DEPRESSION AND SELF-REGULATED LEARNING AS PREDICTORS OF FIRST-YEAR STUDENTS' ACADEMIC PERFORMANCE: A CASE STUDY

by

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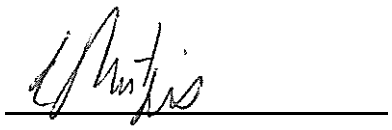
DECLARATION

I, Rina Meintjes, declare that the thesis hereby submitted for the Philosophiae Doctor degree in Higher Education Studies at the University of the Free State is my own, independent work and has not previously been submitted by me at any other university/faculty. All the sources that I have used have been indicated and acknowledged by means of complete references. I furthermore cede copyright of the thesis to the University of the Free State.



R. Meintjes

15 December 2019

Date

ETHICS STATEMENT

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23-Feb-2017

Dear **Mrs Rina Meintjes**

Ethics Clearance: **Depression and self-regulated learning as predictors of first year students' academic performance: a case study.**

Principal Investigator: **Mrs Rina Meintjes**

Department: **School of Higher Education Studies (Bloemfontein Campus)**

APPLICATION APPROVED

With reference to you 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.

Your ethical clearance number, to be used in all correspondence is: **UFS-HSD2016/1064**

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.

We request that any changes that may take place during the course of your research project be submitted to the ethics office to ensure we are kept up to date with your progress and any ethical implications that may arise.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours faithfully

Dr. Juliet Ramohai

PROOF OF LANGUAGE EDITING

11 December 2019

I, Wendy Stone, hereby declare that I have edited the PhD thesis *Depression and Self-regulated Learning as Predictors of First-year Students' Academic Performance: A Case Study* by Rina Meintjes.

Please contact me should there be any queries.

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ABSTRACT

Predictors of first-year students' academic performance, especially in Science, Engineering and Technology (SET) programmes, are more important now than ever before. Exploring the factors associated with academic success with reference to students' mental health, as well as certain learning strategy dimensions that have a positive correlation with academic achievement, is an attempt to face the serious challenge of improving student access, success and throughput rates. Thus, the aim of this study was twofold: firstly, to examine depression and self-regulated learning as possible predictors of the academic performance of students in a first-year Biology module at the University of the Free State (UFS) and, secondly, to establish whether depression and self-regulated learning are associated. Furthermore, the researcher compared the influence of depression and self-regulated learning on the academic achievement of students in the access programme to that of students in the mainstream programme of the UFS Faculty of Natural and Agricultural Sciences. A further comparison was made between students in the two programmes in terms of the prevalence of depression and the incidence of the use of self-regulated learning techniques. The results obtained in the present study showed that levels of depression among students in the UFS Faculty of Natural and Agricultural Sciences are of great concern. Furthermore, the results confirmed that certain learning strategy dimensions have a positive correlation with academic achievement. The study also revealed that depression, self-regulated learning dimensions and academic performance are indeed interlinked. However, since depression did not emerge as a significant predictor of academic performance in the final multiple regression model, the study did not prove unequivocally that depression is indeed a predictor of lower academic performance. Nonetheless, a negative correlation between depression and certain self-regulated learning strategies for both the access and mainstream programmes were observed, which therefore indirectly influences the academic achievement of students in both programmes. Lastly, it transpired that mainstream students are not more prone to applying self-regulated learning techniques than those in access programmes. The researcher recommended that the high levels of depression among first-year students in the Faculty of Natural and Agricultural Sciences at the UFS undergo further evaluation and

that the problem should be addressed. Self-regulated learning strategies that positively influence academic achievement, as identified in this thesis, should be developed and enhanced among first-year students since studies have shown that learning strategies can be learnt.

