf. 3.5.2.5; 3.5.2.8; 3.5.2.9).

Group 3X was also struggling to jell and work together as members were working individually and there was a specific learner who did not understand the work and therefore resorted to being disruptive, hence poking a learner sitting adjacent to him in another group (cf. 3.2; 3.5.1).

#### 6.2.2.1.1.6. Subtheme: Team work

Towards the end of the lesson the groups in general were showing positive progress leading to excellent team work. They also understood that the purpose of using STAD groups was to help the low achieving learners to improve to the next level of achievement, while at the same time every member was helped to improve to their next level of performance as well (cf. 3.5.1; 4.2.4.4; 4.2.4.1; 4.2.5.3).

In the next contact session with Class Y the researcher introduced a new topic, which was quite short. Learners copied the explanations and examples of calculations and formulas needed for this section of the work. After copying the work, learners pleaded to continue with the previous worksheet as they said it was too long. The researcher agreed to the request and groups got consumed by their work to complete the worksheet with quiet voices and involving each member to give an input (cf.4.2.4.2; 3.5.1).

6.2.2.1.1.7. Subtheme: Seeking help causing disturbances

At a later stage of the lesson the researcher realised that different groups were sending representatives to other groups to acquire assistance with one of the sums that had more steps and required the use of different formulas. At this juncture the researcher sensed that disruption or noise might increase and stopped all the groups, and asked them to pay attention while he explains the process. He took the whole class step by step through the entire calculation and showed them how the various formulas were related and how they could be incorporated. The researcher also explained and demonstrated how to convert certain units to the other units, such as kilograms to Newton's (cf.4.2.4.4; 3.5.2.4).

6.2.2.1.1.8. Subtheme: Positive interdependence

After the worksheets were completed by both classes; we went through the concept definitions and other word answers and made corrections. Then different groups were selected to do their calculations on the board explaining to the class their process to the answer as a team. Teams were encouraged by the researcher to allow all members to take part during this (cf.4.2.4.1; 3.5.2.3).

Class X was the one that began with group feedback. The class was, however, given an opportunity to use the first thirty minutes of the lesson completing their worksheets. All groups appeared to have jelled well, displaying high levels of communication and focus on the tasks to be completed. Even group 6X, which was a concern regarding member participation and acceptance, showed significant improvement. Members were conversing and participating fully. The researcher then updated the class on the amount of time left; ‘seven minutes left to the completion of the worksheets’ (cf. 4.2.2.1; 4.2.4.2; 3.5.2.4).

#### 6.2.2.1.2. Theme: Group presentations

Under this theme STAD teams were appointed to present their work-out of calculations showing all steps they took to reach their answers. The purpose was to build team work amongst group members and build their confidence and trust to the whole class during presentations (cf. 3.5.2.3; 3.5.2.1).

The researcher believed that this part of the exercise would contribute to learners’ self-esteem and determination to produce excellent work. The researcher intended for groups to be able to accept corrections from other teams as well as confirmation and support. By so doing the researcher anticipated groups will learn from other groups that portrayed good cooperation during their presentations (cf. 3.5.2.2; 3.5.2.7).

##### 6.2.2.1.2.1. Subtheme: Team work

When the time was up, Group 1X was nominated to come to the front. The researcher asked them to choose a person or persons who would write the work out on the board and those who would explain the steps throughout the sum. After the group had chosen the scribe, the researcher told the whole class to be silent and listen to other group’s explanation. The team chose their leader as a spokesperson to elaborate on the proceedings. The sum was done correctly and the whole class was satisfied and showing understanding (cf. 3.5.2.8; 3.5.2.3; 3.5.2.4).

There was, however, a slight mistake of leaving out the units on the answer. The researcher explained to them how to use the given data units and work out the correct units at the end. The groups marked their work and those who got wrong answers corrected their calculations immediately (cf. 4.2.4.1; 4.2.4.2; 4.2.4.4).

#### 6.2.2.1.2.2. Subtheme: Sharing of responsibilities

Group 7X was the next called to the front to do the next equation. Likewise, one member was assigned to write the sum on the board while others stood by him. During the next phase of the sum another member was appointed to write the second step and the last step was written by a different person. The speaker briefly explained showing misunderstanding of the work and experienced difficulty in explaining it clearly to the class (cf. 3.5.2.5; 2.5.1; 2.5.2). The researcher embraced the presentation, because the speaker gave an explanation even if he was a little confused. That displayed confidence and trust that he would not be humiliated, but instead would be supported (cf. 3.5.2.9; 4.2.4.4).

#### 6.2.2.1.2.3. Subtheme: Facilitator intervention

After Group 7X's presentation the researcher took over and clarified the different stages to the class. Some groups had concerns regarding their methods of calculations. He had to expand the calculation showing every step to indicate how the group did their work out because they had skipped some minor phases expecting everybody to comprehend (cf. 3.4.1; 2.3.3).

The researcher, however, realised that due to the similarity of the formulas in mechanical systems, learners in other groups got confused as to when they should employ a certain formula in their calculations. The content of the worksheet covered three types of mechanical systems and control including linkages, hydraulics and pneumatics and pulleys. The researcher therefore had to go through the different topics and explained broadly where each of the formulas was applicable to avoid confusion during class tests (cf. 4.2.5.4; 4.3.4.1; 4.3.5.4).

When Class Y came for their following period the groups were given an opportunity to do the sums on the board and explain to the class as did Class X. Groups were also given five minutes to do the task and explain it to the class.

Group 7Y was the first assigned to do the first calculation on the board. As they approached the board the researcher reminded the rest of the class to pay attention in order to be able to evaluate their work properly. One member was asked to transcribe the working out while the other member was chosen to explain the proceedings. Their work was done correctly (cf. 3.4.1).

#### 6.2.2.1.2.4. Subtheme: Self-determination

Group 6X followed suit and came to the board to do the next task. As the group leader was doing the sum on the board, the class became restless due to incorrect work. The researcher insisted that they be given an opportunity to explain their work so that they would be able to understand the corrections. When they were done explaining, Group 4X was chosen to come and assist, but could not complete the sum due to time and it was reserved for the next contact session.

In the next class session Group 4X could not wait to approach the board and do the sum and explain the process to the class. The team explained the different stages clearly to the class, showing strong mathematical insight, because the tasks were now getting more difficult and complicated with more steps of calculations (cf. 2.5.1; 2.5.2).

#### 6.2.2.1.2.5. Subtheme: Confidence and excitement

The class was a little exited, because each group was asking to do the beginning calculations as they were easier. Only one group could, however, come to the board at a time and Group 3Y was appointed to do the next sum. They also chose one member to write and another to explain. Because of a slight mistake by putting units in front of the mechanical advantage, other groups hailed asking to do the correction. The researcher asked them: "*keep quiet and give the other group representative a chance to explain the work and perhaps identify the fault. I will ask you to point out the mistake to them afterwards if they don't recognise it*" (cf. 3.5.2.5; 3.5.2.7; 3.5.2.8).

The work of the presenting group was correct, however, a member of one of the groups pointed out the missing units as a mistake to the presenting group. The researcher then explained to the group and class the reason mechanical advantage does not have any units. Then Groups 8Y and 4Y were assigned to do the following calculations respectively, which they did well and the class was satisfied with their work (cf. 2.5.1; 2.5.2; 2.4.4; 2.4.3).

6.2.2.1.2.6. Subtheme: Positive interdependence

Class Y groups in general showed high interaction levels this time around. Group members began to understand and trust one another, resulting in improved focus on the task at hand. The groups' working relationships also improved. Even those hyperactive members in some groups were cooperative to other team members when asked to get their acts together and focus on the work.

In the next session with Class X, all the groups were highly committed to group discussions showing high participation levels. Groups would call me to come and explain the concepts where they could not reach consensus about the answers or working out of the problem (cf. 4.2.5.3 4.2.4.3; 4.2.4.1).

6.2.2.1.2.7. Subtheme: Domination of discussions

An interesting incident was when some members in Group 4Y raised a concern that the team leader was dominating the group discussions, always changing their inputs and writing them differently. When the researcher asked; "*what is the problem?",* the group leader replied; "*I am not dominating the discussion, but I only paraphrase or simplify their contributions for all of us to understand".* After the discussion I realised that he was actually helping the team. The researcher, however, encouraged him to facilitate and allow members to feel and experience the ownership of the work. And asked the group a question; "*How would you resolve issues like these if they come up again?"* One member replied; "*We can resolve it by discussing a problem and not accusing a person"* (cf. 3.5.1; 3.5.2.9).

In the next section of this chapter the researcher have presented and analysed the data that was collected during group interviews. The data was aimed at understanding the phenomenon from the research participants' perspective and interpretations.

### **6.2.3.** Analysis of peer observers on learners **(Data - POL)**

The researcher had requested ten of his colleagues to visit his STAD class and observe in order to fill up the observation schedules for teacher presentations and group work processes. In this section the focus would be on the administration of group work in the Technology STAD classes.

The purpose of extending his invite to them was to minimise the researcher's bias as much as he could by using data that had been produced by various observers to increase the credibility and trustworthiness of the findings of this study.

Figure 6.2 portrayed STAD group in Technology class working on the worksheets.

Figure 6.2 Group interactions

#### 6.2.3.1. Demographics of peer observers

The demographics of the colleagues that helped with the observations are displayed in table 6.3 below. The following peers were not selected based on their particular skills or relationship with the researcher, but simply on their availability. The researcher had to ask any colleague that would possibly be having a free period during his Technology STAD lessons to come and observe of their own accord.

Since there were no specific criteria in choosing the different observers, it was therefore their first experience of the employment of STAD as a cooperative learning technique in this school.

Table 6.3 Demographics of Peer Teacher Observers

| Pseudonyms | Years of Experience | Phases Taught by Peers | Subjects Taught |
|---|---|---|---|
| **Mrs Gomez** | 7 Years | Foundation Phase | Grade 2 subjects |
| **Ms Logan** | 22 Years | Senior and FET Phases | Accounting; Economic Management Sciences (EMS) |
| **Mrs Blitz** | 24 Years | Senior and FET Phases | Physical Science; Natural Sciences |
| **Mr Barnard** | 35 Years | FET Phase | Physical Science |
| **Ms Matthews** | 9 Years | Intermediate Phase | Social Sciences; EMS |
| **Ms Robinson** | 1 Year | Senior and FET Phases | Geography; Life Orientation |
| **Mr Martins** | 2 Years | Senior and FET Phases | Mathematics |
| **Mrs Crouch** | 25 Years | Intermediate Phase | Natural Sciences & Technology; Mathematics |
| **Mr De Venter** | 50 Years | Senior and FET Phases | Mathematics |
| **Mrs Johnson** | 30 Years | Senior and FET Phases | English; Social Sciences |

#### 6.2.3.2. Themes and sub-themes from data - POL

In this section, deductive and inductive methods of analysis of data have been employed. The main themes were deduced from the literature study whereas the subthemes were inductively identified from the data.

The themes and subthemes are outlined in table 6.4 below.

Table 6.4 Themes from Peer Observers

| **Themes** | **Subthemes** |
|---|---|
| Behaviour in groups | • Conduct of team members<br>• Focus on the task<br>• Derailing from the task<br>• Response to authority |
| Communication in groups | • Acceptable noise levels<br>• Respectful interactions<br>• Constructive arguments<br>• Give and take (equality) |
| Respect for team members | • Team work<br>• Sharing knowledge, resources and responsibilities (equally, unfairly)<br>• Support ideas, encourage others |
| Adherence to time frames | • Teacher allocated time<br>• Flexible time adjustments<br>• Lesson structured, organised<br>• Completion of worksheets |
| Ensuring the mastery of content | • No structured mind maps<br>• Proper interactions, discussions and constructive arguments<br>• Shared notes and books<br>• Further explanations by team members |
| Ensuring individual accountability | • Setting the outcome – feedback<br>• Opportunity to reflect on test results<br>• Allocation of member duties<br>• Recording view and answers in individual |

| | |
|---|---|
| | workbooks<br>• Individual participation in discussions |
| Ensuring positive interdependence | • Uncooperative behaviours, domination, dismissal of opinions<br>• Members contributions<br>• Free and active participation<br>• Leaders' encouragements, patience<br>• Confident communication |

6.2.3.2.1. Theme: Behaviour in groups

Behaviour of learners within their groups entailed various aspects, such as deportment and how they maintained order and progress of processes within their teams. Three of the peer observers have been quoted with the following remarks they made;

> Mr Barnard *"Learners behaved excellently and were disciplined with appropriate interactions".*
>
> Ms Logan *"No disruptions experienced – boys were focussed on task at hand"*.
>
> Mrs Blitz *"They were mostly co-operative and getting on with their work"*.

It was therefore evident that learners in Technology STAD groups were trained to use appropriate social skills and small-group skills during groups' interactions. Secondly, the researcher also attests that his presence and interaction with the groups helped to maintain acceptable behaviours within the various groups (cf. 4.2.5.3; 4.2.4.1; 4.2.4.2).

Moreover, one of the peer observers also contented that if there was no proper sequence the situation would have been unruly.

Mrs Gomez *"If routines and control mechanisms have not been put in place, group work can be unruly or noisy"*.

Literature states that a teacher should interact with groups to monitor their progress and comprehension of the work (cf. 3.4.1; 4.2.4.4).

These features that are discussed below arose as sub-themes for the analysis of the collected data on learners' group interaction processes.

6.2.3.2.1.1. Subtheme: Conduct of team members

Conduct of team representatives played a crucial role toward the success or failure of the group process. One of the observers stated that a member of a certain group was dissatisfied, due to continuous pointless arguments that took place between team mates. She put this remark as support to her interview with that specific group.

> Mrs Gomes *"One member, who appeared to be active, said he didn't like group work, because two of the members always landed up arguing about an issue which distracted progress".*

With proper guidance and interventions from the teacher, learners were helped to promote cooperative behaviours that enhanced group productivity. Three peer observers made remarks in this regard.

> Ms Logan *"Learners behaved well in their groups and they got along well with the task issued to them".*
>
> Mrs Blitz *"They were mostly cooperative and getting on with their work".*
>
> Ms Matthews *"They behaved very well, listened and supported each other and a few learners also encouraged other members to do better".*

It could therefore be asserted that learners in STAD teams developed appropriate social skills that were needed for cooperative learning techniques, as well as positive attitudes toward their Technology work (cf. 4.2.4.1; 4.2.4.2; 3.5.2.8).

#### 6.2.3.2.1.2. Subtheme: Focus on the task

The majority of the peer observers alluded that focus among the various groups was improved by the presence of the teacher that moved around and guided the teams on their discussions (cf. 3.4.1; 2.3.1). Three of the peer observers' remarks have been added in support of the above statement.

> Mrs Blitz *"The teacher was continually moving amongst the groups, but they were self-motivated".*
>
> Mr de Venter *"They are absorbed in the task at hand".*
>
> Mrs Gomez *"My walking amongst the groups observing and asking questions promoted some focuses as well as the presence of the teacher as facilitator"*.

Some of the observers also indicated that learners appeared to be self-motivated and showed interest in their task and therefore improved members' focus. Moreover, focus was also maintained, because learners followed a well-rehearsed and structured drill of working in a group set-up as shown below.

> Mr Barnard, *"Well-rehearsed and structured drills were used that were implemented through frequent repetition".*

Furthermore, some of the observers indicated that the posters on the walls also played a role in reminding learners about the expected conduct in their groups. Other observers also stated that strong leadership in the group kept the teams focused on their worksheets (cf. 2.3.3; 2.5.1).

It is therefore important in STAD classes that the teacher be present and actively involved and interacting with the groups to help improve productivity of the groups. Secondly, continuous implementation of STAD helped learners to get used to the routine and were able to focus on their tasks. The researcher had also put up posters on the walls that stipulated the essential elements of cooperative learning that constantly helped learners to recall expected behaviours (cf. 3.5.2.8; 3.7).

6.2.3.2.1.3. Subtheme: Derailing from the task

There were, however, some exceptions within the group members who from time to time led the discussions off the tasks. As stated earlier, some group representatives found STAD groups as a platform to argue against any raised view or always wanted their opinions to dominate the discussions. This kind of behaviour could only be addressed by the researcher if the leader was over ridden by offline discussions that deteriorated the group's process (cf. 3.9; 3.7).

Mrs Crouch articulated the following opinion with regard to the above mentioned: *"It varies, some groups were much focused, some individuals made it difficult for other groups to stay on task. Some learners take a strong leadership role".*

Ms Matthews stated that, *"There were one or two incidents of paper-throwing"*.

The researcher further adds that, the fewer occasions in which these disruptive gestures occurred, shows that monitoring of group processes is very important role of Technology teacher employing STAD. Moreover the teacher

6.2.3.2.1.4. Subtheme: Response to authority

Even though some of the groups' representatives derailed the discussions, observers indicated that they responded well to the authority of their group leaders and the teacher, because he intervened where necessary.

In this regard Mrs Gomez said*: "They were respectful when addressed by the facilitator or me as observer".*

Ms Robinson said: *"They respond very well. Good behaviour from the learners suggests that the educator commands his classroom with authority. Learners respect the class and quickly quieten down once the educator talks to them".*

Moreover, the positive comments from the peer observers suggest that the situation in the Technology classroom where STAD was implemented had order and good control. Furthermore, respect for others made STAD groups to function to their full abilities**. (cf. 3.4.1; 4.2.3)**

#### 6.2.3.2.2. Theme: Communication in the groups

Under this theme the researcher has indicated communicative measures that were identified from the comments of peer observers.

> *Mrs Gomez "Technology could have been used to communicate. Using a portal where all members could be working on a project while stationed in their homes, would still be an active form of participation. Communication could be in the form of video conferencing".*

Mrs Gomez believes that in this era learners are more inclined to the use of technological devices, such as smart phones that could be used for communication in STAD classes. She is of the opinion that sometimes learners got bored of discussing and writing instead of using electronic media as a communication platform. She further believed that electronic communication would stimulate active participation among team members (cf. 4.2.4.8; 4.3.1).

##### 6.2.3.2.2.1. Subtheme: Acceptable Noise Levels

Though my peers were not used to teaching group work in their classes, they pointed out that learners in STAD groups were using normal voice tones during the discussions. Members maintained volume that did not cause disruption of the whole class proceedings, but were loud enough to be heard by their team representatives (cf. 4.2.4.4). Therefore by keeping low voices; the groups enhanced communication channels within themselves.

> Ms Matthews *"It was good as they spoke in normal tones of voices and at an acceptable volume. They took turns to speak".*

> Ms Logan *"They interacted respectfully and audibly – boys were actively involved in the process"*.

The researcher, while moving around from group to group reminded boys of the level of noise expected in STAD classroom (cf. 3.4.1; 3.5.2; 3.5.2.9).

#### 6.2.3.2.2.2. Subtheme: Respectful interactions

Other observers pointed out the presence of respectful interactions during the group proceedings. Learners showed respect to views of others as they listened while other members were putting their suggestions on the table of discussions. Secondly, the groups accepted the guidance of their leaders and worked together toward the final answer (cf. 4.2.4.3; 4.2.4.4).

> Mr De Venter*, "They treat one another with respect and consider each other's opinion*".
>
> Ms Logan *"They interacted respectfully and audibly – boys were actively involved in the process".*

The groups tried by all means to accommodate their members during the discussions and afforded each other chances to contribute. Therefore, members felt free to place their inputs as a result of open communication within their groups (cf. 2.3.1; 2.3.3; 2.4.1; 3.5.1).

#### 6.2.3.2.2.3. Subtheme: Constructive arguments

In group discussions, arguments were bound to be part and parcel of the processes. It, however, depended on the types of arguments within the groups for proper communication to take place. The researcher have indicated earlier that distractive arguments frustrated other members of groups to the extent of becoming passive in discussions. Therefore, constructive arguments as pointed out by other observers, promoted good communication and productivity within the various groups.

> Ms Robinson, *"They share ideas and argue through difficult points with constructive arguments during sessions. There was no evidence of learners being demeaning towards each other".*
>
> Ms Matthews *"Most learners listened very well and responded to what was said, even engaged in debating answers".*
>
> Mr Barnard *"They had focussed discussions and constructive arguments. They observed all views adequately and respected group members".*

The above peer observers' comments support constructivism stand, that learners could acquire knowledge by interacting with other knowledgeable members of the groups (cf. 2.3.1; 2.3.3; 2.5.1).

6.2.3.2.2.4. Subtheme: Give and take

Some of the peer observers had stated that they saw 'give and take' among the group members. Thus members were giving their inputs to contribute to the knowledge of other members as well as receiving views of others to add to their pool of knowledge. Learners were giving each other opportunity and space to be creative and share resources for the benefit of the team. Some of the peer observers also stated the evidence of give and take within the STAD groups.

> Mrs Blitz *"There's give and take"*.
>
> Ms Robinson *"They share ideas and argue through difficult points with constructive arguments during group sessions"*.

It was therefore evident that there was positive interdependence and also that learners had developed social skills that are needed for small group interactions (cf. 4.2.4.4; 3.5.2.2; 3.5.2.3).

6.2.3.2.3. Theme: Respect for team members

Under this theme, observers were to indicate how learners treated one another within their STAD groups. In cooperative learning groups, learners are expected to display acceptable interpersonal and small group skills. Other peer observers commented as follows regarding this matter.

> Mr Barnard, *"The members showed respect to one another by responding appropriately to various inputs and responding with empathy to alternative viewpoints".*
>
> Mrs Blitz *"They treated each other with respect, sense of humour and co-operation".*

Ms Logan *They treated one another well"*.

The peer teacher observers' comments further concludes that learners used acceptable social skills to maintain good group interactions (cf. 3.5.2.3; 3.5.2.9; 4.2.4.4).

6.2.3.2.3.1. Subtheme: Team work

Various observers indicated that team work became a result of respect among the team members. Team representatives were said to be working cooperatively supporting and encouraging one another to work as a team. Open-mindedness was also highlighted as an ingredient that facilitated good team work, as learners were open to the views of their group members (cf. 4.2.4.2; 4.2.5.3; 3.7). Here are some of the remarks raised by peer observers pertaining to team work.

> Mrs Blitz *"they shared by discussing and taking notes during the planning process"*.

> Ms Matthews *"They did very well some even encouraged others to do better and waited for all to finish before moving on"*.

Furthermore, the pool of suggestions made it easier for groups to work through the tasks until they got to their expected answers. By being open to the suggestions of others would also show that all members were given equal opportunities to contribute to the success of the group.

> Ms Logan, *"They co-operated well in group context with civil discussions".*

> Mrs Crouch, *"They listened to each other, gave equal opportunities to each learner".*

Thus, members of different STAD groups were able to accommodate one another and assisted each other toward obtaining their group goals (cf. 4.2.5.1; 2.3.3; 4.2.4.3).

6.2.3.2.3.2. Subtheme: Sharing

Sharing was indicated as an aspect of group work that reflected respect among the group representatives. Different observers stated that learners were sharing knowledge during the group discussions, because those who were knowledgeable would explain the concepts to those who were lacking (cf. 4.2.4.1; 3.5.2.6; 3.5.2.3).

Some observers raised the point that learners were sharing their notes and textbooks as they worked through the worksheets. Moreover, sharing of responsibilities equally among members of the groups was also stated to be a good indication of respect between team mates.

> Mrs Blitz *"They shared by discussing and taking notes during the planning process".*
>
> Mrs Gomez: *"Amongst themselves learners decided who would do which work required for the assignment issued the previous lesson".*

In some instances, some group members felt that responsibilities were not shared as equally as others were dominating and gave them small portions of work to do. Furthermore, those learners who were constantly at loggerheads dominated the teams discussions decreasing the chances for others to share their knowledge and opinions equally (cf. 4.2.4.3; 3.5.2.1; 3.5.1).

6.2.3.2.3.3. Subtheme: Support

Observers further indicated that learners supported ideas that were raised by their peers within their teams. Others were also constantly encouraging other members to bring their view to the table of discussions so that they could get assistance if they needed further clarity on the content. Acknowledgement of individual views also served as support strategy that made members realise that their efforts were noticed and appreciated. Whereas lack of acknowledgement led to members being discouraged, because they felt their efforts were disregarded (cf. 3.5.2.1; 3.5.2.4).

> Mrs Crouch *"They waited for each other at times. However, they got impatient with slower workers".*

> Ms Robinson, *"They support one another's ideas and ask them to explain their reasoning. It shows some of the boys' different levels of thinking and knowledge".*

The peer observers' remarks confirmed that there was social and academic support that existed within the STAD groups in Technology class (cf. 3.5.2.1; 4.2.2.3; 4.2.4.5).

6.2.3.2.4. Theme: Adherence to time frames

Within this section, the observers recognised the aspects of the lesson that had shown time to be an important ingredient that needed to be respected by the STAD groups (cf. 4.2.5.3; 4.2.4.2). The peer observers have noted the following comments:

> Mrs Gomez *"The teacher set a time ultimatum for the group discussion. I did not observe anybody tracking the time within their groups"*.
>
> Mr Barnard *"They were not overly focused on the time restraint but adequate progress was observed without stress due to time limit"*.
>
> Ms Matthews *"The teacher continually reminded the groups of the time they had left and also set the time frames before they started"*.
>
> Ms Robinson *"The task was set for thirty minutes; however some of the groups were only completing the first few questions. Time frame could be extended for this activity"*.

It could therefore, be deduced from the above peer observers comments that time enforcement was the responsibility of the teacher so that the STAD teams could focus on the task at hand. Furthermore, the remarks suggest that a Technology teacher employing STAD need to be flexible to accommodate those groups that have members struggling to comprehend the work (cf. 3.4.1; 2.4.1, 2.4.2; 2.4.3).

#### 6.2.3.2.4.1. Subtheme: Teacher allocated time

The researcher allocated time frames for the group discussions to enable the groups to be focused on their task and be able to complete it by the end of the given time (cf. 3.4.1; 4.2.4.5).

The researcher would constantly remind them of the time that was left to complete a certain section of work. This helped him and the learners to track the progress in different groups, and also to discover any difficulties regarding the work at hand. Therefore, if the researcher realised that a particular task required more time than he had anticipated, then extra time would be given to the teams to work on that task. That extra time allowed him to either clarify the task to the whole class on the board or to individual groups at their tables. Some of the peer observers commented as follows:

> Mrs Gomez *"The teacher set a time ultimatum for the group discussions".*
>
> Mrs Blitz *"The learners were in the time frame the teacher had calculated for the* process".
>
> Ms Matthews *"The teacher continuously reminded the groups of the time they had left and also set the time frames before they started".*

As the researcher stated in the previous subtheme, time frames were used though flexibility to adjust times for other groups to complete their tasks was adopted to encourage adequate and complete tasks by all (cf. 3.5.2.5; 3.5.2.8; 3.5.2.7; 2.5.1; 2.5.2).

#### 6.2.3.2.4.2. Subtheme: Structure of a lesson

The observers further stated that the lessons were structured and organised in a manner that allowed enough time for groups to discuss their views, without hastiness caused by time constraint. Groups worked well and had time to assist one another to understand and complete the given task (cf. 3.4.1; 2.3.3).

> Mr De Venter *"The whole lesson was organised in such a way that enough time was available for discussions"*.

Mrs Johnson *"They finished the task (worksheet)"*.

Completion of work by various groups was as a result of being given enough time to thoroughly go over their work and ensure that all members understood the work. The researcher further believes that, by promoting tasks to be completed – learners also would learn that work given has to be completed at all cost (cf. 3.4.1; 2.4; 2.5.1; 2.5.2).

#### 6.2.3.2.5. Theme: Ensuring mastery of the content.

In this section, the researcher will discuss the subthemes that indicated how groups were able to ensure that all members were acquainted with the learned materials.

##### 6.2.3.2.5.1. Subtheme: Structured mind-maps

Mrs Gomez suggested the use of flip charts during group discussions so that mind-maps could be well structured and visible from a distance. The researcher also believes this was a good idea, especially if groups were to present their work on the flipcharts to the whole class.

> Mrs Gomez *"I felt and suggested that a large flipchart on each desk could be more productive in organising their discussions. Many points were made, but because it was not visible, it was difficult to track the thought-process of the group as a whole"*.

The learners were, however, using their workbooks to record the view of other members as well. The use of workbooks was effective as other observers stated that recording of inputs in workbooks enhanced group discussions, thereby helping learners to master the content. The aim of using workbooks was to improve individual accountability among team members (cf. 4.2.4.3; 3.5.2.7; 2.5.1).

#### 6.2.3.2.5.2. Subtheme: Proper interactions

Cooperative interactions were also raised as ingredients toward mastery of the taught materials. These interactions included free spirited discussions where team members felt save and supported with regard to their contributions. All members were subjected to correction by other members. Some of the peer observers also commented in this regard.

> Mrs Gomez *"Group work is not a democracy – where decisions are made by the majority. Instead it was evident in these groups that they made decisions based on the best solution"*.
>
> Mrs Johnson *"They communicated their ideas with confidence"*.
>
> Mr Barnard *"They all seemed confident and comfortable in groups. All were participating freely and actively in discussions"*.

It was therefore evident that team mates helped each other to comprehend the work and complete the given tasks. Moreover, during these discussions there were constructive arguments that also assisted teams to reach better decisions regarding their answers to the questions on the worksheets (cf. 4.2.4.1; 3.5.2.3).

#### 6.2.3.2.5.3. Subtheme: Shared resources and knowledge

Sharing of resources and knowledge also came up as an essential component to help team representatives to comprehend the content that was taught. Peer teachers stated that learners shared their resources, such as notes and textbooks to assist one another to understand the work (cf. 4.2.5.3).

> Ms Logan *"They were interacting through discussions"*.
>
> Ms Matthews *"They discussed and decided together"*.
>
> Ms Robinson *"they supported one another's ideas and asked them to explain their reasoning. It shows some of the boys' different levels of thinking and knowledge"*.

As they used these resources they transferred knowledge from one to the other. The researcher believes this kind of sharing was facilitated by trust among the members and support that they gave each other for their teams to succeed. Therefore, when learners were discussing and sharing knowledge and resources, they further clarified the concepts to the members that were lacking the understanding of the work (cf. 4.2.5.3; 3.5.2.3; 2.4.2; 2.4.1; 2.5.1; 2.5.2).

#### 6.2.3.2.6. Theme: Ensuring individual accountability

Cooperative learning encourages individual accountability of group members. Therefore, it was important that observers could recognise and note that all learners were taking responsibility for their work.

> Mrs Gomez *"Setting the outcome of the assignment, as having to give feedback personally to the rest of the group was method of ensuring accountability"*.
>
> Mr Barnard *"Each learner recorded his own and group responses in the workbook"*.
>
> Ms Robinson *"They all have to write down their answers in their own workbooks and therefore need to understand the questions and be a part of all the discussions"*.

Therefore, according to peer observers, individual accountability was evident within the STAD groups. The researcher further believes that the higher individual accountability becomes within group tasks the members would be motivated to develop self-efficacy and self-determination (cf. 2.5.1; 2.5.2; 4.2.5.4).

##### 6.2.3.2.6.1. Subtheme: Setting the outcomes for the group

Groups were encouraged to set their expected outcomes as I had explained to them that the purpose of employing STAD was to increase individual and group performances pertaining to their academic achievement and development of social skills.

> Ms Matthews *"They did so mostly through friendly oral encouragement and reminding each other of what is needed to be done"*.

> Mrs Crouch *"They tend to wait for each other and double check each other's answers"*.

Therefore teams had to outline how they were going to obtain performance improvement of every member so that the whole group would benefit from the enhanced scores. The goals set by the groups encouraged individuals to play their part for the success of their team (cf. 3.4.1; 3.5.2.3; 3.5.2.5; 3.5.2.7).

6.2.3.2.6.2. Subtheme: Recording views and conclusions

Thirdly, each member had to record the group inputs during the discussions so that they could go over the work and understand how they reached the conclusion as a team. Members were encouraged to jot down the points as they were brought up and not to wait and copy from others at the end, because they might not be able to follow what transpired during the discussions.

> Mr Barnard *"Each learner recorded his own and group responses in the workbook".*

> Ms Matthews *"Although it was a group activity, each member still had to write their answers into own workbooks. Some groups took turns to answer".*

> Mr de Venter *"Each member must take part in discussions to help formulate answers so that each member can benefit from correct answers".*

As the researcher has stated earlier in this chapter, the intention for individual members of STAD teams to write points of views and conclusions of the group was to increase individual accountability. This was to ensure mastering of the subject matter and provoke self-efficacy and self-determination in each member (cf. 2.5.1; 2.5.2; 3.5.1).

#### 6.2.3.2.6.3. Subtheme: Allocation of member duties

Members were also allocated roles by their team mates, such as scribes when they worked on the worksheets in order to keep everyone focused on the task and speed up the process as they went through various questions.

> Ms Gomez *"Among themselves, learners decided who would do which work required for the assignment issued during the previous lesson"*.

A leadership role was assigned by the researcher to those who were facilitating group discussions and made sure that every member contributed equally to the team conclusions (cf. 4.2.4.3; 4.2.4.4; 4.2.4.5; 3.5.1).

### **6.2.3.2.7.** Theme: Ensuring positive interdependence

Here, the observing colleagues were to state their findings regarding the way learners worked with each other within their respective STAD teams.

> Ms Matthews *"They mostly worked well with every member taking part in some way or another. Some members were too on leadership roles and encouraged other members to do so"*.

> Ms Robinson *"They all have the opportunity to speak out. They ensure their own work is of good quality and neat"*.

The researcher further attests that training learners to become team leaders was a challenge because they were used to individualistic academic phenomenon where every learner is for himself. Assisting these learners continually how to facilitate STAD groups worked and the leaders managed to be in control of their team discussions (cf. 3.4.1; 2.5.1; 2.5.2).

#### 6.2.3.2.7.1. Subtheme: Members contributions

In order to ascertain the presence of positive interdependence within the groups, learners were given equal opportunities to contribute their ideas to the group as well as decision making inputs.

Mrs Blitz *“They shared by discussing and taking not during the planning process”*.

Mr de Venter *“The resource materials are used freely to help them to come to conclusions and to give structure to their ideas”*.

Members also shared their resources and knowledge with other team representatives in order to achieve their group and individual goals (cf. 4.2.4.2; 4.2.5.3; 3.4; 3.4.1).

6.2.3.2.7.2. Subtheme: Free and active participation

Learners in groups were indicated to being comfortable with one another and were free to bring their suggestions to the table and engaged in constructive discussions in order to get to the groups’ conclusions. Members were also encouraged to communicate freely about their opinions and that their views were valuable to the team. The researcher believes learners developed confidence to communicate their views and feelings regarding the work and group processes. Since they engaged in constructive discussions, they began to build up their confidence around each other in order to subject themselves to correction by other members and be embraced by others.

Mr Barnard *“They all seemed confident and comfortable in groups. All were participating freely and actively in discussions”.*

Mrs Crouch *“Some were working at their pace and groups were patient with the work pace of slower members”.*

Cooperative learning class atmosphere should be welcoming to learners’ and the teachers. The environment should be conducive for teaching and learning (cf. 3.4.1; 3.5.1; 3.5.2.2; 3.5.2.4).

6.2.3.2.7.3. Subtheme: Leaders and member encouragement

Some of the observers indicated that leaders of the teams were encouraging members to focus on the task at hand. Those members who were struggling were assisted to understand and complete the work while other members patiently waited. Learners in groups were supporting one another for the benefit of the team.

> Mrs Crouch *"Some were working at their pace and groups were patient with the work pace of slower learners"*.

Accommodating each other to achieve the team goals served as motivation for others to work harder and copy good work ethic from their counterparts (Cf. 2.5.2; 2.5.1; 4.4.1).

6.2.3.2.7.4. Subtheme: Uncooperative behaviours

Learners who experienced rejection of opinions or domination by others, had an opportunity to speak to the researcher as he was moving from group to group to address any grievances and guide the team on how to embrace cooperative learning's essential elements within their groups. Since the researcher had taught the groups how to work in STAD teams, group members were able to identify any unwanted behaviours within their groups. These behaviours were brought to the attention of the researcher to address.

> Mrs Blitz *"There was one very insignificant moment which barely was noticed"*.

> Mrs Crouch *"Learners only interrupted a few times, behaviour often ignored and this seems to be an effective method"*.

The researcher is of the opinion that in some cases, we as educators tend to perpetrate disruptions by shouting at every little incident. Learners could provoke this short tempered behaviour to get a break from work. Therefore, negative enhancement of such behaviours tended to discourage continuity (cf. 3.4.1; 2.5.1; 2.5.2; 4.3.5.3; 4.2.4.4).

### 6.2.4. Analysis of group interviews (Data - GIL)

There were fourteen STAD groups in total from both classes with each class having seven teams of four to five members. The researcher managed to have group interviews with twelve of the groups, due to our tight extra-curricular program. He had to arrange with the teams to have the interviews either during break time or after school just before sports practices began. This was a challenging exercise to the learners and himself, because for each interview schedule he had to have two sessions with each team due to time constraints and learner concentration span. The other setback was to get all group members at the same place at the same time. Therefore the researcher had to continue with the interview in the absence of other members. Another struggle was to get responses from all group members during the interview. Some were dominated by either one or two members and others shied away and were reluctant to respond.

Therefore, due to the above mentioned challenges the interview period stretched over a long period of time, which could be approximately a month.

The group interviews were aimed at probing the effectiveness of the different teams according to their evaluation of what had been taking place in their groups through the term. Secondly, it was to investigate learners' perceptions with regard to working in cooperative groups and also comparing them to individual work. Thirdly, how STAD groups helped low achieving learners to develop intrinsic motivation to learn on their own after school hours.


Figure 6.3 Group Interviews

The learners could be identified by a number between one and eight (1 to 8) that indicated the group or table number, a letter from A to E represented a specific learner in the group and a letter X or Y that stated the class to which a learner belonged.

Table 6.5 Demographics of STAD Groups

| Class | Table | Group | Learner | Learner ID | Responses to the question: How good do you think your group functioned? |
|---|---|---|---|---|---|
| **X** | 8 | 8X | A | 8AX | ; '*Not efficient, not enough as it was expected of us*'. |
| | | | B | 8BX | '*We excel in practical stuff*'. |
| | | | C | 8CX | '*We did do well because of argument*'. |
| | | | D | 8DX | Did not respond |
| | | | | | |
| **Y** | 4 | 4Y | A | 4AY | '*We worked well towards the end as we began to bond and improved my marks'.* |
| | | | B | 4BY | *Our leader played a pivotal role to help us work together'.* |
| | | | C | 4CY | *We worked well because our marks improved'.* |
| | | | D | 4DY | '*We got more insight with our work and gained knowledge to work together*'. |
| | | | E | 4EY | Did not respond |

The picture on the next page shows a Group Interview set-up during the process of collecting data on learners' experiences of using STAD.

#### 6.2.4.1. Constant comparison analysis of group interviews data

The graphical figure below indicated the sequence of constant comparison data analysis that the researcher had implemented when he analysed the data collected during group interviews.