Keywords: *Academic performance; depression; self-regulated learning; access programme; mainstream programme*

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AIDS	Acquired Immune Deficiency Syndrome
ANCOVA	Analysis of covariance
ANOVA	Analysis of variance
AP	Access programmes
AP (score)	Admission point
AQL	Academic and Quantitative Literacy
BRIC	Brazil, Russia, India and China
BSc	Bachelor of Science
CD4	Cluster of differentiation 4
CHE	Council on Higher Education
CPP	Career Preparation Programme
DASS	Depression, Anxiety and Stress Scales
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
DoE	Department of Education
DoH	Department of Health
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th ed.
FET	Further Education and Training
H_0	Null hypothesis
H_1	Alternative hypothesis
HCert	Higher Certificate
HIV	Human Immunodeficiency Virus
IBM	International Business Machines
IEA	International Association for the Evaluation of Educational Achievement
M	Mean
MAT	Mathematics
MBChB	Bachelor of Medicine, Bachelor of Surgery
MSLQ	Motivated Strategies for Learning Questionnaire

N	Number of participants
NBT	National Benchmark Tests
NCCMH	National Collaborating Centre for Mental Health
NCRIPTAL	National Centre for Research to Improve Postsecondary Teaching and Learning
NCV	National Certificate (Vocational)
NSC	National Senior Certificate
NEED	Need for Education and Elevation
NQF	National Qualifications Framework
p or p-value	Probability value of statistical significance
PhD	Doctor of Philosophy
PIRLS	Progress in International Reading Literacy Study
P-P plot	Probability-probability plot
PSI	Personality Systems Interaction
QEP	Quality Enhancement Project
r	Pearson's correlation
RSA	Republic of South Africa
s	Spearman's correlation
SD	Standard deviation
SA	South Africa
SAS	Statistical Analysis Software
SASH	South African Stress and Health study
SC	Senior Certificate
SCU	Statistical Consultation Unit
SET	Science, Engineering and Technology
SPSS	Statistical Package for Social Sciences
SRL	Self-regulated learning
Std. Dev.	Standard deviation
TIMSS	Trends in International Mathematics and Science Study
TVET	Technical and Vocational Education and Training
TRC	Truth and Reconciliation Commission

UAP	University Access Programme
UFS	University of the Free State
Unisa	University of South Africa
UPP	University Preparation Programme
VIF	Variance Inflation Factor
WHO	World Health Organization
WMH	World Mental Health
ZPD	Zone of Proximal Development

CHAPTER ONE
OVERVIEW OF THE STUDY

1.1 ORIENTATION TO THE STUDY

According to the South African Department of Higher Education and Training (DHET) (2013:31), “Improving student access, success and throughput rates are a very serious challenge for the university sector and must become a priority focus for national policy and for the institutions themselves”.

More than twenty-five years after our first democratic elections, many of South Africa’s citizens are still in the grip of poverty. Although Government has been increasing social support for those in need during this period, this is not a sustainable solution. Job creation is the key and, by implication, education and training, which will enable people to fill these jobs as they are created. Herein lies the role of higher education institutions. As stipulated in the White Paper for Post-School Education and Training (RSA DHET, 2013:7), it is the goal of the Department of Higher Education and Training (DHET) to have 1.6 million head-count enrolments in public universities by 2030. This goal is in accordance with the continued efforts of Government since the introduction of democracy in 1994. Higher education must be accessible to all, especially students who were disadvantaged under the old dispensation. However, the reality is that Africa, as a whole, is currently trailing behind the rest of the world in terms of the global trend towards the massification of higher education. During the late 20th and early 21st centuries, it has become a global trend to provide entry to higher education to as many people as possible. While the participation rates in higher education in developed countries are between 70% and 80%, for BRIC,[1] it is in the order of 37.5% and in Africa only about 6% (RSA CHE, 2016a:10).

Furthermore, an analysis of the Department of Higher Education and Training’s national list of occupations in high demand (RSA, 2018:8) reveals that increasing the graduate output of Science, Engineering and Technology (SET) programmes at the higher education institutions of this country is of cardinal importance in meeting the demand for

[1] BRIC is an acronym for a group of countries, including Brazil, Russia, India and China.

these occupations. Although the head-count enrolments for SET programmes have grown substantially over the first decade of the new millennium (from 160 802 students in 2000 to 263 721 in 2011), the number of SET graduates as a percentage of the total number of graduates have not increased significantly (27% in 2000 to 29% in 2011). This means that the country is still not producing the number of SET graduates needed in terms of the economic development objectives (RSA DHET, 2013:28). Therefore, increased access to higher education and, specifically, SET programmes, needs to be addressed. This poses a problem since South Africa's current schooling system is not on par (Moloi, 2014:265; Wolhuter, 2014:1-22; Maddock & Maroun, 2018:211). Many potential higher education SET candidates are not receiving the necessary quality of tuition at school, which is their constitutional right, to adequately prepare them for participation in SET programmes. The result is that twenty-five years after the new dispensation, there are still tremendous problems in terms of candidates meeting either the general entrance requirements of higher education institutions in South Africa or the specific admission requirements for SET programmes in these institutions.

Not only is it important to increase access, but it is equally important to increase graduate output. In 2011, the graduation rate[2] at South African universities was a mere 15% compared to the international norm of 25% for students in a three-year degree programme in contact education (RSA DHET, 2013:32). Moreover, black students are still the most susceptible to poor graduation rates (RSA CHE, 2019:12,14). Since 2008, various researchers (Jones, Coetzee, Bailey & Wickham, 2008:16-22; Soudien, 2010:16-22; Collins & Millard, 2013:74,77; RSA CHE, 2013a:55-64; Fataar, 2018:601-604) have provided several reasons for this, including:

- social, geographical and financial constraints;
- language of instruction;
- poor schooling;
- cultural barriers; and
- an unpreparedness on the part of higher education institutions in terms of providing sufficient academic support to disadvantaged students.

[2] Graduation rate refers to the number of graduates in a given year divided by the total head-count enrolments of that year.

Consequently, role players in higher education have focused on finding innovative ways of improving the throughput rate of university students. To this effect, the Council on Higher Education (CHE) established the Quality Enhancement Project (QEP), which involved close collaboration between the CHE and individual higher education institutions to ensure the success of the project which had the following goals (RSA CHE 2014a:1):

- improving the quality of undergraduate education;
- increasing the number of quality graduates; and
- developing a higher education system that continues to improve as members of the higher education community collaborate to share good practices and solve common problems.

Moreover, the former Department of Education (DoE[3]) expected the higher education system to address the articulation gap between school and higher education programmes (RSA DoE, 1997:2.32). Evidence for this articulation gap can be found in the low number of qualified candidates, high first-year attrition rates[4] and low completion rates in regulation time[5] (RSA CHE, 2007:42-43). Unfortunately, only about one third of the candidates who wrote the annual National Senior Certificate (NSC[6]) examination in 2018, met the requirements for admission to bachelor's degree programmes (RSA DBE, 2019:72). Moreover, even if a student does qualify for admission to a bachelor's degree programme, it does not mean that he or she meets the additional admission requirements set by the faculties of higher education institutions offering SET programmes. The admission requirements of SET programmes usually include a good pass in Mathematics and Physical Sciences. In 2018, the number of Mathematics candidates who passed with a final mark of 40% or above comprised 37.1%, only 2.5% of whom obtained distinctions. In the same year, the number of candidates who passed Physical Sciences with a mark of 40% or above consisted of 48.7%, only 4.7% of whom obtained distinctions (RSA DBE, 2019:84, 98). The articulation gap between school and higher education is also evident

[3] The DoE was one of the departments of the South African Government until 2009, when it was divided into the Department of Basic Education (DBE) and the Department of Higher Education and Training (DHET).
[4] First-year attrition rate refers to the percentage of first-year students who are registered at an institution during a particular year but who do not continue with their studies at the same institution in the ensuing year.
[5] Regulation time is the minimum time needed to complete a qualification, for example, three years for a general academic bachelor's degree.
[6] The Senior Certificate (SC) offered before 2008 and has been phased out and replaced with the National Senior Certificate (NSC).

in the high first-year attrition rate. In 2006, the first-year attrition rate of the first-time entering cohort for contact three-year degrees was 24% and 21% for contact four-year degrees (RSA CHE 2013a:44).