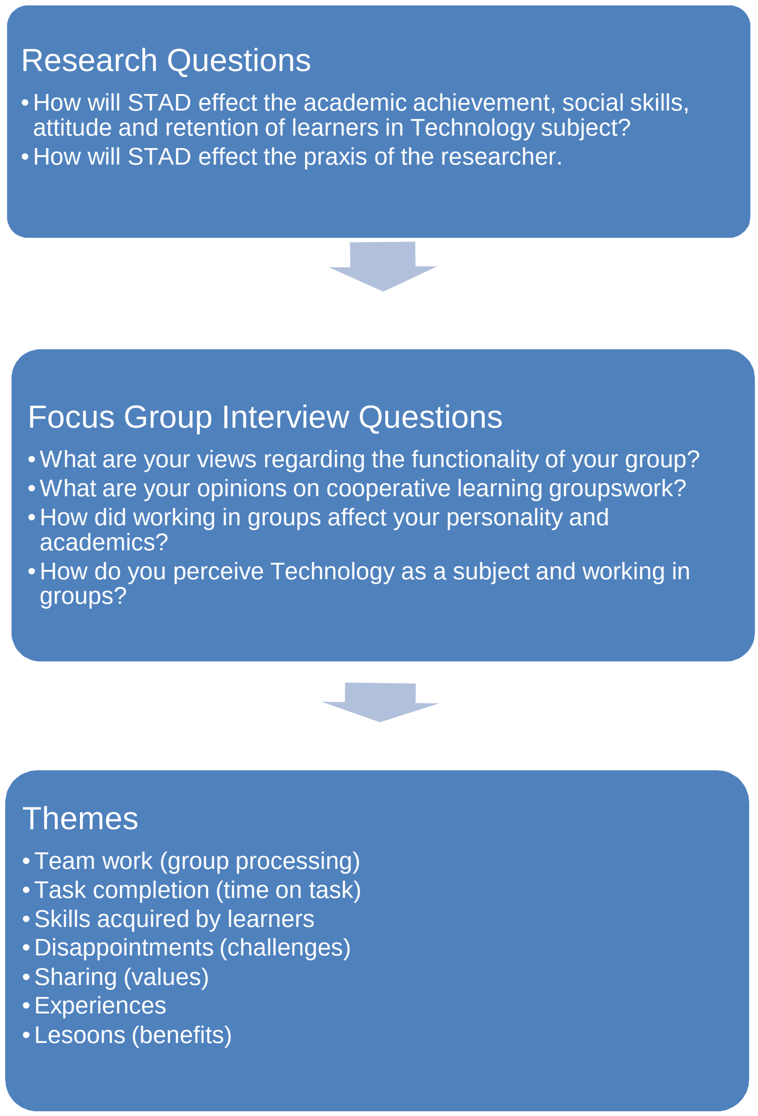



Figure 6.4 Constant Comparison

#### 6.2.4.2. Themes and subthemes emerging from group interviews data

The table below shows the themes and subthemes that emerged from the data from the group interviews.

Table 6.6 Groups interview themes

| Main themes | Sub themes |
|---|---|
| **Team work (Group processing)** | Learners began to trust each other.<br>Members supported and encouraged one another.<br>The atmosphere within the group was positive.<br>The leadership of the group was strong.<br>Learners built relationships amongst themselves.<br>Learners developed a positive attitude to group work.<br>Other learners became mediators in the group. |
| **Task completion (Time on task)** | Quality of work presentation improved.<br>Productivity increased during discussions.<br>Members identified each other's strengths.<br>Each member was given equal opportunity to contribute. All were treated and valued equally as members.<br>Knowledge acquisition was high. |
| **Skills learned** | Problem solving and Conflict resolution<br>Communication skills<br>Social skills / building friendships<br>Ability to manage time was cultivated.<br>Preparation for work place.<br>Listening skills.<br>Thinking skills / improved thinking patterns (critical thinking) |
| **Disappointments (Challenges)** | Internal and external distractions.<br>Members' lack of focus at times.<br>Lack of team work/ cooperation.<br>Dependency syndrome.<br>Members' isolation and side-lining<br>Weak leadership<br>Extra-curricular commitments |

| | | |
|---|---|---|
| **Sharing** | More insight was gained through the sharing of knowledge.<br>Members' inputs made brain storming easier.<br>Learning to accommodate one another. |
| **Experiences** | Learned to be patient with each other.<br>Learned self-control<br>Learned that groups need to be monitored to function well.<br>Pleasant experience<br>Self-confidence was boosted |
| **Lessons (Benefits)** | Group work was not a platform for fooling around.<br>Compromise was an important aspect of group work.<br>Open-mindedness to views of others.<br>Gave constructive criticism.<br>More effort equalled work of high quality.<br>Respected fellow members.<br>Received help and gave support.<br>Stay positive to enhance group processes. |

#### 6.2.4.3. Theme: Team work (group processing)

The research regards group processing as the different phases each group goes through from the formation of the groups. Thus, from the time when the personalities of learners clashed and without any compromise. At these early stages learners would feel side-lined by the groups if their opinions were not taken into consideration. During these stages some of the learners wanted out of their groups, because they felt other members were not accountable.

> Learner 4AY *"We worked well towards the end as we began to bond and improved my marks"*.
>
> Learner 6AX *"Okayish, there were some problems we had to solve"*.

Learner 2AX *"Firstly we did not know each other well, we started growing to know each other and began to work well together as friends"*.

Some learners would look at this arrangement as a burden to carry everybody on his back, because he wouldn't compromise substandard work. Although learners were in the same class, they were strangers to each other's world view and perceptions about school work. In the focus groups interviews the researcher asked questions that made the groups look back from the beginning of working in STAD groups to the end. Some of the members managed to recall the state of their groups in the beginning, while others could only refer to the recent state. When the researcher asked the groups how well they thought they functioned and how they knew that their groups did not function well?, various responses were obtained from different groups with some group interviews being dominated by one or two members as others were silently supporting the team members' answers. In the following paragraphs the researcher have analysed the various sub-themes that appeared under this theme (cf. 4.2.4.4; 4.2.4.5; 4.2.4.1; 2.3.1).

6.2.4.3.1. Subtheme: Strong leadership

In the STAD groups the researcher assigned the top achievers in each group to be leaders, since they were the first to be categorised into various teams. Other members joined them at the tables where they were as the researcher appointed and distributed them among the leaders. Although, it was not in the scope of this study to compare academic abilities with leadership abilities, the researcher alluded to only the effects of strong leadership as well as those of weak leadership that were raised by learners during the interviews.

Learner 4DY; '*Our leader played a pivotal role to help us work together'.*

Leadership appeared to be the backbone of the STAD teams since they were trusted for assisting with the group cohesion to obtain the optimum functionality of the team members. As the above statement indicated, group members managed to recognise the presence and the significance of leadership role in group work. Therefore, leadership could be one of the skills that learners acquire or strengthen when working in STAD groups. The response indicated that the group leader made it possible to create a good working atmosphere by enhancing pleasant working relationships among the members. The researcher could also argue that group members came to an understanding that playing a leadership role was not an easy task and therefore not a status symbol, but a serving position. The researcher believed that he (the leader) had to practice what he preached in order for other members to be able to follow his lead.

> Learner 2AX; '*Firstly we did not know each other well, we started growing to know each other and began to work well together as friends*'.

> Learner 6BX; '*Attitude to each other was not good at the start of our group work*'.

The above utterances show that it was not a smooth process to start working productively in groups as Johnson and Johnson (2009: 366) stated that "one cannot place learners in a group and expect them to function properly". It was therefore important for the researcher to teach his learners cooperative learning values that they needed to adhere to in order to enable their groups to function productively (cf. 2.4.1; 2.4.2; 2.4.3; 2.5.1; 2.5.2).

Moreover, a group leader that understood the principles and values of cooperative learning groups had to constantly remind the members to adhere to the stipulated working conditions and rules. The repetition and modelling played a great role to have members buy into the vision he was leading them toward. He therefore, had to be a mediator where every member could raise any issues without fear of being side-lined (cf. 2.5.1; 2.5.2).

Learners have indicated that they did not know each other well, and had to adjust to getting to work and know the people they sat with around a table. In the next section the need for relating to those you work with in STAD groups will be discussed..

On few occasions the group leader appeared to have played an important role to motivate and encourage group members to aim higher and focus at delivering work of high standard. Motivation is a vehicle used by learners to exert more effort into their work, because of a certain level of satisfaction due to the affirmation they received through words or actions. Motivation theories contend that a person's confidence is built by the satisfaction of basic human needs (cf. 2.4.), whereby the highest level of human needs contentment would lead to self-determination if met. The learners asserted that a positive atmosphere and friendship had developed that served the purpose of inspiration and instilling self-esteem that allowed them to become productive contributors in group discussions.

6.2.4.3.2. Subtheme: Learners build relationships

The above stage would be followed by a phase where group members realised that they needed to do something to find them working together as a team. They had to engage one another and develop a working relationship and put group norms and values on the table. They were still strangers to each other's social world and unsure on how to communicate with respective team members and accept being part of the group.

> Learner 4CY; '*We had few conflicts where we had to give inputs'*.

> Learner 4DY; '*It was when our leader got an answer wrong - however we corrected all that and solved our conflict'*.

The learners commented that building up a relationship was not an easy process as they had to deal with misunderstandings of which they were not sure how the other party would react. It was, however, a risk worth taking for the benefit of all members of the team. When a group was still new the relationships were fragile and needed to be treaded upon very carefully in order to maintain peace and harmony within a group (cf. 4.2.2.1; 3.5.2.3).

> Learner 7CX; '*We struggled with focusing on task at hand. Secondly, our group relied on one person to sort of help us – the group leader*'.

At some stage the members found one member to whom they could all relate with ease and used him as a mediator in a conflict situation. In this case it was a group leader who had to resolve the misunderstandings and motivate the group to focus on the task at hand. Since the leader in this case was the only one trusted, he had to find ways of maintaining order pertaining to work and discipline within the group without breaking anyone's trust in him.

Learner 8AX; '*Sometime before the first test it was every man for himself*'.

The researcher therefore contends that learners at this stage still felt insecure within their groups and did not trust one another fully with their academic performances. Secondly, they did not know how to handle disagreements due to the fact that they would not want to make compromises easily with other learners. Compromises could be regarded as a defeat or belittling by other group members, hence one had to fight for his opinion at all costs, because he could only trust his own judgement. Thirdly, since groups were formed with learners performing at different levels academically; lower achieving learners were insecure to give their inputs in the fear of being crushed by the knowledgeable others. They did not regard their contributions as valuable to the group due to low self-esteem (cf. 2.4.1; 2.4.3; 2.5.1).

6.2.4.3.3. Subtheme: Learners begin the journey of trust

Once a working relationship was in place, learners would then begin to tap into each other's social world and try to get to know and understand one another's personality as a way of oiling the friction that occurred during the group discussions. At this stage individuals in the different groups began to open up towards each other building trust and interdependence. Learners were free within their groups to give input or argue a viewpoint and still feel as valuable members of the team even if their suggestions had been put aside. They regarded and embraced decisions that the group made, because they were part of the same conclusion, as they accepted changes made to their individual contributions towards the benefit of the team (cf. 3.5.2.4; 3.5.2.3; 3.5.2.7).

The fear of rejection as stated in the previous section became a thing of the past and a point of reference when things were not going well in the team. They regarded themselves as conquerors when any challenge arose and motivated each other that they had been through worse situations than this. They could overcome it as well.

Learner 8AY; '*We are efficient in our work and contributed equally*'.

Learner 8BY; '*Everyone had an opportunity to offer opinion*'.

Once trust had kicked in, learners began to view one another's suggestions as equally important to the benefit of the team. Each member felt part of the decisions and therefore a respectable and valuable member. The notion of "swim or sink together" became a reality in the group. Learners began to show need for each other in order to succeed.

> Learner 4AY; '*We worked well towards the end as we began to bond and improved my marks'.*

> Learner 4DY; '*We got more insight with our work and gained knowledge to work together'*.

They realised that they could actually learn a lot from each other if they flocked together. The improved relationships were also able to stand any negative forces and this enhanced the working environment within the teams. They began to support each other and unearthed their strengths to improve the level of participation in their groups. Thus the atmosphere within the groups became conducive for academic progress and productive discussions (cf. 3.5.2.9; 3.7; 2.5.2).

The researcher therefore argues that at that stage the language of the group members changed from me, I, or him to we and our, showing the unity within the team. At this phase the group learners' focus was inclined to the positive side of the group processes. Debating facts and views were no longer seen as a threat to the group's progress, but as the main driving force towards the group's goals. Learners had built trust and interdependence and therefore could rely on each other with ease. They understood that each member was valuable and his participation was of the utmost importance towards reaching the aims of the group. Therefore group had taken priority to self. Members began to learn from one another, understood each other and assisted members to do their best through various actions and verbal contributions.

6.2.4.3.4. Subtheme: Members support and encourage one another (social support)

Social support as a cooperative learning outcome is backed by motivation theories, such as that of Maslow that indicated that learners valued life more if they had someone to rely and lean on for emotional, social and academic needs. Therefore, the researcher alluded to the fact that learners in a classroom where they feel valued, trusted and loved by peers develop self-confidence to speak and raise their views, which in turn developed their intellect abilities (cf. 2.4.1; 2.4.2; 2.5.1; 3.5.2.1).

In order to support the above utterances, the researcher has some learners' responses to the question "**How can you explain your experience with cooperative learning group work?**"

> Learner 3CY; '*It was good because we also get to know each other better*'.

> Learner 2BY; '*We managed to use specialised skills like drawing and math and used each member's strength for the success of our team*'.

These learners' responses clearly stressed the importance of social support even from peers in the classroom setting.  The researcher upholds the notion that needs may not be met in chronological order as the Alderfer's ERG motivation theory stated, the reason being that learners might value different kinds of needs according to how they prioritise them. One learner might be academically competent with low self-esteem, while the other is outspoken with lower academic abilities (cf. 2.4.1; 2.4.2; 2.4.3)

> Learner 2BY; '*We are all trying to be at the top of class*'.

The team indicated that their intention as a team was to be the top of the class.  The only way they could achieve this was by supporting and helping each other to improve a member's performance. Therefore, member support was as equally important for the benefit of the team. This group became aware that to achieve theirr goal they needed unity and minimise any discouragements that might hinder other members to fully participate and give constructive contributions.

> Learner 6CY; '*We learned how others work, if slow we encouraged them to increase pace a little*'.

Another aspect of support is stated above as encouraging each other to complete the tasks given. Showing and also guiding others to manage their time based on the amount of work they had so as to avoid incomplete assignments or even tests.

> Learner 6DY; '*We also learned which members are easily distracted and helped them to get back to our topic*'.

Keeping all members focused was vital as a way of support, because most of the time for acquiring of knowledge was wasted in those moments of being lost. This made the easily distracted members rectify their unwanted behaviour and adapt the values that would help them improve on their academic performance.

A certain leaner had alluded that to him the most outstanding social support was when he was able to be helpful to others in terms of academic assistance. Before working in STAD groups he could not anticipate that his contribution in another learner's academics could be a meaningful achievement to him. The researcher could argue that social support is a two way traffic that satisfies the receiver of the assistance and the one lending a helping hand (cf. 3.5.2.1; 3.5.2.2).

#### 6.2.4.3.5. Subtheme: Self-esteem

The researcher also adds that social support improves learners' self-confidence or self-esteem that when satisfied, self-determination comes in, because Maslow regards it as the highest need in his motivation theory.

> Learner 4CY; '*It has given me more self-confidence*'.

> Learner 7AX; '*Strange because I am used to being quiet and no one giving input to my work. I had to be accountable to other people, and it builds team work*'.

Another goal for this study was to use STAD groups to help learners develop self-determination towards their academics as this would help them value their academic performance even more. The researcher's argument was that self-determination theories reported that it was motivation based on internal satisfaction rather than extrinsic satisfaction (Cf. 2.4.1; 2.4.2; 2.4.3; 2.5.1; 2.5.2).

### 6.2.4.4. Theme: Task completion (time on task)

Task completion was one of the highlights that learners mentioned, that even at home they worked diligently to complete their homework in determination to give valuable contributions during the group discussions.

> Learner 2AY *“We managed to finish our work quickly”*.

> Learner 4AX *“W managed to produce the work in time”*.

Thus, according to the learners’ experiences of the STAD phenomenon and interpretations of the situation – their time on task improved (cf. 4.2.4.3; 4.2.4.5)

#### 6.2.4.4.1. Subtheme: Equal opportunities and quality of work

Cooperative learning suggested that learners in groups should accommodate each other and allow every member to be an active participant. Secondly, learners should be taught how to handle opposition to their opinions in a constructive and respectable manner. Likewise, the opposing member should take into consideration the way he argued as well, by basing the query on the facts other than the person that came up with the idea. When asked questions that required to understand “how they think they have worked as a group”, learners gave responses, such as the ones illustrated below (cf. 3.5.2.8.).

> Learner 8AY; ‘*We are efficient in our work and contributed equally*’.

> Learner 4AY; ‘*It is how our leader presented his work that inspired me’*.

Equal opportunities to learning came up more often in various discussions with the groups. It came to the researcher’s understanding that in STAD groups, learners saw the support from their peers and the teacher as a valuable gesture that resembled fairness in terms of knowledge acquisition by all members. Therefore, the researcher can claim that in classes where STAD is not employed, learners do not experience the fairness or equal opportunity to learning that they attested to have enjoyed (cf. 2.5.1; 2.5.2).

Learners further denoted that STAD teams contributed more toward the efficiency of the work produced as others could learn how some learners managed to get better marks at all times. Thus members discovered that presentation of work played a crucial role toward improving academic performance. The researcher believes they fathomed that presentation of work also helped to enhance the attitude to the work one is doing. It (presentation of work) showed that one was either interested or just doing the work because it was required of him to do so.

> Learner 8CX; '*We did do well because of argument*'.

> Learner 6CY; '*Everybody contributed during discussions*'.

From the above responses the researcher could attest that after some time in a group working together under proper guidance by the teacher, learners would begin to value each other's contributions. It was also clear that, arguments that were constructive during group discussions added great value to the anticipated group outcomes. Although there were some challenges that groups encountered, none could not be resolved in a respectful manner that encouraged the members to carry on working well together. This method of teaching and learning developed learners into becoming active and participative members of the society that worked well with others as an expected outcome by the Curriculum and Assessment Policy Statement (DBE, 2011: 5).

Due to the fact that members of groups alluded to every individual being afforded an opportunity to contribute to the group discussions, it was evident that communication skills were developed as well as improving learners' language skills. The learners experienced the importance of sharing views and emotions with others developing emotional support skills. This is one of the basic needs mentioned by Maslow and Alderfer in their theories of human needs that learners would like to have at school and class level in order to feel secure and loved by fellow peers. Cooperative learning regards this as social support; where learners were able to access a sort of emotional, academic and instrumental assistance from their peers (Johnson & Johnson, 1995b: 108).

#### 6.2.4.4.2. Subtheme: High knowledge acquisition and increased productivity

The learners responded in various ways to the later questions touching on different aspects of teamwork expectations. Team members inspired one another to work hard in order to gain more knowledge of the content material that was being done. The learners showed that in order for the team to succeed every member should be valued equally and support each other through the work (cf. 4.2.5.3; 3.5.2.6).

Learner 4BY; '*I have taught them that we should work hard*'.

Learner 6BX; '*If you want good marks, you must put effort to it*'.

Learner 2AY; '*I've taught the group to focus more*'.

The responses shown above emphasised the importance of academic improvement and success as one of cooperative learning groups' goals. The learners further confirmed that knowledge could be acquired from other team mates other than the teacher only as the transferor of content. Therefore, learners had more to offer in a classroom set- up, rather than being passive participants towards their learning. Thus teaching practice needs to give learners this opportunity to exercise responsibility regarding their academic work and to one another. It is not an easy task for a teacher to reach each and every learner in the class of thirty or more learners. By employing cooperative learning in the classroom, teachers are able to access all learners academically and emotionally through their peers (cf. 3.5.2.7; 2.4.3; 2.5.1; 2.5.2).

The researcher also observed that it was easier to listen to someone sitting close to you with the same intentions and goals. Sometimes learners might think they learned to please the teacher and forgot that it was for their own good. When another learner explained the importance of focussing and putting extra effort, it did not sound foreign to the other. It was said at peer level that the learner might find it to be a possible exercise that is achievable as other learners could do it. Therefore, in this case a learner judges his actions by comparing himself to the actions of other learners.

> Learner 4CY; '*In a group; I can gain more knowledge about the type of work we are doing*'.

Therefore, learners appeared to have developed a sense of taking responsibility toward their school work since they would have to report to their teams during group discussions that they comprehended their work. This working together positively affected the productivity of the groups.  Learners stated that improved focus and hard work were some of the core goals they set for their teams to intensify their performance academically. It could be contended that learners had to pass different stages of group formation before they could manage to work together smoothly toward the intended goals groups would like to achieve (cf. 2.5.1; 2.5.2).

#### 6.2.4.5. Theme: Skills acquired by learners

Learners signified that they had obtained various skills during the period when STAD was implemented in Technology classes. The researcher has singled them out in the section below and most of them could be classified under social skills (cf. 3.5.2.9; 3.5.2.8).

##### 6.2.4.5.1. Subtheme: Conflict resolution

Conflict is part of our lives especially where one works with other people being at school, home, church or workplace. It is not a situation that can easily be avoided when working in cooperative learning groups. The researcher believes it would be an abnormal atmosphere when all group members agreed about every input or decision that had been taken at all occasions. His interpretation of such abnormality would be unhealthy discussions promoting deception and hypocrisy among members instead of bringing out the real facts out of members. In such a group, members would not be proud to say we did it or it was our mutual feeling. Instead they would have encountered dissatisfaction and rebellion by those who felt unrecognised. It was therefore good to hear groups stating that they had some misunderstandings and they managed to resolve them, whether by seeking help or by themselves (cf. 3.5.2.9; 3.5.2.4; 3.5.2.3).

Learner 6BX; '*We fixed the differences and started to work well*'.

Learner 8CX; '*If there was a problem we would solve it*'.

Moreover, conflicts, misunderstandings and arguments might be caused by various aspects in the group. Firstly groups were formed of people who were different in personalities and preferences of working patterns. Some preferred working individually before STAD was implemented in the Technology class and now had to involve others in decisions (cf. 3.4.1).

Learner 4DY; '*It was when our leader got an answer wrong - however we corrected all that and solved our conflict'*.

Therefore, being shown your faults in terms of work or even conduct within a group became a hassle that hampered group progress. Once a situation hindered the work proceedings of the group it was regarded as a problem. The team members had to work on the strategies to solve the problem facing their group so that they could proceed with their academic obligations. The strategies could have been by asking for intervention from the teacher, or by themselves setting ground rules and values for their group to work constructively (cf. 4.2.4.4).

Learner 6BX; '*Attitude to each other was not good at the start of our group work*'.

In some groups attitudes were not conducive for productive group work, because members were strangers to one another, puzzled and not knowing how to start engaging each other in discussions. These attitudes might be born out of dissatisfaction of being placed in a team with people one never thought of associating oneself with or seeing the situation as a burden especially to the leaders. It was therefore the responsibility of the members to seek help to resolve the situation that was hostile to productivity. It was either one or more members who rose up as mediators to facilitate the process of reaching common ground and agreeing that they needed each other in order to succeed, or called the teacher for assistance as mentioned previously (cf. 3.4.1; 3.4.3; 3.5.1).

Learner 1CY; '*Another member was isolating himself from the rest of us*'.

Learner 4CY; '*I came in between during conflicts*'.

It can therefore be asserted from the above responses that learners became problem solvers within their groups by dealing with conflicts as problems that faced their various groups. Furthermore, learners showed that a change of attitude played a vital role pertaining to the ability of resolving any problems that the groups might have come across. Therefore, STAD as a cooperative learning method helped develop the type of learners that are envisaged by the South Africa’s Basic Education Department as stated in CAPS document (DBE, 2011: 5).

If these learners were able to solve group problems then it would be easier for them to apply the same strategies to resolve societal challenges. This in turn will make them valuable members of their communities who have the ability to come up with solutions to problems, helping the society to progress.

#### 6.2.4.5.2. subtheme: Communication skills

Lack of communication within the STAD groups was a big problem that thwarted the progress of team processes toward achieving group goals. It was indicated in learners’ responses that miscommunication built a wall between the members. Therefore if there is a wall between people who need to talk face-to-face, the exercise would be fatal as they would not be able to hear or understand each other clearly. Then this barricade had to be broken before the group could become functional (cf. 4.2.2.1; 4.2.4.4; 3.5.2.9).

> Learner 1DY; ‘*communication has always been a problem and a drift between us*’.

Sometimes, communication among the group members could be broken by unnecessary and immature quarrels that did not unite, but instead distracted the team’s progress. Learners had to learn to develop skills to minimise derailing and time wasting arguments that were not fruitful to the team (cf. 3.5.2.8).

> Learner 8AX; ‘*We had a lot of disagreements*’.

When communication had improved within the groups, it became easy for them to begin to share information and give each other a chance to raise views. The groups were then able to reach agreements and make decisions that helped better the groups' productivity.

Learner4CX; '*We should give constructive inputs*'.

Groups' energy had to be redirected to build the team and focus on the set goals that groups were aiming to achieve. Communication was then improved by willingness of members to cooperate and start to focus on the task at hand and give inputs that were constructive. Once the members had bought into the leadership of the group, ways of talking became focused on the task and explanations were easily done to those who did not comprehend certain sections of the work. Members got free to ask questions and give their points of view to advocate equal participation of all members (cf. 4.2.4.5; 4.2.5.3; 3.5.2.8).

Communication is not only verbal, but could be read from certain cues or facial expressions.

Learner 8AY; '*We had positive atmosphere*'

The way group members behaved themselves within their groups communicated their intentions if they promoted a positive atmosphere conducive for group work or negative ones that were disruptive and hindered groups' progress. The researcher could then claim that the members of the different groups managed to learn to communicate with one another in a respectful manner that developed an atmosphere that was acceptable for cooperative learning groups. That was the environment that promoted effectiveness of individual members and the group as a whole (cf. 3.5.2.9; 3.5.2.4; 4.2.4.4).

#### 6.2.4.5.3. Subtheme: Building friendships

Other learners expressed improvement pertaining to use of good communication skills within the group setting, learning each other's personality and knowing each other better. The researcher contends that it takes courage for a learner to study the personality of a fellow student in order to be able to accommodate one another for the purpose of reaching a common group goal (cf. 3.5.2.4; 3.5.2.3; 3.5.2.1; 2.4.1).

Learner 2AX; '*I socially improved and know how to communicate with others in a proper and humanly manner*'.

Learner 6AX; '*I learned to develop patience and self-control – not to be angry with others*'.

This showed that learners developed to a level of being able to compromise their comfort of thinking about self only, but accommodated others with different personality patterns. Furthermore, learners were able to use each other's strengths in the direction of obtaining satisfying group results. The researcher also argues that unpleasant behaviours, such as distraction and isolation affected the state of the group work negatively (cf. 3.5.2.1; 3.5.2.2).

Learner 3BY; '*it was good, because we learn other people's personalities*'.

Learner 1CY; '*Another member was isolating himself from the rest of us*'.

It can be deduced from learners' responses that if one member was not cooperative, either by not participating or being disruptive, it developed tension in the group. This was because other members had to leave whatever important task they were doing and attend to the redundant behaviour and thus reverted to the academic activity in process. Thus, learners in that group took it upon their shoulders to see to it that their team became functional for the purpose of attaining the intended group goals.

Some learners maintained that not only their academic endeavours paid off, but people skills were also nurtured during groups' interaction sessions. These learners alluded that STAD developed them totality as human beings that live amongst other people. It is therefore an imperative exercise to learn the manner of associating with others in the classroom situation. It is more appropriate, especially when learning to socialise with others in a manner that is meaningful and acceptable to them as well. The researcher realised that when the working relationship among the group members was good, the whole team began to enjoy working in STAD teams as they had discovered the usefulness of working with other learners. Then the researcher could claim that when we are many there is more effort, wisdom and strength than working alone (cf. 3.5.2.3; 3.5.2.4; 3.5.2.9).

Learner 3AY; '*I learned life skills knowledge and it improved our marks*'.

Learner 3BY; '*It has improved our social skills*'.

Learner 3CY; '*It was fun and interesting*'.

It seemed to have been an enjoyment to others as well to be able to have a meaningful input to the lives of fellow learners. The researcher could also add that enjoyment was also a product of free spirited interaction with members of the team. Thirdly, it could be a result of a sense of belonging and receiving assistance from other team members (cf. 3.5.2.7; 2.5.1; 2.5.2).

Learner 3DY; '*It improved our confidence*'.

The researcher therefore attests that, when a learner has the necessary support in the classroom, it is easy for him to develop confidence, boost self-esteem and be free to contribute to whole class discussions. Furthermore, learners were able to exercise their creativity and critical thinking when taking part in team discussions. They understood that they could suggest possible solutions to tasks with ease, knowing that being wrong is part of learning and that is the main reason to come to school (cf. 3.5.2.8;3.5.2.6).

Moreover, students learned and gained the understanding of dealing with various personalities in their teams and developed mechanisms of discouraging or coping with such personalities. Through their understanding of these personalities, they mastered handling and coping with hostile situations brought about by misunderstandings within their respective teams (cf. 3.5.2.9; 3.5.2.2).

Learner 6DX; '*Some have short temper and we solved it by keeping calm*'.

Learner 4AX; '*I learned to be positive, always smile and be friendly*'.

Learner 4BX; '*I learned that negativity could have bad effect on our work*'.

They therefore acquired skills to maintain a positive atmosphere within their groups. They further realised that negativity consumed a lot of energy that hindered them from being productive as teams and wasted their time. This then cultivated psychological health among the members and resulted in supportive and focused group environment (cf. 3.5.1; 4.2.4.1).

#### 6.2.4.5.4. Subtheme: Ability to manage time effectively

Groups had acquired skills and techniques to work effectively, such as to manage time effectively:

Learners 4AX; '*We managed to produce the work in time*'.

- Where all were free to contribute and were afforded equal opportunities to learn.
- Where members of groups had healthy working relationship and were able to learn from one another.
- Where all members of the team collectively worked on the task at hand and aimed to complete it to the best of their abilities.
- Where members understood the importance of productivity by contributing constructive inputs.
- Where members always upheld their groups' goals as the ultimate end.

These factors helped the teams to set their goals based on time frames given to them by the teacher.

Learner 7BX; '*The time was short and there is a section we did not do well*'.

Therefore groups realised that time management was an important aspect of working in STAD groups, because a badly managed time on a task resulted in them not being able to achieve good marks in other sections of the work. They began to consider time constraints for their activities so that by the end of the given time frame all members understood the material that was supposed to be learned (cf. 3.5.1; 3.5.2.6; 4.2.4.5; 4.2.5.3).

#### 6.2.4.5.5. Subtheme: Preparation for work place

Furthermore, learners in STAD groups learned to work with others in a respectable and considerate manner. They had specified that this skill would help them in the future after their school careers into the professional world where they would need to work with colleagues and partners. They would also be able to build working relationships that were healthy with all their future colleagues and superiors. It would further enable them to take advice from colleagues and supervisors at work.

> Learner 7AX; '*When I saw the leader doing all the work, I wanted to help*'.

> Learner 3BY; '*It helps prepare us for after school in employment – working with other people*'.

Moreover, the learners would be able to work as team players and give assistance where needed for the benefit of the company, because they had learned to aim at achieving groups' goals.  It would also be effortless for them to buy into the vision of the company they worked for and strive to attain what it stood for (cf. 4.2.5.3; 3.5.2.7; 2.5.1).

The researcher therefore regarded the above statement of a learner to be an example of a critical thinker too, because he had already associated group work with the future. He had a picture of himself sitting in a boardroom discussing the company's challenges and having to work together with other board members, brain storming to reach an expected solution (cf. 3.5.2.6; 2.5.2).

#### 6.2.4.5.6. Subtheme: Listening skills

Listening is part of communication in the group situation, the researcher realised that it was a skill that helped members of the groups to afford each other equal opportunity to contribute to the group discussions. The researcher believed that without listening to one another during groups' discussions, teams would not be able to advance in the tasks assigned to them instead members would resort to working as individuals (cf. 3.5.2.9; 3.5.2.4; 3.5.2.3).

> Learner 1AY; '*There are two members who are always at lock-a heads*'.

Therefore, a group environment where learners did not listen to one another turned into pointless debates that stalled the discussion processes and productivity of groups (cf. 3.5.2.8; 4.2.5.3).

#### 6.2.4.5.7. Subtheme: Improved thinking patterns (critical thinking)

Thinking was also an integral aspect of working in STAD groups, because the purpose was to facilitate effective learning to improve academic performance of all learners. Therefore, learners in STAD teams had exercised productive thought patterns in order to contribute valuable inputs to the task at hand for the sake of achieving set groups outcomes (cf. 3.5.2.8; 3.5.2.6; 2.5.1; 2.5.2).

> Learner 8BY; '*It gives us a wide range of answers and see how other people think*'

> Learner 2BX; '*A leader taught us how to think outside the box*'

Critical thinking could also be defined as "exploratory talk", where interactions that included explicit reasoning, hypotheses, arguments, challenges and justifications of facts were of paramount (Veenman, Denessen, Van den Akker & Van der Rijt, 2005: 119; Gillies, 2008: 330).

Some studies argued that critical thinking could be achieved by giving learners effective group cognitive activities. They further contended that higher-order thinking could be induced by thought provoking questions and activities of explaining concepts, to develop the logical reasoning capacity of learners (King, 2008: 75; Lombard & Grosser, 2008: 563). Below are some responses to the probing on "how learners perceived cooperative learning compared to individual work?"

> Learner 7BX; '*It helped me also because I don't know all the things – others explained to me and also as I explain I learn too and learn to work with others*'.

> Learner 2BX; '*It is easy to brainstorm answers with more people*'.

The researcher could argue from the above responses by learners that working in cooperative group setting improved learners' critical thinking as they had to debate their points of view by supplying the team with reasons and facts to support their inputs. Secondly, as the teams were brain storming, they would have to revisit their different responses, analyse and synthesise them thoroughly in order to arrive at the expected end. In order for learners to analyse their answers they needed to apply critical thinking through debate (cf. 3.5.2.6.).

Learner 6AX; '*I choose to work alone because if someone disagrees we have to think of another idea*'.

Though some learners might not have enjoyed this exercise, it was because they were expected to give answers without reasoning to back up their suggestions. CAPS document for Technology stipulated that schools should develop critical thinkers through active and critical learning approaches (DBE, 2011: 5). Therefore, teachers are discouraged rote teaching students to remember the content without understanding, and encouraged to cultivate critical thinkers that are able to apply the knowledge acquired in class and use it in other social and professional contexts.

Learner 4AY; '*Everyone gets to say something to get to the correct answer. Alone I could write a wrong answer with no one correcting me*'.

Different points of view were brought to the table for discussion. These views became a pool of ideas from which the group members referred to as they tried to solve a problem or answer a question properly. There was a possibility that all suggestions might have been correct to a certain extent and needed to be reworded in order to appropriately answer the question. Therefore, learners had to synthesise and paraphrase their responses to produce a good quality response (cf. 3.5.2.6; 3.5.2.3; 4.2.44).

#### 6.2.4.6. Theme: Disappointments and challenges

STAD was no different from other teaching techniques developed by humans and could therefore not be 100% efficient, as a scientific saying that states that no manmade invention was perfect.

Learner 2CY *"Sometimes we got distracted and talked about other things"*.

Learner 3AY *"We did not improve as we expected"*.

Learner 6BX *"Attitude to each other was not good at the start of our group work"*.

In the implementation of STAD in Technology classes, learners also faced certain challenges that they needed to overcome or rectify (cf. 3.5.2.4; 3.5.2.9).

#### 6.2.4.6.1. Subtheme: Internal and external distractions

Members of various groups alluded that there were some distractions within their groups, whereby other members would ask irrelevant questions that derailed the teams' discussions. Teams found this kind of behaviour as one of the major time eaters that limited the productivity of their teams (cf. 3.5.2.8).

> Learner 1AY; '*One of our members likes to ask irrelevant questions that lead us astray*'.

Learners had to implement measures that would help curb the unwanted behaviours and promote those that were beneficial to the groups' success. However, there were learners who seek assistance from another group. This as well tended to be spoiling the working mode of other teams.

> Learner 3AY; '*People from other tables close to ours were interfering with our group*'

Interferences by other groups diverted the groups' focus to the intruder or help seeker which in turn would affect the teams' concentration back to the task in and adverse way. Sometimes this disruption could be a result of groups' tables being too close to each other, allowing members from different groups to physically be in contact with one another (cf. 3.4; 3.4.1).

#### 6.2.4.6.2. Subtheme: Members lack of focus

Lack of focus within a group could be related to the internal disruptive behaviours among the members. It could be a mechanism that a disruptive member used to seek attention for help due to lack of comprehension of the work being done, or it could be a learner who had no interest in the task (cf. 3.4.1; 3.5.1; 4.2.4.5).

> Learner 8CX; '*Group members take us off focus by side tracking our discussions*'.

The assertion above could suggest lack of interest in the work or minimal concentration span of that learner. There were those with short concentration spans that felt that they needed to take breaks from work now and then which became a problem in a group setting, because they needed to adjust their time on task duration.

#### 6.2.4.6.3. Subtheme: Lack of team work

This setback appeared to be a concern in the beginning of STAD groups, where learners had not yet developed skills to work with others. The members were also strangers to one another at that time and had to work on enhancing a working relationship, effective communication and how to treat each other with respect in order to improve productivity of their groups (cf. 3.5.1; 4.2.4.3; 4.2.5.3).

Learner 8AX; '*Sometime before the first test it was every man for himself*'.

As a result of non-existence of cooperation within a group, members resorted to working as individuals, because trust and interdependence were non-existent as well.

In this paragraph the researcher has identified some of the repercussions caused by lack pertaining to basic human needs and essential elements of cooperative learning within the group set- up. Here learners' responses towards the second question that sought to find how negative behaviours could affect the effectiveness of the group would be displayed. That could result in a group that was stagnant due to absence of belonging and trust, and minimum guidance or cooperation within that group (cf. 2.4.1; 2.4.2; 2.4.3).

Literature has showed that it is normal for groups to get swayed from the task at hand for a moment as some points of views may remind other members of certain incidents out of the context. Dwelling in the wilderness for long, could, however, result in a strained atmosphere, as others wanted to get back to work while others were stuck in irrelevant discussions. Therefore, prolonged derail was hampering group progress and causing a team to fall behind. It affected the working relationship among the team members negatively to a certain extent due to anxiety caused by lost time. Secondly, it could also lead to groups producing inadequate and substandard work for the sake of meeting the time constraints and avoiding possible punishment because of incomplete work (cf. 3.4.1; 3.5.1; 3.5.2.8).

#### 6.2.4.6.4. Subtheme: Dependency syndrome (free-riders)

Learners indicated that in the beginning of their group work it was not easy to give opinions regarding the work being discussed, because they felt they had members who were more able and that their inputs might not have made a difference. Learners were not yet free to participate as they were not sure how their responses would be treated and thought it would be easy to just listen to the leader and go with the flow, because he was more knowledgeable than them (cf. 3.5.2.7).

> Learner 7CX; '*We struggled with focusing on task at hand. Secondly, our group relied on one person to sort of help us – the group leader*'.

Group members had to be assured that their contributions were valuable toward the success of the team. Moreover, they would increase their knowledge and understanding of the taught material when they participated in reaching the answers to the worksheets as a team (cf. 3.5.2.4; 3.5.23).

#### 6.2.4.6.5. Subtheme: Members' isolation and side-lining

Furthermore, due to lack of trust among members at the start of employing STAD in Technology class, other members of the groups were reserved and could not open themselves up to other people. They therefore chose not to cooperate, but isolated themselves from the rest, because of fear of inputs being looked over by other members or just being afraid to give incorrect suggestion (cf. 3.5.2.3; 3.5.2.4).

The possibility was that learners had side-lined one another, because they could not jell well, or because they did not have a relationship before the implementation of STAD. As classmates they also knew each other's work ethics and might not have preferred to be grouped with those who had low work values already thinking of the struggle to help the individual to adjust his work morals.

Pressure could also affect learners negatively in their groups when they realised that their pace of progress was not matching the given deadline. This could cause splits within the groups as other members might decide to work on their own to catch up with time, seeing that other were inconsiderate of the time factor. If this happened, group goals were at stake as they would now be ignored like the one group earlier mentioned that "*towards the first test it was each man for himself*" or the survival of the fittest in our everyday language. The purpose of the STAD teams was we "*swim or drown together"*, a famous cooperative learning groups' slogan as well as instilling self-efficacy among members of the team (cf. 3.5.2.7; 4.2.4.4; 4.2.4.5; 2.5.1).

#### 6.2.4.6.6. Subtheme: Weak leadership

The researcher believes that weak leadership within a group could be a challenge that delayed the group's progress as there should be someone who directed or facilitated discussions among members. Where a leader was not effective members were not cooperative and their work was behind and in some instances members would just copy from each other's workbook without working together to obtain the answers.

> Learner 4DY; '*It was when our leader got an answer wrong - however we corrected all that and solved our conflict'*.

Another important issue was unnecessary self-defence that could be caused by a member of the team feeling unprotected within the team. Especially, as a high performing learner, it was somehow normal in the beginning to not trust the judgement of others. The consequences of such behaviour could be delaying the trust among the team members and de-motivating as others might not feel worthy of doing anything correct. Such attitude could as well develop resentment within the team as other members would have to strive to prove the defensive other wrong at all cost – generating undesired and unproductive arguments (cf. 3.5.2.2; 3.5.2.1; 2.5.1).

#### 6.2.4.6.7. Subtheme: Extra-curricular commitments

Our school has a wide range of extra-mural activities, which learners have to participate in and honour their commitments to various teams to which they belong. It was a challenge in a sense that most of the time some group members had to miss classes during extra-mural tours and tournaments.

A team member who missed a portion of work became clueless the next time he came to class on the work that was in progress and members had to recapitulate by explaining the previous work before proceeding (cf. 3.5.2.8; 3.5.2.2; 3.5.2.1)

#### 6.2.4.7. **Theme:** Sharing

Learners further indicated that STAD groups taught them to share knowledge and resources with one another and to be involved toward obtaining group goals.

> Learner 8AY; '*We get to share each other's ideas*'.
>
> Lerner 2CX *"We learn more in a group and share ideas"*.

Thus sharing of ideas during STAD teams' discussion sessions help members to learn more from each other (cf. 4.2.4.1; 2.3.1; 2.3.2).

##### **6.2.4.7.1.** Subtheme: Gaining more insight

Sharing of information was highlighted as a source for more insight within the groups. Learners stated that as they discussed the work and brought a variety of inputs to the table and that it was an exercise that enhanced their knowledge of the learned material. They were able to view different suggestions and learned how others' contributions assisted them to understand the work better.

> Learner 2DX *"Working in a group improves our thinking patterns"*.
>
> Learner 2CY *"Yes, if you don't understand something, one group member can explain it"*.

As stated previously, learners further confirm that STAD groups are very helpful regarding acquiring more knowledge (cf. 2.3.1; 4.2.4.5; 2.5.1).

6.2.4.7.2. Subtheme: Brain storming

Members of STAD groups further indicated that brain storming was much easier when working in teams, because in one round there were already four to five different views on the table than when one was working individually.

> Learner 3AY *"In groups because we share our points of view, than individually where it is stressful thinking of what is right"*.

This exercise became trouble-free because learners had learned to share their information in order to obtain the groups' goals (cf. 4.2.4.1; 2.3.2; 3.4.3).

**6.2.4.7.3. Subtheme:** Accommodating one-another

Learners have stipulated that they learned each other's personalities, strengths and weaknesses that helped them to make means to meet each other halfway.

> Learner 3AY; '*You might not always be able to be with people you expect to be with*'.

Therefore, in the process of learning others and adjusting to become considerate consumed some time for groups' progress. It was, however, a necessary practice for the betterment of the teams' performances (cf. 3.5.2.1; 3.5.2.2).

> Learner 8BY; '*Some people are smarter than others and make work easier*'.

Moreover, within the groups were members with various abilities, some were slower that the others and all had to catch up and complete the task at hand as a team. Some of the learners, however, found this exercise as demanding a lot from their sides, developing a negative attitude to working with people that were less capable as they were.

> Learner 4BY; '*I prefer to work individually, because as a group leader you have a baggage to carry and wait for everyone to finish or understand the work*'.

It was important for learners to understand that the purpose of STAD teams was to assist other members of the groups to learn values, such as producing good work that was well presented. Secondly, members needed to know that help was available within their teams and they did not have to wait for the teacher's assistance all the time (cf. 3.5.2.3; 3.5.2.4; 3.5.2.7; 2.5.1).

#### 6.2.4.8. Theme: Learners experiences from STAD groups

The researcher continued to ask learners questions concerning the lessons they received from their group mates as well as the teachings that others learned from them. This was to find out from the learners if they experienced the process as productive and helping regarding various classroom situations. Learners were asked questions, such as: *"w**hat have you learned from other team members?'*** Learners were expected to give their opinions regarding academics, social skills and attitude towards their school work in general. The other question was: *"**What do you think you have taught your team mates?"*** This was to help learners do some introspection and explain their impact on the group processes.

In this paragraph learners indicated how they were taking care of each other in their various groups. Learners' feedback portrayed a conscientious social support to their team members by being open and willing to assist at all times. We are a busy school extramurally, whereby some learners could miss a few days of school on sports tours. The school's policy states that it is the individual learner's responsibility to catch up with the work he missed during the sport tour or any form of absenteeism (cf. 3.5.2.7; 3.5.2.1).

> Learner 2BY; '*I've taught them to work with each other*'.
>
> Learner 4CX; '*We help each other catch up in case of absenteeism*'.
>
> Learner 2CY; '*I taught them to ask for help if needed*'.

Therefore, if a learner was absent from class, it would not be easy to catch up without the assistance of the group members. It was not easy for the researcher as well to go back to the previous work during class as he had prepared work for that period. A learner might end up catching up work without an understanding of the basics. With a diligent cooperative learning group support it became easier for the teacher and the learner, because the team mates took it upon themselves to offer help in order to achieve the common group goals (cf. 3.5.2.1; 3.5.2.7).

#### 6.2.4.8.1. Subtheme: Patience and self-control

As stipulated previously, learners within the groups had unequal academic performances with a varied set of values that they upheld regarding their school work. Those with high work ethics and were time conscious during the group activities had to compromise at times to wait for others to catch up with them before proceeding to the next task.

Other learners stated that they recognised and appreciated not being intellectually equal as group members. They therefore improved their social skills to support each other by allowing two-way communication traffic. By so doing they inspired creativity and critical thinking out of one another, leading to multiple ways of solving the problem and reaching the common answer (cf. 3.5.2.7; 2.5.1; 2.5.2).

> Learner 8AY; '*There are more ways to solve a problem not just one*'.
>
> Learner 8BY; '*Some people are smarter than others and make work easier*'.

Since others were seen as smarter in the groups, this did not demoralise others to give their inputs during discussions. They expected the 'smarter' ones to help and guide them to get to the expected group outcome. The researcher guesses 'smarter' does not necessarily imply high achievers, but also those who are able to 'think out of the box' and come up with various suggestions to help the team achieve its intended goals.

They therefore had to avoid getting their emotions high while dealing with slower ones or helping others that took time before understanding the work. Those who were struggling also had to learn to prevent themselves from getting angry or non-cooperative when they were being helped and be willing to accept the goodwill of others (cf. 3.5.2.9; 4.2.4.5).

#### 6.2.4.8.2. Subtheme: Monitoring of Groups

Some learners indicated that the presence of the teacher during their group sessions was very helpful. They knew if they had problems with particular individuals that caused the group to work inadequately the teacher was available to intervene in such cases. Furthermore, they were aware they could call him at any time for help in terms of clarifying certain portions of work that the group members did not understand to be able to explain it to each other (cf. 3.4.1; 4.2.5.2).

> Learner 8AX; '*At the beginning I preferred individual work but now since I got used to group work it is more interesting*'. '*The reason being some teachers tell us to go on to the field and work there without monitoring us*.'

Learners also attested that their previous experiences with group work were not pleasant because other teachers of other subjects would let them do group work without supervision.

According to the above responses, it showed that supervision during group discussions was essential for the sake of smooth progress of the task at hand as well as the process of group proceedings. Learners felt more at ease when the teacher was around to assist where there was a need pertaining to the content. Secondly when a disciplinary query arose within a group, learners would want to bring such situations to his attention while still fresh (cf. 3.5.2.6; 2.3.1; 2.5.1). Therefore, the character of a teacher that uses STAD in class should be encouraging and facilitating discussions among learners, not the one that wants complete silence in class.

#### 6.2.4.8.3. Subtheme: Pleasant experience

Learners also pointed out that in STAD as a cooperative learning group set-up you might not be with your everyday friends in a group as it was structured according to levels of achievement and race. It was therefore important for learners to accept anyone who was put into their team and work hard to clear any differences and work together for the sake of group success. Thereby, members were expected to meet each other halfway and build up a new working relationship, which is not always a smooth exercise (cf. 2.4.1; 2.4.2; 2.4.3).

> Learner 3AY; '*You might not always be able to be with people you expect to be with*'.

It could be an exasperating situation to start working with people you did not choose or even preferred to work with. At a later stage when structuring had, however, fallen into place and they understood how to work with others then the group processes became a fruitful drill that helped members to improve.

> Learner 8AX; '*Sometimes it can be frustrating sometimes fruitful*'.

As a result of improved interdependence among the group members, conflicts became lesser and more time was spent on the task. This kind of environment within groups made members begin enjoying one another as they realised that working together gave support to all members (cf. 3.5.2.7; 3.5.2.4; 3.5.2.1).

> Learner 4BY; '*I used to hate group work but now I enjoyed myself'*.

Some learners further stated that working in groups made their individual homework easier and lighter as they approached it with confidence due to the insight they had gained in their groups' discussions. According to these statements the researcher could argue that homework was mostly completed and correct and therefore there was less stress to focus on punishing learners for homework not done, but rather on doing corrections with every learner ready to take part.

> Learner 4BX; '*Homework is more efficient that individually*'.

Moreover, self-efficacy of individual learners also increased and they had determination to work efficiently, even on their own, as they have learned from others that work must be done with all dedication. They also learned that the more time spent on learning the better and easier it became to understand the material taught in class. They then became more participative in their groups, because of boosted self-confidence (cf. 2.5.1; 2.5.2).

#### 6.2.4.8.4. Subtheme: Improved self-confidence

Members of various groups indicated that their self-confidence was boosted by words of encouragements that they received from their leaders and fellow members. They also pointed out that the opportunities to give opinions in group discussions also motivated them as they became conscious of their value and that of their contributions as well.

> Learner 4CX *"Individual homework became easier because of the group discussions"*.

> Learner 4CY *"It has given me more self-confidence"*.

Learners feel freer to raise their points of view without fear of their personalities being crushed by other members. They felt secure and welcomed within their various groups (cf. 2.5.1; 2.5.2).

### 6.2.4.9. Theme: Lessons or benefits from using STAD

In this section the researcher will discuss the subthemes regarding the lessons and benefits that learners have stated to have acquired.

#### 6.2.4.9.1. Subtheme: The meaning of group work

Learners realised that working in STAD teams was not a platform for fooling around with team members, but a space to focus in the activities issued to groups. It was a situation whereby members helped one another to obtain group and individual goals.

> Learner 3AY *"It is interesting as we learn to work as a team"*.

> Learner 4DX *"I think if we can form our own groups we can work better"*.

> Learner 2AX *"I prefer working in a group, only if we are not left on our own because other people do not want to work"*.

Learners in STAD groups began to understand that positive interdependence is an essential part of working in cooperative learning groups (cf. 3.5.2.1; 3.5.2.2; 4.2.4.1; 4.2.4.2).

#### 6.2.4.9.2. Subtheme: Compromise

Compromise was stipulated as an important aspect of group work. Learners initially indicated that they had to learn each other's personality traits and learned to accommodate and be patient with each other.

> Learner 7AX *"I learned that no one is less equal because everybody is clever in their own way"*.
>
> Learner 8AX *"We learned to compromise"*.
>
> Learner 8CX *"I learned to be patient with other members"*.

Therefore learners in STAD teams acquired people skills that helped their groups to unite toward obtaining team goals (cf. 3.5.2.1; 3.5.2.2; 4.2.4.4).

#### 6.2.4.9.3. Subtheme: Open-mindedness

Learners also indicated that working with others in a group made brain storming an easy process that allowed various suggestions from which members of a group had to synthesise the most appropriate response with the activity. Therefore, working with many inputs needed one to be open-minded during the process of generating the best suitable answer to the task.

> Learner 8BX *"I learned to keep open mind"*.
>
> Learner 6DX *"I learned to be able to listen to others"*.
>
> Learner 3CY *"We learn how to share opinions and express ourselves"*.

Therefore, keeping an open mind played a role that helped STAD teams to be able to receive others' view points and also to freely give inputs (cf. 3.5.1; 3.5.2).

#### 6.2.4.9.4. Subtheme: Constructive criticism

Constructive criticism was raised as a way of motivating others to participate without fear, because they knew if their inputs were incorrect. Explanation and reasons would be given that showed the inappropriateness of the suggestion.

> Learner 2BY; '*You have people to help you if you don't understand*'.

> Learner 4CX *"We should not criticise others and their ideas"*.

Some of the groups' opinions might not be correct and should be rejected as a result. The member who gave the rejected opinion was expected to come on board as the group gave reasons for not accepting such a suggestion. The learner should not take it as character assassination, but as correction and help from fellow members. This should not be a discouraging moment, but rather a supportive, knowledge building and encouraging opportunity as it would help with individual tests (cf. 3.5.2.1; 4.2.4.5; 4.2.4.1).

#### 6.2.4.9.5. Subtheme: More effort equals work of high quality

Some of the leaders encouraged their team members to work hard in order to produce work of high standard that was well presented. Members took this advice and began to implement it after school with their homework activities. They therefore learned that if they put in extra effort, participation in group sessions became enjoyable as they contributed from the point of knowledge (cf. 2.5.1; 2.5.2).

Since learners had expressed their impact on other group members, the researcher would like to explore the reception and acknowledgement of others' influences in the groups. The learners' statements below confirmed that to have received values of hard work as bearing anticipated outcomes.

> Learner 4AY; '*I have learned that I have to work hard*'.

> Learner 4CY; '*I learned that even the smallest mark can have improvement on your total*'.

These values also helped them to recognise that every piece of work and input they received from other group members was significant. Once an individual had developed the characteristics of being a hard worker and tasted the fruits thereof, he would take every input to his knowledge seriously to maintain the high standard of work. It served as a motivation and also for him to realise that he was capable of producing good work like others and pressed to keep it up (cf. 2.5.1; 2.5.2; 4.2.5.3; 3.5.2.8).

#### 6.2.4.9.6. Subtheme: Respect for others

Learners also alluded to the fact that respecting one another within their groups played an integral role in building good working relationships as well as friendships. Moreover, they were able to listen to each other and gave one another a chance to give an input without being interrupted (cf. 3.5.2.1; 3.5.2.2).

> Learner 8AY; '*I helped the team to treat each other with respect*'.

Respecting one another and their opinions developed trust among the group members, because each member felt valuable and needed in the team. One might think this was not a necessity in the classroom, but it supported the CAPs statement for Technology, namely, that education should include social justice, inclusivity and human rights (DBE, 2011: 5). In this fashion of employing STAD in Technology class, the rights of learners to be heard and express themselves were achieved.

#### 6.2.4.9.7. Subtheme: Receive and give

Members of different groups also stated that when help was offered, one should be ready and willing to accept it in order to be able to support others as well.

#### 6.2.4.9.8. Subtheme: Stay positive

Learners indicated that they learned to be positive at all cost in order to enable smooth processing of group activities.

#### 6.2.4.10. General views and perceptions

The researcher could therefore also add that there was a high possibility of learners enjoying to do their individual homework, because they knew should they get stuck while doing their work, doors of communication were open to access the group members for further clarity. If this atmosphere of working together was not created in the classroom, it would be difficult for learners to ask others other than their everyday friends, who might as well be in the dark in some instances. In this case there were other individuals with high academic abilities that one could consult for assistance without any inferiority complex. It therefore resulted in high turn up of completed and efficient homework, as well as improved preparation for class tests.

The researcher believes that with a good influx of efficient homework, individual learners would develop self-determination as studies indicated in the previous chapters. When a learner began to enjoy his work and strove to achieve better results for his satisfaction, rather than expecting a certain incentive, it showed a development of intrinsic motivation. The will to do efficient work was coming from within in order to be like another group member who was able to obtain excellent marks in his work. On his own a learner wanted to adapt habits from high achievers, such as improved focus in class, productive participation in groups and whole class teacher questioning and putting extra effort to do work at home (cf. 2.4.1; 2.4.2; 2.4.3; 2.5.1; 2.5.2).

Moreover, learners had shown interest and preference of working in STAD teams instead of working as individuals in class, when the researcher asked them if they preferred to work in groups or as individuals? What have they learned from each other during the employment of STAD as a method of teaching and learning? They pointed out several advantages of being in cooperative learning groups. Most learners still preferred to work in groups, except for one leader of a group, who thought being in a group affected him negatively.

> Learner 4BY; '*I prefer to work individually, because as a group leader you have a baggage to carry and wait for everyone to finish or understand the work*'.

Among the group leaders he was the only one who raised this concern, of which the whole purpose from the beginning was to help low achievers to understand the work. In the researcher's opinion a learner missed the reason for using STAD in the Technology classroom, because the researcher had explained to them that as leaders they should be patient with other members as they might not be quick to comprehend the work like they as leaders do. The purpose was to assist others to improve their academic performances so that they could be motivated to aim higher and work harder. According to cooperative learning proponents, social support in group work was essential so that all members would feel valuable and secure (cf. 3.5.2.1; 3.5.2.4; 2.5.1; 2.5.2).

Learner 4DX; '*I think if we can form our own groups we can work better*'.

From the above response the researcher discovered a fear of the unknown was prevailing in this learner's thoughts. It seemed that he experiences difficulty in building new working relationship with other classmates he might regard as strangers in his personal space. He believed settling for friends he already knew would make the process easier. According to the researcher's understanding a friendship built out of other interests is, however, not usually conducive for a work relationship. The atmosphere in that group would be more socially related than work related and could possibly harm the academic progress of a group. The researcher understood that in a group formed based on academic work, they would always remember their main purpose as a group even after they had bonded into becoming friends. Therefore, group work ethics would still be maintained in order to achieve the group goals.

Most learners chose to work in teams, because they recognized there was more to gain and contribute by working with others. Cooperative learning outcomes, such as academic support was mentioned as an advantage that these learners experienced. They stipulated that knowledge of the work and content was elected and displayed in group discussions. Therefore, the ones who were struggling were able to get assistance at their level and pace. If the teacher had to go to every individual in class, the lesson would probably end before reaching half of the class. Working in teams was therefore effective according to these learners. After the teacher had explained surely one member of a group had clearly understood and could further elaborate on the explanation of the content. If it happened that in a certain group none of them clearly understood, it was easier for the teacher to attend to the group and clarify the explanations (cf. 3.5.2.4; 3.5.2.1; 3.5.2.2).

Other learners further indicated positive results produced by working in STAD teams, such as building friendships from working relationships. The researcher speculated that such friendships had a positive impact on learners' behaviours and attitudes towards their academic mandate, because the core of such friendships was based on work. The researcher therefore, also believes that these kinds of relationships were more concerned about how a fellow friend was doing academically. Therefore, learners would end up encouraging and supporting one another with their school work, even after school hours.

Thus, the more one engaged in group discussions the more he realised that others' suggestions were valuable. Therefore, in order to gain more knowledge it is important to accept that decisions made in group discussions might not be in your favour at all times. Learners articulated that this type of engagement helped develop critical thinking as another outcome of cooperative learning. As a critical thinker, the researcher believes it is easier to acquire problem-solving skills. The broader one expands his thinking patterns the opportunities are explored to reach a solution (cf. 4.2.4.2; 4.2.5.3; 3.2.6; 2.5.1; 2.5.2).

### 6.2.5. Analysis of peer observers on the researcher (teacher) (Data - POT)

In this part of the data analysis chapter, observation schedule (cf. Appendix 1) was used to obtain data pertaining to the researcher's praxis. The observation schedule was also divided into three main points or topics that would be able to enlighten the study on the effects of STAD on the professional practice of the teacher (as the researcher). The topics included researcher's method of teaching, knowledge of content or subject matter and classroom management. The researcher understood that these identified subjects of inquiry would be able to cover all basics required from a teacher as a professional entity.

These were the same colleagues that did observation schedules for learners in the previous section of this chapter.

Under the above mentioned subjects of inquiry, themes were derived from the questions and sub-themes emanated from the observers' responses. Table 6.5 below summarises the themes and sub-themes from this data.

Table 6.7 Analysis of Researcher's Praxis

| **Topic of Inquiry** | **Main Themes** | **Sub-themes** |
|---|---|---|
| METHOD OF TEACHING | Teacher interactions | Question and answer |
| | | Moving around |
| | Teacher responses | Expanded responses |
| | | Guiding responses |
| | Intra-group interactions | Self-disciplined learners |
| | | Roles of team leaders |
| | | Equality among members |
| KNOWLEDGE OF SUBJECT MATTER | Quality of work given to learners | Well-structured work |
| | | Addresses various cognitive levels |
| | Teacher knowledge level of technology | Presented with confidence |
| | | Use of correct terminology |
| | Teacher preparation | Clear instructions |
| | | Use of Various Resources |
| | Teacher delivery of content | Base-Line assessment |
| | | Techniques of explaining |
| | Teacher explanation of concepts | Whole class and groups |

| | | |
|---|---|---|
| | | Techniques of explaining |
| | Learners responses to probes | Free to respond |
| | | Learners probes |
| CLASSROOM MANAGEMENT | Entrance of learners | Practiced routine |
| | | Acceptable Settling Period |
| | Classroom atmosphere | Tension-free |
| | | Cooperative |
| | Control measures | Moving around |

6.2.6. Topic of inquiry: Method of teaching

The researcher used STAD as a cooperative learning technique and teaching method for Technology classes, and used either the lecture or question and answer methods to introduce the new learning material or explain concepts that needed to be clarified. Therefore, peer observers were to write down what they had seen during their time of class visits.

> Mr Barnard*: "It is well structured and pupils are comfortable to contribute freely".*

According to Mr Barnard the free spirited atmosphere was a highlight that contributed positively towards effective group discussions and interactions (cf. 3.5.2.8; 3.5.2.5; 3.5.2.2).

### 6.2.6.1. Theme: Teacher interaction with learners

Under this theme the observers noted the various ways that the teacher (researcher) was collaborating with learners during the Technology STAD lessons.

> Mrs.Gomez: *"The teacher encourages responses from learners by asking questions; as he revised previous learning material. The responses were plotted as summary on a whiteboard".*

> Mrs. Blitz: *"He introduced the task and then went from group to group. He took the role of a facilitator and seriously ensured the boys understand their task".*

The researcher stimulated learners' participation by probing to help them be active and further interacted with different group (cf. 3.4.1; 3.7).

#### 6.2.6.1.1. Subtheme: Question and answer method

The peer observers had stipulated that the interaction between learners and the teacher were improved by means of probing learners at the beginning of the period as base-line assessment to evaluate learners' understanding of the previous work. Learners were also comfortable and free to respond and gave opinions openly in the classroom. Therefore, the teacher could claim that the atmosphere within the classroom was conducive for learners to interact with my probes.

> Ms. Robinson: *"The teacher is always asking questions and building upon the learners answers. He is guiding them to the correct answers or to certain ideas".*

> Mr. De Venter: *"Very good, the lesson is kept lively by question and answer method, leading the learners to develop their knowledge about packaging".*

Other observers stated that the teacher either responded to the learners' questions directly or diverted them to other groups to invigorate the interaction with the whole class. They also reflected that the teacher would write various views from the learners on the board so that we could together extrapolate helping them to construct knowledge of the work (cf. 3.4.1; 4.2.5.2).

#### 6.2.6.1.2. Subtheme: Moving around classroom

Furthermore, some of the observers pointed out that the researcher was moving around from group to group probing them to stimulate discussions among team members. As the researcher was going to different teams, boys asked clarity seeking questions and he helped them solve. In that way learners were helped to understand the work. Some of the peer observers indicated that working with groups needed patience, which they observed as the teacher was responding to questions and attending all the teams ensuring productivity.

> Mr Martins: *"Very good, constantly moving around to answer and discuss questions".*
>
> Ms Robinson: *"He responds positively and guides the learners walking from group to group, assisting their thought processes".*

The researcher believes that a teacher in a STAD class needs to be interactive, visit the groups to assess their progress and give them support (cf. 3.5.2.1; 3.4.1; 2.4.1; 2.4.2; 2.5.1).

### 6.2.6.2. Theme: Teacher's response to learners probes

In this section, observers were to elaborate on the manner in which the teacher responded to learners probes and whether it was a helping or detrimental exercise according to them.

> Mr Martins: *"Teacher answers and expands on questions asked by individuals".*

Ms. Matthews: *"He responded straight away and in a manner that answered learners' questions without doing it for them – guided them to find answers themselves".*

The researcher is of the opinion that a teacher employing STAD should be well prepared for the lesson to be able to guide learners and help them comprehend the work (cf. 3.4.1; 2.5.1; 2.5.2, 4.2.5.2).

#### 6.2.6.2.1. Subtheme: Teacher expanded and guided responses

Moreover, regarding his responses to learners' probes the observers alluded that it appeared that the teacher had met the needs of learners because the teacher would give them more clarity on the sections of work they seemed to have struggled with. Then the teacher would also give them comprehensive answers by adding real-life examples to help them understand.

Mrs Blitz: *"He listened to any question and gave comprehensive answers".*

Mrs Johnson: *"Educator is as inclusive as possible".*

Some observers were aware that the teacher also asked the learners questions that guided them to reach the conclusions by themselves. Each response from the class was triggering another probe that led learners to further discovery and construction of knowledge regarding the topic that was taught. If their interpretations were incorrect, the teacher would further explain or rephrase and give them the correct terminology as well (cf. 3.4.1; 2.5.1; 2.5.2; 4.2.5.2; 3.5.2.1).

Mr Barnard: *"He responds well and gives guidance in his responses to help learners achieve the outcomes".*

Ms Matthews: *"The teacher guided, encouraged and reminded learners throughout the lesson in a manner which gave the learners the opportunity to think for themselves".*

As it was said earlier, that thorough preparation for the lesson boosts the educators' confidence to expatiate more on the taught material (cf. 4.2.5.2; 3.4.1).

#### 6.2.6.3. Theme: Intra-Group interactions

In this section the teacher's peers were to perceive and note down how they experienced the way in which team members interacted with each other.

> Ms Logan *"Learners were respectful towards each other in the lesson"*.

> Ms Matthews *"They interacted well with each other – listened to each other and some encouraged others to do better. Some threw pieces of paper at each other though"*.

Peer observers indicated that learners in STAD groups were mostly well behaved towards each other, though there were some disruptive elements (cf. 4.2.4.2; 4.2.4.4).

##### 6.2.6.3.1. Subtheme: Self-disciplined learners

The observers stated that groups were predominantly cooperative as they interacted freely focused on the task at hand. They also noted that learners were aware of what was expected of them in terms of working in STAD groups as principles were on the class walls.

> Mr Barnard: *"The groups were disciplined yet open – comfortable and respectful interaction environment existed".*

> Mr De Venter: *"Very active discussions done in the groups with good self-discipline evident".*

Moreover, the issue of self-discipline was raised as a product of prior training of learner in STAD (cf. 4.2.2.1; 4.2.4.4; 3.3).

##### 6.2.6.3.2. Subtheme: Roles of team leaders

Roles of leaders in some groups were noticeable to the observers as they had indicated that leaders were the main facilitators of the group discussions.

Furthermore, leaders were also helping low achievers to come to the same level of understanding as other members of the team.

> Mrs Blitz: *"They were working on the task discussing what they needed to do and planning. One or two productively were allowing their group-mates to carry the load. But there was predominantly good interaction and team work".*

> Mr Martins: *"Generally it appears that one learner takes a leading role in the discussions".*

Furthermore, it could be confirmed that STAD as teaching method and a learning technique contributed positively towards building learners' confidence and leadership skills (cf. 3.5.1; 3.5.2.1; 3.5.2.7; 2.4.1).

#### 6.2.6.3.3. Subtheme: Equality among members

Among other aspects, observers also postulated that group members shared the tasks amongst themselves. All members were afforded an opportunity to contribute to the team discussions and that they would have to agree on the answer before writing anything down. Other peer observers also highlighted the issue of constructive discussions that took place openly and members were free to request help from their team.

> Ms Robinson: *"The groups interact well because the group members had to all decide on constructive discussions and openly raising their opinions".*

The use of STAD in Technology classes promoted equal opportunities towards learning as members of the groups were given a chance to contribute to the team's decisions (cf. 3.5.2.3; 4.2.4.1).

### 6.2.7. Topic of Inquiry: Knowledge of content

Under this part of the study, observers were to critically assess how the teacher was acquainted with the subject matter and how he ensured that learners understood the work.

#### 6.2.7.1. Theme: Quality of work given to learners

Moreover, their assessment of the worksheets' standard and the way they defined the quality of the content on the worksheets would help the teacher to improve.

> Mrs Gomez: *"I observed the theoretical part of a Design Process. On investigating the learners' drawings they appeared to be of good quality, neatly and meticulously drawn. The designers appeared to have taken ownership of their products by reflecting on them in discussion".*
>
> Mrs Blitz: *"I think so; they knew what was expected of them. They were able to work independently with confidence".*
>
> Mr Barnard: *"Yes, he gave well-structured worksheet with assessment given to groups".*

The observers had indicated that the structure of the worksheets showed good quality as well as the learners' activities. Thus learners also improved the quality of the work they produced (cf. 2.5.1; 2.5.2).

##### 6.2.7.1.1. Subtheme: Well-structured work

The observers alluded that the worksheets were stimulating learners to employ different skills. Thus, it began with simpler recall questions and was building upon the prior knowledge to more complex work that required learners to think deeper in order to reach the conclusion. The logical sequence of the worksheets motivated learners to deepen their thoughts and improved activeness of group discussions.

> Ms Robinson: *"The introduction was very good – the learners were involved and started the lesson with a solid background to the topic. The worksheet required learners to use various skills such as prior knowledge, methods of deduction, decision making, making considerations and conclusions and using opinions correctly".*

The teacher's preparation for the lesson plays a positive role in ensuring smooth running and chronological order of content delivery in class (cf. 4.2.5.2; 3.4.1).

6.2.7.1.2. Subtheme: Various cognitive levels

Furthermore, peer observers postulated that the worksheets were adequate and included lower-order, middle-order and higher-order questions that enthused learners to engage more on team discussions. The initial questions had laid a solid foundation for the following ones that motivated learners to try and get to the answer using higher level thought patterns.

> Ms Matthews: *“The activities or worksheets covered lower-order, middle-order and higher-order questions”.*
>
> Ms Robinson: *“The worksheet starts with what the learners already know. Then it asks them to build upon this knowledge, by using questions as guidelines. New words are introduced during the lesson”.*
>
> Mr Martins: *“Test questions are more direct”.*

CAPS for Technology require learners not only to understand the content but also be able to apply it. For this aim to be achieved the question paper should consists of multi-cognitive levels (cf. 2.4.1; 2.4.2; 2.4.3; 2.5.1; 2.5.2; 4.3.5.4).

6.2.7.2. Theme: Teacher knowledge level of technology

In this section, the colleagues were to identify the teacher’s knowledge of Technology as a school subject by stating various aspects that led them to their respective conclusions.

> Mrs Gomez: *“It was presented with confidence”.*
>
> Mrs Crouch: *“He has good insight into his subject. He could comfortably answer questions and correct pupils’ ideas”.*

Moreover, literature recommends that a Technology teacher should be knowledgeable regarding the subject matter and philosophical underpinnings of the subject (cf. 4.3.4.1; 4.3.5.3; 3.4.1).

#### 6.2.7.2.1. Subtheme: Presented with confidence

The observers indicated that the teacher had presented subject matter with ease and confidence, showing that he understood what he was teaching the learners. The teacher was also able to relate the content to real-life situations to help learners to grasp the work much more easily.

> Mrs Blitz: *“He is confident and clearly at ease with the subject”.*

> Mr Martins: *“Teacher is well prepared and confident with the subject”.*

As stated earlier in this chapter, preparation for the lessons played a significant role with regard to boosting the confidence of the researcher as a Technology teacher – during his lesson presentations (cf. 3.4.1; 4.3.5.4; 4.3.5.3; 4.3.4.1).

#### 6.2.7.2.2. Subtheme: Correct terminology

Technology, like other scientific subjects, employs specific terminology that needed to be emphasised to learners so that they would know which terms were more appropriate in the context of Technology as a subject. Some observers also pointed that out as a way of displaying high levels of the knowledge of subject matter in Technology. Understanding of technological terms by learners would make it easy for them to apply the acquired knowledge appropriately and would also be able to reason as technologists using acceptable terms to define concepts.

> Ms Matthews: *“Excellent; he uses correct terminology and links knowledge with everyday examples”.*

Furthermore, terminology is of utmost important for the Technology teacher to acquaint himself or herself with. The reason being the subject Technology is broad in nature and encompasses various subjects that use specific terms of operation that learners in Technology need to know as well (cf. 4.3.2; 4.3.3; 4.3.4.1).

#### 6.2.7.3. Theme: Teacher preparation

Under this theme, peer observers had indicated various points that had reflected thorough preparation of Technology lessons during the use of STAD.

> Ms Robinson: *“He was very well prepared, worksheets were ready and information was ready on the board – obviously knew exactly what he wanted to achieve with the lesson”.*

Preparation for lessons has become ubiquitous in this study because every process in the classroom refers back to the introductory lessons of explaining the concepts. Therefore, the researcher further emphasises that preparing for Technology is a requirement for every teacher (cf. 4.3.5.3; 4.3.4.1; 4.2.5.2).

##### 6.2.7.3.1. Subtheme: Clear instructions

Moreover, observers stated that instructions on the white board and those given verbally were clear and learners could easily follow them. Furthermore, the lesson presentations were well structured, which was easier for them as observers to follow.

> Ms Logan: *“Instructions were written out clearly on the board – a continuation of a previous lesson”.*

The worksheets were ready for distribution at the end of the teacher presentations. These attributes were essential for the lessons to run smoothly and avoiding unnecessary time wasting habits (cf. 3.4.1; 4.2.5.2).

##### 6.2.7.3.2. Subtheme: Use of various resources

As strength for good preparations, observers indicated that the researcher (teacher) was able to use various resources, such as white board, textbooks, and learners’ workbooks in order to help learners understand the content that had been taught.

> Mr De Venter: *“After the introductory, worksheets were handed out to lead the discussions in the group. The worksheets are completed as the discussions go on”.*

Mr Barnard: *"He was well prepared and used resources such as worksheets, whiteboard and textbooks".*

When a Technology teacher is well prepared for the lesson, it would be easier for him or her to identify the kind of resources needed for the lesson (cf. 3.4.1; 4.2.5.2; 4.3; 4.3.2; 4.3.4.1).

6.2.7.4. Theme: Teacher's delivery of content

Under this section, the observers had identified and explained the strategies, methods and techniques that the teacher employed during Technology STAD lessons.

Mrs Blitz: *"He knew where he was going – the lesson was structured".*

Mr *de Venter: "A very good lesson plan in place – the lesson developed according to the plan".*

Good delivery of content is also dependant on thorough preparation for the lesson because a Technology teacher would not be able to fluently and clearly explain the content that he or she is not familiar with (cf. 4.3.4.1; 3.4.1; 4.3.5.4; 4.3.5.3).

6.2.7.4.1. Subtheme: Base-line assessment

Baseline assessment was highlighted as a significant part of lesson presentations by peer observers. They stipulated that the teacher was building from learners' prior knowledge to the new content that was going to be introduced. They further explained that he used presentation methods, such as talk-and-chalk where he spoke and wrote important aspects and concepts on the board. Others indicated that the researcher used the question and answer method where he asked learners to find out if they remembered the previous work.

Mrs Gomez: *"The introduction composed of revision of the previous lesson that was summarised in point form in one colour on the whiteboard".*

Therefore, good preparation enabled the researcher to probe the learners further leading them into new content to be taught. Some of the observers also stated that the teacher would probe learners in such a way that they were able to discover and reach conclusions by themselves (cf. 4.3.5.4; 4.3.5.3).

6.2.7.4.2. Subtheme: Explaining techniques

In order to meet the needs of various learners in Technology class, some observers attested that the teacher employed different techniques to help learners to understand the work. The teacher was able to link the content to real-life situations using relevant examples or by use of drawings on the white board to give learners a clear illustration of the concepts and processes.

> Mr Barnard: *"He uses the whiteboard to summarise suitable class responses".*
>
> Ms Robinson: *"He is very good and allows learners to give their inputs. He explains certain concepts personally to groups so that they can engage in further discussions".*

Therefore, a Technology teacher who implements STAD as a teaching method should learn to accommodate various learning styles and abilities of his or her learners (cf. 4.2.2.2; 4.2.2.3; 2.5.1; 4.2.5.2).

6.2.7.5. Theme: Teacher's explanation of concepts

Furthermore, colleagues had indicated in this part of the study the measures the teacher tad taken to ensure that learners comprehended the material they were taught.

> Ms Matthews: *"The teacher used examples, to explain concepts and he also used drawings".*
>
> Mrs Crouch: *"He started with a quick introduction; he revised previous lessons with a question and answer method. He used drawn pictures to support new content. He gave class work to reinforce new content – with time limit".*

Moreover, Technology teachers should try by all means to give authentic examples to help learners to associate the content with real world context (cf. 2.3; 2.3.1; 3.5.2.6).

#### 6.2.7.5.1. Subtheme: Whole-class to small groups

As stated previously in this section, peer observers specified that the teacher started from the known to the unknown. The researcher had to establish that class and the teacher were on the same page with regard to the taught content before he could proceed to the next topic.

> Mr Martins: *"Teacher lists required information to the class in general and then deals with individual questions in smaller groups".*

Peer observers stated that the teacher would begin with whole-class discussions and afterward attend groups individually to further clarify the concepts or probe them to enhance group discussions (cf. 4.3.4.1; 4.3.2; 4.3.5.4).

#### 6.2.7.5.2. Subtheme: Summarising

Another point was that the teacher would write the expected responses on the white board as learners raised their views and selected the most appropriate responses. The teacher would also explain to the learners the reasons other points of view were not regarded as applicable as others.

> Ms Matthews *"The teacher used examples, to explain concepts and he also used drawings"*.

> Mr Martins *"He is very good and allows learners to give their inputs. He explains certain concepts personally to groups so that they can engage in further discussions"*.

They further postulated that the teacher used examples and sketches or drawings that clearly explained the concepts (cf. 4.3.5.3).

### 6.2.7.6. Theme: Learners' responses to probes

Under this section, observations revealed that learners were afforded an opportunity to raise clarity seeking questions to ensure understanding of the work.

> Mr Barnard *"Enthusiastically, yet respectful and focused on the topic and question posed"*.
>
> Mrs Crouch *"Learners responded quickly to probes, and many asked questions to gain further knowledge. Lesson caught learners' attention and many of their questions went deeper into the topic"*.

#### 6.2.7.6.1. Subtheme: Learners were free to respond

The observers indicated that learners responded well and were quick to respond. Their responses were mostly focused on the topic of discussion. Another aspect pointed out was that learners seemed free to respond to the questions without fear of giving wrong answers.

> Mr de Venter *"Learners listened very carefully to what the teacher is saying and follow up by asking questions, which lead to more discussions"*.
>
> Ms Robinson *"They responded well and felt free to respond without fear of being wrong. Many hands went up at a time"*.

Therefore, when learners are free to respond and pose probes interaction between the teacher and learners increase – thereby helping the teacher to assess the state of learners' understanding of the work (cf. 3.4.1; 4.3.5.3; 4.3.5.4; 4.3.4.1).

#### 6.2.7.6.2. Subtheme: Learners also probed the teacher

Learners were said to have been free to ask questions that seemed to seek more information on the work at hand. They further stated that the freedom of learners increased communication with confidence within their respective teams and during the whole class discussions.