Low completion rates in regulation time reflected in cohort studies conducted by the CHE serve as a third indicator of the articulation gap between school and higher education programmes. For example, cohort statistics (RSA CHE, 2019:62-63) indicate that only 23% of African students, 24% of Coloured students, 29% of Indian students and 45% of White students who enrolled in a contact three-year degree in 2012 obtained their degrees in the minimum period of time (regulation time). In total, only 29% of all students (all ethnicity groups) who enrolled in a contact three-year degree in the same year obtained their degrees in the minimum period of time. At contact institutions, only about one quarter of the students graduate in regulation time and 48% within five years. According to estimates, 55% of a yearly intake will never obtain their degree (RSA CHE, 2013a:15). For SET programmes, the picture is even more dismal. In total, only 22% of all students who enrolled in a contact three-year degree in Science in 2012, obtained their degrees in the minimum period of time (RSA CHE, 2019:71). These statistics emphasise the fact that many candidates who do meet the admission requirements of higher education institutions are underprepared for undergraduate programmes. Subsequently, higher education institutions have been motivated to think creatively in terms of establishing programmes that will:

- broaden accessibility to these institutions;
- increase the throughput rate; and
- address the articulation gap between school and higher education programmes.

One way in which the aforementioned challenges have been addressed is through the creation of foundational and extended curriculum programmes at higher education institutions (RSA CHE, 2016a:302,327). These programmes have been substantially funded by the DHET for several years and provide students who have only some, but not all, of the competencies or required performance levels needed to gain access to higher institution programmes with the means to do so (RSA CHE, 2013a:70-72; RSA DHET, 2014:311; RSA CHE, 2016a:9,12,162,164). To this effect, the University of the Free State

(UFS) introduced its University Access Programme (UAP[7]) as well as four- and five-year extended curriculum programmes in a number of faculties (including Natural and Agricultural Sciences[8]). These programmes offer students who were unable to obtain admission to the university as a result of not having met the entrance requirements, an alternative way of gaining access. For simplification, the UAP and extended curriculum programmes will be referred to collectively as the access programme (AP).

Prospective university students have dreams and aspirations regarding their higher education experience. In many instances, a prospective student's expectations concerning the final Grade 12 results are unrealistic. Consequently, the actual results obtained lead to tremendous disappointment. These students, who are subsequently forced to enrol in an access programme, often regard this as a negative experience, and questions arise regarding their own self-worth and ability. The negative feelings experienced by students in access programmes are often enhanced by the negative attitudes of other students, higher education institutions themselves and other role players in higher education (for example, bursary donors) towards these APs (RSA CHE, 2013a:72). Negative thoughts can lead to depressive symptoms and feelings of anxiety, which can influence students' academic performance (Hysenbegasi, Hass & Rowland 2005:150; Mihăilescu, Diaconescu, Ciobanu, Donisan & Mihailescu 2016:S284). The result is a vicious cycle: while poor results keep students from entering a mainstream programme at a higher education institution, the depression and anxiety experienced in the access programme might prevent them from reaching their full potential. At the UFS the demands on students in these access programmes have increased significantly over

[7] Previously known as the University Preparation Programme, UPP. Currently, to be admitted to the one-year UAP, the following admission requirements must be met:

- the NSC or National Certificate (Vocational) (NCV) Level 4 that grants access to diploma or higher certificate studies, the NCV is a vocational study opportunity offered by Further Education and Training (FET) public and private colleges;
- a minimum Admission Point (AP) of 20;
- 4 subjects with an achievement level of 3 (40% - 49%);
- a minimum achievement level of 3 (40%) for the official language of instruction.