Ms Logan *“The teacher responded in an orderly manner – answered questions directly”*.

Ms Matthews *“He responded straight away and in a manner that answered learners’ questions without doing it for them – guided them to find answers themselves”*.

Allowing learners to pose probes is a necessity in STAD class in order to have a two way interactions and communication between the teacher and the learners – in order to improve learning (cf. 3.4.1; 4.3.4.1; 2.5.1; 3.8).

### 6.2.8. Topic of Inquiry: Classroom management

Furthermore, the observers stated that the overall administration of the lesson from the beginning to the end was flowing as planned. Mostly, the peer observers alluded on the well-rehearsed routine that they identified.

#### 6.2.8.1. Theme: Entrance of learners

Observers had to note how learners entered the class to obtain a clearer view of what was expected of them inside the classroom.

Mrs Gomez: *“They line up outside. The teacher ushers them in at the door. They walked in chi-chat mode to their desks”.*

Ms Logan: *“They entered class in a relaxed manner and were orderly”.*

Mrs Blitz: *“They entered the classroom in a relaxed manner but weren’t really noisy. It was organised in that they knew their places, sat down and were ready for the lesson. They were in a routine”.*

The purpose of managing the process of entering classroom, helped the researcher to maintain order and create an environment that was conducive for teaching and learning (cf. 4.3.5.3; 3.5.2.2).

#### 6.2.8.1.1. Subtheme: Practiced routine

Most peer observers indicated that learners were lined up outside the classroom before they could enter the class to ensure that all learners entered the classroom within a short period of time to avoid disruptions of late coming. Once all learners were in the line they would enter in an orderly fashion even though some would still whisper to each other. Then the learners stood behind their chairs waiting for the teacher’s greeting before they sat down. The teacher believes that this created uniformity for learners to know what was expected of them from the beginning to the end of the lesson.

> Mr Barnard: *“Impressively fast and were well trained to prepare appropriately for start”.*

Training learners to adhere to a routine helped them to know what to expect when they enter the classroom. In that way order is instilled in learners (cf. 4.3.5.3; 3.4.1).

#### 6.2.8.1.2. Subtheme: Acceptable settling period

Teacher observers alluded that the time that learners took from entering to the beginning of the lesson was an acceptable length that preserved the teaching time.

> Ms Matthews: *“Very quickly; there were a few late comers but the teacher dealt with this very well”.*

Furthermore, teaching learners a particular routine helped the researcher to manage the use of time in the Technology class and distribute it according to class events (cf.4.3.5.3; 3.4.1).

### 6.2.8.2. Theme: Classroom atmosphere

Moreover, the observers were to identify if the atmosphere in the Technology classroom was suitable for employing STAD as a cooperative learning technique.

> Mrs Gomez: *“Some boys spoke while the lesson was being presented, but it did not create a disruptive undisciplined atmosphere”.*

The researcher believes that the classroom atmosphere should be free and not hostile, whereby learners may hesitate to be actively involved (cf. 3.5.2.2; 3.5.2.1; 4.3.5.3).

6.2.8.2.1. Subtheme: Tension-free

The classroom environment was said to be relaxed, friendly and focused on the task at hand. It was a situation that stimulated learners' participation in all class discussions. The majority of the learners were more enthusiastic with the work they were assigned to do and everybody seemed to be involved with the proceedings.

> Mrs Johnson: *"Classroom has a positive atmosphere and appears to be tension free".*
>
> Mr de Venter: *"A relaxed atmosphere – a perfect climate for teaching".*

In a tension-free classroom, learners tend to easily take part during teacher learner interactions – and are able to seek further clarity (cf. 5.3.5.3; 4.2.5.2).

6.2.8.2.2. Subtheme: Cooperation of learners

Moreover, learners were also said to have been cooperative, interacting with one another in a respectable manner promoting good communication within the groups. Other learners were supporting 'weaker' learners and encouraging them to work harder to comprehend the work.

> Ms Robinson: *"It was a very good introduction. The worksheet was very constructive and engages the learners throughout the lesson".*
>
> Ms Logan: *"Learners were respectful towards each other during the lesson".*
>
> Mrs Blitz: *"They were mostly co-operating and getting on with the task".*
>
> Ms Matthews: *"They interacted well with each other _ listened to each other and some encouraged others to do better. Some threw pieces of paper at each other though".*

When learners feel that they are in control of their learning, they try to do their best in proving their ability to can be independent and be trusted by the teacher (cf.4.3.5.3; 3.4.1; 3.5.2.5; 3.5.2.7).

### 6.2.8.3. Theme: Control measures

Furthermore, the colleagues had to observe and indicate the strategies that the teacher used to keep the class in order during the group discussions.

> Ms Logan: *"He calls boys by name to get their attention".*
>
> Mrs Johnson: *"He uses positive reinforcement to create an atmosphere conducive to teaching and learning.*

The researcher also believes that, to maintain a tension-free and relaxed atmosphere in STAD classes – disciplining learners should be done in a manner that would discourage unwanted behaviours. On the one hand the learners should still feel free to participate or ask question where necessary (4.2.5.2; 4.3.5.3).

#### 6.2.8.3.1. Subtheme: Moving around as a control measure

The teacher's visibility and interaction with different groups was noted as an important aspect to maintain control over the class without having to shout at them. Secondly, knowing learners by names was also raised as strength because the teacher was able to directly reprimand the perpetrator and not generalising the situation including innocent learners. The teacher also kept on reminding them about the expected cooperative learning group behaviours so that they were always conscious of any unwanted behaviours.

> Mrs Crouch: *"He is very aware of the individual pupils needs and picks up their actions quickly; often reminds them of the correct behaviour.by moving around from table to table – creates in itself good control".*

Ms Matthews: *"The teacher interacted with learners throughout the lesson and at whole-class, group and individual levels in a friendly, yet respectful manner".*

Being visible and accessible to learners in STAD teams promote productive discussion and improve learners' time on task. Moreover, learners also feel that the teacher is part of the proceedings as they could access help at any point in time (cf. 4.3.5.3; 3.4.1; 3.5.2.7; 3.5.2.1; 3.5.2.2; 2.4.2; 2.5.1; 2.5.2).

## 6.3. Analysis of quantitative data

As was stated in the previous chapter, descriptive statics was employed to analyse data from the tests scores and examination scores of learners.

### 6.3.1. Learners' tests scores (Data - TSL)

Tables 6.8 and 6.9 displayed the learners' achievement scores in the two class tests that were administered during Technology STAD lessons and the November examination that was written at the end of the year. The end of year examinations were a moderated summative assessment to ensure that all the content was fairly covered and that the questions range from lower order to higher order level.

Table 6.8. Grade 8X Tests Scores

| GRADE 8X TECHNOLOGY | | | | | | |
|---|---|---|---|---|---|---|
| LEARNER NUMBER | CLASS TEST 1 MECHANISMS | % TEST 1 | CLASS TEST 2 MECHANISMS | % TEST 2 | NOVEMBER EXAMINATION | %NOVEMBER EXAMINATION |
| MARKS | 30 | 100 | 30 | 100 | 80 | 100 |
| L1X | 14 | 47 | 6 | 20 | 20 | 25 |
| L2X | 26 | 87 | 18 | 60 | 41 | 51 |
| L3X | 20 | 67 | 21 | 70 | 43 | 54 |
| L4X | 13 | 43 | 18 | 60 | 37 | 46 |
| L5X | 11 | 37 | 12 | 40 | 27 | 34 |
| L6X | 14 | 47 | 7 | 23 | 48 | 60 |
| L7X | 18 | 60 | 16 | 53 | 45 | 56 |
| L8X | 27 | 90 | 20 | 67 | 60 | 75 |
| L9X | 19 | 63 | 7 | 23 | 35 | 44 |
| L10X | 16 | 53 | 8 | 27 | 15 | 19 |
| L11X | 12 | 40 | 7 | 23 | 14 | 18 |
| L12X | 17 | 57 | 17 | 57 | 38 | 48 |
| L13X | 16 | 53 | 12 | 40 | 36 | 45 |
| L14X | 15 | 50 | 24 | 80 | 42 | 53 |
| L15X | 27 | 90 | 23 | 77 | 64 | 80 |

| | | | | | | |
|---|---|---|---|---|---|---|
| L16X | 15 | 50 | 17 | 57 | 48 | 60 |
| L17X | 14 | 47 | 11 | 37 | 65 | 81 |
| L18X | 28 | 93 | 19 | 63 | 67 | 84 |
| L19X | 19 | 63 | 11 | 37 | 52 | 65 |
| L20X | 21 | 70 | 9 | 30 | 36 | 45 |
| L21X | 21 | 70 | 20 | 67 | 64 | 80 |
| L22X | 24 | 80 | 20 | 67 | 34 | 43 |
| L23X | 16 | 53 | 10 | 33 | 29 | 36 |
| L24X | 25 | 83 | 19 | 63 | 51 | 64 |
| L25X | 17 | 57 | 14 | 47 | 50 | 63 |
| L26X | 12 | 40 | 15 | 50 | 44 | 55 |
| L27X | 25 | 83 | 30 | 100 | 64 | 80 |
| L28X | 13 | 43 | 7 | 23 | 32 | 40 |
| L29X | 20 | 67 | 20 | 67 | 66 | 83 |
| L30X | 29 | 97 | 24 | 80 | 76 | 95 |
| | | | | | | |
| **8X AVE** | | **63** | | **51** | | **56** |

Table 6.8 presented the Grade 8X Technology scores for Test 1, Test 2 and scores obtained by learners in their November examinations. By comparing the average scores for all three assessment tasks; Class 8X appeared to have had a higher average (63%) for the first test that was administered during the implementation of STAD in the Technology lessons, whereas in the second test, the class average lowered to (51%). Therefore, in general the academic achievement scores of

learners in Class 8X did not show improvement in learners performances, instead they indicate depreciation. The class picked up their performance during the November examinations as the class average increased with 5% to an average of 56%.

Table 6.9 Grade 8Y Tests Scores

| GRADE 8Y TECHNOLOGY | | | | | | |
|---|---|---|---|---|---|---|
| LEARNER NUMBER | CLASSTEST 1 MECHANISMS | % TEST1 | CLASSTEST 2 MECHANISMS | % TEST 2 | NOVEMBER EXAMINATIONS | % NOVEMBER EXAMINATIONS |
| MARK | 30 | 100 | 30 | 100 | 80 | 100 |
| L1Y | 19 | 63 | 15 | 50 | 28 | 35 |
| L2Y | 18 | 60 | 20 | 67 | 53 | 66 |
| L3Y | 26 | 87 | 23 | 77 | 48 | 60 |
| L4Y | 13 | 43 | 17 | 57 | 50 | 63 |
| L5Y | 16 | 53 | 18 | 60 | 45 | 56 |
| L6X | 24 | 80 | 16 | 53 | 43 | 54 |
| L7Y | 27 | 90 | 23 | 77 | 70 | 88 |
| L8Y | 9 | 30 | 20 | 67 | 29 | 36 |
| L9Y | 14 | 47 | 19 | 63 | 37 | 46 |
| L10Y | 15 | 50 | 19 | 63 | 47 | 59 |
| L11Y | 9 | 30 | 20 | 67 | 35 | 44 |
| L12Y | 12 | 40 | 9 | 30 | 37 | 46 |
| L13Y | 14 | 47 | 21 | 70 | 47 | 59 |
| L14Y | 12 | 40 | 16 | 53 | 44 | 55 |
| L15Y | 19 | 63 | 19 | 63 | 58 | 73 |
| L16Y | 25 | 83 | 19 | 63 | 63 | 79 |
| L17Y | 16 | 53 | 11 | 37 | 56 | 70 |
| L18Y | 13 | 43 | 14 | 47 | 17 | 21 |
| L19Y | 10 | 33 | 15 | 50 | 36 | 45 |
| L20Y | 17 | 57 | 10 | 33 | 24 | 30 |
| L21Y | 29 | 97 | 21 | 70 | 48 | 60 |
| L22Y | 21 | 70 | 20 | 67 | 51 | 64 |
| L23Y | 15 | 50 | 20 | 67 | 48 | 60 |

| | | | | | | |
|---|---|---|---|---|---|---|
| L24Y | 21 | 70 | 16 | 53 | 45 | 56 |
| L25Y | 12 | 40 | 13 | 43 | 24 | 30 |
| L26Y | 18 | 60 | 14 | 47 | 24 | 30 |
| L27Y | 30 | 100 | 30 | 100 | 72 | 90 |
| L28Y | 21 | 70 | 18 | 60 | 50 | 63 |
| L29Y | 19 | 63 | 19 | 63 | 24 | 30 |
| L30Y | 13 | 43 | 10 | 33 | 36 | 45 |
| | | | | | | |
| **8Y AVE** | | **59** | | **58** | | **54** |

Furthermore, Table 6.9 displayed Grade 8Y Technology scores that learners obtained in their class Test 1, Test 2 and November examinations. The comparison of the two tests show consistency regarding general performance of the whole class as the averages for Test 1 and Test 2 were 59% and 58% respectively. The average score for the November examinations, however, decreased to 54%.

Table 6.10 Comparison of 8X & 8Y Test 1

| GR 8Y SCORES | | | GR 8X SCORES | | |
|---|---|---|---|---|---|
| LEARNER NUMBER | CLASSTEST 1 MECHANISMS | % TEST1 | LEARNER NUMBER | CLASS TEST 1 MECHANISMS | % TEST 1 |
| MARK | 30 | 100 | MARKS | 30 | 100 |
| L1Y | 19 | 63 | L1X | 14 | 47 |
| L2Y | 18 | 60 | L2X | 26 | 87 |
| L3Y | 26 | 87 | L3X | 20 | 67 |
| L4Y | 13 | 43 | L4X | 13 | 43 |
| L5Y | 16 | 53 | L5X | 11 | 37 |
| L6X | 24 | 80 | L6X | 14 | 47 |
| L7Y | 27 | 90 | L7X | 18 | 60 |
| L8Y | 9 | 30 | L8X | 27 | 90 |
| L9Y | 14 | 47 | L9X | 19 | 63 |
| L10Y | 15 | 50 | L10X | 16 | 53 |
| L11Y | 9 | 30 | L11X | 12 | 40 |

| | | | | | |
|---|---|---|---|---|---|
| L12Y | 12 | 40 | L12X | 17 | 57 |
| L13Y | 14 | 47 | L13X | 16 | 53 |
| L14Y | 12 | 40 | L14X | 15 | 50 |
| L15Y | 19 | 63 | L15X | 27 | 90 |
| L16Y | 25 | 83 | L16X | 15 | 50 |
| L17Y | 16 | 53 | L17X | 14 | 47 |
| L18Y | 13 | 43 | L18X | 28 | 93 |
| L19Y | 10 | 33 | L19X | 19 | 63 |
| L20Y | 17 | 57 | L20X | 21 | 70 |
| L21Y | 29 | 97 | L21X | 21 | 70 |
| L22Y | 21 | 70 | L22X | 24 | 80 |
| L23Y | 15 | 50 | L23X | 16 | 53 |
| L24Y | 21 | 70 | L24X | 25 | 83 |
| L25Y | 12 | 40 | L25X | 17 | 57 |
| L26Y | 18 | 60 | L26X | 12 | 40 |
| L27Y | 30 | 100 | L27X | 25 | 83 |
| L28Y | 21 | 70 | L28X | 13 | 43 |
| L29Y | 19 | 63 | L29X | 20 | 67 |
| L30Y | 13 | 43 | L30X | 29 | 97 |
| **8Y AVE** | | **59** | **8X AVE** | | **63** |

The data in Table 6.10 displayed a comparison of Technology Test 1 for Grades 8Y and 8X, whereby Grade 8X had produced a higher class average (63%), whereas Grade 8Y had a class average of 59% that is lower by 4%. Therefore, Grade 8X had proven to have performed a little better than Grade 8Y in this test.

Table 6.11 Comparison of 8X & 8Y Test 2

| GR 8Y SCORES | | | GR 8X SCORES | | |
|---|---|---|---|---|---|
| LEARNER NUMBER | T 2 MECHANISMS | % TEST 2 | LEARNER NUMBER | TEST 2 MECHANISMS | % TEST 2 |
| MARK | 30 | 100 | MARKS | 30 | 100 |
| L1Y | 15 | 50 | L1X | 6 | 20 |
| L2Y | 20 | 67 | L2X | 18 | 60 |
| L3Y | 23 | 77 | L3X | 21 | 70 |

| | | | | | |
|---|---|---|---|---|---|
| L4Y | 17 | 57 | L4X | 18 | 60 |
| L5Y | 18 | 60 | L5X | 12 | 40 |
| L6X | 16 | 53 | L6X | 7 | 23 |
| L7Y | 23 | 77 | L7X | 16 | 53 |
| L8Y | 20 | 67 | L8X | 20 | 67 |
| L9Y | 19 | 63 | L9X | 7 | 23 |
| L10Y | 19 | 63 | L10X | 8 | 27 |
| L11Y | 20 | 67 | L11X | 7 | 23 |
| L12Y | 9 | 30 | L12X | 17 | 57 |
| L13Y | 21 | 70 | L13X | 12 | 40 |
| L14Y | 16 | 53 | L14X | 24 | 80 |
| L15Y | 19 | 63 | L15X | 23 | 77 |
| L16Y | 19 | 63 | L16X | 17 | 57 |
| L17Y | 11 | 37 | L17X | 11 | 37 |
| L18Y | 14 | 47 | L18X | 19 | 63 |
| L19Y | 15 | 50 | L19X | 11 | 37 |
| L20Y | 10 | 33 | L20X | 9 | 30 |
| L21Y | 21 | 70 | L21X | 20 | 67 |
| L22Y | 20 | 67 | L22X | 20 | 67 |
| L23Y | 20 | 67 | L23X | 10 | 33 |
| L24Y | 16 | 53 | L24X | 19 | 63 |
| L25Y | 13 | 43 | L25X | 14 | 47 |
| L26Y | 14 | 47 | L26X | 15 | 50 |
| L27Y | 30 | 100 | L27X | 30 | 100 |
| L28Y | 18 | 60 | L28X | 7 | 23 |
| L29Y | 19 | 63 | L29X | 20 | 67 |
| L30Y | 10 | 33 | L30X | 24 | 80 |
| **8Y AVE** | | **58** | **8X AVE** | | **51** |

Table 6.11 shows a comparison of Technology Test 2 results for both Grades 8Y and 8X respectively. In this second test Grade 8Y maintained their average range although their score went down by 1% to 58%. In the case of Grade 8X, the class average went down by 12%, obtaining an average score of 51%. These results showed that Grade 8X did not apply themselves as they did with the first test.

Table 6.12 Comparison of 8X & 8Y Exam 1

| GR 8Y EXAM SCORES | | | GR 8X EXAM SCORES | | |
|---|---|---|---|---|---|
| LEARNER NUMBER | NOVEMBER EXAMINATIONS | % NOVEMBER EXAMINATIONS | LEARNER NUMBER | NOVEMBER EXAMINATION | % NOVEMBER EXAMINATION |
| MARK | 80 | 100 | MARKS | 80 | 100 |
| L1Y | 28 | 35 | L1X | 20 | 25 |
| L2Y | 53 | 66 | L2X | 41 | 51 |
| L3Y | 48 | 60 | L3X | 43 | 54 |
| L4Y | 50 | 63 | L4X | 37 | 46 |
| L5Y | 45 | 56 | L5X | 27 | 34 |
| L6X | 43 | 54 | L6X | 48 | 60 |
| L7Y | 70 | 88 | L7X | 45 | 56 |
| L8Y | 29 | 36 | L8X | 60 | 75 |
| L9Y | 37 | 46 | L9X | 35 | 44 |
| L10Y | 47 | 59 | L10X | 15 | 19 |
| L11Y | 35 | 44 | L11X | 14 | 18 |
| L12Y | 37 | 46 | L12X | 38 | 48 |
| L13Y | 47 | 59 | L13X | 36 | 45 |
| L14Y | 44 | 55 | L14X | 42 | 53 |
| L15Y | 58 | 73 | L15X | 64 | 80 |
| L16Y | 63 | 79 | L16X | 48 | 60 |
| L17Y | 56 | 70 | L17X | 65 | 81 |
| L18Y | 17 | 21 | L18X | 67 | 84 |
| L19Y | 36 | 45 | L19X | 52 | 65 |
| L20Y | 24 | 30 | L20X | 36 | 45 |
| L21Y | 48 | 60 | L21X | 64 | 80 |
| L22Y | 51 | 64 | L22X | 34 | 43 |
| L23Y | 48 | 60 | L23X | 29 | 36 |
| L24Y | 45 | 56 | L24X | 51 | 64 |
| L25Y | 24 | 30 | L25X | 50 | 63 |

| | | | | | |
|---|---|---|---|---|---|
| L26Y | 24 | 30 | L26X | 44 | 55 |
| L27Y | 72 | 90 | L27X | 64 | 80 |
| L28Y | 50 | 63 | L28X | 32 | 40 |
| L29Y | 24 | 30 | L29X | 66 | 83 |
| L30Y | 36 | 45 | L30X | 76 | 95 |
| **8Y AVE** | | **54** | **8X AVE** | | **56** |

Table 6.12 displayed a comparison of the November examinations scores for both Grades 8Y and 8X. The averages of both classes are at close range even though Grade 8X obtained 56%, which is higher by 2% compared to 54% of Grade 8Y. Therefore, it could be asserted that both classes had retained the learned material equally.

## 6.4. Conclusion

In this chapter the researcher presented and analysed the first set of data that was captured on video recordings of STAD lessons proceedings in the Technology classroom. The focus was on the teacher's delivery of content and presentation of the lessons. This data looked into three fundamental aspects of the lesson according to him as the researcher and experienced technology educator. The first element was lesson planning that ensured that tuition time was used appropriately in the Technology classroom. Secondly, time management was another aspect that the teacher looked into as it allowed him to distribute various components of the lesson evenly through the period of a technology lesson. Lastly, class control and discipline were other elements that the teacher inquired on to assist him to have order and promote effective teaching and learning during Technology classes where STAD was implemented.

The second set of video recorded data focussed on group processes and facilitation to enable the teacher to inspect if groups were truly engaged in discussion that were based on the task at hand. The data was collected in relation to the facilitation role that he played during the group discussions or activities. The data was also related to interactions within the groups and how they communicated amongst themselves and the levels of noise during the group activities. This data was also valuable to help him identify the manner in which disruptive behaviours developed so that he could formulate mechanisms to remedy the situations and enhance the productivity of groups.

In the third data set that emanated from group interviews that the researcher had with most of the STAD groups, he aspired to understand the learners' interpretations of working in STAD teams. As he had stated earlier in the chapter that these groups were interviewed based on their availability during the course of several weeks, there were no special requirements. Instead he anticipated to have interviewed all the groups. During the interviews learners raised different effects of STAD that were important to them, such as building friendships, getting help and giving assistance to others, equal opportunities to learn that were created by working in cooperative learning groups, to cite few of them.

The fourth set of data was compiled from observation schedules that were completed by the researcher's teacher colleagues, who were invited to observe STAD lessons based only on their availability and interest. These observers also raised various points, such as respectful interactions within the groups; constructive arguments during discussions to get to the correct answers on the worksheets, sharing of knowledge and resources and teamwork were evident.

The fifth array of data that emanated from the observation schedules that peer observers filled in during their visits in the researcher's (teacher's) class where he employed STAD as a teaching technique, focused on my praxis as a researcher. Various observers alluded to several positive aspects, such as well-structured lessons, clear baseline assessment and instructions and the use of correct terminology and different resources during the lessons, just to mention few.

The sixth collection of data was from the class tests scores that learners wrote during Technology STAD lessons. These scores assisted the researcher to analyse the effects of STAD on academic achievement of individual learners as well as groups' performances.

Lastly, the seventh set of data was gathered from the end of year examinations results of learners. The researcher also analysed the individual and group achievements to conclude on the effects of STAD on learners’ retention of content in Technology.

In the next chapter the researcher will stipulate the findings of this study according to the analysis that was done in this section of the study.

# CHAPTER 7

# DISCUSSION OF FINDINGS AND RECOMMENDATIONS

## 7.1. Introduction

In the previous chapter the researcher detailed the presentation of data that was obtained using various instruments. The first set of data emerged from the **reflective journal** (Data – RJT), the second data was obtained from the **video recordings** on STAD groups interactions (Data – VL), the third set of data was gathered from **peer observations** on STAD groups interactions (Data – POL), the fourth set of data was collected during STAD **group interviews** (Data – GIL), the fifth set of data was gathered from **observations by teacher colleagues** on the researcher (Data – POT)a and the sixth and the last set of data was obtained from the **Technology tests and examinations scores** (Data – TSL).

This chapter will elaborated on the findings of this study regarding the learners' academic performances, retention of content and various themes that emanated from group interactions, observations, group interviews, teacher presentation observations and the reflective journal.

## 7.2. Findings from data – RJT

In this section the researcher reported on the findings that he had discovered in the reflective journal recordings, which were directed at collecting data on his lesson presentations during the use of STAD in the Grade 8 Technology classes. In the above mentioned data there were three main themes, namely: class presentations, time management and class control and discipline.

### 7.2.1. Class presentations

Under this theme the researcher experienced that for STAD lessons to run accordingly in Technology classes, he had to be fully prepared for every lesson. Being prepared allowed the researcher as teacher to present the content sequentially from learners' prior knowledge and building up to the new material that was introduced.

The researcher's confidence during the presentations was intact, because he knew what he was talking about and was able to project his voice through the class with clear explanations. He also responded to learners' questions with buoyancy, giving relevant authentic examples of the work the learners were doing.

The researcher could detect if learners did not comprehend the work by formulating appropriate probes that enabled him to remedy the situations. Thus, going over the same work with learners to cultivate understanding using simpler methods did not become a hassle. The researcher was therefore also proficient in making use of the whole class to help those learners who could not comprehend the work we were doing.

In addition, proper planning contributed positively to the researcher using lesson time wisely and effectively, as he had time to interact with various groups while others were working on the task at hand. He could therefore get to know the status of each group and learner regarding their comprehension of the content and challenges pertaining to group processing interactions. The ability to attend to learners at group levels made it easier for him to confront unique group adversities without interference of other teams. This opportunity further enabled him to reach learners at their various levels of understanding and was also able to encourage the groups to keep focus on the task at hand to improve the productivity and effectiveness of their teams (cf. 6.2.1; 6.2.1.2.2; 6.2.1.3.2).

Benefits were not only for learners as teachers also gained from implementing cooperative learning methods in their classrooms. Lesson planning was highlighted as one of the noticeable improvements that occurred, secondly there was time to observe how learners interacted and had an opportunity to assist individual groups, which in turn enabled the teacher to attend to each learner in the classroom. The educator learnt to also receive insight from learners and guided their understanding toward the content at hand in the correct context (Murdoch & Wilson, 2008: 7).

The researcher was skilled in preparing content that was enough for learners to absorb and comprehend in a short period of time (cf.3.8.).

### 7.2.2. Time management

Within this theme the researcher realized that every minute of a lesson needed to be budgeted for during lesson planning. The knowledge of how time was going to be spent in the Technology STAD classes had a positive impact on the researcher’s confidence, as every activity was planned and scheduled appropriately.

The ability to allocate time evenly across the lesson period also gave the researcher the opportunity to interact with all the groups. The researcher’s presence and availability to assist groups, motivated learners to use their team discussions to the best of their ability, knowing that should there be a problem he was at their reach to assist.

STAD groups became more productive and effective in terms of work completion and understanding of the taught material. Another aspect that the researcher discovered was that more teaching time used to be wasted during the period when learners had to cut and paste their notes and worksheets into their workbooks. The implementation of STAD in Technology classes enlightened me to guillotine the worksheets or notes beforehand to minimise wastage of lesson time as pasting could be done quickly. There was now no need for the teacher to assign a learner going around with a box collecting off-cuts from different tables while a classroom remained neat as well for the day.

Thus putting more effort on preparation for lessons helped use teaching time effectively.

### 7.2.3. Class control and discipline

Thorough preparation for Technology STAD lessons taught the researcher to identify pitfalls that might hinder the effectiveness of the STAD teams. It therefore came to the researcher’s realisation that learners had to be made aware of value for time; to enhance their deportment in between classes. The researcher established that learners enjoyed extending outside classroom time using various tactics, such as strolling and chatting. If they were not acquainted by the teacher to rush to the next class at the end of the lesson, they would take close to one third of a period’s time.

The researcher therefore learned to be conscious of control and disciplinary measures at all times to avoid unruly situations in a classroom. Thus the researcher had to instil the behaviour expected from learners in class before going into the classroom. He also ascertained that his movements during the lesson from group to group maintained order and focus among the team members.

The researcher further learned that preparing for a lesson did not only focus on the content, but covered all essential aspects of classroom administration.

## **7.3.** Findings from data **– VL**

Video recordings of learners during their group discussions were also analysed in the previous chapter of this study. The researcher stipulated the findings thereof by classifying them under their respective themes.

### 7.3.1. Group processing

Firstly, it came to the researcher’s understanding that cooperative learning groups required sufficient time for training learners to work interdependently within their groups. The researcher realised this need, because after seven weeks of preparing learners for cooperative group learning, some groups were still going through the stages of forming, rejecting some of their members. Although they were only in a STAD team for three weeks, he believed that the four weeks of preparation, while they were still in their friendship groups would have helped learners to be familiar with STAD. The researcher learned that once the group members were new to the team, they needed to be taught again on how to work cooperatively in their new groups. This was because they considered themselves as strangers in the STAD teams.

Once the groups began to be functional and cooperative, learners engaged in discussions and used proper levels of voices. As the time progressed through the lesson, voices escalated unaware due to enjoyment, but his reminder to use appropriate voice levels helped them to improve their communication within the groups.

As the researcher has stated earlier in this section, some teams were still struggling to work together. He went to these groups and heard their concerns and assisted them to start working as a team, assuring them he was always accessible to help should there be any point for concern.

It was therefore necessary that the researcher was there for various groups to help and remind them the purpose of being in STAD teams. After these short consultations with the teams, interactions and communication improved, enhancing the productivity and effectiveness of the group.

If the researcher could, however, compare the two Technology STAD classes based on cultural dominance, Class X was mainly dominated by learners with an Afrikaans and English cultural background. This class took a much longer period of time before he could see positive interdependence among the members of STAD groups. Whereas, Class Y, which had prominent membership of different African cultural background, displayed quicker positive interactions within their STAD teams as did the Class X.

#### 7.3.1.1. Team work

Team work was evident after learners had developed trust amongst themselves in their STAD groups. This was demonstrated by their freedom to choose members to play various roles and the ability to support one another during their team presentations.

Groups showed positive interdependence during their team discussions, which contributed to smooth running of group processes. Apart from intra-group team work, learners began to feel free to seek help from other groups if they were not certain about the outcomes of their group's work. This behaviour improved workmanship among learners as they realised that asking for assistance was a wise gesture and not demoralising. The learners became free, comfortable with one another and felt safe within their groups.

Maslow's theory of needs stated that when physiological needs are met, then another set of needs develop. These were safety needs. These needs would include shelter, good health, justice, fairness and consistency as basics that a child sought to experience on daily basis. Other safety needs depended on family the set-up, such as divorce, dysfunctional families, death and assault that took place in the home (Maslow, 1943: 4; Martin & Joomis, 2007: 72; Idemobi, 2011: 169)

#### 7.3.1.2. Attitudes of learners

Various groups also showed self-determination when doing presentations on the whiteboard in a certain way. Even if their work had some mistakes or was incorrect, they did not give up, but persisted in completing and presenting before the whole class. This behaviour improved excitement toward presenting and encouraged other groups to explain their workout with confidence. The class also did corrections showing the whole class and the group that presented where the workout had gone wrong, and the steps to rectify the incorrect answer.

Research indicated that self-determined learners would experience a sense of freedom and interest in working with others towards attaining group goals in a classroom where STAD was employed. The self-determination theory also suggested that people were actively involved towards their growth and development by interacting with their environment (Gillard, 2007: 1; Van den Broeck, Vansteenkiste and De Witte, 2008: 1).

The researcher could, therefore claim that a positive attitude was evident from learners due to the enthusiasm shown by groups to showcase their workout to the whole class.

#### 7.3.1.3. Social skills

Regarding social skills the researcher discovered that in the early stages of implementing STAD in the Technology classroom, some learners displayed behaviours that disrupted group processes. Some of the learners were not satisfied with the people they were within their teams.

In addition the social interdependence theory stated that there are three psychological processes resulting from interdependence. Namely, substitutability is regarded as the degree to which actions of one person are substituted for the actions of another individual. Secondly, Inducibility is considered as the openness to being influenced and to influencing others. Lastly, cathexis is regarded as an investment of psychological energy in objects outside oneself, such as teammates, friends, family and colleagues at work (Johnson, 2003: 935; Johnson & Johnson, 2005: 290; Johnson, Johnson & Smith, 2007: 17).

As time, however, matured learners began to recognise the value of each member of a group after the researcher had intervened and explained the expected working circumstances within STAD teams. Therefore, it was evident that the above psychological processes had to take place before the groups could function effectively.

Later on during STAD lessons, learners began to communicate productively in their various teams. They built trust amongst themselves and therefore it was easier for them to seek assistance from other members and contribute to the discussions. Learners had shown development of skills to talk with respect within their groups, sharing of knowledge and resources and support to one another was also evident.

These characteristics contributed toward positive interdependence during group processing stages.

On the contrary, the researcher realised that in groups where positive interdependence was lacking, some learners resorted to disruptive behaviours due to lack of understanding the content that groups were busy with. The learners felt left-out as they could not do any work other than disturbing other team members as an indication to seek assistance.

The social interdependent theory further indicated that positive interdependence brings about promotive interaction, whereas negative interdependence produces oppositional or contrient interaction as indicated in the previous paragraph, whilst no interdependence results in the absence of interaction (Johnson & Johnson, 2005: 292; Johnson, Johnson & Smith, 2007: 17).

## 7.4. Findings from data – GIL

In this section the researcher will explicate on the findings of the data obtained from STAD groups' interviews. The data collected aimed at understanding learners' experiences of the Technology STAD lessons from their own interpretations of the phenomena.

### 7.4.1. Group processing

From learners' experiences it was revealed that leadership skills were some of the outcomes that emanated from the implementation of STAD in Technology classes. The learners pin-pointed the roles played by their group leaders toward the success of their groups. Thus, good and strong leadership within the groups motivated other members to actively and confidently participate in team discussions.

The researcher believes that for a learner in STAD groups to develop and implement their leadership skills within the group set-up could be influenced by improved self-esteem as one of the cooperative learning outcomes. Self-esteem is an essential psychological outcome of cooperative learning methods, in which students find themselves as valuable and important individuals. These beliefs are critical for learners to develop abilities to withstand disappointments, to be confident in making decisions and eventually becoming productive (Lazarowitz and Kersenty, 1990: 145; Slavin, 1990: 43).

#### 7.4.1.1. Social skills

The above effect also suggested that learners were able to accept to be led by others and gave them the necessary respect. Therefore, learners managed to develop cooperative skills that allowed them to work well with other members. The use of STAD in Technology classes facilitated teams to build working relationships and friendships as results thereof. They also built trust amongst themselves and valued each other's contributions. As a result, groups improved cohesion and positive interdependence among the members of the teams (cf. 3.5.2.9.).

Social and academic support became essential attributes within the teams due to increased trust and a feeling of safety among the other group members. Therefore, they learned to give and receive support to augment each other's self-esteem, self-confidence and self-determination toward contributing positively to enhance the performance of their groups (cf. 3.5.2.1.).

#### 7.4.1.2. Other skills

Conflict is one of the situations that cannot be avoided easily when working with other people. The reason being that people are different as individuals regarding our values, priorities, choices they embrace in their lives and unique personalities.

Johnson and Johnson (1990: 32) contend that placing socially unskilled students in a learning group and telling them to cooperate, would obviously not be successful. Learners should be taught the interpersonal and small-group skills needed for high quality cooperation and be motivated to use them. These skills include building of trust among team members, appropriate decision making as a team, good communication ethics that show respect to others and managing of arising conflicts in a constructive and supportive manner (Smith, Sheppard, Johnson & Johnson, 2005: 95).

Therefore learners had indicated that conflict resolution was one of the skills that they learned during the implementation of STAD in Technology classes. They further indicated that they identified the causes of conflicts and began to address them or avoid situations that were more vulnerable to development of unnecessary misunderstandings. Thus learners developed their own mechanisms and strategies to solve problems that distracted their group's progress.

The establishment of good communication methods was one of the strategies learners employed to curtail hindrances to achieving their intended group goals. Therefore, learners also acquired skills to communicate well with respect as an outcome of working in STAD teams. As a result, listening skills as an essential aspect of communication were enhanced, because learners had to hear and digest the viewpoints raised by other members in order to reach a common conclusion of their discussion.

Thinking became an important feature of STAD groups' discussions and was a necessary skill to be developed. Therefore, learners began to incline their thought patterns to become more productive as they had to contribute valuable inputs in the teams' discussions. They then had to train their minds to synthesise suggestions and ideas before saying them to the whole group, and as a result critical thinking among learners was improved as well (cf. 3.5.2.6.).

Learners further stated that they learned to consider time constraints during their group work. They realised that by using their time effectively resulted in obtaining the set group goals, such as completing their work, improving group's and individual performances as well as producing work of high quality (cf. 3.5.2.8.).

Lastly, members of STAD teams asserted that the implementation of STAD in Technology prepared them for future workplaces as they obtained skills to work well with other people in a professional manner.

#### 7.4.1.3. Equal opportunities

Emanating from the group interviews, learners raised the aspect that STAD provided equal opportunities to learning as each member was given a chance to contribute toward the group's outcomes. These equal opportunities to learning cultivated and enhanced the quality of work produced by good teamwork.

As learners interacted, the productivity of their groups also increased due to improved focus on the task at hand. Therefore, enhanced focus eventually led to the learners' acquisition of knowledge rising, thereby improving the performance of members in their class tests.

#### 7.4.1.4. Benefits through sharing

Sharing was another advantage that learners posited to have improved from working in STAD teams. They indicated that more insight in the content could easily be obtained because there were more views put on the table during discussions and also members raised various angles to approaching the tasks. Therefore, brainstorming became an uncomplicated exercise, other than the trouble of an individual trying to come up with different ideas. Because of varied opinions, learners further developed the ability to work with open-minds that enabled them to compromise to more suitable suggestions on the table during discussions.

In sharing members of STAD groups indicated that they learned to accommodate each other by using strengths of members appropriately. They further attested that STAD helped to nurture their self-control toward distractive behaviours and managed to confront challenges in a dignified manner. Members of STAD groups said that their self-confidence had been boosted by words of encouragement by other team mates.

Cooperative learning again promotes positive social relations among classmates through peer interaction and mutual assistance in small groups. It gives expression to the motivating effect of working together with others toward a common goal free from competition and it cultivates learners' sense of acceptance on an equal stance with group members. It is therefore important to create a social context that nourishes the willingness to engage in the endeavour to develop and sustain mutually shared knowledge (Sharan & Shaulov, 1990: 174; Van den Bossche, 2006: 493).

Learners mentioned to have learned values, such as more effort produced good quality work, constructive criticism built the team and reflected respect among members and lastly, remaining positive at all times motivated group's performance.

In addition, STAD groups alluded to having had a pleasant experience working in STAD teams mainly because the teacher was available to give assistance academically and behaviourally during Technology lessons.

#### 7.4.1.5. Challenges faced by learners

In this section, learners indicated few challenges that were dominant in the early stages of using STAD in the Grade 8 Technology classes. Internal distractions that emanated from members who would ask irrelevant questions that were off the track came up with more emphasis. On the one side, external disturbances occurred if members of other groups began to ask for assistance, thereby hampering the group's progress. Other hindrances that learners mentioned were: lack of focus by members and the raising of uninformed inputs and perspectives that side-tracked the group's discussion.