[8] The University Access Programme offers two choices within Natural and Agricultural Sciences, namely UAP (Natural Science) and UAP (Agricultural Science). To qualify for enrolment in the UAP (Natural Science), the following additional criteria must be met:

- a minimum achievement level of 3 (40%) for Grade 12 Mathematics;
- a minimum achievement level of 3 (40%) for Grade 12 Life Sciences or Physical Sciences.

For enrolment in the UAP (Agricultural Science), a candidate must have obtained a minimum achievement level of 5 (60%) for Mathematical Literacy or Mathematics with a minimum achievement level of 2 (30%). If a candidate took Mathematical Literacy in Grade 12, an AP score of 24 or higher is required.

the years in terms of workload and requirements that must be met in order to continue with their studies[9]. This is another contributing factor to the depressive symptoms experienced by some of these students since, not only do they have a busy academic programme, but they are also aware that failure in even one of their modules can lead to the termination of their studies. Students who succumb to stressful circumstances are unable to perform academically and may be inclined to suffer from depression and anxiety.

However, it is not only students in the access programmes who might experience depression. Studies have shown that the incidence of depression among university students is higher than that of the general population (Ibrahim, Kelly, Adams & Glazebrook, 2013:397). Students from a low socio-economic environment have an increased risk of developing depression symptoms (Andrews & Wilding, 2004:518; Eisenberg, Gollust, Golberstein & Hefner, 2007:540; Lisznyai, Vida, Németh & Benczur, 2014:61). Many of the students enrolled at the UFS are from poor families (UFS, 2016a:35), and financial constraints may lead to food insecurity. A study conducted by the UFS Department of Nutrition and Dietetics revealed that up to 64.5% of students studying at the UFS are struggling with food insecurity (Van den Berg & Raubenheimer, 2015). In addition to having a negative effect on academic performance, hunger may also enhance or lead to common mental disorders, including depression (Lund, Breen, Flisher, Kakuma, Corrigall, Joska, Swartz & Patel, 2010:523; Muldoon, Duff, Fielden & Anema, 2013:798). Children or adolescents who experience hunger are also at an increased risk for suffering from depression later on in their teens or as young adults (McIntyre, Williams, Lavorato & Patten 2013:125). Other contributing factors to depression among university students include geographical constraints, language of instruction, poor schooling, cultural barriers and an unpreparedness on the part of higher education institutions to provide sufficient academic support to disadvantaged students. Depression symptoms experienced by a student may include reduced energy, loss of concentration or an inability to focus, and feeling anxious or immobilised (National Collaborating Centre for Mental Health (NCCMH), 2010:18-19, 628-639; Torpy, Burke & Glass, 2010; American Psychiatric Association (APA), 2013:160-165; World Health Organisation (WHO), 2015:

[9] To continue with the second year of study in the Faculty of Natural and Agricultural Sciences, the following apply:

- students in the BSc Extended Programmes and UAP (Natural Science) must successfully complete all the modules in the first year of study with an average of 60% for the academic modules;
- students in the UAP (Agricultural Science) and BAgric Extended Programme must successfully complete all the modules in the first year of study with an average of 55% for the academic modules.

Chapter 5, F32). A student who experiences these symptoms of depression will not be able to perform well academically (Hysenbegasi, Hass & Rowland, 2005:150; Mihăilescu, Diaconescu, Ciobanu, Donisan & Mihailescu, 2016:S284).