Some groups stated to have experienced segregation caused by members who isolated themselves from the team, or those who were rejected by the group, because they did not bring in their part. Thus, groups became individuals working independently and other members grew to be free-riders solely depending on other members. These unsolicited conducts led to other groups being dysfunctional and the researcher had to intervene to remedy the situations (cf. 3.9.).

Some of the challenges included weak leadership skills and extra-curricular commitments by members of the STAD groups. In the beginning of STAD lessons, group leaders did not clearly understand their roles of guiding and facilitating the discussions within their respective teams, even though the researcher had explained it before. He therefore had to go over the explanation on several occasions until all group leaders comprehended their function in the groups. The last challenge that affected the STAD teams was extra-curricular activities that kept group members out of class for some days. This situation left other groups without leaders or academically able members. The struggle was more on updating those members who were away for some time.

## 7.5. Findings from data – POL

This data was collected from the researcher's teacher colleagues who were observing the STAD lessons in Technology. The researcher had issued them observation schedules that assisted them to identify the significant aspects of the lessons during their respective class visits. Data – POL were intended to capture the views of different observers regarding STAD group work in the Grade 8 Technology classes.

### 7.5.1. Behaviour in STAD groups

Observers mentioned that there were some minor incidents where learners in STAD teams would derail from the task at hand. Most of the lesson period learners were, however, said to have displayed high levels of focus on the work and motivated as well.

Observers indicated that noise levels within the groups and the whole class were tolerable since the teams used normal voice tones. The researcher believed the noise levels were under control, because learners in STAD groups did not talk all at once, but gave each member an opportunity to express his viewpoint, while others listened. After group members had heard another member's suggestion, they would then take turns to argue their inputs in a constructive manner. Finally learners were referred to as giving others assistance and receiving support from other members for the purpose of achieving group goals.

### 7.5.2. Teamwork in STAD groups

The observations by peer teachers had revealed that learners seemed to have worked in unity, sharing their knowledge and resources in an orderly fashion. Those group members who did not understand the work were assisted in a respectable manner by those that comprehended the material. Therefore, members of the STAD groups showed the observers academic and social support that existed within their teams.

### 7.5.3. Time management

The remarks made by some observers revealed that the Technology lessons, where STAD was implemented, were well structured. Thus, there was enough time for the teacher to introduce the topic and explain the concepts and still provided ample time for learners in STAD teams to do their worksheets. Therefore, time was used effectively during the STAD lessons in Technology (cf. 6.2.1.).

### 7.5.4. Group processes

The observers noted cooperative interactions and highly motivated discussions among the team members. All members of STAD teams were involved in the processes of contributing toward the expected group goals. Furthermore, observers had stated that members of STAD groups were sharing their resources while transferring knowledge to one another. The group members further ensured that each member was accountable by writing the work in his workbook.

In addition, the observers indicated that the leadership role was evident within the STAD teams, as leaders were encouraging their team members to work harder and focus on the task at hand.

## 7.6. Findings from data – POT

This data emanated from observations that were done by peer teachers on the researcher's praxis or classroom administration and content delivery during lesson presentations.

### 7.6.1. Method of teaching

Observations had revealed that the researcher mostly used the question and answer method to stimulate learner involvement, and little bit of the lecture method for delivery of the content and explanation of concepts. The observers indicated that question and answer method engaged learners, because they became active and participated by means of responding to probes and asking for clarity. The researcher believes that the question and answer method stimulated the learners to be ready to participate actively within their STAD teams.

After the researcher had explained the concepts and clarified instructions, observers noted that he was intermingling with individual groups, assessing their state of cooperation and comprehension of the work.

They indicated that his response to learners' questions were steering learners to think and discover answers by themselves. Secondly, where necessary the researcher would expound on the topic showing them the broader perspective of the Technology concepts we were addressing.

During group discussions, teams were at liberty and had their independency where leaders facilitated proceedings and allowing all members to raise their contributions. Some observers also indicated that some team leaders were supporting members that were struggling to understand the work and displayed equal treatment of members during the discussions.

### 7.6.2. Knowledge of the subject matter

Under this section, the observers had shown that the researcher was presenting the content with ease and gave authentic and relevant examples to ensure that learners understood the work. The use of correct technological terminology was highlighted as an important aspect that indicated the researcher's high levels of knowledge regarding Technology content.

They further indicated that the researcher began the Technology lessons with base-line assessment to gauge the status of understanding and prior knowledge of learners. If the need arose, it was an undemanding exercise for him to recapitulate and build gradually upon what learners already knew, by employing various techniques to elucidate the material to learners. Techniques, such as illustrating sketches or drawings, point-form summary of the content and redirecting the clarity seeking questions to other members of the class were used during STAD lessons.

Lastly, due to thorough preparation for Technology lessons, observers stated to have seen the researcher using a variety of resources when presenting lessons and giving clear instructions that were easily followed by learners.

### 7.6.3. Classroom management

The observers had mentioned a disciplined routine that was displayed by learners when they came to Technology classroom. They indicated that learners lined-up at the door where the teacher was waiting for them to curb extended disruptions. The orderly entrance of the learners resulted in learners being quick to settle down for the lesson to commence on time. Other classroom management techniques that were mentioned were researcher's visibility among the STAD groups through the lesson and ensuring that groups were swamped in their work. Lastly, the atmosphere in the classroom was said to be tension-free as learners worked well and orderly in a relaxed mode within their teams.

## **7.7.** Findings from data **–** TSL

This data were gathered from the two class tests that learners wrote during the implementation of STAD in Grade 8 Technology classes and the November examinations that learners wrote at the end of the academic year. The data aimed at discovering the effects of STAD on learners' academic achievement and on learners' retention of the material taught during the use of STAD.

The comparison of learners Technology Test 1 and Test 2 scores for Grade 8X had shown a significant decline by 12% on the class average scores, from 63% to a 51% average in the second test. Grade 8Y scores for Test 1 and Test 2 did not indicate a noticeable decline or increase pertaining to class averages in both tests, because the class averages were 59% and 58% respectively.

Grade 8X produced higher class average scores of 63% for Test 1 compared to the class average of 59% obtained by Grade 8Y. These scores have shown minor difference in terms of academic performance between the two classes. In the second test, Grade 8Y appeared to have maintained the same level of performance by obtaining 58%, while Grade 8X got a lesser class average by 7% showing a significant difference between the two classes.

Both classes had obtained approximately equal class averages for the November examinations, indicating that the level of retaining the content that was taught ranged equally in both classes.

## 7.8. Triangulating various data sets

Under this section of the discussion of findings, the researcher has triangulated related data that was collected by means of using different instruments. The purpose is to explore any similarities and contrasts that may have arose.

Firstly the researcher compared data findings from his reflective journal and the observations by teacher peers regarding the classroom practices (praxis) of himself as the researcher.

### 7.8.1. Theme: Class presentations by the researcher

Under this theme both sets of data, Data-RJT and Data-POT had revealed that the researcher used the question and answer method to stimulate learner participation during lesson presentations. Learners were also free to ask for clarity of the concept they could not clearly understand. The two data sets also concurred, that thorough preparation for Technology lessons enabled the researcher to expand on learners' probes and guide them toward discovering correct answers by themselves.

Data- POT further indicated that the classroom atmosphere was free-spirited, allowing learners to interact with comfort. Data-RJT stressed the ability of the researcher (teacher) to move around addressing and attending to various groups as a tool that inspired productive interactions within the different groups.

Lastly, both collections of data agreed that the researcher and the learners benefitted from the use of STAD in Technology classes. Thus, the teacher learned to prepare comprehensively for lessons and distributed the work fairly throughout the lessons to ensure learners were busy for the whole period. Thorough preparation helped the researcher to detect any hiccups pertaining to learners understanding of the work during the base-line assessment and was able to employ various resources for teaching and explaining concepts.

### 7.8.2. Theme: Classroom management

Within this theme, the two sets of data indicated that learners were trained in a routine that assisted smooth running of lessons with minimal disruptions. It was not often that the researcher had to reprimand learners due to misbehaviour because precautionary measures that were put in place.

### 7.8.3. Theme: Time management

The two sets of data acquiesced that comprehensive planning and preparation for Technology lessons played a significant role regarding appropriate and effective use of teaching and learning time. Therefore, work was evenly distributed across the lesson period.

In the next section of this chapter, the researcher has triangulated themes that emerged from data on STAD team's interactions. The following data sets were triangulated; Data-VL, Data-GIL and Data-POL for the purpose of evaluating the agreements and peculiarities among them.

### 7.8.4. Theme: Group processing

Under this theme the three sets of data indicated that the role of leadership was evident as they took over the facilitation of interactions within their respective teams. Data-VL had stated that effectiveness of the teams began after the researcher intervened and reminded the teams of the purpose of using STAD as a learning technique.

These compendiums of data assured that positive interdependence was also evident as STAD teams showed constructive interactions. Since learners had begun to build trust among them, they felt safe and free to participate in their group discussions. Their unity improved the sharing of knowledge and resources for the attainment of group goals.

### 7.8.5. Theme: Social skills

Findings from these sets of data further proved that the learners developed skills to communicate with respect during group discussions, giving each member a chance to state his inputs. The members of various teams began to value each other's opinions and accepted the leadership of other learners in their groups. Moreover, academic support within the STAD groups was also evident as a professional relationship increased.

Learners also seemed to have had acquired other skills, such as conflict resolution skills, critical thinking skills, professional or working relationship skills and abilities to manage their time effectively as groups and as individuals.

In the next section the researcher has formulated recommendations for the implementation of STAD in Technology classroom.

## 7.9. Recommendations

Under this part of the study the researcher has outlined recommendations regarding the coaching and mentoring of Technology teachers in other cooperative learning methods including STAD. I further contended on the implementation of STAD in Technology classes.

### 7.9.1. Recommendations for Technology teachers training

The following recommendations are made for Technology teachers to employ STAD as a cooperative learning strategy in teaching the subject:

- Firstly, Curriculum and Assessment Policy Statement for Technology subject recommended that learners should be taught collaborative ways of learning to improve critical thinking and team playing skills (DBE, 2011: 8).
- Mr Magwena Maluleke, the South African Democratic Teachers Union in his defence for poor Grade 12 results for the year 2014, however, stated that blame should not be on teachers but on the Department of Basic Education. He was attesting that teachers were not given training regarding the

requirements of the new National Curriculum Statement Grades R-12 (SABS Morning Live, 05/01/2015).

- Drawing from the above assertions, the researcher could then argue that Senior Phase Technology teachers also have not received the necessary training regarding the requirements of Curriculum and Assessment Policy Statement for Technology.
- The Department of Basic Education needs to run seminars and workshops that would coach Technology teachers in cooperative learning methods of teaching and learning techniques for the purpose of addressing this prerequisite.
- The DBE could outsource independent entities or professionals that specialise in the cooperative learning approach for the administration of these seminars and workshops. Moreover, the researcher believes that these training sessions should not be a once off event, but continuous and there are various methods of cooperative learning that Technology teachers would need to be enlightened of.
- The reason for acquiring professional training in the cooperative learning teaching approach is for Technology teachers to be able to educate their learners on the use of cooperative learning methods, such STAD. This cooperative learning tutoring could begin with training teachers to implement STAD, as literature has stated that it is the simplest of all the cooperative learning methods.
- In order to perpetuate this training in the future, the Department of Basic Education and other stakeholders in the South African school curriculum could initiate a Technology teachers' mentoring programme within various districts. This exercise could be employed after the present teachers have been well trained in cooperative learning and are competent to assist one another and new incoming Technology teachers.
- The researcher further suggest the implementation of STAD and other cooperative learning methods for a whole-school program to build consistency among the learners and teachers, to avoid situations where teachers would assign learners unguided and unmonitored group tasks. This is a cause for

concern, because it demotivates learners toward working in groups, untrained to deal with group dynamics.

### 7.9.2. Recommendations for implementing STAD in the classroom

The following recommendations are made as to how STAD as a cooperative learning strategy can be implemented the classroom:

- After Technology teachers have acquired training on STAD and other cooperative learning methods, they should then give learners proper training on working in cooperative learning groups.
- As stated in previous chapters, cooperation does not just take place in any group setting. It is therefore necessary to teach learners the principles and the essential elements of cooperative learning and show them how to conduct cooperative group interactions.
- Secondly, the teacher should clearly explain the aim and purpose of employing STAD in a Technology class to learners. The teacher could, for example list the skills that learners are expected to develop during the use of STAD or any other cooperative learning method. In turn, learners should be offered the opportunity to evaluate their group processes to examine if they are on the right track toward obtaining or cultivating the stipulated skills. The Technology teacher as well should reflect on the processes of group discussions and assess if the purpose would be achieved.
- Thirdly, when implementing STAD in the Technology classroom, teachers should be well prepared to ensure good delivery of the subject content. The Technology teacher should further ascertain that worksheets for group work cover various cognitive levels for learners to be able to apply the acquired knowledge as another requirement for Curriculum and Assessment Policy Statement for Technology.
- Thorough preparation for Technology lessons would help the teacher to manage time for lessons effectively. The teacher would also be able to assess the state of understanding of learners during the class presentations. The

Technology teacher would be able to have good class control and discipline while moving around the groups intervening and assessing progress.

7.9.3. Recommendations regarding how teachers employ STAD as a cooperative learning strategy in teaching Technology effectively

The following recommendations are made as to how teachers employ STAD as a cooperative learning strategy in teaching Technology:

- Technology teachers should be encouraged to develop skills so as to gain access to the inner world of their learners with the belief that when teachers possess the right skills, they can earn the trust of their learners.

- Technology teachers should endeavour to use different methods, such as: multi-level teaching, storytelling, learning through play, songs, rhymes, group work, individual work and cooperative learning to help learners experience variety in their learning.

- Technology teachers should use the active and participative teaching strategies to put learners in a more discursive mode and also to help them expand what they already know as they interact with other members of their groups.

- Technology teachers should also make sure they employ the right strategy or strategies in their teaching in order to succeed in their teaching and also aid learners to succeed alongside, as the latter partake in the teaching and learning experience.

- Technology teachers should make use of the communicative approach (questions and answers) so that they are fully informed about the state of the class before they start teaching. In this way learners will be stimulated to ask questions and respond to the questions posed by their teachers and mates.

- To overcome the challenges Technology teachers face in applying the cooperative learning approach, teachers should use strategies that encourage learners to find information, remember it, organize it, apply it and do creative things with it.
- The approach should be employed in such a way that learners will understand they are not competing with other members of the group, but learning to gain more knowledge and skills as they help their task teams to succeed in given tasks.

- Lastly, the strategy, when applied, should put learners in a position to enable them to possess the ability to be able to find solutions to problems that they may encounter in their studies by means of being creative as well as innovative in their thinking when it comes to real-life situations.

7.9.4. Recommendations regarding more learner involvement in applying STAD as a learning technique in advancing performance in Technology

The following recommendations are made regarding motivation to increase learner involvement in applying STAD as a teaching strategy in advancing performance in Technology:

- Teachers should facilitate STAD activities in such a way that the learners will be motivated and interested in the learning experience as a way of curbing or totally eradicating the challenges that come with the application of the STAD strategy in teaching.

- STAD teams must be composed in such a way that it fully accommodates and caters for shy and diverse learners. In the STAD teams there should be learners who are confident, so they can impart on the shy ones to partake fully in group activities, while accepting contributions of the shy ones even when they are not what is expected.

- In terms of tasks for Technology, firstly, curriculum planners should restructure the syllabus, so teachers will not be overloaded in their teaching. Secondly, teachers should endeavour to break down the content in CAPS Technology in such a way that they can effectively cater for STAD activities in their teaching.
- With regards to timetabling and the duration of time spent on STAD activities, Technology teachers should plan with school management to arrange for appropriate times for STAD activities and they should have their groups organized ahead of time, so that they will not spend a long time trying to organize the learners into groups before classes start.

- Lastly, Technology teachers have to negotiate with their school management and other teachers to create awareness of the essence of the STAD technique, so that notions teachers are wasting time and that of the other teachers stepping in, while STAD activities are on-going, will be totally diffused.

In the following section of this chapter the researcher has illustrated my contributions to the body of knowledge by developing a modified STAD for the purpose of nurturing intrinsic motivation among learners in the Technology classroom.

## 7.10. Researcher's contribution to body of knowledge

The researcher stated in chapter 1 of this study that the contextual setting at the school where the research was done promotes individualistic learning in a way of only recognising high academic achievers, per class, per subject. In his view the system is not doing justice toward many learners that might have shown improvement in academic endeavours, although it also encourages those who perform well to keep on doing well.

The researcher's case is to advocate group recognitions as well, because he believes they instil some motivation in learners to pursue improving their academic performance as the competition pool is broader. He is of the opinion that group progression points used to recognise the most improved group have the potential to cultivate intrinsic motivation in lower and moderate achievers in the long run. If they realise that their efforts to keep on improving bear good fruits, they might end up owning and embracing hard work for the joy of obtaining good scores over the recognition prize.

Table 7.1 indicated the comparison between the modified STAD for teaching Technology and the original STAD by Robert Slavin.

Table 7.1 Original VS Modified STAD

| STAD | Modified STAD for Technology |
|---|---|
| Teacher Presentations | Teacher Presentations |
| Learners put in heterogeneous groups | Learners put in heterogeneous groups |
| Groups work on worksheets | Groups work on worksheets |
| Learners write individual quizzes | Groups present their work to whole class |
| Group Scores used to find a winning team | Individual homework |
| Group recognition | Members give feedback to their group |

| | |
|---|---|
| | Multi-cognitive level test is administered |
| | Group scores used to get a winning team |
| | Group recognition |

This modified STAD is aimed at increasing individual accountability within STAD by introducing individual homework. The learners have alluded in the previous chapter that individual homework motivated them to be well prepared for group discussions that followed in order to give valuable contributions. Instead of quizzes the researcher opted for multi-cognitive level type of tests, because the Curriculum and Assessment Policy Statement for Technology indicated that learners should be able to recall and apply knowledge obtained in Technology lessons.

## 7.11. Further studies

For the purpose of verifying and complementing the results obtained from this study, a longitudinal study could be used for gathering quantitative data.

Secondly, a multi-phase mixed methods study could be done as follow up study, either in different years at the same school or including other schools in the province.

A continuation of this study could be done in co-ed schools with both girls and boys in the same classes. The study could focus on the development of social skills across the borders of gender.

Other studies could be done at other single sex schools as well as mixed gender schools that have culturally diverse classroom settings and embark mostly on the effects of STAD on learners' intercultural embracing values.

A similar study focusing on the Technology teachers' praxis could be done quantitatively.

## 7.12. Limitations of this study

One of the limitations was the inability to get all group members for some of the teams during group interviews.

The classroom space was a little bit congested, and because of the big tables some groups were too close to each other, enabling members to talk to members of other group.

It took a while before my teacher colleagues could agree to observe due to a tight schedule at the school.

It was a challenge also to introduce STAD to the learners, because they lacked knowledge at the beginning regarding the purpose behind the use of STAD. They were sceptic to be allocated into groups by the teacher and wanted to choose their team mates.

The fieldwork started later than anticipated as it was time to complete the year schedule and embark on revision and therefore had to rush through some of the work.

Lastly, due to few Technology contact sessions with learners per week, it also took longer for STAD groups to begin working as a unit.

## 7.13. Conclusion

This chapter outlined the findings of this study regarding the effects of STAD on the researcher's praxis.

The aspects of class practice that emerged from the data included thorough preparation for Technology lessons and boosted the researcher's confidence during the content delivery period and instilled good time management skills and classroom control strategies.

The chapter elaborated on the findings regarding learners' interactions during group discussions.

The findings indicated that learners acquired various social skills. Critical thinking was also provoked and a positive attitude toward Technology was developed. Though their tests score did not reveal any significant improvement, their retention of the content was evident.

In the next chapter a framework for implementing STAD in Technology will be discussed.

# CHAPTER 8

# THE FRAMEWORK FOR IMPLEMENTING STAD IN TECHNOLOGY

## 8.1. Introduction

In the previous chapter, the researcher elaborated on the findings of the empirical investigation of the study.

Emanating from these findings and empirical research discussed in chapters 5, 6 and 7 and the literature study that was done in chapters 2, 3, and 4, the researcher was able to develop a proposition of a framework for implementing STAD in Technology.

This proposed framework would serve as guideline for Technology teachers in employing STAD. Furthermore, the framework is based on a constructivism perspective that suggests learners to be active participants in learning. In this way of being involved learners would be able to construct their own knowledge from the taught content and further apply the acquired knowledge critically by making informed decisions (Horn, 2009: 515; Jansen, 2009: 175). The reason behind the above postulations is to support the Curriculum and Assessment Policy Statement for Technology in achieving the aim of producing learners that are team players and able to apply the constructed and acquired knowledge constructively (DBE, 2011b: 8).

The research review in chapter 2 has indicated that STAD is underpinned by constructivism teaching and learning beliefs and founded in cooperative learning principles. Therefore the following essential elements of cooperative learning form the basis for the operational guidance of STAD teams in Technology classrooms.

## 8.2. Elements of Cooperative Learning in STAD

❖ Positive interdependence is regarded as a core component or heart of STAD teams. Here, members of STAD teams are assigned the responsibility of ensuring that all parties apply concerted effort for the benefit of the whole group (Laing, 2002: 31; Johnson, Johnson & Smith, 2012: 14). Members of STAD teams should be trained to become accountable and submissive to one another in cultivating positive interdependence within their groups (cf. 3.5.1.).

- ❖ Individual and group accountability in STAD teams discourage the “free riders” spirit among the members. Each member is encouraged to bring his or her contribution to the table for discussions or give feedback on the task that was assigned to him or her. By so doing, the team is afforded an opportunity to identify a member or members that may need extra help from the team mates for the purpose of obtaining the stipulated group goals (Johnson & Johnson, 2006: 317; Johnson & Johnson, 2009: 368).

  Individual accountability improves learners’ self-efficacy as they observe others modelling higher work ethics and achieving good results and being constantly persuaded and encouraged by team mates to “pull-up their socks”. Learners in STAD groups would eventually develop beliefs that they too have the ability to produce work of high quality and obtain good results (cf. 3.5.1; 2.5.1.). Learners that are accountable develop self-determination by being actively involved toward their cognitive growth and emotional competence by interacting with others in STAD teams (cf. 2.5.2.).
- ❖ Face-to-face promotive interaction in STAD groups could be observed when team members work together, promoting each other’s success. The goals are achieved through the honest sharing of resources, correct information and helping one another to comprehend the work at hand (cf. 3.5.1.). Supporting each other instrumentally, encouraging and applauding one another’s efforts promote cognitive development and construction of knowledge from the experiences (Johnson, 2003: 939).
- ❖ Interpersonal and small group skills are acquired during face-to-face interaction processes of the STAD groups. These skills do not just happen, but learners need to be guided by the Technology teacher showing them acceptable ways of conveying information to other members, resolving conflicts within the group and good leadership qualities to mention but a few of these skills (Johnson & Johnson, 2006: 320).
- ❖ Group processing teaches learners in STAD teams to maintain an effective working relationship with other group mates. Thus STAD groups need to be provided with criteria for evaluating their group processes in order to identify attributes that contributed positively towards achieving group goals and embrace

them. The teams would also have to discover those behaviours that impacted negatively on the group causing a team not to obtain its intended goals, so that they should be eliminated and discouraged by all means (Johnson et al. 2007: 24).

In order for these elements to be evident in STAD groups, the researcher recommends that Technology teachers should be trained in STAD. The reason being, it would be difficult for Technology teachers to implement STAD in their classes if they do not have the “know-how”, as they would not be able to assess if the previously mentioned characteristics exist in the groups. If teachers are not trained, they may assign learners into groups and expect them to be functional, although research has proven the necessity of training of learners as well.

If Technology teachers had attended many work-shops, they would then be able to transfer their knowledge and skills needed for STAD teams to the class. Once the STAD teams have synthesized, it would then be pragmatic to instil the values and principles mentioned below among the group mates.

**8.3.** Values and principles embraced in STAD teams

- Social support pertains to learners having access to peers that they could rely on for emotional, instrumental, informational and appraisal help (Veenman et al. 2005: 117). A trained Technology teacher would be able to guide learners how to support each other emotionally without interfering, giving one another instrumental help that would encourage cognitive development and be generous in supplying correct information regarding the content. Mostly, the teacher should encourage STAD groups to appraise each other by acknowledging their efforts toward the achievement of the team goals (cf. 3.5.2.1; 2.4.1; 2.4.2).
- Psychological health encourages learners to overcome stressful situations or repellent characteristics of newly formed STAD teams. These attributes include beliefs, cultural background, academic norms, general values and life goals. It is therefore crucial for Technology teachers to understand group dynamics and help learners develop a psychologically safe, interpersonal context within their groups

(Johnson & Johnson, 1995b: 110; Van den Bossche, 2006: 498). (cf. 2.4.1; 2.4.2; 2.5.1; 3.5.2.2)

- Positive interpersonal relationships also help learners to develop a professional working relationship that does away with negative behaviours, such as a "dependency syndrome", but seeks (to keep instrumental help) to develop members' cognitive and social skills (cf. 2.4.3; 2.5.2; 3.5.2.3).
- Interpersonal attraction in STAD groups assist learners to develop social cohesion that is beyond racial, cultural or ethnic background. Learners strive to achieve a common goal as a team (cf. 3.5.2.4; 2.5.1).
- Motivation or effort to achieve regarding STAD implementation is mostly based on an extrinsic type of reward system to encourage learners to aim at achieving higher academic scores (Slavin, 1990: 14; Slavin, 1992: 159; Johnson & Johnson 2008: 15). This study, however, seeks to incorporate intrinsic motivation as a principle within STAD groups (cf. 3.5.2.5; 2.4.1; 2.4.2; 2.4.3; 2.4.4).
- Critical thinking could be defined as actively engaging in STAD group discussions to explore various solutions to a problem, with meaningful justification of facts and explicit reasoning that activates construction of meaning from group interactions (cf. 3.5.2.6.)
- Self-esteem in STAD groups develops through positive interactions that acknowledge the value of contributions each member brings to the discussion table (cf. 3.5.2.7).
- Time-on-task is a principle where learners are encouraged and trained to create productive STAD group discussions and effective use of allocated time. Learners need to know how to sift correct input from the wrong ones or integrate various contributions to achieve group goals, not forgetting to acknowledge all members for their efforts and commitment (cf. 3.5.2.8; 2.5.1).
- Social skills are a group of abilities and qualities that are taught to learners for the purpose of creating cooperative groups, since Johnson and Johnson, 1990: 32) clearly state that placing socially unskilled learners in a group does not form cooperative teams. These skills help team members to promote respect and acceptable work ethics among team mates (cf. 3.5.2.9).

The presences of these values in Technology STAD classes contribute to the learning processes that are supported by constructivist theories.

### **8.4.** Learning Technology in STAD teams

After encompassing the various components and values of cooperative learning that are found in STAD groups, the researcher deemed it fit to incorporate learning processes as a part of the framework for implementing STAD in Technology classroom.

#### **8.4.1.** Learning process of technology students

Social constructivism contends that, as much as learning is an individual or internal processing of information, it is, however, influenced by participation in social activities or collaborative interactions as in STAD teams (Sanchez & Loredo, 2009: 335; Kinniburg, 2010: 76; Sohel, 2010: 21).

Moreover, Laing (2002: 20) illustrates that discussions in STAD groups help learners to retain 50% of the learned material. When learners engage in teaching and explaining the work to other team members it improves retention of the content to 90% (cf. Fig. 3.3).

Self-determination theory further attests that learners that feel to be in control of their learning in STAD teams develop positive attitudes. Thus, learners increase interest towards learning**,** develop trust among the team mates, boosting each other's self-esteem, resulting in persistence (intrinsically motivated) in maintaining work of a high standard (McLoughlin & Oliver, 1994: 3; Deci & Ryan, 2008: 183; Stone, Deci & Ryan, 2008: 5; Ryan, 2009: 2).

In addition, theorists developed models of the learning process to assist teachers in serving learners in their classes. Pan and Hawryszkiewycz, (2004: 735), however, argue that most of these learning models are created for objectivist ways of learning rather than constructive styles of learning.

**S**ince Technology is a process based subject, the researcher opted for the experiential model of learning for learners in Technology STAD classes. The researcher has outlined the experiential learning process in the next section of this chapter.

**8.4.1.1.** Kolb's experiential learning model

The experiential learning model stipulated four stages that constitute effective learning for learners in Technology classes where STAD is implemented (Kolb, 1976: 22; Schneider & Stern, 2010: 73-75). The following levels are briefly explained below:

- Concrete experience states that learners should be openly and actively engaged in gaining new knowledge and experiences. This stage then suggests that the Technology teacher should encourage learner participation from the beginning of the lesson by already employing interactive strategies of lesson presentations. Thus by so doing, learners would be ready to actively engage in team study when that time arrives.
- Reflective Observations suggest that learners in the Technology class should further learn to reflect and observe new knowledge from various perspectives. In STAD teams, learners help one another to get different viewpoints that stimulate the understanding of new concepts (Pan & Hawryszkiewycz, 2004: 740).
- Abstract conceptualisation encourages learners in Technology STAD classes to make (construct) meaning from learned experiences and content. Since STAD uses interactive techniques of learning, learners are motivated to construct knowledge from observing the inputs of other team mates as they share information (Pan & Hawryszkiewycz, 2004: 741).
- Active experimentation is a level of application that the NCS encourages. Once the information has been internally processed and knowledge or meaning is constructed, learners would be enabled to make informed decisions towards solving technological problems or meeting societal needs and wants.

The researcher is of the opinion that learning models suitable for STAD classes would be those that accommodate both objectivists' and constructivists' ways of learning. The researcher's contention is based on the nature of STAD as a teaching method that employs objectivism when the teacher transfers knowledge to learners during lesson presentations. STAD also uses constructivism when learners in STAD groups engage in constructive discussions.

## **8.5.** Elements of teaching praxis in STAD

There are various elements of good teaching practices stated below that Technology teachers need to embrace when implementing STAD in their classrooms. These aspects include planning and preparation, classroom management, lesson presentation and professional responsibilities.

### **8.5.1.** Planning and preparation

Under this section, the Technology teacher is expected to demonstrate knowledge and understanding of the content that he or she teaches. The teacher should be able to select an appropriate and suitable teaching method that would meet set instructional goals (Broad & Evans, 2006: 30). Thus, lesson cohesion is one of the characteristics that indicate thorough planning and preparation (Danielson, 1996: 1; Mishra & Koehler, 2006: 1027; OECD, 2009: 13; Danielson, 2013: 8).

Mctighe and Wiggins (2012: 2-6) postulate in their backward design framework that in planning and preparing, a Technology teacher should set lesson goals or objectives, plan assessment that would reflect desired outcomes and develop a lesson that imparts knowledge, allow learners to construct meaning and apply the acquired knowledge.

### **8.5.2.** Classroom management

This element includes creating an environment suitable for teaching and learning in Technology classroom. The Technology teacher should further cultivate a culture of effective learning among members of STAD groups. Technology teachers need to encourage STAD teams to engage in constructive interactions that are productive and show respect for each other. Technology teachers are expected to manage all classroom procedures, such as effective use of time and resources, and behaviours within various teams (Furtwengler, 1992: 60-61).

### **8.5.3.** Lesson presentation/ instruction

The teacher is expected to engage learners during the content delivery session, using question and answer techniques, motivating learners to be actively involved in the learning and teaching situation. Thus, for proper interaction to occur, the Technology teachers should be able to clearly and accurately explain the concepts. He or she should not be tense, but free and flexible and to be able to spend more time on the part of work that learners may not comprehend. Learners should be emotionally free to ask questions seeking clarity. In return the teacher is expected to respond appropriately to learners' probes by giving proper feedback (Danielson, 1996: 2; OECD, 2009: 13).

### **8.5.4.** Professional responsibility

Broad and Evans (2006: 98) state that teachers need to acquire and master professional knowledge, professional practice, professional values and a professional relationship. Technology teachers should learn to become curriculum experts regarding the requirements of NCS on the teaching of Technology through continuing professional development. Technology teachers should serve as motivators to their learners by building their self-esteem and encouraging their active involvement towards learning. The classroom environment is another important factor that needs to be safe and conducive for teaching and learning (HMIE, 2009:16).

## **8.6.** The role of Technology teachers in STAD classes

The Technology teacher needs to have pedagogical content knowledge that encompasses both good knowledge of subject matter and employment of relevant methods of teaching that address various interests, skills and academic abilities of learners (Mishra & Koehler, 2006: 1025)

The teachers should have knowledge of the state of learners' prior knowledge and be able elaborate more on the concepts for learners to grasp and be aware of the philosophical background of Technology as a subject. Technology teachers should be able to address any misconception of the subject by learners and foster appropriate understanding (Mishra & Koehler, 2006: 1025). The teachers should further be conversant with the types of knowledge needed in Technology, such as conceptual, procedural, physical nature and functional knowledge (cf. 4.3.3).

The Technology teachers need to embrace the elements of good praxis as stipulated earlier in this chapter.

Thus Technology teachers should always be well prepared for lessons to ensure smooth running of the teaching process. The teachers also have to create a safe and appropriate environment for employing STAD where learners are free to interact.

The Technology teachers are further expected to be interactive in their teaching methods and monitor the group discussions in order to assess the learning progress of learners. While monitoring, teachers should play a supportive role to individuals and groups, motivate the teams to work consistently towards completing their tasks.

Technology teachers are also expected to know the different abilities of their learners and accommodate the various learning styles of learners.

Technology teachers assess learners' activities and give feedback that builds up on the learners' knowledge and further encourages learners to evaluate their group processes (cf. 6.2.1; 6.2.1.2.2; 6.2.1.3.1; 6.2.1.3.2).

## **8.8.** The role of a learner in the Technology STAD class

The type of a learner that is envisaged is one who is an active participant towards his or her learning. Learners in Technology classes where STAD is employed should actively engage in whole class discussions and team interactions. These learners must be able to accept various viewpoints from their team mates and understand that there could be a number of ways to solve a technological problem.

Learners in STAD classes should become divergent thinkers that are able to brainstorm and also accommodative of others, bearing in mind that they learn in different ways as well. Learners in STAD should strive to be effective team players, motivating each other to be openly involved in their groups. Learners in their individuality should also be accountable towards his or her learning in order to bring constructive contributions to the team (cf. 6.2.2.1.1.3; 6.2.2.1.2.1; 6.2.2.1.1.8).

Learners in Technology classes where STAD is employed should be able to share resources, knowledge and responsibilities for the purpose of obtaining group goals. They should also have confidence in each other and work with excitement and joy (Gillies & Boyle, 2009: 935).

## **8.8.** Employing modified STAD in Technology

Originally the teaching of STAD goes through six levels or stages, namely lesson presentation, assigning learners into heterogeneous groups, team study, individual quiz, team scores and team rewards. In this study the researcher, however, modified the STAD into nine stages. He added group presentations, individual homework, feedback to teams on individual task, and swapped individual quizzes with multi-cognitive level tests for individuals.

The researcher explored incorporating these other three stages to increase learners' individual accountability. The researcher understood that by increasing individual accountability, learners would develop the interest of doing well on these activities to give constructive feedback and contributions to the group. This was also to help learners develop self–efficacy and self-determination to carry on doing well, especially after receiving positive feedback, support and appraisal from team mates (cf. 2.5.1; 2.5.2).

The self-termination theory states that learners who have acquired a sense of competence in their academic work and have a platform to apply this competence by giving meaningful contributions to their STAD teams where they are acknowledged and therefore feel psychologically safe, would eventually develop a need for autonomy to do their work (cf. 2.5.2).

### **8.8.1.** Teacher presentations

During teacher class presentations, the Technology teachers should display aspects that indicate thorough preparation of the lesson. Thus, the lesson outline as it unfolds should show cohesiveness of the content, building from the known to the unknown. The teachers must always be conscious of the state of class understanding (diagnostic) and be flexible in terms of implementing remedial processes with immediate effect. Their lesson deliveries ought to be interactive, by employing methods such as question-and-answer to help assess the class. While involving learners, the teachers should have created an environment that allows learners to be free to respond to teachers' probes and also to pose questions to the teacher. In all these mentioned attributes, Technology teachers are expected to motivate learners to produce work of high standard and manage lesson time appropriately to have an opportunity to attend to individual learners where necessary (cf. 6.2.1.1; 6.2.1.1.1; 6.2.1.2.1; 6.2.1.2.2; 6.2.1.3).

### **8.8.2.** Assigning learners into heterogeneous teams

In STAD the teachers choose or make up the teams based on various differences in order for learners to develop needed interpersonal and group skills. The groups need to be composite of learners with different levels of academic achievement, teams must be representative of diverse cultures in the class and teams should have both genders in cases of co-ed schools (cf. 4.2.5).

### **8.8.3.** Team study

The learners are given worksheets in their respective groups. They then engage in constructive discussions working as a team to achieve group goals. The teacher at this stage moves from team to team assessing the progress and intervening where necessary. If the teacher realises that most groups are asking for clarity on the same problem, he or she should call for the attention of all groups, explain the problematic section of the work and permit further clarity seeking questions. The teacher should then be able to respond in a manner that the instructions and work are clear to the learners and team discussions could then resume (cf. 6.2.1.4; 6.2.1.4.1; 6.2.2.1.1.4; 6.2.2.1.1.3).

**8.8.3**. Individual homework

Here, the teacher gives learners individual exercises that they would do at home, based on the same content that was taught. It is the responsibility of each learner, if he or she faces a difficulty in the task, to contact one of the team mates or even a friend who is in another team, so that he or she could come and give feedback to the group on the next Technology lesson (cf. 6.2.3.2.6; 6.2.3.2.5; 6.2.3.2.7.1).

**8.8.4.** Feedback to STAD teams

The learners get together in their respective teams and the group leader would facilitate the discussions giving every member an opportunity to explain how they experienced the homework and managed to do the tasks. The leader should not hesitate to report any member who did not do homework to the teacher immediately. This would help to do away with "social loafing" within the groups. Learners are then encouraged to applaud the effort of each member as a motivation gesture to keep on producing good work.

When these two steps are followed up consistently by the teacher, learners would eventually develop self-esteem, self-efficacy and self-determination, all leading to intrinsically motivated learners. Learners will have a feeling of fulfilment after completing their work and being appreciated for applying extra effort (cf. 2.4.1; 2.5.1; 2.5.2).

**8.8.5.** Group presentations

During this period, learners come to the front of the class as a team to present their work. Learners are also encouraged to give every member an opportunity to say something regarding the task being explained by the team. This is an important aspect of Technology as a subject, because learners are required to present their projects to the class with every member having a part to present.

Seated groups are afforded a chance to pose questions and give recommendations where necessary. Seated groups need to give the teacher feedback regarding presentation aspects only if the teacher gave such assessment criteria (cf. 6.2.2.1.1.6; 6.2.2.1.1.2; 6.2.2.1.1.8; 6.2.2.1.2.2).

**8.8.6.** Individual class tests

After a particular section of the content is completed that has enough material to administer a test, the teacher could then set a multi-cognitive level type of test. Each learner is given a test script to do individually without any assistance. It is important for the teacher and groups to be certain that their members are ready for the test. On that note, the tests should not come as surprises to learners, as some if not most of them could not think or function properly when in shock of an unknown test. Therefore, learners should be informed well in advance that a test on this particular content will be written on a particular day or week (cf. 4.2.5.4).

**8.8.7.** Group scores

When the test has been assessed, the individual scores of team members are combined using a special Robert Slavin formula. Points are awarded according to the degree of member improvement in the case of each team. A team with high improvement points would be the winner for that test. This manner of calculating points pushes the teams to encourage members to do better in the next tests.

**8.8.8.** Team rewards

Team rewards are incentives that are given to the winning teams and could be in the form of certificates or publishing the team's report in the school's weekly letter.