It has been proposed that teaching self-regulated learning techniques to students who experience depression may reduce their negative moods (Tavakolizadeh & Qavam, 2011:1088; Van Nguyen, Laohasiriwong, Saengsuwan, Thinkhamrop & Wright, 2015:68) which may, in turn, lead to better academic performance (Sadi & Uyar, 2013:31; Mega, Ronconi & De Beni, 2014:128; Zimmerman & Kitsantas, 2014:154). Furthermore, it can be argued that not only does the application of self-regulated learning techniques lead to improved academic performance (Zimmerman, 2008:176; Sadi & Uyar, 2013:29; Mega et al., 2014:128), but that the positive impact of better academic results on self-esteem may also result in decreasing a student's depression symptoms (Eisenbarth, 2012:154). For this reason, self-regulated learning techniques can be used as a tool to break the cycle of academic underperformance, negative feelings and depression. According to Zimmerman (2008:166), "[s]elf-regulated learning (SRL) refers to the self-directive processes and self-beliefs that enable learners[10] to transform their mental abilities, such as verbal aptitude, into an academic performance skill, such as writing". Thus, self-regulated learners take ownership of their own learning on a metacognitive, motivational and behavioural level (Zimmerman, 2002:66), where metacognition is the self-understanding of personal strengths and weaknesses. This involves introspection regarding a person's own learning processes. Learners with a high level of metacognitive awareness are able to control their own weaknesses during a learning action by adjusting their individual learning strategies in order to overcome the weakness (Zimmerman, 2002:65). Self-motivation is dependent on a learner's beliefs regarding learning, including self-efficacy (in other words, the belief in one's ability to complete tasks and in the achievement of goals). Intrinsic interest also plays a part in self-motivation. If a learner has an intrinsic interest in the subject matter that must be mastered, he or she will be more motivated to master it in a self-regulatory manner (Zimmerman, 2002:66). Furthermore, the self-regulated learner is able to apply certain processes with each learning task (Zimmerman, 2002:66, Mega et al., 2014:122). These processes include goal setting, applying strategies to achieve the set goals,

[10] In this thesis, reference is made to student and learner interchangeably. Because the term "self-regulated learner" is such an integral part of this thesis, when self-regulated learning is addressed, learner is used instead of student.

following through on the strategies to obtain these goals, monitoring progression and adapting learning strategies to future learning activities. A learner's ability to successfully complete a learning task depends on the extent to which he or she is able to apply these processes.

In view of the previous discussion regarding the possible effect of students' mental well-being as well as the use of self-regulating strategies in academic performance, two independent variables, namely depression and self-regulated learning, were identified as focal points in the current study. The effects of both depression and the use of self-regulated learning techniques on students' academic performance in a first-year Biology module were evaluated. The Biology module, BLGY1513, was chosen for this study since it is the only first-semester module for which first-year Natural and Agricultural Sciences access programme students and mainstream students are registered simultaneously. The academic performance of students in the BLGY1513 module was the dependent variable in this study. Furthermore, this study attempted to establish the relationship (if any) between depression and the application of self-regulated learning techniques. The study was conducted with first-year Natural and Agricultural Sciences access programme students and mainstream students, after which the results were compared.

1.2 RESEARCH QUESTIONS

The primary research question posed in this study was formulated as follows:

Do depression and self-regulated learning predict academic achievement in a first-year Biology module at the UFS, and are these predictors associated?

This research question was subdivided into the following research questions:

- Is there an association between depression and self-regulated learning, and do these two constructs influence students' academic performance in a first-year Biology module at the UFS?
- How does the influence of depression and self-regulated learning on academic achievement in a first-year Biology module compare between students in access programmes and those in mainstream programmes?

- How does the prevalence of depression among access programme students compare with that of mainstream students?
- Are mainstream students more prone to applying self-regulated learning techniques than those in access programmes?

1.3 AIM AND OBJECTIVES

The overarching aim of this study is twofold: firstly, to research depression and self-regulated learning as predictors of the academic achievement of students in a first-year Biology module at the UFS; and, secondly, to establish whether depression and self-regulated learning are associated.

Thus, the objectives of this study are as follows:

- to establish whether depression and self-regulated learning are associated;
- to research the influence of these two constructs on the academic achievement of students in a first-year Biology module;
- to compare the influence of depression and self-regulated learning on academic achievement in a first-year Biology module between students in the access programmes and those in mainstream programmes;
- to compare the prevalence of depression among access programme students with that of mainstream students;
- to compare the incidence of the use of self-regulated learning techniques by access programme students with that of mainstream students;
- to describe the theoretical underpinnings of the objectives and to provide a possible explanation for the research relationships; and
- to make recommendations regarding the enhancement of the learning experience of first-year students at the UFS.