This study, however, seeks to improve learners' intrinsic motivation by helping learners to find satisfaction in their good work ethics and achievements. The researcher believes that not all schools could afford weekly or even monthly awards for STAD groups in their schools. Although it is a nice gesture to appreciate the efforts of learners with tangible prizes, this raised a concern to the researcher that STAD could not be employed in disadvantaged schools. If that was the case, then the researcher has stipulated some principles of motivation to see if internal satisfaction and determination could not be reached with little extrinsic influence such as verbal praise.

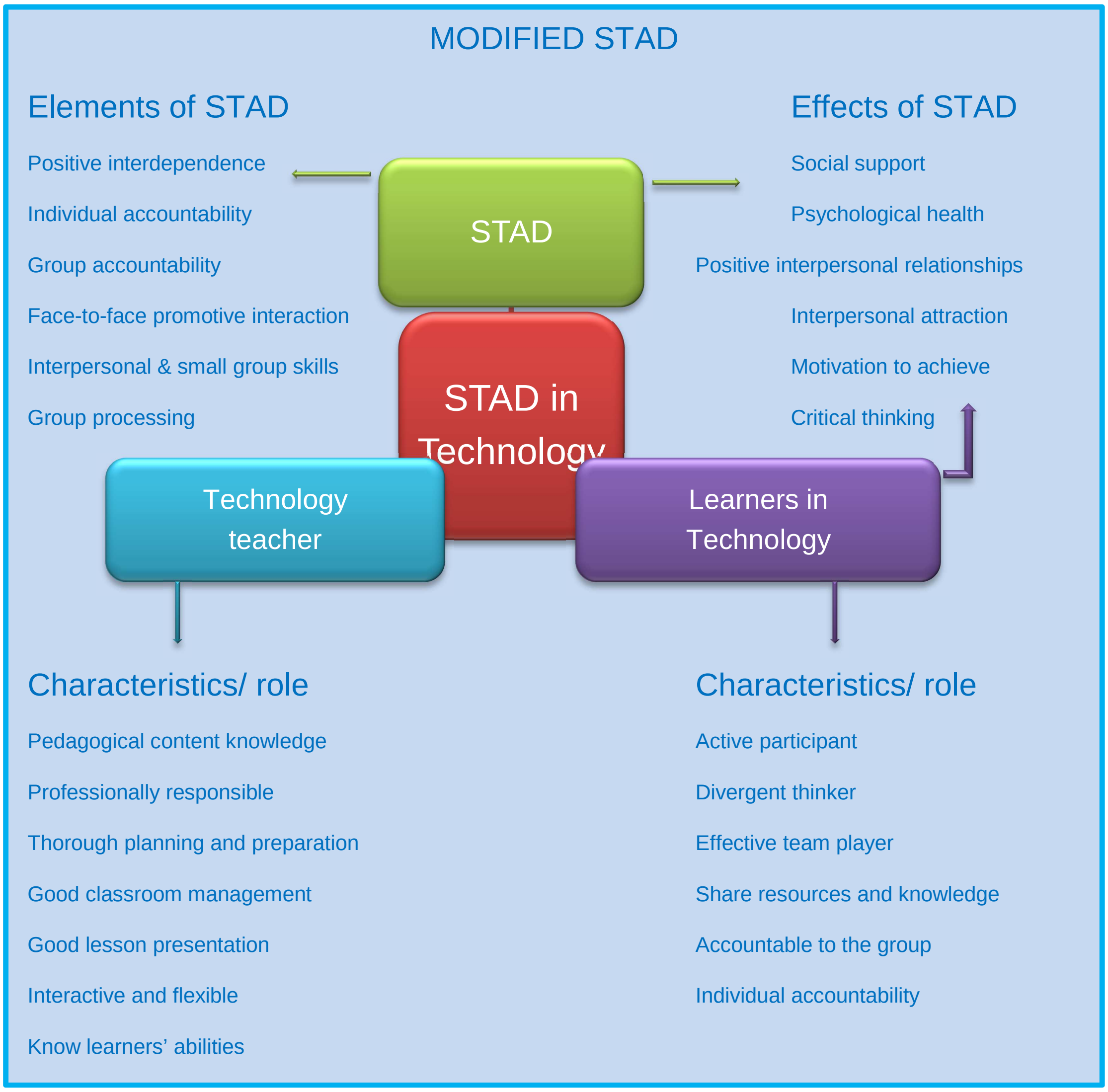
Boekaerts (2010: 92 – 100) lists and discusses eight principles that could serve as motivation in the Technology classroom where STAD is implemented.

- Learners are more motivated when they feel competent to do what is expected of them.
- Learners are more motivated to engage in learning when they perceive stable links between specific actions and achievement.
- Learners are more motivated to engage in learning when they value the subject and have a clear sense of purpose.
- Learners are more motivated to engage in learning when they experience positive emotions towards learning activities.
- Learners direct their attention away from learning when they experience negative emotions.
- Learners free up cognitive resources for learning when they are able to influence the intensity, duration and expression of their emotions.
- Learners are more persistent in learning when they can manage their resources and deal with obstacles effectively.
- Learners are more motivated to engage in learning and use motivation regulation strategies when they perceive the environment as favourable for learning.

The researcher is of the opinion that if the above mentioned principles are well applied in Technology STAD classes, intrinsic motivation for learners to find satisfaction in their work could be achieved.

In the diagram below, the researcher shows the graphical representation of the proposed framework for implementing STAD in Technology.

Figure 8.1 Framework for implementing STAD in Technology



## BIBLIOGRAPHY

Abu, R.B. & Flowers, J. 1997. The effects of cooperative learning methods an achievement, retention, and attitudes of Home Economics Students in North Carolina, *Journal of Vocational and Technical Education*, V13 (2): http://scholar.l.b.vt.edu/journals/JVTE/v13n2?Abu.html. [Accessed 2010/02/11]

Abuseileek, A.F. 2007. Cooperative vs individual learning of oral skills in a CALL Environment*. Computer Assisted Language Learning*, 20 (5): 493-514.

Addison, T. 2006. *Defining and Measuring of Cultural Diversity in Project Teams*. University of Witwatersrand, Johannesburg: University of Witwatersrand.

Adesoji, F.A. & Ibraheem, T.L. 2009. Effects of Student Teams-Achievement Divisions Strategy and Mathematics Knowledge on Learning Outcomes in Chemical Kinetics. *The Journal of International Social Research.* 2 (6): 15-25.

Alemu, G., Stevens, B. & Ross, P. 2011. Semantic Metadata Interoperability in Digital Libraries: A Constructivist Grounded Theory Approach, *JCDL,* 11 (1): 13-17.

Ali, R., Akhter, A., Shahzad, N. Sultana, N. & Ramzan, M. 2011. The impact of motivation on students' academic achievement in Mathematics in problem based learning environment. *International Journal of Academic Research,* 3(1): 306-309.

Ali, S., Rohindra, D., Coll. R. (2008). Student perceptions of a culturally diverse classroom environment. *Research in Science & Technological Education*, *26*(2), 149-164.

Allen-Collinson, J. 2012. *Interpretivist research paradigm.* Lincoln: University of Lincoln.

Allison, B. N, & Rehm, M. L. 2006. Meeting the needs of culturally diverse learners in Family and Consumer Sciences Middle School classrooms. *Journal of Family and Consumer Sciences Education,* 24(1): 50-63.

Andrade, A.D. 2009. Interpretive research aiming at theory building: adopting and adapting the case study design. *The Qualitative Report*, 14 (1): p42-60.

Arab British Academy for Higher Education. 2005. *ERG Theory.* http://www.abahe.co.uk_Alderfer. [Accessed 23/08/2013].

Arab British Academy for Higher Education. 2011. *Herzberg's Motivation-Hygiene Theory (Two Factor Theory).* Arab British Academy for Higher Education. http://www.abahe.co.uk_herzberg. [Accessed 23/08/2013].

Arthur, J. 2012. *Research methods and methodologies in education.* London: SAGE.

Ash, M.G. 1981. *The role of developmental concepts in the history of gestalt theory: The work of Kurt Koffka.* USA, Springer.

Attle S. & Baker B. 2007.Cooperative learning in competitive environment: classroom applications. *International Journal of Teaching and Learning in Higher Education* 19 (1): 77-83.

Avenant, P.J. 1986*: Guidelines for Successful Teaching.* USA: SAGE.

Bachman, C.M. & Stewart, C. 2011. Self-Determination Theory and Web-Enhanced Course Template Development. *Teaching of Psychology Journal*, 38 (3): 180-188.

Backman K. & Kyngäs H.A. 1999.Challenges of the grounded theory approach to a novice researcher*. Journal of Nursing and Health Sciences,* 1 (1): p147-153.

Baker, T. & Clark, J. 2010.Cooperative Learning – A Double-Edged Sword: A Cooperative Learning Model for Use with Diverse Student Groups. *Intercultural Education*, 21(3): 257-268.

Balfakih, N.M.A. 2003: The Effectiveness of Student Teams-Achievement Divisions (STAD) for teaching high school chemistry in the United Arab Emirates*, International Journal of Education*, V25 (5): 605-624.

Ball, B. 2012. *A summary of motivation theories.*

http://www.uorcoach.be/en/employee-motivation-ebook/. [Accessed 13/ 11/ 2011].

Bandura A. 2001. Social Cognitive Theory: An agentic perspective*. Annual Reviews*, 52: 1-26.

Banks, J.A. 2004. Teaching social justice, diversity, and citizenship in a global world. *The Educational Forum*, 68: 289-298.

Barkoukis, V. Tsorbatzoudis, H., Grouios, G. & Sideridis, G. 2008.The assessment of intrinsic and extrinsic motivation and amotivation: Validity and reliability of the Greek version of the Academic Motivation Scale. *Assessment in Education: Principles, Policy and Practice,* 15 (1): 39-55.

Baxter, P. & Jack, S. 2008. Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers*. The Qualitative Report*, 13 (4): 544-559.

Bazeley P. 2013.*Qualitative Data Analysis: Practical strategies.* London: SAGE.

Berry, K. S. 2006. Research as bricolage: Embracing relationality, multiplicity and complexity. In K. Tobin & J. L. Kincheloe (Eds.), *Doing educational research: A handbook* (pp. 87-116). Rotterdam: The Netherlands: Sense Publishers.

Berry, W. 2008: Surviving Lecture: A Pedagogical Alternative, *College Teaching* V 56 (3): 149-153.

Bisman, J.E. 2012. The road less travelled: An overview and example of constructivist research in Accounting. *Australasian Accounting, Business and Finance Journal,* 6 (5): 3-22.

Blaik-Hourani, R. Constructivism and revitalizing Social Studies. *The History Teacher,* 44 (2): 227-249.

Borkowski, N. 2005. *Content Theories of Motivation.* In N. Borkowski (Eds) Understanding Individual Behaviours (p p113- 138). DBA, CPA, FACHE.

Brereton, P. Kitchenham, B. Budgen, D. & Li, Z.  2008. Using a protocol template for case study planning. *EASE,* 1 (1): 1-8.

Broad, K. & Evans, M. 2006. *A review of literature on professional development content and delivery modes for experienced teachers.* Toronto: University of Toronto.

Brooks, D.W. & Shell, D.F. 2006. Working memory, motivation and teacher-initiated learning. *Journal of Science Education and Technology,* 15 (1): 17-30.

Brown, A.P. 2008. Review of the literature on case study research. *Canadian Journal for New Scolars in Education,* 1 (1): 1-13.

Brown, A.P. 2010. Qualitative method and compromise in applied social research. *Qualitative Research,* 10 (2): 229-248.

Burla L. Knierim, B. Barth, J. Liewald, K. Duetz, M. & Abel, T. 2008. From Text to Codings: Intercoder Reliability Assessment in Qualitative Content Analysis. *Journal of Nursing Researc*h, 57 (2): p113-117.

Burnard P. Gill, P. Stewart, K. Treasure, E. & Chadwick, B. 2008. Analysing and presenting qualitative data*. British Dental Journal,* 204 (8): p429-432.

Cameron, R. 2011. Mixed methods research: The Five Ps Framework, Electronic *Journal of Business Research Methods*, 19 (13): 1-15.

Carr, P. 2006. *Educational Policy and the Social Justice Dilemma*. Canada. Unpublished paper.

Carter, S.M. & Little, M. 2007. Justifying knowledge, justifying method, taking action: Epistemologies, methodologies, and methods in qualitative research. *Qualitative Report*, 17 (10): p1316-1328.

Chen, H-C. 1997. A comparison between cooperative learning and traditional, whole-class methods – teaching English in junior college. *Academic Journal of Kang-Ning*, (3): 69-82.

Choi, J, Johnson, D. W. & Johnson, R. T. 2011. Relationships among cooperative learning experiences, social interdependence, children's aggression, Victimisation, and Pro-social Behaviours. *Journal of Applied Social Psychology,* 41 (4): 976-1003.

Christie, M. Rowe, P. Perry, C. & Chamard, J. 2000. *Implementation of Realism in Case Study Research Methodology.* Paper presented at International Council for Small Business, Annual Conference, Brisbane.

Chung, R-G., Lo, C-L., Hsieh, T-H., Chang, W-L. & Hu, Y-C. 2010. Different cooperative learning grouping and problem-based instruction in promoting student's learning performance*. World Transactions on Engineering and Technology Education,* 8 (3): 289-294.

Clarke J. 1994. *Pieces of the Puzzle: The Jigsaw Method.* In S. Sharan (Eds) Handbook of Cooperative Learning Methods, Greenwood Press, USA.

Cohen, L. Manion, L. & Morrison, K. 2007: *Research Methods in Education, 6th ed.* London, Routledge-Farmer.

Coffey, H. 2008. *Cooperative learning.* http://www.learnnc.org/1p/pages/4653?style=print. [Accessed 2011/03/03]

Coll, R. K. & Chapman, R. 2000. Choices of methodology for cooperative education researchers. *Asia-Pacific Journal of Cooperative Education,* 1 (1): p1-8.

Conroy, S. A. 2003. A pathway for interpretive phenomenology. *International Journal of Qualitative Methods,* 2 (3): p1-42.

Cottone, R. R. 2007: Paradigms of counselling and psychotherapy, revisited: Is social constructivism a paradigm? *Journal of Mental Health Counselling,* V 29 (3): 189-203.

Cowie, H. Smith, K.A. & Remalaver, P. 1994. *Cooperation in the multi-ethnic classroom: The impact of cooperative groups work on social relationships in middle schools.* London. Fulton.

Creswell, J. W. 2000. *Research design*. London: SAGE.

Creswell, J. W. 2006. *Understanding mixed methods research,*

http://www.sagepub.com/upm-data/10981_chapter_1.pdf [Accessed 14/01/2015]

Creswell, J. W. 2009. *Research design: qualitative, quantitative and mixed methods approaches 3rd ed*. London: SAGE.

Creswell, J. W. 2012. *Educational research: planning, conducting and evaluating quantitative and qualitative research 4th ed.* Boston: Pearson.

Creswell, J.W. & Garrett, A. 2008: *The "movement" of mixed methods research and the role of educators,* South African Journal of Education 28 ( ): 321-333.

Creswell, J. W. & Miller D. L. 2010. *Determining validity in qualitative inquiry.* Theory into Practice 39 (3): 124-130.

Creswell, J.W., Klassen, A.C. & Plano-Clark, V.L. 2011. *Best practices for mixed methods research in the health sciences.* USA, Office of Behavioural and Social Sciences Research.

Danielson, C. 1996. Enhancing professional practice: A framework for teaching. *Association for supervision and curriculum development,* 1 (1): 3-4.

Danielson, C. 2013. *The framework for teaching evaluation instrument,* www.danielsongroup.org [Accessed 26-01-2015].

DBE (Department of Basic Education) 2010. *The National Policy for Equitable Provision of an enabling School Physical Teaching and Learning Environment*. Pretoria: Government Printer.

DBE (Department of Basic Education) 2011a. *Curriculum and Assessment Policy Statement: Technology Senior Phase. Final draft.* Pretoria: Government Printer.

DBE (Department of Basic Education) 2011b. *Curriculum and Assessment Policy Statement Grades 7-9 Technology.* Pretoria: Government Printer.

DBE (Department of Basic Education) 2012. *Curriculum and Assessment Policy Statement (CAPS) Technology Senior Phase. Final draft*. Pretoria: Government Printer.

De Kock A. ,Sleegers P. , and Voeten M.J.M. 2004. New Learning and the Classification of Learning Environment in secondary Education. *Review of Educational Research,* 74 (2) 141-170. http://www.jstor.org/stable/3516054 [accessed 29/03/2012].

De Lyser D. and Sui D. 2013.Crossing the qualitative-quantitative chasm III: Enduring methods, open geography, participatory research, and the fourth paradigm*. Progress in Human Geography,* p 1-14. http://phg.sagepub.com [accessed, August 20, 2013].

Deci, E. L. & Ryan, R. M. 2008.Self-Determination Theory: A Macro-theory of human motivation development, and health. *Canadian Psychology,* 49(3): 182-185.

Deci, E.L. Vallerand, R.J. Pelletier, L.G. & Ryan, R.M. 1991. Motivation and Education: The Self-determination perspective. *Educational Psychologist,* 26(3&4): 325-346.

Demir, K. 2011. Teacher's intrinsic and extrinsic motivation as predictors of student engagement. *e- Journal of New World Sciences Academy,* 6(2): 1397-1409.

Denzin, N. K., & Lincoln, Y. S. (eds.). 1999. *The SAGE handbook of qualitative research* 3rd ed. Thousand Oaks, California: SAGE .

Denzin, N.K. & Lincoln, Y.S. 2010. *The discipline and practice of qualitative research.* Chapter 1, in N.K. Denzin & Y.S. Lincoln (Eds) The Sage Handbook of Qualitative Research. http://www.sagepub.com/upm_data/40425_chapter 1.pdf [Accessed 27-10-2014].

Deutsch M. 1949. *A theory of cooperation and competition*. Michigan, The Research Center for Group Dynamics ANN Arbor.

Deutsch M. 1988. *A proposal for research into the social, psychological, and educational effects of introducing cooperative learning into a school system*. Columbia: Columbia University.

Deutsch M. 1991. *A personal history of social interdependence theory, research and practice*. Columbia: Columbia University.

Deutsch M. 2006. *A theory of cooperation-competition and beyond*. Columbia: Columbia University.

Devans, M.U. 2011. The relevance of glaserian and straussian grounded theory approaches in researching human resource development, *International Conference on Financial Management and Economics IPEDR,* 11, 348-352.

Dewey J. 1903. Democracy in education. *The Elementary Teacher,* 4 (4): 193-204.

DiCicco-Bloom B. & Crabtree B. 2006.The qualitative research interview*. Blackwell Publishing Ltd. Medical Education*, 40 (1): 314-321.

Digest, E. 1985. *Cooperative learning in social studies education: What does research say?* http://www.ericdigest.org/pre-923/cooperative.html. [Accessed 2010/02/18]

Dikici, A. and Yavuzer, Y. 2006. The Effects of Cooperative Learning on the Abilities of Pre-service Art Teacher Candidates to Lesson Planning in Turkey*, Australian Journal of Teacher Education,* 31 (2): 36-44.

Doymus, K, Simsek, U, Karacop, A. & Ada, S. 2009. Effects of two cooperative learning strategies on teaching and learning topics of Thermo-Chemistry. *World Applied Sciences Journal,* 7 (1): 34-42.

Dyer, R.R., Reed, P.A. & Berry, R.Q. 2006. Investigating the relationship between high school Technology Education and test scores for Algebra 1 and Geometry. *Journal of Technology Education*, http://scholar.lib.vt.edu/ejournals/JTE/v17n2/dyer.html. [Accessed 4/17/2013].

Eames, C. and Bell, B. 2005.Using socio-cultural views of learning to investigate the enculturation of students into the scientific community through work placement. *Journal of Science, Mathematics and Technology Education,* 5(1): 153-169.

El Hussein, M. 2014. Using Grounded Theory as a Method of Inquiry*:* Advantages and Disadvantages. *The Qualitative Report*, 19 (13): 1-15.

Elo S. & Kyngäs H. 2007.The qualitative content analysis*. Journal of Advanced Nursing*, 62 (1): 107-115.

England E. And Chernauskes-Beecher S. 2012. *Kurt Lewin: Life Overview and Social Forces*. Journal of Scientific Psychology, Special Issue, 13-19.

Ferguson P. 1995. *Cooperative learning and critical thinking.* secondary schools and cooperative learning theories. In Pederson and Digby (Eds.) Models and Strategies. USA: Garland Publishing.

Ferre-Caja E. & Weiss M.R. 2002. Cross-Validation of a model of intrinsic motivation with students enrolled in high school elective courses*. Journal of Experimental Education,* 71 (1): 41-65.

http://www.jstor.org/stable20152696 [accessed 29/03/2012].

Finelli, C.J. Bergon, I. & Mesa, V. 2011. *Student teams in the Engineering classroom and beyond: setting up students for success*. Michigan: University of Michigan.

Fortune, T. 2000. *Immersion teaching strategies observation checklist*, ACIE Newsletter, The Bridge.

Foster, P.N. 1994. Technology Education: AKA Industrial Arts*. Journal of Technology Education*, 5 (2): http://scholar.Lib.vt.edu/ejournals/JTE/jte-v5n2.html [accessed 203/04/11].

Foster, P.N. 1995. Industrial Arts/Technology Education as a Social Study: The original intent? *Journal of Technology Education*, 6 (2):

http://scholar.lib.vt.edu/ejournal/JTE/jte-v6n2/foster.jte-v6n2.html [accessed 4/17/2013].

Frith, C. 1996. *Motivation to Learn.* Education Communication and Technology, University of Saskatchewan.

Frisby, C. L.. 1993. “Afrocentric” Explanations for School Failure: Symptoms of Denial, Frustration, and Despair. http://0-web.ebscohost.com.wagtail.ouvs.ac.za/ehost/detail?vid=4&hid=113&sid=77c35da... [Accessed 5/27/2011].

Furtwengler, C. B. 1992. How to Observe Cooperative Learning Classrooms. *Educational Leadership,* p59-62.

Gagne M. & Deci E. L. 2005.Self-Determination Theory and Work Motivation*.* *Journal of Organizational Behaviour*, 26: 331-362.

http://www.jstor.org/stable/4093832 [accessed 29/03/2012]

Gaith, G. 2003: Effects of the Learning Together Model of Cooperative Learning on English as a Foreign Language Reading Achievement, Academic Self-esteem, and Feelings of School Alienation*, Bilingual Journal* V 27 (3) pp 451-474.

Gautreau, C. 2011. Motivational factors affecting the integration of a learning management system by faculty. *The Journal of Educators Online,* 8 (1), p1-25.

Gauvain M. 1998. *Cognitive Development in Social and Cultural Context.* Cambridge University Press.

Geelan, D. R. 1995. Matrix Technique: A constructivist approach to curriculum development in scince. http://www.bravus.com/matrix.htm [Accessed 10/02/2011].

Gibbert, M. and Ruigrok, W. 2010. The “What” and “How” of Case Study Rigour: Three Strategies Based on Published Work. *Organizational Research Methods,* 13 (4), p710-737.

Gibbert, M. Ruigrok, W. & Wicki, B. 2008. What passes a rigorous case study?. *Strategic Management Journal*, 29 (13): 1465-1474.

Gillard, A. 2007. *Self-Determination Theory*, American Camp Association, Texas: Texas A&M University.

Gillet, N. Vallerand, R.J. & Lafreniere, M-A. K. 2012. Intrinsic and Extrinsic School Motivation as a function of Age: The Mediating Role of Autonomy Support. *Journal of Social Psychology Education,* 15, 77-95.

Gillies R. M. 2002. The Residual Effects of Cooperative Learning Experiences: A Two Year Follow up. *The Journal of Education Research*, 96 (1): 16-20. http://www.jstor.org/stable/27542408. [Accessed 05/03/2012].

Gillies, R. M. & Boyle, M. 2009. Teachers' reflections on cooperative learning: Issues of implementation. *Teacher and Teacher Education,* 26 (1): 933-940.

Glaser, G. B. 2002. Constructivist Grounded Theory?: 47 Paragraphs*. Forum Qualitative Social Research, Online Journal*, 3(3): 1-5.

Glasgow, J. 2010. The End of Historical Constructivism: Circularity, Redundancy, Indeterminancy. *The Monist,* 93 (2), p321-335.

Google Images 2011. *Action Research Cycle Diagram.*

www.googleimages.com/actionreseach. [accessed, 05-02-2014]

Graneheim U.H. & Lundman B. 2004.Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Journal of Nurse Education Today,* 24 (1): p105-112.

Gray, D.E. 2004: *Doing Research in the Real World,* London: SAGE.

Gray, D.E. 2009: *Doing Research in the Real World.* 2nd Ed, London: SAGE.

Guba, E.G. & Lincoln, Y.S. 1994. *Competing paradigms in qualitative research.* In N.K. Denzin, & Y.S. Lincoln (Eds.) Handbook of qualitative research: Thousand Oaks, pp105-117, California: SAGE.

Gushue, G. V. & Whitson, M. L. 2006. The relationship among support, ethnic identity, career decision self-efficacy, and outcome expectations in African American high school students. *Journal of Career Development,* 33 (2): 112-124.

Hale, J.E. 1993. Rejoinder to "… Myths of black cultural learning styles" in defence of Afrocentric scholarship.

http://0web.eebscohost.co.wagtail.ouvs.ac.za/ehost/detail?vid=4&hid=113&sid=75c50f9. [Accessed 5/27/2011].

Hammersley, M. 2012. Methodological paradigm in educational research. *British Educational Research Association,* 1 (1): 1-30.

Hanze, M. & Berger, R. 2007. Cooperative learning, motivational effects, and student characteristics: an experimental study comparing cooperative learning and direct instruction in 12th grade physics class. *Learning and Instruction,* 17 (2007): 29-41.

Harkness, S.S. 2008. Social constructivism and the believing Game: a mathematics teacher's practice and its implementations. *Educ Stud Math,* 70 (1): 243-258.

Hendrix, J.C. 1999: *Connecting Cooperative Learning and Social Studies,* Indiana: Village Woods Middle School.

Herschbach, D.R. 1995. Technology as Knowledge: Implications for Instructions. .*Journal of Technology Education,* 7 (1):

http://scholar.lib.vt.edu/ejournals/JTE/v7n1/herschbach.jte-v7n1.html. [accessed 2013/04/11].

Hertz-Lazarowitz R. ,Kirkus V.B. & Miller N. 1992. *An overview of the theoretical anatomy of cooperation.* In R. Hertz-Lazarowitz & Miller (Eds.) The Classroom in Interaction in Cooperative Groups, Cambridge: Cambridge University Press.

Hertz-Lazarowitz R. 2008. *Beyond the Classroom and into the Community: the Role of the Teacher in Expanding the Pedagogy of Cooperation.* in R.M. Gillies, Ashman & Terwel (Eds.)The Teacher's Role in Implementing Cooperative Learning in the Classroom, USA: Springer Science and Business Media.

Hesse-Biber S. N. & Leavy P. 2011. *The practices of qualitative research 2nd ed.* London: SAGE.

Higgs J. & Cherry N. 2009.*Doing Qualitative research on practice*. In Writing qualitative research on practice (eds.) by Higgs J., Horsfall D. and Grace S. Rotterdam: Sense Publishers.

Hill, A.P. 2011. *A brief guide to self-determination theory*. New York: Hospitality, Leisure, Sport and Tourism Network.

Hoepfl, M. C. 1997. Choosing qualitative research: a primer for Technology Education researchers. *Journal of Technology Education*, 9 (1): 47-63.

Holmes, J. G. 2002. Interpersonal Expectations as the Building Blocks of Social Cognition: An Interdependence Theory Perspective. *Journal of Personal Relationships,* 9: 1-26.

Hong, J.C. Hwang, M.Y. Wong, W.T. Lin, H.C. & Yau, C.M. 2012. Gender difference in social cognitive learning at a technological project design*. International Journal of Technology and Design Education*, 22: 451-472.

Hong, J.C. Chen, M.Y. Wong, A. Hsu, T.F. & Peng, C.C. 2012b. Developing physics concepts through hands-on problem solving: a perspective on a technological project design. *International Journal of Technology and Design Education*, 22: 473-487.

Horak, R. 2011. *The Two-Factor Theory and working time arrangement.* Faculty of management and informatics, Zilna: University of Zilna.

Horn, I. 2009. Learner-Centeredness: an analytical critique. *South African Journal of Education*, 29: 511-525.

Hornby, A.S. 1995: *Oxford Advanced Learner's Dictionary of Current English,* Oxford: Oxford University Press.

Hornby A.S. 1997. *Oxford Advanced Learners Dictionary 5th ed*. Oxford: Oxford University Press.

Hornby G. 2009. The effectiveness of cooperative learning with trainee teachers. *Journal of Education for Teaching,* 35 (1): 161-168.

Householder, D.L. 2012.International handbook of research and development in technology education: Book review. *International Journal of Technology and Design Education,* 22, 115-122.

http://scholar.lib.vt.edu/ejournals/JTE/v8n1?deVries.html [accessed 2013/04/17]

Huitt, W. G. 2004. *Maslow's Hierarchy of Needs*. Redwoods: College of the Redwoods Distance Education.

Huitt, W. G. 2011. Motivation to Learn: an Overview. *Educational Psychology Interactive.* http://www.edpsycinteractive.org/topics/motivation/motivate.html [Accessed 11/14/2011].

Hynes, M. H. 2012. Middle-School teachers' understanding and teaching of the engineering design process: a look at subject matter and pedagogical content knowledge. *International Journal of Technology and Design Education,* 22: 345-360.

Idenobi, E.I. 2011.The Implication of Abraham Maslow's Hierarchy of Needs Theory to Business Activities in Nigeria. *African Journal of Technology,* 1(1): 168-178.

Inman, J. 2001. *Running head: Cognitive Theory.* Oregon: Department of Education Graduate School, Oregon State University.

Ivankova, N.V., Creswell, J.W. & Clark, V.L.P 2010: *Foundations and approaches to mixed methods research,* First Steps in Research (eds.), by K. Maree.

Jackson, R., Karp, J., Patrick, E. & Thrower, A. 2006: *Social Constructivism Vignette,* http://projects.coe.uga.edu/epltt(index.php?title=social_constructivism. [Accessed 2011/02/10]

Jalilifar, A. 2009. *The effects of cooperative learning techniques on college students' reading comprehension*. Iran: Shahid Chamran University of Ahaz.

Jang, E.E., McDuagall, D.E., Pollon, D., Herbet, M. & Russell, P. 2008: Integrative mixed methods data analytic strategies in research on school success in challenging circumstances, *Journal of Mixed Methods Research* V 2 (3): 221-247.

Jansen, H. 2009. *Curriculum: Organizing Knowledge for the Classroom 2nd ed*. Cape Town: Oxford University Press.

JÄrvinen, E-M. 2001. *Education about and through Technology. Oulu:* Faculty of Education, University of Oulu.

Jensen, M. Moore, R. & Hatch, J. 2002. Cooperative learning: Part I: cooperative quizzes. *The American Biology Teacher*, 64 (1): 29-34.

Johansson, R. 2005. *Case Study Methodology*. International Association of People-Environment Studies, Stockholm.

Johnsen, S. & Curtis, N.E. 2009. *Improving achievement and attitude through cooperative learning in Maths class.* Lincoln: University of Nebraska – Lincoln.

Johnson, B. and Christensen, L. 2004: *Educational Research: Quantitative, Qualitative and Mixed Methods Approaches,* USA: Library of Congress Cataloging-in-Publication Data.

Johnson, D.W. 2003. Social Interdependence: interrelationships among theory, research and practice. *American Psychologist*, 934-945.

Johnson D.W. & Johnson R.T. 1989. *Cooperative learning, values, and culturally plural classroom.*

File://c:\mydocuments\cooperativelearninginculturallydiverseclassroom.htm [accessed 2/4/2015].

Johnson D.W. & Johnson R.T. 1994a. *Learning together. In h*andbook of cooperative learning methods (eds..) by Sharan. Greenwood: Greenwood Press.

Johnson D.W. & Johnson R.T. 1994b. *Structuring academic controversy.* In handbook of cooperative learning methods (eds.) by Sharan. Greenwood: Greenwood Press.

Johnson D.W. & Johnson R.T. 1995a. *Cooperation and the use of Technology.* Minnesota: University of Minnesota.

Johnson D.W. & Johnson R.T. 1995b. *Cooperative learning and non-academic outcomes of schooling: The other side of the Report Card.* In Secondary schools and cooperative learning theories, models and strategies (eds.) by Pedersen & Digby. USA: Garland Publishing INC.

Johnson, D.W. 2003.*Social* Interdependence: Interrelationships Among Theory, Research and Practice. *American Psychologist*, 934-945.

Johnson, D.W. and Johnson, R.T. 2005.New Developments in Social interdependence Theory. General Psychology Monograph, 131(4): 285-358.

Johnson D. W. & Johnson R. T. 2006. New developments in social interdependence theory. genetic, *Social and General Psychology Monographs*, 131 (4): 285-358.

Johnson D.W. & Johnson R.T. 2008. *Social interdependence theory and cooperative learning: the teacher's role:* in the teacher's role in implementing cooperative learning in the classroom (eds.) by Gillies, Ashman and Terwel. USA: Springer Science and Business Media.

Johnson, D. W. & Johnson, R. T. 2009. An Educational Psychology Success Story: Social Interdependence Theory and Cooperative Learning. *Educational Researcher*, 38(5): 365-379.

Johnson D. W., Johnson R. T. & Holubec E. J. 1994. *Cooperative Learning in the Classroom.* Alexandria:  Library of Congress Cataloging-in-Publication Data.

Johnson D. W., Johnson R. T. & Smith K. A. 1995. *Cooperative learning and individual student achievement in secondary schools.* In Secondary schools and cooperative learning theories, models and strategies (eds.) by Pedersen and Digby. USA: Garland Publishing INC.

Johnson D. W., Johnson R. T. & Smith K. A. 2004. *Cooperative learning.* Minnesota: University of Minnesota.

Johnson, D.W., Johnson, R.T. & Smith, K.A. 2007. The state of cooperative learning in postsecondary and professional settings. *Educational Psychology Review,* 19, 15-29.

Johnson D. W., Johnson R. T. & Stanne M. B. 2000. *Cooperative learning methods: a meta-analysis.* Minnesota: University of Minnesota.

Kanuka H. 2010. *Deliberative inquiry*. In New Approaches to Qualitative Research: Wisdom and Uncertainty (eds.) by Savin-Baden M. and Major C.H. London: Taylor and Francis e-Library.

Kincheloe, J. L. 2001. Describing the bricolage: Conceptualizing a new rigor in qualitative research. *Qualitative Inquiry, 7*(6): 679-672.

King A. 2008. *Structuring Peer Interaction to Promote High-order thinking and Complex Learning in Cooperative Groups:* in The Teacher's Role in Implementing Cooperative Learning in the Classroom (eds.) by Gillies, Ashman and Terwel. USA: Springer Science and Business Media.

Kinniburgh J. 2010. A Constructivist Approach to using GIS in the New Zealand Classroo*m. New Zealand Geographer*, 66: 74-84.

Knight G.P. & Bohlmeyer E.M. 1990.*Cooperative Learning and Achievement: Methods for Assessing Causal Mechanisms.* In Cooperative learning theory and research (eds.)by Sharan. USA: Library of Congress Cataloging-in-Publication Data.

Koehler, M.J. & Mishra, P. 2005. Teachers learning Technology by design*. International Society for Technology in Education*, 21 (3): 94-102.

Koffka K. 1922. *Perception: An Introduction to the Gestalt-Theorie.* Calicut: Nalanda Digital Library, Reginal Engineering College.

Koffka K. 2010. On the Structure of the Unconscious. *Gestalt Theory* 32 (4): 375-388. Originally published 1928.

Kolb, D.A. 1976. Management and learning process. *Spring* 18 (3): 21-31.

Kordakiet M. Daradaimis, T. Fragidakis, D. & Grigoriadou, M. 2012. *Adapting the Collaborative Strategy 'Students Team Achievement Divisions' in an Information Technology Work Place.*Springer-Verlag, Berlin Heidelberg.

Koro-Ljungberg M. Yendol-Hoppey, D. Smith, J.J. & Hayes, S.B. 2009.Epistemological Awareness, Instantiation of Methods, and Uninformed Methodological Ambiguity in Qualitative Research Projects. *Educational Researcher,* 38 (9): 687-699.

Krauss S.E. 2005. Research paradigms and meaning making: A Primer. *The Qualitative Report*, 10 (4): 758-770.

Kumagai, A.K. & Lypson, M.L. 2009. Beyond Cultural Competence: Critical Consciousness, Social Justice, and Multicultural Education. *Academic Medicine,* 84(6): 782-787.

Kuntz K.J. & McLaughlin T. F. 2001.A comparison of cooperative learning and small group individualized instruction for math in a self-contained classroom for elementary students with disabilities*. Educational Research Quarterly*, 24(3): 41-56.

Lacey, A. & Luff, D. 2001. *Qualitative Data Analysis*. In Trent focus for research and development in pramary health care, (eds.) by Lacey, A. and Luff, D. pp1-34.

Lai, E.R. 2011. *Motivation: A Literature Review.* Pearson.

http://www.pearsonassessments.com/research [accessed 29/03/2012].

Laing T. 2002. *Implementing Cooperative Learning in EFL Teaching: Process and Effects.*Unpublished thesis.

Lauckner, H. Paterson, M. & Krupa, T. 2012. Using Constructivist Case Study Methodology to Understand Community Development Processes: Proposed Methodological Question to Guide the Research Process. *The Qualitative Report,* 17 (25): p1-22.

Lazarowitz L. & Karsenty G. 1990.*Cooperative learning and students' academic achievement, process skills, learning environment, self-esteem in Tenth-Grade Biology classroom.* Cooperative Learning Theory and Research (eds.) by Sharan. USA: Library of Congress Cataloging-in-Publication Data.

Lee C., Ng M. & Jacobs G.M. 1997. *Cooperative Learning in the Thinking Classroom: Research and Theoretical Perspectives.* Singapore: Paper presented at the International Conference on Thinking.

Leech, N.L. and Onwuegbuzie, A.J. 2007: *A Typology of Mixed Methods Research Designs,* USA: Springer Science and Business Media.

Lekgoathi, S.P. 2010. The History Workshop, Teacher Development and Outcomes-Based Education over the past seven years. *African Studies,* 69(1): 103-123.

Lemmer, E., Meier, C. and van Wyk, N. 2012. *Multicultural Education 2nd Ed: A Manual for the South African Teacher.* Pretoria: Van Schaik.

Lévi-Strauss, C. (1966). *The savage mind*. Chicago, IL: University of Chicago Press.

Lewis, T. 1999. Research in teaching Technology Education – some areas of need*.* *Journal of Technology Education*, 10 (2):

.http://scholar.lib.vt.edu/ejournals/JTE/v10n2/lewis.html. [Accessed, 2013/04/17].

Li, M.P. & Lam, B.H. 2005. *Cooperative learning*. Hong Kong: Hong Kong Institute of Education.

Life in MBA. 2012. *Alderfer's ERG Theory.* Unpublished paper, p1-4.

Lifvendahl, T. 2005. *Theories of Motivation: Overview.* Notes,

www.drtomlifvendahl.com [Accessed 31/05/2012].

Lombard K. & Grosser M. 2008.Critical thinking: are the ideals of OBE failing us or are we failing the ideals of OBE? *South African Journal of Education,* 28: 561-579.

Macfarlane B. 2010. *Values and virtues in qualitative research.* In New Approaches to Qualitative Research: Wisdom and Uncertainty (eds.) by Savin-Baden M. and Major C.H. London: Taylor and Francis e-Library.

Mack, L. 2010. The philosophical underpinnings of educational research. *Polyglossia,* 19 (1): 5-11.

Mack, N., Woodsong, C., MaQueen, K.M., Guest, G. & Namey, E. 2005: *Qualitative Research Methods: A Data Collector's Field Guide,* USA: Family Health International.

MacKenzie, N. & Knipe, S. 2006. Research dilemmas: Paradigms, methods and methodology. Issues In *Educational Research.*

http://www.iier.org.au/iier16/mackenzie.html [Accessed 2014/10/27].

Magos, K. 2012. But I cannot do Research': Action-Research and Early Childhood Teachers. A case study from Greece. *Teachers and Teaching: Theory and Practice*, 18 (3): 331-343

Maimbo, H. & Pervan, G. 2004. *Designing a case study protocol for application in IS research.* Curtin: Curtin University of Technology.

Majoka M.I., Dad M.H. & Manhood T. 2010.Student Team Achievement Division (STAD) as an active learning strategy: Empirical evidence from Mathematics classroom. *Journal of Education and Sociology*, ISSN:2078-032X, 16-20.

Malan, S.P.T. 2000: The New Paradigm' of Outcomes-based Education in Perspective, *Journal of Family Ecology and Consumer Science*, V28 p22-28

Maloof, J. and White, V.K.B. 2005. Team study training in the college biology laboratory. *Journal of Biological Education*, 39 (3): 120-122.

Mangan, J. Lalwani, C. & Gardner, B. 2004. Combining quantitative and qualitative methodologies in logistics research. *International Journal of Physical Distributions and Logistics Management,* 34 (7): 565-578.

Manisera, M. Dusseldorp, E & Van der Kooij, A.J. 2005. *Component Structure of Job satisfaction based on Herzberg's theory.* Brescia: Department of Quantitative Methods, University of Brescia.

Maree, K. & Pietersen, J. 2010: *Standardisation of a questionnaire,* In First Steps in Research (eds.) by Maree K. pp 214-223, Pretoria: Van Schaik Publishers.

Maree, K. & Pietersen, J. 2010: *The quantitative research process,* In First Steps in Research (eds.) by Maree K. p 144-153, Pretoria: Van Schaik Publishers.

Martin, D. & Joomis, K. 2007. *Building Teachers: A Constructivist Approach to Introducing Education,* Belmont, CA: Wadsworth.

Martin, D. & Joomis, K. 2009. *Building Teachers: A Constructivist Approach to Introducing Education*. Wadsworth.

Martin-Stanley B.L. & Martin-Stanley C.R. 2007.*Constructivism and Technology: Strategies for Increasing Student Learning Outcomes.*National Science Association.http://www.nssa.us/journals/2007-29-1/2007-29-1-15.htm. [Accessed 2011/02/10].

Maslow, A.H. 1943. A Theory of human motivation. *Psychological Review*, 50 (1): 370-396.

McGregor, S.L.T. & Murnane, J.A. 2010. Paradigm, methodology and method: Intellectual integrity in consumer scholarship. *International Journal of Consumer Studies,* 34 (4): 419-427.

McLoughlin, C. & Oliver, R. 1994. *Who is in control? Defining Interactive Learning Environments.* Edith Cowan University.

McMillan, J.H. & Schumacher, s. 2010. *Research in education: evidence-based Inquiry 7th Ed.* USA: Pearson Education Inc.

McNaughton, S. Lai, M. MacDonald, S. & Farry, S. 2004.*Designing more effective teaching of comprehension in culturallu and linguistically diverse classrooms in New Zealand*. Australian Journal of Language and Literacy, 27(3): 184-197.

Mctighe J. & Wiggins, G. 2012. *Understanding by design framework.* ASCD Alexandria, USA.

Mertens, D.M. 2007. Transformative paradigm: mixed methods and social justice, *Journal of Mixed Methods Research*, 1 (3): 212-225.

Mertens, D.M. 2010. An *introduction to research.* In Research and Evaluation in Education and Psychology. http://www.sagepub.com/upm_data/29985_chapter 1.pdf [Accessed 27-10-2014].

Messerschmidt J.J.E. 2003. Introduction of cooperative learning to Grade 4 learners in some disadvantaged schools. *South African Journal of Education*, 23(2): 107-112.

Maimbo, H. & Pervan, G. 2004. *Designing a case study protocol for application in IS research*. Perth: Curtin University of Technology.

Miller, N. & Harrington, H.J. 1990. *A situational identity perspective on cultural diversity and teamwork in class.* In Cooperative Learning Theory and Practice (eds.) by sharan. USA: Library of Congress Cataloging-in-Publication Data.

Mills, J., Bonner, A. & Francis, K. 2006. The Development of Constructivist Grounded Theory, *International Journal of Qualitative Methods*, 5 (1): 1-10.

Milne, L. & Edwards, R. 2013.Young children's view of the technological process: an exploratory study*. International Journal of Technology and Design Education*, 23, 11-21.

Milner IV, H.R. 2001. Culturally relevant pedagogy in a diverse urban classroom. *Urban Review*, 43, 66-89.

Mishra, P. & Koehler, M.J. 2006. Technological content knowledge: a framework for teacher knowledge. *Teacher College Report, 108 (6): 1017-1054.*

Moodie, T. 1995. *Some Approaches to Teaching and Learning,* in empower the teacher (eds.) by Courts, A.

Moore, L.L. Grabsch, P & Rotter, D. 2010. Using Achievement Motivation Theory to explain student participation in a residential leadership learning community. *Journal of Leadership Education,* 9 (2): 22-34.

Moretti F. Van Vliet, L. Bensing, J. Deledda, G. Mazzi, M. Rimondini, M. Zimmermann, C. & Fletcher, I. 2011. A standardized approach to qualitative content analysis of focus group discussion from different countries*. Journal of Patient Education and Counselling,* 82 (3): 420-428.

Morgan, D.L. 2007. Paradigm lost and pragmatism regained: methodological implications of combining qualitative and quantitative methods, *Journal of Mixed Methods Research,* 1 (1): 48-76.

Morris, E. and Burkett, K. 2011. Mixed methodologies: a new research paradigm or enhanced quantitative paradigm, *Online Journal of Cultural Competencies in Nursing and Healthcare*, 1 (1): 27-36.

Morrow, S.L. 2005. Quality and trustworthiness in qualitative research in counselling psychology. *Journal of Counselling Psychology,* 52 (2): 250-260.

Motala, S. 2009. Privatising public schooling in post-apartheid South Africa – Equality consideration. Compare: *A Journal of Comparative and International Education,* 39(2): 185-202.

Msila, V. 2010. *From apartheid education to the Revised National Curriculum Statement: Pedagogy for Identity formation and Nation building in South Africa.* Unpublished paper.

Muraya, D.N. & Kimano, G. 2011. Effects of cooperative learning approach on biology mean achievement scores of secondary school students' in Machakos District, Kenya. *Educational Research and Reviews*, 6 (12): 726-745.

Murdoch K. & Wilson J. 2008. *Helping your pupils to work cooperatively*. USA: Routledge.

My Fundi. 2012. *The History of Education in South Africa IV.*

http://myfundi.co.za/e/the_history_of_education_in_south_africa_IV [Accessed 06/06/2012].

Nagel, P. 2007: Moving beyond lecture: cooperative learning and the secondary social studies classroom*, Education,* 128 (3): 363-368.

Nasir, N.S. & Hand, V.M. 2011. Exploring sociocultural perspectives on race, culture and learning. *Review of Educational Research,* 76 (4): 449-475.

National Department of Education, 2002. *Revised National Curriculum Statement Grades R-9 (Schools) Policy: Technology.* Pretoria: Government Printer.

National Department of Education, 2003. *National Curriculum Statement General Education and Training: Assessment Guidelines for Technology (Intermediate and Senior Phase)*. Pretoria: Government Printer.

National Department of Education, 2003a. *Revised National Curriculum Statement Grades R-9 (Schools): Teachers' Guide for the Development of Learning Programmes Technology*. Pretoria: Government Printer.

National Department of Education. 2003b. *National Curriculum Statement General Education and Training Assessment Guidelines for Technology (Intermediate and Senior Phases)*. Pretoria: Government Printer.

National Department of Education 2010: *Curriculum Assessment Policy Statement: Technology, Final draft,* Pretoria: Government Printer.

Nejadghanbar H. & Mohammadpour L. 2012. On the effect of interest-oriented Student Team Achievement divisions on the reading comprehension achievement of English as a foreign language. *Journal of Academic and Applied studies*, 2(11): 21-33.

Newton F.B. & Ender S.C. 2010.*Students Helping Students: A Guide for Peer Educators on College Campus 2nd Ed*. USA: Jossey-Bass.

Nichols, M. 2004. Motivation and Hygiene as a framework for eLearning practice. *Educational Technology,* 7 (3): 1-4.

Niehaus K. ,Rudasill K.M. & Adelson J.L. 2012. Self-efficacy, intrinsic motivation and academic outcomes among Latino middle school students participating in an after-school program.Hispanic *Journal of Behavioural Sciences*, 30 (1): 67-95.

Nieuwenhuis J. 2010. *Qualitative research designs and data gathering techniques.*In First Steps in Research (eds.) by Maree K. Pretoria: Van Schaik Publishers.

Nieuwenhuis, J. 2010a: *Introducing qualitative research,* In First Steps in Research (eds.) by Maree K. Pretoria: Van Schaik Publishers.

Nieuwenhuis J. 2010b. *Analysing qualitative data*. In First Steps in Research (eds.) by Maree K. Pretoria: Van Schaik Publishers.

Oakley, B. Felder, R.M. Brent, R. & Elhajj, I. 2004. Turning student groups into effective teams. *Journal of Student Centered Learning*, 2 (1): 9-34.

O'Brien, R. 1998. *An overview of the approach methodological approach of action research,* Toronto: Faculty of Information Studies, University of Toronto.

*O'Brien R. 2001. An overview of the methodological approach of action research,* http://www.we.net/~robrien/papers/arfinal.html [accessed 2010/01/19]

O'Connor, H. & Gibson, N. 1998. A step-by-step guide to qualitative data analysis. *A Journal of Aboriginal and Indigenous Community Health*, 1 (1): 63-90.

OECD, 2009. *Teacher evaluation: A conceptual framework and examples of Country Practices.* Paper Presented at the OECD Mexico Workshop.

Onwuegbuzie, A.J., Collins, K.M.T. & Jiao, Q.G. 2009. Performance of cooperative learning groups in a postgraduate education research methodology course: the role of social interdependence. *Active learning in Higher Education,* 10 (3): 265-277.

Onwuegbuzie A.J. & Leech N.L. 2007. Sampling Designs in Qualitative Research: making the sampling process more public*. The Qualitative Report*, 12 (2): p238-254.

Ormston, R. Spencer, L. Barnard, M. & Snape, D. 2013. *The foundations of qualitative research.* In qualitative research practice, (eds.) by Ritchie, J. LA: Sage Publications, LA, p1-25.

Pajares, F. 2001. Toward a positive Psychology of academic motivation. *The Journal of Educational Research*, 95 (1): 27-35.

Palmer D. 2005. *A* motivational view of constructivist informed teaching*. International Journal of Science Education,* 27 (15): 1853-1881.

Pan, W. & Hawryszkiewycz, I. 2004. *A method of defining learning process*. In Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference, (eds.) by Atkinson, R. Perth: ASCILITE p734-742.

Panitz T. 2011. *Collaborative versus cooperative learning – a comparison of the two concepts which will help us understand the underlying nature of interactive learning.* http://home.capecod.net/~tpanitz/tedsarticles/coopdefinition.htm(1of15)25/5/2548 [accessed 29/03/2012].

Pendlebury, S. & Enslin, P. 2004. *Social justice and inclusion in education and politics: the South African case*. Journal of Education, 1(34): 31-50.

Petrina, S. 1992. *Curriculum change in technology education: A theoretical perspective on personal relevance curriculum design.* Journal of Technology Education, 3 (2): http://scholar.lib.vt.edu/ejournals/JTE/v3n2/htmlpetrina.html. [Accessed, 2013/04/17].

Petrina, S. 2003. The Educational Technology is Technology Education manifesto*. Journal of Technology Education,* 15 (1):

http://scholar.lib.vt.edu/ejournals/JTE/v15n1/petrina.html. [Accessed, 2013/04/17].

Pew, S. 2007. Andragogy and pedagogy as foundational theory for student motivation in higher education. *Student Motivation,* 2 (1): 14-25.

Phuong-Mai, N. Terlouw, C. Pilot, A. & Elliott, J. 2009. Cooperative learning that features a culturally appropriate pedagogy. *British Educational Research Journal,* 35 (6): 857-875.

Pianta, R. C. 2009. Conceptualization, Measurement, and Improvement of Classroom Process: Standardized Observation can Leverage Capacity, *Educational Researcher,* 38 (2): 109-119.

Plants, H. L., R. K. Dean, J.T. Sears, W. S. Venable (1980). A Taxonomy of Problem-Solving Activities and Its Implications For Teaching. In James L. Lubkin (ed.) *The Teaching of Elementary Problem Solving in Engineering and Related Fields* (pp 21-34). Washington D.C.; American Society for Engineering Education.

Pope C., Van Rooyen P. & Baker R. 2002. Qualitative methods in research on health care quality*. Journal of QualSaf Health Care*, 11 (1): 148-152.

Poston, B. 2009. An Exercise in personal exploration: Maslow's Hierarchy of Needs. *Surgical Technologist*, 1, 347-353.

Potter, P. 2011. Technologists talk: making the links between design, problem-solving and experiences with hard materials. *International Journal of Technology and Design Education*, http://0-link-springer.com.wagtail.ufs.ac.za/article/10.1007/s10798-011-9159-3/fulltext.html. [Accessed 4/30/2013].

Pouliot, V. 2007. "Subjectivism": toward a constructivist methodology. *International Studies Quarterly,* 51 (1): 359-384.

Powell K.C. & Kalina C.J. 2009.Cognitive and social constructivism: developing tools for an effective classroom. *Education,*130, (2): 241-250.

Rahimi, A. & Abedini, A. 2009. The interface between EFL learners' Self-efficacy concerning listening comprehension and listening proficiency. *Novitas-Royal,* 3 (1): 14-28.

Ranaivoson, H. 2007. *Measuring cultural diversity: A review of existing definitions*. Paris: University of Paris.

Rasinen, A. 2003. Analysis of the Technology Education Curriculum of six countries. *Journal of Technology Education*. http://scholar.lib.vt.edu/ejournals/JTE/v15n1/rasinen.html. [Accessed 2013/04/11].

Rauscher, W. 2011. The technological knowledge used by technology education students in capability tasks. *International Journal of Technology and Design Education*, 21: 291-305.

Reddy, V., Ankiewicz, P., De Swardt, E. & Gross, E. 2003.The essential features of Technology and Technology Education: A conceptual framework for the development of OBE (Outcomes-Based Education) related programmes in Technology Education*. International Journal of Technology and Design Education*, 13, 27-45.

Redmond, B.F. & Cramer, C. 2012. *Needs theories overview.*

https://wikispaces.psu.edu.display/PSYCH484/2.+Need+Theories. [Accessed 08/20/2012].

Redwoods. 2010. *Maslow's Hierarchy.* CA: College of the Redwoods Distance Education.

Reiss S. 2004. Multifaceted nature of intrinsic motivation: The theory of 16 basic desires*. Review of General Psychology*, 8 (3): 179-193.

Richards, J. 2014. *Practice teaching: A reflective approach*,

http://www.professorjackrichards.com/.../Practice-Teaching-A-Reflective-Approach-chap-7-classroom-observation-in-Teaching-Practice. [Accessed 05/11/2014].

Richards K. 2009. Trends in qualitative research in language teaching since 2000*. Language Teaching Cambridge University Press*, 42 (2): 147-180.

Richards L. 2006. *Handling Qualitative Data: A Practical guide.* London: SAGE.

Riddell, S. 2009. Social justice and inclusion in Scottish education. *Discourse, 30,* (3): 283-297.

Ritchie, L. & Williamon, A. 2011. Primary school children's self-efficacy for music learning. *Journal of Research in Music Education*, 59, (2): 146-161.

Ritz, J. M. 2009. *A new generation of goals for Technology,* Education Journal of Technology Education, 20 (2): http://scholar.lib.vt.edu/ejournals/JTE/v20n2/ritz.html. [Accessed, 2013/04/17].

Rohaan, E.J., Taconis, R. & Jochems, W.M.G. 2012. Analysing teacher knowledge for technology education in primary schools. *International Journal of Technology and Design Education,* 22, 271-280.

Ryan, R. M. 2009. *Self-Determination Theory and Wellbeing*. A Paper Presented at the WeD Research review, Bath: University of Bath.

Ryan, R.M. & Deci, E.L. 2000.Intrinsic and extrinsic motivation: classic definitions and new directions. *Contemporary Educational Psychology*, 25, 54-67.

Ryan, R. M. and Niemec, C.P. 2009. Self-Determination Theory in Schools of Education: Can Empirically supported Framework also be Critical and Liberating? *Theory and Research in Education*, 7(2): 263-272.

Samovar, L.A. Porter, R.E. & McDaniel, E.R. 2009. *Communication between cultures 7th Ed.* Wardworth, Canada.

Samovar, L.A. Porter, R.E. McDaniel, E.R. & Roy, C.S. 2012. *Communication between cultures 8th Ed.* Wardworth, Canada.

Sanchez, J.C. & Loredo, J.C. 2009. Constructivisms from a genetic point of view: A critical classification of current tendencies. *Integr Psych Beav,* 43 (1): 332-349.

Sanders, M. 2001. New paradigm or old wine? The status of Technology Education practice in the United States. *Journal of Technology Education*. http://scholar.lib.vt.edu/ejournals/JTE/v12n2/sanders.html. [Accessed 2013/04/11].

Sapon-Shevin, M. 2004. *Increasing diversity in schools.* In Teaching Cooperative Learning: The challenge for Teacher education (eds.) by Cohen et al. New York: State University of New York.

Schein E.H. 1995. *Kurt Lewin's Change Theory in the field and in the classroom: Notes toward a model of managed learning.* Invited paper for a special issue of Systems Practice.

Schnieder, M. & Stern, E. 2010. *Cognitive perspective on learning ten cornerstone findings.* In Nature of Learning: Using Research to Inspire Practice (eds.) by Dumont, H. OECD, p69-90.

Schneidewind, N. 2004.*Educating teachers for socially conscious cooperative learning.* In Teaching cooperative learning : the challenge for teacher education (eds.) by Cohen et al. New York: State University of New York.

Scott, A. 1998. Student Teams Achievement Divisions (STAD) in a Twelfth grade classroom: Effects on student achievement and attitude. *Journal of Social Studies Research,* http://findarticles.com/p/articles/mi_qa3823/is_199804/ai_n873828/print [Accessed 4/29/08].

Sharan, Y. & Sharan, S. 1994. *Group investigation in the cooperative classroom.* In Handbook of cooperative learning methods (eds.) by Sharan, S. USA: Library of Congress Cataloging-in-Publication Data.

Sharan, S. & Shaulov, A. 1990. *Cooperative learning, motivation to learn and academic achievement.* In Cooperative learning theory and research (eds.) by Sharan, S. USA: .Library of Congress Cataloging-in-Publication Data.

Sharan, Y. 2010. *Cooperative learning: a diversified pedagogy for diverse classrooms*. Intercultural Education, 21(3): 195-203.

Shenton, A.K. 2004. Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information,* 22(1): p63-75.

Sherman L. W., Schmuck R. & Schmuck P. 2004. *Kurt Lewin's contribution to the theory and practice of education in the United States: the Importance of Cooperative Learning.* Unpublished article.

Sherow S. 2006. *PA Literacy Corps Theory to Practice: Adult teaching and Learning Strategies for Tutors. Pennsylvania:* Pennsylvania State University.

Slavin, R.E. 1977: *Student Teams and Achievement Divisions: Effects on Academic Performance, Mutual attraction, and Attitudes,* Maryland: The Hopkins University.

Slavin, R.E. 1980: The effects of student teams and peer tutoring on academic achievement and time-on-tas., *Journal of Experimental Education*, 48, (4): 252-257.

Slavin R. E. 1990. *Cooperative Learning: Theory, Research and Practice.*Allyn and Bacon, USA.

Slavin, R.E. 1991: *Synthesis of Research on Cooperative Learning,* In Cooperative Learning and Collaborative Schools (eds.) by Brandt R.S. p 82-89, USA: Library Congress Cataloging-in-Publication Data.

Slavin R. E. 1992. *When and why does cooperative learning increase achievement? Theoretical and empirical perspectives.* In Interaction in cooperative groups (eds.) by Hertz-Lazarowitz and Miller. USA: Cambridge University Press.

Slavin R. E. 1995. *Research on cooperative learning and achievement: What we know, what we need to know,* Maryland: John Hopkins University.

Slavin R.E. 1996. *Research for the future: research on cooperative learning: What we know, what we need to know.* Maryland: John Hopkins University.

Slavin R.E. 2010. *Cooperative learning: What makes group-work work?* New York*:* University of York and John Hopkins University.

Slavin R.E., Hurley E.A & Chamberlain A. 2003. *Cooperative learning and achievement: theory and research:* in Handbook of Psychology (eds.) by Weiner, I.B., Reynolds, W.M. & Miller, G.E. USA: John Wiley and sons, Inc.

Slavin R.E. & Madden N.A.1994. *Team Assisted Individualization and Cooperative Integrated Reading and Composition.* In Handbook of cooperative learning methods (eds.) by Sharan, S. USA: .Library of Congress Cataloguing-in-Publication Data.

Slavin R.E & Oickle E. 1981. Effects of cooperative learning teams on student achievement and race relations: treatment by race interactions. *Sociology of Education,* 54, 174-180.

Smith K.A. 2006. *Pedagogies of Engagement: Preparing students for an Interdependent World.* A paper presented at the annual conference in October on Case Study Teaching in Science.

Smith, K.A. 2010. *Preparing Students for an Interdependent World: Role of Cooperation and Social Interdependence Theory*. Minnesota: University of Minnesota.

Smith K.A., Sheppard, S.D., Johnson, D.W. & Johnson, R.T. 2005. Pedagogies of engagement: classroom based practices*. Journal of Engineering Education*, 94, (1): 87-101.

Snape, P. & Fox-Turnbull, W. 2011. Perspectives of authenticity: implementation in technology education*. International Journal of Technology and Design Educatio*n. http://0-link.springer.com.wagtail.ufs.ac.za/article/10.1007/s10798-011-9168-2/fulltext.html. [Accessed, 4/30/2013].

Sohel M.K. 2010. *Perspectives of social constructivism approaches on learning.* http://www.telecentre.org/profiles/blogs/perspectives-of-social. [Accessed 2011/02/10].

Sonthara, K. & Vanna, S. 2009. *Cooperative learning: theory and practice.* Boston, World Education.

South African Qualification Authority. 2001. *General Education and Training Certificate (GETC)*. Policy document, Pretoria: Government Printer.

Stables, K. 1997. Critical issues to consider when introducing Technology Education into the curriculum of young learners. *Journal of Technology Education*, http://scholar.lib.vt.edu/ejournals/JTE/v8n2/stables.jte-v8n2.html. [Accessed 2013/04/17].

Stears, M. 2009. How social and critical constructivism can inform science curriculum design: a study from South Africa. *Educational Research,* 51, (4): 397-410.

Steenhuis, H-J. & Bruijn, E.J. 2005. *Empirical research in OM: three paradigms.* Washington: College of Business and Public Administration, Eastern Washington University.

Stein, S.J., Ginns, T.S. & McDonald, C.V. 2007. Teachers learning about Technology and Technology Education: Insights from a professional development experience*. International Journal of Technology and Design Education*, 17, 179-195.

Stockdale, S.L. & Williams, R.L. 2004. Cooperative learning groups at the college level: differential effects on high, average, and low exam performers. *Journal of Behavioural Education*, 13 (1): 37-50.

Stol, K-J. and Fitzgerald, B. 2014. *Research Protocol for Case Study of Crowdsourcing Software Development.* http://staff.lero.ie/stol/publications, university of Limerick. [Accessed 27-10-2014].

Stone, D.N. Deci, E.L. & Ryan, R.M. 2008. *Beyond Talk: Creating Autonomous Motivation through Self-Determination Theory*. Kentucky: University of Kentucky.

Streeter A. 1999. *Cooperative learning strategies.* Lowa: University of Lowa.

Swab, G. 2012. *The effects of cooperative and individualistic learning structures on achievement in a college-level computer-aided drafting course*. Virginia: Polytechnic Institute and State University.

Tanner, K. Chatman, L.S. & Allen, D. 2003. Approaches to cell Biology teaching: cooperative learning in the Science classroom – beyond students working in groups. *Cell Biology Education*, 2 (1): 1-5.

Tarim, K. & Akdeniz, F. 2007. Effects of cooperative learning on Turkish Elementary Students' Mathematics achievement and attitude towards Mathematics using TAI and STAD Methods, *Educ. Stud. Math* (2008) 67, 77-91.

Teck-Hong, T. & Waheed, A. 2011 Herzberg's Motivation-Hygiene Theory and job satisfaction in the Malaysian retail sector: The mediating effect of love of money. *Asian Academy 0f Management Journal,* 16 (1): 73-94.

Teed R., McDaris T. & Roseth C. 2006. *Cooperative Learning.* Starting Point http://serc.carleton.edu/introgeo/cooperative/index.html [accessed 2010/11/02]

Themane, M.J. & Mamabolo, J.M. 2010. *Diversity as a curriculum challenge in South African Schools*. Polokwane: Department of Educational Studies, University of Limpopo.

Terrell, S. R. 2012. Mixed-methods research methodologies, *The Qualitative Report,* 17 (1): 254-280.

Thomas D.R. 2003. *A general inductive approach for qualitative data analysis.* School of Population Health, Auckland: University of Auckland.

Tiantong, C. & Teemuangsai, K. 2013: Student team achievement divisions (STAD) technique through the moodle to enhance learning achievement. *International Educational Studies*, 6 (4): 85-92.

Trede F. & Higgs J. 2009. *Framing research questions and writing philosophically.* In Writing qualitative research on practice (eds.) by Higg J., Horfall, D. and Grace S. Rotterdam: Sense Publishers.

Trpovski, J. 2004. *Cooperative learning in introductory Political Science Course: enriching courses with active learning*. Chicago: Paper presented at the annual meeting of the Midwest Political Science Association.

Turja, L., Endepohls-Ulpe, M. & Chatoney, M. 2009. A conceptual framework for developing the curriculum and delivery of Technology Education in early childhood. *International Journal of Technology and Design Education*, 19, 353-365.

Turner, D.W. III 2010. Qualitative interview design: A practical guide for novice investigators. *The Qualitative Report*, 15 (3): 754-760.

Usher E.L. 2009. Sources of middle school students' self-efficacy in Mathematics: A qualitative investigation. *American Educational Research Journal,* 46 (1): 275-314.

Usher E.L. & Pajares F. 2008. *Self-Efficacy for Learning: A Validation Study.* Educational and Psychological Measurements, 1, 442-463.

Van den Bossche, P., Segers, M. & Kirschner, P.A. 2006. Social and cognitive factors driving teamwork in collaborative learning environment: team learning beliefs and behaviour. *Small Group Research,* 37 (5): 490-521.

Van den Broeck, A., Vansteenkiste, M. & Dewitte, H. 2008. *Self-Determination Theory: A theoretical and empirical overview in Occupational Health Psychology*. USA: Van den Broeck. Indd.

Van den Broeck, A., Vansteenkiste, M, Lens, W. & Dewitte, H. 2010. Unemployed Individuals' Work values and Job Flexibility: An Explanation from Expectancy-Value Theory and Social-Determination Theory. *Journal of International Association of Applied Psychology: An International Review,* 59(2), 296-317.

Van der Horst, H. & Mcdonald, R. 1997: *Outcomes-Based Education: A Teacher's Manual,* Pretoria: Kagiso Publishers.

Van Niekerk, E., Ankiewicz, P. & Swardt, E. 2010. *A* process-based assessment framework for technology education: a case study. *International Journal of Technology and Design Education*, 20, 191-215.

Van Wyk M.M. 2007. *The use of Cooperative Learning in Economics in the Further Education and Training Phase in the Free State Province.* Unpublished PHD Thesis, Free State: University of the Free State.

Van Wyk, M.M. 2009. *Cooperative Learning as a Teaching Strategy for the Classroom: A Practical Guide for Economics Teachers,* Germany: VDM Verlag Dr. Muller Akteingesellschaft & Co.

Van Wyk M.M. 2010. Do student teams' achievement divisions enhance economic literacy? An Quazi-experimental design*. Journal of Technology*, 23(2): 83-89.

Van Wyk M.M. 2012. The effects of the STAD-cooperative learning method on student achievement, attitude and motivation in Economic Education*. Journal of Technology,* 33, (2): 261-270.

Van Wyk M.M. 2013. The Use of Economics games as a participative teaching strategy to enhance student learning. *Journal of Technology*, 35, (2): 125-133.

Van Wynsberghe, R. & Khan, S. 2007. Redefining case study. *International Journal of Qualitative Methods, 6, (2: 1-10.*

Vansteenkiste, M. Lens, W. & Deci, E.L. 2006. Intrinsic versus extrinsic goal contents in self-determination theory: another look at the quality of academic motivation. *Educational Psychologist*, 4, (1): 19-31.

Vansteenkiste, M. Simons, J. Lens, W. Soenens, B. & Matos, L. 2005. Examining the motivational impact of intrinsic versus extrinsic goal framing and anatomy-supportive versus internally controlling communication style of early adolescents' academic achievement. *Child Development,* 76, (2): 483-501.

Vaughan, W. 2002. *Effects of Cooperative Learning on Achievement and Attitude Among Students of Colour*. Xavier: Xavier University.

Veenman, S. Denessen, E., Van den Akker, A. & Van der Rijt, J. 2005. Effects of a cooperative learning program on the elaborations of students during help seeking and help giving*. American Educational Research Journal* 42, (1): 115-151.

Venegas K.M. & Huerta A.H. 2010. *Urban ethnography: Approaches, perspectives and challenges.* In New Approaches to Qualitative Research: In Wisdom and Uncertainty (eds.) by Savin-Baden M. and Major C.H. London: Taylor and Francis e-Library.

Verillon, P. 2004. Revisiting Piaget and Vigotsky: in search of a learning model for Technology Education. *The Journal of Technology Studies*, http://scholar.lib.vt.edu/ejournals/JOTS/Winter-Spring-2000/verillon.html. [Accessed 2013/04/11].

Wahyuni, D. 2012. The research design maze: understanding paradigms, cases, methods and methodologies, J*AMAR*, 10, (1): 69-80.

Walker C.L., Shore B.M. & French L.R. 2011. A theoretical context for examining students' preference across ability levels for learning alone or in groups*. High Ability Studies,* 22, (1): 119-141.

Walmsley, B. 2003. Partnership-centred learning: the case for pedagogic balance in Technology Education. *Journal of Technology Education*, http://scholar.lib.vt.edu?ejournals/JTE/v14n2/walmsley.html. [Accessed 2013/04/12].

Warner, S. A. & Morford, L. L. 2004. The status of design in Technology teacher education in the United States*.* Journal of Technology Education, 15, (2): http://scholar.lib.vt.edu/ejournals/JTE/v15n2/warner.html. [Accessed, 2013/04/17].

Warin, B. Kolski, C. & Sagar, M. 2011. Framework for the evolution of acquiring knowledge modules to integrate the acquisition of high-level cognitive skills and professional competencies: Principles and case studies. *Computers and Education*, 57 (2011): 1595-1614.

Warraich, N.F. & Ameen, K. 2010. *What motivates LIS professionals in the institutions of higher learning: case of Pakistan*. Sweden: World Library and Information Congress.

Williams J.K. 2003. *Maslow's Hierarchy of Needs and Alderfer's ERG Theory.*

Europe: European Social Fund, European Union.

Williams, P.J. 2011. *Research in technology education: looking back to move forward.* International Journal of Technology and Design Education, http://0-link.springer.com.wagtail.ufs.ac.za/article/10.1007/s10798-011-9170-8/fulltext.html. [Accessed, 4/30/2014].

Willis, J.W. 2007. *World Views, Paradigms, and Practice of Social Science Research.* Chapter 1 in Foundations of Qualitative Research: Interpretive and Critical Approaches, (eds.) by Willis, J.W. USA: SAGE..

Wise Hat, 2004: *Large children's classes and STAD,*

http://www.wisehet.com/resources/articles/largechildrensclassandstad.php. [Accessed 2010/02/17]

Wonacott, M.E. 2001. *Technological Literacy*. USA: Eric digest.

Wong, Y.L. & Siu, K.W.M. 2012. A model of creative design process for forstering creativity of students in design education. *International Journal of Technology and Design Education*, 22: 437-450.

Woods, A. 2012. *School leadership, literacy and social justice: the place of local school curriculum planning and reform*. New York: Springer Publishing Company.

Wright, N. & Losekoot, E. 2010. *Interpretative Research Paradigms: Points of Difference.* Auckland: Auckland University of Technology.

Yahaya, N. Yahaya, A. Ramli, J. Hashim S. & Zakariya, S. 2010. The effects of extrinsic motivational factors in Learning among students in secondary school in Negeri Sembilan*. International Journal of Psychological Studies,* 2, (1): 128-136.

Yang, C-L, Hwang, M.Y. & Chen, M.Y. 2011. An Empirical study of the existence, relatedness, and growth (ERG) theory in consumer's selection of mobile value-added services. *African Journal of Business Management,* 5, (19): 7885-7898.

Yawson, R.M. 2012. *An* epistemological framework for Nanoscience and Nanotechnology literacy. *International Journal of Technology and Design Education*, 22, 297-310.

Zakaria E. & Iksan Z. 2007. Promoting cooperative learning in Science and Mathematics Education: A Malaysian perspective*, Eurasia Journal of Mathematics, science and Technology Education,* 3, (1): 35-39.

Zandvanian, A. & Dryapoor, E. 2013. Mixed methods research: A new paradigm in educational research, *Journal of Educational and Management Studies,* 3, (4): 525-531.

Zarei, A.A. 2012. The effects of STAD and CIRC on L2 reading comprehension and vocabulary learning. *Frontiers of Language and Teaching*, 3 (1): 161-173.

Zimmerman, B.J. 2000. Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology,* 25, (1): 82-91.

Zhang Y. & Wildemuth B.M. 2008. *Qualitative analysis of content.* Unpublished article.

Zucker, D.M. 2009. *How to do case study research.* Massachusetts: School of Nursing Faculty Publication Series, University of Massachusetts-Amherst.

Zuga, K.F. 1999. *Addressing women's ways of knowing to improve the Technology Education environment for all students.* Journal of Technology Education, 10, (2): http://scholar.lib.vt.edu/ejournals/JTE/v10n2/zuga.html. [Accessed, 2013/04/17].

# APPENDICES: (SECTION A) RESEARCH INSTRUMENTS

**APPENDIX 1**

TEACHER CLASSROOM OBSERVATION SCHEDULE (TCOS)

1. **Method of teaching**

    1.1. How does classroom sitting arrangement reflect the method of teaching?

    1.2. What is the level of teacher learner interaction?

    1.3. How does the teacher respond to learners' questions?

    1.4. How are the groups' interaction processes?

    1.5. How does the teacher play a facilitating role in the classroom?

    1.6. Does the teacher issue enough and good quality class work?

    1.7. Do test questions reflect on the levels of Bloom's Taxonomy?

2. **Content/ Subject matter**

    2.1. What is the teacher's knowledge level of Technology content?

    2.2. How prepared is the teacher for the lesson?

    2.3. How is the teacher's delivery of the Technology content?

    2.4. How is the teacher explaining and illustrating concepts and processes of Technology?

    2.5. How do learners respond to teacher's probes?

3. **Classroom management**

    3.1. How do learners enter the classroom?

    3.2. How long does it take learners to settle down for the lesson to begin?

    3.3. How is the classroom atmosphere in general?

    3.4. How do learners behave during the lesson?

    3.5. What measures of maintaining control and order does the teacher take?

This TCOS is intended to respond to the research questions "How does the implementation of STAD in Technology classroom impact the researcher's praxis?" and "How can I improve a learner-centred classroom environment through the use of STAD?". The schedule is adapted from (Newton and Ender, 2010:106; Hale and City, 2009: 55).

**APPENDIX 2**

LEARNER CLASSROOM OBSERBATION SCHEDULE (LCOS)

1. **Behaviour**
   1.1. How do learners behave within their groups?
   1.2. How often do learners display disruptive behaviours?
   1.3. How do learners respond to authority?

2. **Social skills**
   2.1. How do learners in groups communicate or talk?
   2.2. How do learners in display active listening in their groups?
   2.3. How do learners show respect to each other's point of view?
   2.4. How do learners treat one another in their groups?
   2.5. How do learners share their knowledge and resources in their groups?
   2.6. How do learners support one another in their groups?
   2.7. How do learners encourage each other to achieve group goals?

3. **Working skills**
   3.1. How do groups keep focused on their tasks?
   3.2. How are the groups adhering to time frames on task?
   3.3. How do groups ensure that each member understands the work done?
   3.4. How do groups practice individual accountability?
   3.5. How do groups display positive interdependence?

The above schedule is derived from (                ). It is intended to respond accurately to the research question, "How would the implementation of STAD in Technology classroom enhance learners' social skill?"

**APPENDIX 3**

GROUP INTERVIEWS SCHEDULE (FGIS)

1. **Group processing**
    1.1. How good do you think your group functioned?
    1.2. How do you know that your group performed well?
    1.3. How do you know that your group did not do well?
    1.4. What did you see or hear one of the members say that motivated your group to work exceptionally?
    1.5. What did you see or hear one of say that negatively affected the effectiveness of your group?
    1.6. How can you describe each member’s contribution to your group’s success?
2. **Learner’s perception of working in groups**
    2.1. How is cooperative group work different to working individually?
    2.2. Do you think you prefer working with others or by yourself? Why?
    2.3. How can you explain your experience with cooperative group work?
    2.4. What was the important lesson you learned from working in teams?
    2.5. What do you think you have taught your teammates?
    2.6. What have you learned from other team members?
3. **Learner preparation**
    3.1. How do you feel if you could not contribute to group responses?
    3.2. Do you think it is necessary to study or review the work at home before coming to group discussions? Why?
    3.3. How does group work motivate you to upgrade your academic achievement?
    3.4. How do you manage to help others understand the work and improve their academic performance?
    3.5. What can you do differently in order to lead your group to success?
4. **Learners’ attitude**
    4.1. What is it that you like most about Technology as a subject? Why?

4.2. How does working in groups help you to change your attitude about Technology?

4.3. What are your expectations when you think of Technology?

4.4. Are your expectations met? Why?

The above schedule is adapted from (Murdoch and Wilson, 2004: 45). This schedule is intended to answer the following research questions; “How could the use of STAD in Technology classroom help develop learners’ intrinsic motivation?” and “How could the implementation of STAD in Technology classroom enhance learners’ attitudes towards Technology?

## APPENDIX 4

Table. 8 Class Timetable 1

| | CLASS TIME TABLE | | | | TEACHER: C. MASOABI | 2013 |
|---|---|---|---|---|---|---|
| | **TIME** | DAY 1 | DAY 2 | DAY 3 | DAY 4 | DAY 5 |
| | 07:30 - 07:45 | **Chapel** | **Form Period** | **Congregational** | **Chapel** | **Chapel** |
| PERIOD 1 | 07:45 - 08:15 | **CAT GR 10** | **TECH GR 7A** | **TECH GR 8A** | **TECH GR 8B** | **CAT GR 11** |
| PERIOD 2 | 08:15 - 08:45 | **CAT GR 10** | **TECH GR 7A** | **TECH GR 8A** | **TECH GR 8B** | **CAT GR 11** |
| PERIOD 3 | 08:45 - 09:15 | | **TECH GR 9B** | **TECH GR 9A** | **CAT GR 11** | |
| PERIOD 4 | 09:15 - 09:45 | | **TECH GR 9B** | **TECH GR 9A** | **CAT GR 11** | |
| PERIOD 5 | 09:45 - 10:15 | **TECH GR 8B** | **CAT GR 11** | **CAT GR 11** | **CAT GR 10** | **TECH GR 9A** |
| PERIOD 6 | 10:15 - 10:45 | **TECH GR 8B** | **CAT GR 11** | **CAT GR 11** | **CAT GR 10** | **TECH GR 9A** |
| BREAK | 10:45 - 11:15 | | | | | |
| PERIOD 7 | 11:15 - 11:45 | **TECH GR 9B** | **TECH GR 7B** | **CAT GR 10** | | **CAT GR 10** |
| PERIOD 8 | 11:45 - 12:15 | **TECH GR 7B** | **TECH GR 7B** | **CAT GR 10** | | **CAT GR 10** |
| PERIOD 9 | 12:15 - 12:45 | **TECH GR 7B** | | **TECH GR 9B** | **TECH GR 9A** | |
| PERIOD 10 | 12:45 - 13:15 | **TECH GR 7A** | | **TECH GR 9B** | | **TECH GR 8A** |
| PERIOD 11 | 13:15 - 13:45 | **TECH GR 7A** | **TECH GR 8B** | | **TECH GR 8A** | **TECH GR 8A** |

**APPENDIX 5**

EVALUATION CRITERIA FOR REFLECTIVE JOURNAL

1. **Class Presentations**

1.1. Method of teaching (content delivery)

Notes

…………………………………………………………………………………

………………………………………………………………………………………
.

1.2. Teacher-Learner interaction

Notes

………………………………………………………………………………..

………………………………………………………………………………………
.

1.3. The role of the teacher

Notes

…………………………………………………………………………………

………………………………………………………………………………………
…

1.4. Teacher Preparation

Notes

…………………………………………………………………………………

………………………………………………………………………………………
..

**1.5.** Knowledge of the subject matter

Notes

………………………………………………………………………………….

…………………………………………………………………………………………

.

**2. Time Management**

2.1. Usage of time in class

Notes

…………………………………………………………………………………….

…………………………………………………………………………………………

…

2.2. Allocation/ distribution of work

Notes

………………………………………………………………………………….

…………………………………………………………………………………………

.

2.3. Time taken before lessons start

Notes

…………………………………………………………………………………….

…………………………………………………………………………………………

.

**3. Class Control and Discipline**

3.1. Learner entrance into the classroom

Notes

………………………………………………………………………………….

……………………………………………………………………………………

.

3.2. Time to settle down

Notes ……………………………………………………………………………

……………………………………………………………………………………

3.3. Disciplinary measures

Notes ……………………………………………………………………………

……………………………………………………………………………………

3.4. Classroom environment

Notes ……………………………………………………………………………

…………………………………………………………………………………..

**This schedule was adapted from Painta, and Hamre, 2009: 111; Fortune, 2000: 2; Richards, 2014: 101)**

**APPENDIX 6**

EVALUATION CRITERIA FOR VIDEO RECORDINGS ON LEARNER INTERACTIONS

1. How do learners interact when working on worksheets?

   ……………………………………………………………………………………………
   ……………………………………………………………………………………………
   …………………………………………………………………………………………….

2. Is there a positive progress regarding team cohesion?

   ……………………………………………………………………………………………
   ……………………………………………………………………………………………
   …………………………………………………………………………………………….

3. Do groups spend most of their time on the task at hand?

   ……………………………………………………………………………………………
   ……………………………………………………………………………………………
   …………………………………………………………………………………………….

4. Do groups ascertain that all members understand the work that is being done?

   ……………………………………………………………………………………………
   ……………………………………………………………………………………………
   …………………………………………………………………………………………….

5. What type of voices do groups use during discussions?

   ……………………………………………………………………………………………
   ……………………………………………………………………………………………
   ……………………………………………………………………………………………..

6. Do groups show positive interdependence among members?

   ……………………………………………………………………………………………
   ……………………………………………………………………………………………

## APPENDIX 7A

### TECHNOLOGY WORKSHEET 1

GRADE 8 WORKSHEET 1 14 AUGUST

**HYDRAULICS AND PNEUMATICS**

**INSTRUCTIONS:** Work in your groups and answer the following questions.

The group leader for this session should make sure that all team members understand the activities.

Make sure that every member gets a chance to explain each question.

Question 1

Explain the difference between the hydraulic system and the pneumatic system. (4)

……………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………
………………………..

Question 2

Draw a simple hydraulic system below and fully label its parts. (15)

Question 3

Fill in a systems diagram below for the above hydraulic system and explain what happens at each stage or level.
(3) + (6)

………………………………………… ………………………………………… …………………………………..

| | | |
|---|---|---|
| | | |

e two examples of hydraulic systems and pneumatic system that we use in real life situations. (8)

a. ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

b. ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

c. ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

d. ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

Question 5

If the hydraulic system in question two has an **effort distance** of 72cm and a **load distance** of 24cm, what would be its **mechanical advantage**? Show all the steps in your calculation. (3)

Question 6

If the car jack has a **mechanical advantage** of 12 and an **effort distance** of 288cm, what would be the **load distance** of the hydraulic jack? (5)

Question 7

The hydraulic jack in question 6 has a **large piston area** of $150cm^2$ and an **area of a small piston** as $25cm^2$. Calculate the **mechanical advantage** of this hydraulic jack. (3)

Question 8

If the hydraulic jack in question 6 has a **mechanical advantage** of 10 and a **small piston area** of $18cm^2$, what would be the surface **area of the large piston**?
(5)

Question 9

A hydraulic system in question 2 has a **small piston radius** of 8cm and a **large piston area** of $256cm^2$. Calculate the **mechanical advantage** of this hydraulic system. (6)

Question 10

If a small piston with a radius of 12cm applied a force of 50N on the hydraulic fluid, how much would the pressure of the fluid be? (4)

**APPENDIX 7B**

TECHNOLOGY WORKSHEET 2

GRADE 8 WORKSHEET 2 21 AUGUST

Hydraulics and linkages Marks: 45

Instructions: Do the activity in your groups.

Do not refer to your notes or previous activities.

Do all work on the worksheet.

SECTION A (hydraulics)

Formulas: $MA = effort\ distance\ \div\ load\ distance$

$MA = large\ piston\ area\ \div small\ piston\ area, A = \pi r^2$, $circumference = \ \pi d$

Π = 3.14, $d = 2r$

QUESTIONS

1. Fill in a systems diagram for a hydraulic lift that is used by mechanics to lift cars during service sessions.

______________________ ____________________ __________________

(3)

(6)

2. Name two examples of pneumatic systems and their real life application.
   A. ………………………………………………………………………………………
   ……………………………………………………………………………………… (1)
   B. ………………………………………………………………………………………
   ……………………………………………………………………………………… (1)
3. Calculate the pressure exerted on the hydraulic fluid if the area of the small piston is $30cm^2$ and the force applied on the piston is 120N. (3)

4. If the effort distance of the system is 80cm and has a mechanical advantage of 4. What would be the value of the distance moved by load? (3)

5. The hydraulic system comprises of a small piston with a diameter of 20cm and a large piston with a circumference of 157cm. Calculate the mechanical advantage of this system. (10)

SECTION B (Linkages)

Formulas: $MA = load(N) \div effort(N)$ gravity = 9.8m/s

$MA = Load\ distance \div effort\ distance$ $Force = mass \times gravity$

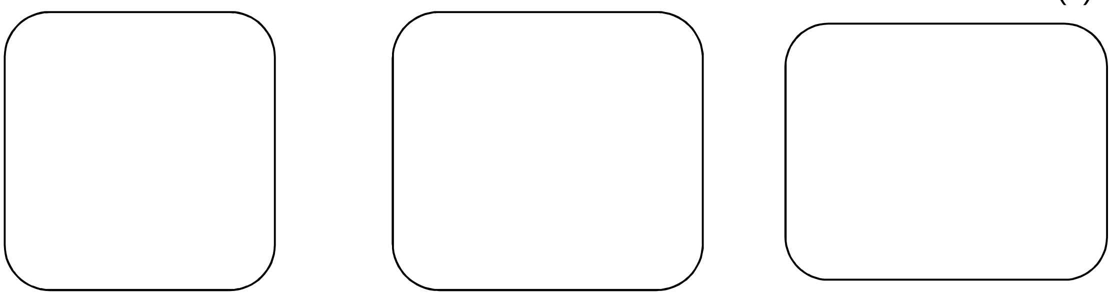
6. What are linkages? (2)

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
……………………

7. Give three examples of linkages and their real life applications.
   A. ……………………………………………………………………………………
   …………………………………………………………………………………… (1)
   B. ……………………………………………………………………………………
   …………………………………………………………………………………… (1)
   C. ……………………………………………………………………………………
   …………………………………………………………………………………… (1)

8. Fill in the systems diagram below for one of the above examples of your choice.

________________ ________________ ________________ (3)



(6)

9. If the system in question 8 moves a load of 20kg with a mechanical advantage of 2, how much effort do you need to apply? (4)

**APPENDIX 8A**

TECHNOLOGY CLASS TEST 1

GRADE 8 CLASS TEST 1 (MECHANISMS) 28 & 29 AUGUST

MARKS: 30

TIME: 30

QUESTIONS

1. Explain the differences between the hydraulic system and the pneumatic system. (2)

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
……………………..

2. Draw a simple hydraulic system below and fully label its parts. (10)

3. If the hydraulic system in question two has an **effort distance** of 144cm and a **load distance** of 36cm, what would be its **mechanical advantage**? Show all the steps in your calculation. (3)

4. Fill in the systems diagram below for one of the linkage mechanisms of your choice.

____________________ ______________________ ________________ (6)

5. The hydraulic system comprises of a small piston with a diameter of 30cm and a large piston with a circumference of 235.5cm. Calculate the mechanical advantage of this system. (9)

Formulas that may be needed for this test are given below:

: $MA = effort\ distance \div load\ distance$ $MA = large\ piston\ area \div small\ piston\ area,\ A = \pi r^2, circumference = \pi d$

Π = 3.14, $d = 2r$

**APPENDIX 8B**

TECHNOLOGY CLASS TEST 2

GRADE 8 | CLASS TEST 2 (MECHANISMS) | 11&12 SEPT.

NAME………………………………………………………….. MARKS: 30

TIME: 30 Min

SECTION A: THEORY

1. Define the following terms. (3)
   a. Linkages
   ………………………………………………………………………………
   ………………………………………………………………………………
   …………
   b. Pulleys
   ………………………………………………………………………………
   ………………………………………………………………………………
   …………
   c. Gears
   ………………………………………………………………………………
   ………………………………………………………………………………
   …………
2. Name the three kinds of linkages. (3)
   ……………………………………………….
   ……………………………………………….
   ……………………………………………….
3. Explain the following parts of the pulley system. (3)
   a. A block
   ………………………………………………………………………………
   ………………………………………………………………………………
   …………
   b. A tackle
   ………………………………………………………………………………
   ………………………………………………………………………………
   …………
   c. A fall
   ………………………………………………………………………………
   ………………………………………………………………………………
   …………
4. What is the purpose of the idler gear in the gear system? (2)
   ………………………………………………………………………………
   ………………………………………………………………………………
   …………

5. If the driver gear turns anticlockwise in a gear train that has an idler gear, in which direction will the driven gear turn? Why? (2)
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………

## SECTION B: CALCULATIONS

Formulae: $MA = \frac{load\ distance}{effort\ distance}$ $MA = \frac{load}{effort}$ $MA = \frac{effort\ distance}{load\ distance}$

$MA = no.of\ falls$ $GR = \frac{no.of\ teeth\ on\ driven\ gear}{no.of\ teeth\ on\ driver\ gear}$ $VR = \frac{no.of\ rpm\ of\ driver}{no.of\ rpm\ of\ driven}$

$Force = mass\ \times gravity$ $gravity = 9.8\ m/s^{-2}$

6. If a dustbin pedal moves for 5cm and the lid moves for 25cm, what will be the mechanical advantage of the linkage system? (3)
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
……………………………………
7. The toolbox trays weigh 3kg in total and the mechanical advantage of the toolbox is 3. Calculate the effort needed to push the handle to open the toolbox. (4)
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
……………………………………
8. If a pulley system lifts a load on 60N and the effort applied is 20N, how many falls does the pulley system have? (3)
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

……………………………………………………………………………………………
……………………………………………………………………………………………
………………………………

9. A pulley system lifts a load for 25cm with the system's mechanical advantage of 4. Calculate the distance moved by effort. (3)
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
………………………….

10. A driver gear has 30 teeth and the gear ratio of the gear train is 3:2. How many teeth does the driven gear have? (3)
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………

**APPENDIX 9**

TECHNOLOGY NOVEMBER EXAMINATION PAPER

GRADE 8 TECHNOLOGY PAPER

NOVEMBER EXAMINATIONS

**EXAMINER: C MASOABI** **MARKS: 100**

**TIME: 1 HR**

**INSTRUCTIONS**

This paper consists of six sections.

Answer all the questions on the provided answer sheet.

In Section A you only write the letter of your chosen answer.

In Section B you write only the missing word.

In Section C and part of Section D you choose the correct answer from the brackets.

All the drawings or sketches must be **drawn in pencil** and **labelled in pen**.

Show your workout on all the calculations including formulas.

Formulas are provided in Appendix A at the end of this question paper.

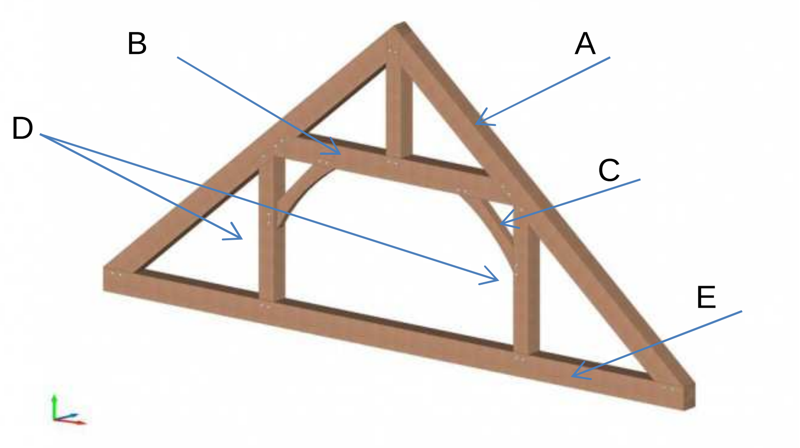
## SECTION A – Structures multiple choice

1. A ……… is made up of rigid parts joined together.
   A. Shell structure B. Solid structure C. Frame structure
2. …………… support the weight of the roof timbers and roof covering.
   A. Roof B. Walls C. Roof trusses
3. ………….. is a horizontal member that connects two opposite rafters to form a roof truss.
   A. Column B. Tie beam C. Strut
4. ………….. is a rope that pulls on a structure to stand firm.
   A. Tie B. Tie beam C. Strut
5. ………….. is a diagonal member that keeps structure firm by pushing against other two members.
   A. Column B. Tie C. Strut
6. …………… is a supporting column that is attached to the centre of the tie beam; extends toward the top of the roof truss framework.
   A. Column B. King post C. Queen post
7. ………….. is a force that causes one part of the structure to slide past another.
   A. Tension force B. Shear force C. Magnetic force
8. ………… is a force that pushes against a structure.
   A. Compression force B. Shear force C. Torsion force
9. ………… is a force that turns or twists structures.
   A. Torsion force B. Tension force C. Compression force
10. ………… is a force that pulls members of the structure apart.
    A. Tension force B. Magnetic force C. Torsion force

**[10]**

## SECTION B – Structures short answers

11. Label a roof truss drawn below that uses queen posts.




(5)

12. When a structure is stiffened by members crossing one another is called ………………. (1)
13. When triangular shapes are used as a technique to strengthen a structure is known as ………………. (1)
14. A beam that is placed above a window or a door is called a …………………. (1)
15. A curved structure that can support a lot of weight is known as ……………. (1)
16. Frame structures are used to …………….. a load. (1)

**[10]**

## SECTION C - Mechanisms

17. An ………… is a slanting surface connecting the lower level and higher level used for lowering of raising a load. (1)
18. A …………… is a double inclined plane with the two inclines facing each other. (1)
19. A …………. is the gear that causes movement in a gear train. (1)
20. A term that describes gears that are rotating in the same direction is …….. (1)
21. A middle gear that makes two gears to rotate in one direction is ………… (1)
22. ……….. is when two or more gears are meshed together. (1)
23. A cam system changes a ………… motion into a ……………….. movement. (2)
24. A cam system uses a ……………. Whereas a crank system uses …………… to move a load. (2)

{***connecting rod, gear train, synchronize, idler gear, rotary, driver gear, wedge, cam follower, inclined plane, driven gear, reciprocating, linear***}

**[10]**

## SECTION D – levers

25. Draw labelled simple schematic diagrams that represent the three classes of levers. Indicate the directions of the effort and the load.

A. First Class lever — *Correct and labelled = 3*
*Directions indicated = 2*

B. Second Class lever — *Correct and labelled = 3*
*Directions indicated =2*

C. Third Class lever — *Correct and labelled = 3*
*Directions indicated = 2*

(15)

26. Draw a systems diagram for a pair of scissors when you cut paper in Technology classroom.

*Three stages = 3*
*Explanations per stage =2 (2x3)*

(9)

27. A ……… is a fixed or movable connection in a lever or linkage that allows force to turn about. (1)

28. Machines are made up of a combination of ……………………….. (1)
29. A ………. is made by connecting several levers together. (1)
30. Give a real life example for each of the three classes of levers. (3)

**[30]**

## SECTION E – gears and calculations

31. There are four main types of gears we learned about this year. Name these gears and explain to Stacey how she would identify them.

*Name of gear = 1*

*Explanation = 2*

3x4 = (12)

32. Calculate the mechanical advantage (MA) of a lever, if effort distance (ED) is 600 cm and load distance (LD) is 100cm. (3)
33. Calculate the load distance if a lever has a mechanical advantage of 0.8 and effort distance of 80cm. (4)
34. Calculate a gear ratio (GR) of a gear train consisting of a driver gear with 30 teeth, idler gear with 20 teeth and a driven gear with 90 teeth. (3)
35. Calculate the number of teeth of the driver gear if the gear train in ***question 34*** has a gear ratio of 3:2. (4)
36. Calculate the output speed of the gear train in ***question 34*** if the input speed is 600rpm. (4)

**[30]**

## SECTION F – electrical systems

37. Copy the table and draw the symbols for the following electrical components.

| Component | Symbol |
|---|---|
| LED | |
| Buzzer | |
| Motor | |
| Resistor | |
| Electromagnet | |

(5)

38. Draw a parallel circuit with three cells, three bulbs, closed switch and the direction of current flow. (5)

**[10]**

**Total marks: [100]**

**Formulas that may be used are provided below.**

$$MA = \frac{Effort\ distance}{Load\ distance}$$

$$GR = \frac{Number\ of\ teeth\ of\ driven\ gear}{Number\ of\ teeth\ of\ driver\ gear}$$

$$Rpm\ driven = \frac{Rpm\ driver\ x\ Number\ of teeth\ of\ driver\ gear}{Number\ of\ teeth\ of\ driven\ gear}$$

## APPENDIX 10

SAMPLE OF TECHNOLOGY LESSON PLAN

| | |
|---|---|
| Lesson Plan: Technology | Class: Grade 8 |
| Lesson: Mechanical systems | Date: 02 September |
| Topic: Pulleys | School: |
| Teacher Activity: Present and ask questions | Aims |
| 1. Definition of pulleys: A wheel grooved on the rim or edge.<br><br>2. Types of pulleys: Block and Tackle<br>Belt drives<br><br>3. Components of pulley systems: Mounting<br>Fixed pulley (block)<br>Moving pulley (tackle)<br>Rope<br>Load (in Newtons)<br><br>4. Real life applications of pulley systems<br>• Block & tackle mechanism<br>• Draw water in deep wells<br>• Belt drives (conveyor belts)<br>• Cranes | Learners should be able to:<br><br>1. Define a pulley and a pulley system.<br><br>2. Design a multiple pulley system.<br><br>3. Identify real life applications of pulley systems.<br><br>4. Explain the reasons behind using pulley systems.<br><br>5. Calculate mechanical advantage in pulley systems using various methods. |

| | |
|---|---|
| 5. Ideas on making a pulley out of recycled materials<br><br>• Use polish lids<br>• Round pieces of wood<br>• Bottle caps<br><br>6. Mechanical advantage: The leverage machines give us.<br><br>• Formulae: MA = $\frac{load}{Effort}$<br>• MA = $\frac{effort\ distance}{Load\ distance}$<br>• MA = number of falls | |
| 7. Learners activity<br><br>• Learners should do activity 6 on page 105 in their groups.<br>• Each group should design a three (3) pulley system and explain how it works. | Resources: grade 8 Technology textbook |

# APPENDICES: (SECTION B) LETTERS

**APPENDIX 11**

RESEARCH ETHICAL CLEARANCE LETTER BY UFS

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

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Ethics Office

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BarclayA@ufs.ac.za

25 August 2011

<u>ETHICAL CLEARANCE APPLICATION:</u>

*THE EFFECTS OF STUDENT TEAMS ACHIEVEMENT DIVISIONS (STAD) AS A COOPERATIVE LEARNING METHOD IN A CULTURALLY DIVERSE SCHOOL SETTING.*

Dear Mr C S Masoabi

With reference to your application for ethical clearance with the Faculty of Education, I am pleased to inform you on behalf of the Ethics Board of the faculty that you have been granted ethical clearance for your research with the following stipulations:

- Arrangements must be made for getting assent from learners for participation in this research (in addition to the consent from parents). A suggestion would be a separate assent form for students of different age groups using simplified language (or pictures) which they will be able to understand and a more detailed form for parents, explaining the research process, risks, benefits and requirements. Please feel free to visit the Ethics Office for assistance with this should you need.
- Consideration should be made regarding how the control group will be directly benefited from this research, perhaps in a follow-up programme of some sort.
- It should also be stipulated that the primary researcher, namely yourself, will be present when the data is gathered (sensitive data may not be gathered by a research assistant or teacher alone).

Please submit the abovementioned changes to the ethics office (Room 13, Winkie Direko Building, University of the Free State) before commencement of your research.

Your ethical clearance number, to be used in all correspondence, is:

**UFS-EDU-2011-0030**

This ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension in writing.

We request that any changes that may take place during the course of your research project be submitted in writing to the ethics office to ensure we are kept up to date with your progress and any ethical implications that may arise. At the conclusion of your research project, please submit a project report stating how the research progressed and confirming any changes to methodology or practice that arose during the project itself. This report should be under 500 words long and should contain only a brief summary focusing primarily on ethical considerations, issues that may have arisen and steps taken to deal with them during the course of the research. Upon receipt of this report, a final ethical clearance certificate will be issued to you, which will form part of your final dissertation.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours sincerely,

Andrew Barclay
Faculty Ethics Officer

**APPENDIX 12A**

APPLICATION LETTER TO THE FREE STATE DEPARTMENT Of EDUCATION

Mr. CS Masoabi
P.O Box 12331
Brandhof
9324

28 April 2011

Ms. M Gaberone
Chief Education Specialist: IRRISS
Room 1204
Provincial Government Building
Free State Department of Education
Private Bag X20565
BLOEMFONTEIN
9300

**REGISTRATION OF RESEARCH PROPOSAL**

We, Dr G Alexander (Promoter) and Prof MM van Wyk (Co-promoter), hereby confirmed that Mr. CS Masoabi (student no. 1996367494) has been registered as a Ph.D student in our School for Education Studies. He is currently conducting research in Social Sciences education. The title of his thesis is: ***Effects of Student Teams Achievement Divisions (STAD) as a cooperative learning method in a culturally diverse school setting.***

With this research study our student hope to contribute to effective teaching and learning of Social Sciences in the Senior Phase in the Motheo education district.

It is further hoped that when the outcomes (Findings and Recommendations) of this study is completed, the findings will be of great value for the empowerment of Social Sciences teachers in the Free State Department of Education.

Regards

**Dr. G Alexander (School for Education Studies-UFS)**
**Promoter**

**Prof. MM van Wyk (Department of Teacher Education, School of Education-UNISA)**
**Co- promoter**

## APPENDIX 12B

LETTER OF APPROVAL BY THE FREE STATE DEPARTMENT OF EDUCATION

education
Department of Education
FREE STATE PROVINCE

Enquiries: Khatite M.C
Reference: 16/4/1/13 - 2011

Tel: 051 404 9275
Fax: 051 404 9274
E-mail: research@edu.fs.gov.za

**2011 – 05 –12**

**MR C. S. MASOABI**
**10272 Grassland**
**HEIDEDAL**
**9306**

Dear Mr Masoabi

**REGISTRATION OF RESEARCH PROJECT**

1. This letter is in reply to your application for the registration of your research project.
2. Research topic: **Effects of student teams achievement division as a cooperative learning method in a culturally diverse school setting.**
3. Your research project has been registered with the Free State Education Department.
4. Approval is granted under the following conditions:-

4.1 The name of participants involved remains confidential.

4.2 The questionnaires are completed and the **interviews are conducted outside normal tuition time**.

4.3 This letter is shown to all participating persons.

4.4 A bound copy of the report and a summary on a computer disc on this study is donated to the Free State Department of Education.

4.5 Findings and recommendations are presented to relevant officials in the Department.

5. The costs relating to all the conditions mentioned above are your own responsibility.

6. **You are requested to confirm acceptance of the above conditions in writing to:**

**DIRECTOR: STRATEGIC PLANNING, POLICY AND RESEARCH,**
**CNA Building, Maitland Street - Private Bag X20565, BLOEMFONTEIN, 9301**

We wish you every success with your research.

Yours sincerely

**FR SELLO**
**DIRECTOR: STRATEGIC PLANNING, POLICY AND RESEARCH**

Directorate: Strategic Planning, Policy & Research – Private Bag X20565, Bloemfontein, 9300 – Room 301, Old CNA building, Maitland Street, Bloemfontein 9300 – Tel: 051 404 50 / Fax: 051 447 7318 E-mail: quality@edu.fs.gov.za

www.fsdoe.fs.gov.z

## APPENDIX 13A

LETTER OF REQUEST TO THE SCHOOL PRINCIPAL

P.O. Box 12331

Brandhof

9324

25 July 2011

The Principal

St. Andrew's School

Dan Pienaar Drive

Bloemfontein

Dear Sir

REQUEST TO CONDUCT STUDY RESEARCH AT ST. ANDREW'S

I am currently a PHD student in the Faculty of Education in the School of Educational Studies, at the University of the Free State. I would like to request your permission to allow me to do my research for my studies at our school.

The research would involve mainly learners in the Grade 8 class for the first term of 2012. The study would be experimental, using and comparing different teaching methods and their effectiveness with regard to aspects such as academic achievement, retention of knowledge, social skills and attitudes.

One of the two Grade 8 classes would be taught using a cooperative learning method and the other class would be taught using a traditional talk and chalk method. A video camera would be used as an instrument for observation.

Should the teaching method in the experimental class have more advantages for the control class, then the control class would be introduced to the more advantageous method.

I would like to assure you of the confidentiality of the research project and that the anonymity of the learners would be protected. I would also like to request your sanction to approach the parents for their permission to allow their children to be part of this research.

Your kind consideration of this request would be highly appreciated.

Yours truly

Charles Masoabi

## APPENDIX 13B

LETTER OF REQUEST TO THE PARENTS OF LEARNERS

FIAT LUX

1863

ST ANDREW'S SCHOOL

BLOEMFONTEIN

Dear Parent,

I am a long-serving member of staff at St Andrew's School. I am currently doing research for a Doctor of Philosophy degree at the University of the Free State in the Faculty of Education in the School of Educational Studies. I would like to involve my Grade 8 classes in a study that will be completed in the first term of 2012.

The study will be experimental, by using and comparing different teaching methods and their effectiveness with regard to aspects such as academic achievement, retention, social skills and attitudes.

The one class will be taught using a cooperative learning method and the other class will be taught using a traditional talk and chalk method. A video camera will be used as an instrument for observations.

Should the teaching method in the experimental class have more advantages to the control class, then the control class will be taught using the advantageous method.
I would also like to assure you that the confidentiality and the anonymity of your child will be protected.

The research has the approval of the Department of Education and the Principal. If you have any queries please contact me at the school or contact the headmaster.

Yours faithfully

Charles S. Masoabi

C R Thomas

C.R. Thomas
Headmaster

St Andrew's School, Bloemfontein, PO Box 12331, Brandhof, 9324, Tel: 051 444 2639, Fax: 051 447 6951
email: admin@sasb.co.za, www.sasb.co.za

## APPENDIX 13C

LETTER OF APPROVAL FROM THE PRINCIPAL AND PARENTS

150

FIAT LUX

1863 - 2013

ST ANDREW'S SCHOOL
BLOEMFONTEIN

30 August 2013

Faculty of Education
School of Educational Studies
University of the Free State
PO Box 339
Bloemfontein
9300

To whom it may concern

**PERMISSION FOR CHARLES MASOABI TO CONDUCT STUDY RESEARCH AT ST ANDREW'S SCHOOL**

I, CR Thomas do hereby give Charles Masoabi, Id 7008295842088, permission to conduct research at St Andrew's School.

Should you have any further queries, please do not hesitate to contact me.

Yours sincerely

CR Thomas

CR Thomas
Headmaster

St Andrew's School, Bloemfontein, PO Box 12331, Brandhof, 9324, Tel: 051 444 2639, Fax: 051 447 6951
email: admin@sasb.co.za, www.sasb.co.za

## APPENDIX 14

TEMPLATE OF GRADE 8 TECHNOLOGY CONTENT FROM CAPS DOCUMENT

TECHNOLOGY GRADES 7-9

**GRADE 8 TERM 2**

It is compulsory to cover the given scope in the term indicated. The sequence of the work within the term must be adhered to.
Skills – investigating, drawing, designing, making and presenting should improve progressively from term to term.

| Hrs | Focus | Content, concepts and skills / Enabling Tasks |
|---|---|---|
| 2 | **Impact of technology** **Processing** **Investigation skills** **Communication skills** | • **The positive impact of technology:** many natural materials have been replaced in modern times by new or improved materials. Some new materials are environmentally friendly by being bio-degradable.<br>• **Case study 1:** investigate the impact of plastic shopping bags on the environment.<br>• **Report**: learners write a report evaluating the effectiveness of using thicker, bio-degradable plastic shopping bags which shoppers must buy. |
| 2 | **Investigation skills** | · Case study 2: technology with a positive impact on society.<br>- Investigate how waste paper and cardboard are recycled to produce new products for the packaging industry.<br>· Development: draw a development of an opened container. |
| 2 | **Designing skills** **Making skills** | · Practical activity: a product requires packaging. Design and make packaging for a purpose. The nature of the product determines the design and properties of the packaging material.<br>· Learners work safely to make and assemble the above packaging product. |
| **FORMAL ASSESSMENT TASK 2: Mini-PAT** | **TOPIC: Impact of technology / Processing / Structures** | |
| **CONTEXT: Will be given by materials developers** | **CONTENT: Counteracting effects of negative technology [70%]** | |
| 2 | **Impact of technology** **Investigating skills** | • **Case study 3**: technological products can have a <u>negative</u> impact.<br>· Investigate a technological product that can have a negative impact on society.<br>• **Class discussion:** facilitate a class discussion on possible solutions that can counteract or compensate for the negative impact of the technology identified. |
| 2 | **Structures** **Processing** | • **Revise:** forces that act on material – tension; compression; bending; torsion; shear.<br>· Adapting materials to withstand forces – reinforcing concrete, plywood.<br>· Selecting metal sections (I-beam, angle iron, T-bar, etc.) to withstand forces and to save material. |
| 2 | **Design skills** **Making skills** | • **Design**: learners adapt a material or design a product that will solve the problem or reduce the impact or negative effects of the technology identified.<br>• **Design**: learners sketch free-hand sketches showing two possible solutions.<br>• **Make:** learners draw their chosen solution in 3D using isometric projection.<br>• **Make:** learners make the model/prototype/product they have designed safely. |
| 2 | **Making skills** **Evaluation skills** | • **Make (cont.)**: Learners make the model/prototype/product they have designed safely.<br>• **Evaluate**: learners evaluate their solution in terms of its effectiveness in solving or reducing the negative impact of the technology identified. Their evaluation will be assessed in terms of its objectivity, fairness, accuracy and scope (depth). |
| 2 | **Communication skills** | · Communicate: Teams present their plans, model and evaluation. |
| 1 | **Formal Assessment Task:** | **Term Test** **[30%]** |
| **Formal Assessment: Term 2:** | **Weighting: 10% of promotion mark** | |
| | **Mini-PAT: [70%]** | **Formal Term Test: [30%]** **Total: 100%** |

24 CURRICULUM AND ASSESSMENT POLICY STATEMENT (CAPS)

TECHNOLOGY GRADES 7-9

**GRADE 8 TERM 3**

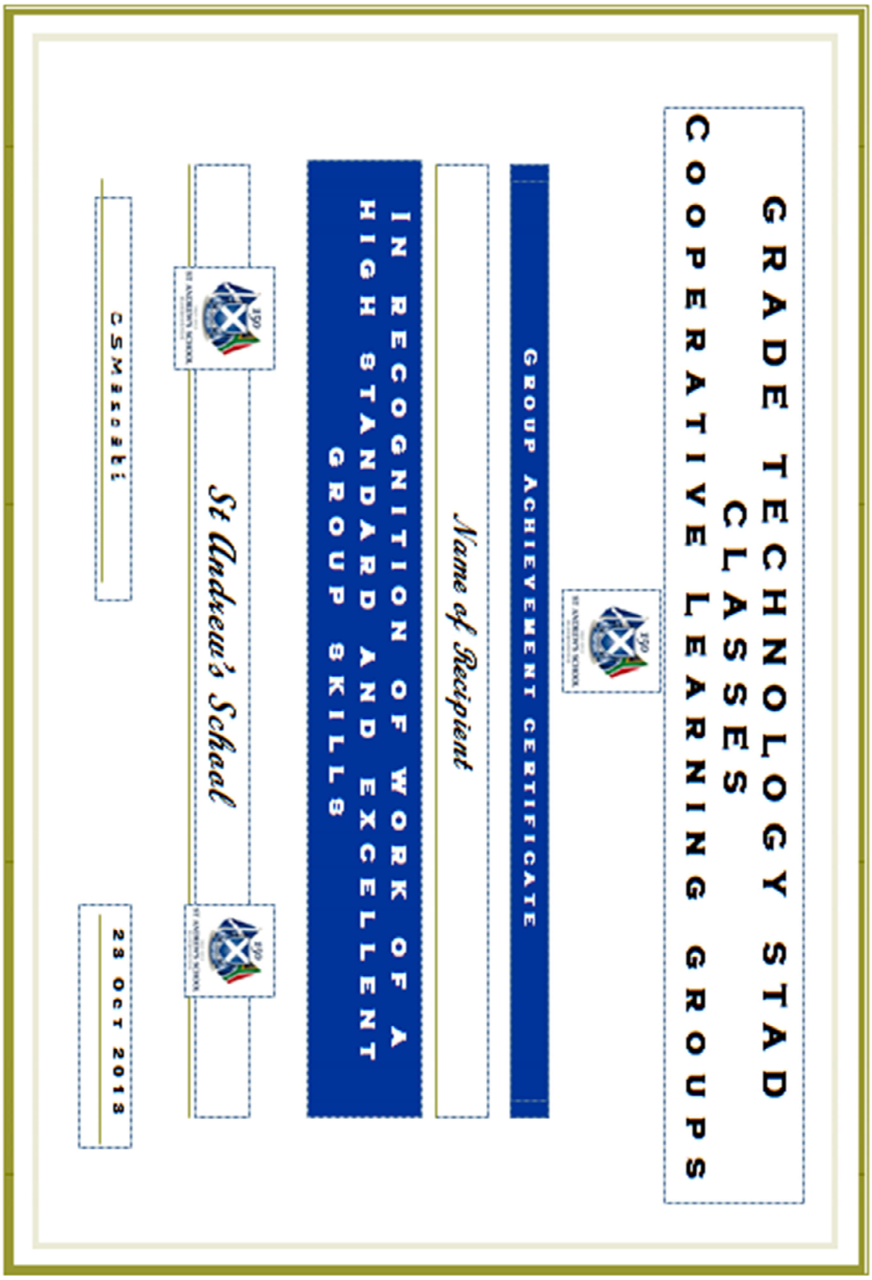
It is compulsory to cover the given scope in the term indicated. The sequence of the work within the term must be adhered to.
Skills – investigating, drawing, designing, making and presenting should improve progressively from term to term.

| Hrs | Focus | Content, concepts and skills / Enabling Tasks |
|---|---|---|
| 2 | **Mechanical systems and control** | **Revise: Levers** – single levers and levers linked in pairs.<br>Single first-class lever – mechanical advantage depends on the position of the fulcrum.<br>Linked first-class levers – consider various samples, e.g.:<br>- Paper scissors (if equal length blade and handle) – no mechanical advantage.<br>- Secateurs (long handle and short, strong blades) – mechanical advantage > 1.<br>- Single second-class lever – always gives some mechanical advantage.<br>- Linked second-lass levers – consider various samples, e.g.:<br>- Office punch – mechanical advantage > 1.<br>- Heavy duty stapler – mechanical advantage > 1.<br>- Single third-class lever – never gives any mechanical advantage.<br>- Linked third-class levers – consider various samples, e.g.:<br>- Office light-duty stapler – mechanical advantage < 1.<br>- Pair of tweezers – mechanical advantage < 1.<br>- **Gear systems** – concepts (counter rotation, idler, velocity ratio, force multiplication).<br>- Two spur gears of unequal size – note counter rotation and velocity ratio.<br>- Two spur gears of unequal size – note velocity ratio and force ratio (mechanical advantage < or > 1).<br>- Two spur gears connected via an idler – note synchronised rotational direction.<br>- Suitable materials – the idler needs to be of a harder material than the other gears.<br>- Two bevel gears linked to transfer the axis of rotation through 90°. |
| 2 | **Mechanical advantage calculations** | ***Calculate* mechanical advantage (MA)**<br>• **Levers:** mechanical advantage calculations for levers using ratios.<br>• Calculations using LOAD/EFFORT; load ARM/effort ARM; etc.<br>• *Do NOT use the method of "taking moments about a point".*<br>• **Gears:** mechanical advantage calculations for gears using ratios.<br>Calculations using tooth ratios; gear wheel diameters; velocity ratios. |
| 2 | **Communication skills** **Design skills** | **Represent gear systems graphically:** use circular templates and/or pair of compasses to draw gear systems with:<br>• The driven gear rotating in the ***opposite*** direction to the driver (counter rotation).<br>• The driven gear rotating in the ***same*** direction to the driver (include an idler gear).<br>• The driven gear rotating ***faster*** than the driver (with and without an idler).<br>• The driven gear rotating ***slower*** than the driver (with and without an idler).<br>**Design brief**: learners write a design brief with specifications for a device that will use a combination of gears to achieve:<br>• A mechanical advantage with force multiplication of three times.<br>• An increase in output velocity of four times.<br>**Draw**: use an isometric projection using simple instruments (as in Maths Set) to draw sketches showing gear systems that meet each of the two above specifications. |

CAPS 25

## APPENDIX 15

SAMPLE OF STAD GROUPS AWARD CERTIFICATE



## APPENDIX 16

LANGUAGE EDITING LETTER

STRIATA NW 11
Private Bag X20702
Universitas
9321
02.02.2015

TO WHOM IT MAY CONCERN

This is to certify that Mr. Charles Sechaba Masoabi's thesis has been language edited by Mrs. B. A. Janse van Rensburg, a former lecturer in the Department of Didactics at the University of the Free State. Any queries can be directed to me at 051 5220879 or 072 611 5357 or at the above address

B. A. J. van Rensburg

B.A. Janse van Rensburg
MA in English (University of Pretoria)