1.4 PARADIGMATIC FRAMEWORK FOR THE STUDY

This section provides an overview of the supporting paradigm (or approach) used in this study. The concept of research paradigms was first introduced by Kuhn in 1962 (Kuhn, 1996:10). A research paradigm is the theoretical or intellectual framework according to

which the research is conducted, and rests on three pillars, namely the ontology, epistemology and methodology of the paradigm (Mack, 2010:6). Grant and Giddings (2002:12) state that "[o]ntology refers to our most basic beliefs about what kind of being a human is and the nature of reality". Thus, it is the metaphysical contemplation of the nature of being, and determines the epistemology of a specific paradigm. Epistemology is the philosophy regarding knowledge, and is the study of the source, nature and limitations of the theory of knowledge. The epistemology defines the manner in which the researcher acquires and interprets knowledge. This requires the researcher to consider whether he or she is acting as an objective observer during the research or whether he or she is subjectively involved with the research subjects (Cohen, Manion & Morrison, 2007:7). Both the ontology and epistemology of a paradigm contribute to the choice of methodology. The aim of the methodology is to understand the process of scientific enquiry (Kapolan, 1973, cited in Cohen, Manion & Morrison, 2007:47). The methodology directs the researcher's formulation of the research question, as well as the choice of methods used to gather and interpret the data. The methods refer to the tools or techniques used to gather and evaluate the data, for example questionnaires or scientific experiments (Grant & Giddings, 2002:12; Mackenzie & Knipe, 2006:196).

Various paradigms are recognised today, including logical positivism, post-positivism, interpretivism, transformativism and pragmatism (McMillan & Schumacher, 2010:5-6). Logical positivism forms the foundation of the scientific method and empirical science. The assumption is that the study of humans can be conducted in the same way in which nature is studied (McMillan & Schumacher, 2010:5). A recognised set of rules is followed while conducting the research and, when reporting on the findings, the researcher aspires towards absolute objectivity. By its very nature, social research calls for an adjustment to the logical positivist paradigm. Research on human beings must take into account their complexity and individualistic nature. The researcher is also a complex human being with his or her own opinions and philosophy of life. Subsequently, research in the social sciences has led to the emergence of the post-positivist paradigm which developed from logical positivism (Kivunja & Kuyini, 2017:32). Like the positivist, the post-positivist follows a path of observation and measurement. However, the role of the fallible researcher in the process, as a whole, as well as the importance of the context of the research are acknowledged. For the post-positivist, absolute objectivity is unattainable, but can be aspired to by critically evaluating the findings of other researchers in an effort

to find the best answer to a research question. Table 1.1 offers a comparison between the ontology, epistemology and methodology of the positivist and post-positivist paradigms.

Table 1.1: Comparison between the positivist and post-positivist paradigms (Cohen et al., 2007:8-9; Lincoln, Lynham & Guba, 2011:100; Scotland, 2012:10)

	Paradigm	
	Positivism	**Post-positivism**
Ontology	Naïve realism: knowledge exists independently of the researcher and can be fully captured.	Critical realism: knowledge exists independently of the researcher, but full understanding of a reality can never be reached.
Epistemology	Absolute objectivism: the researcher is a completely impartial and detached observer of the research.	Modified objectivism: the researcher strives to eliminate all factors that might influence the objectivity of the researcher but acknowledges that absolute objectivity is impossible.
Methodology	Nomothetic (law-based) approach: proof of hypotheses is sought to formulate laws.	Hypotheses can never be proven as correct, but can be proven wrong.
Method	Leans towards the quantitative	Leans towards the quantitative

The researcher of the current study has been involved in the UFS access programmes for the past twenty three years. What became evident over this period of time, is that some students thrive and excel within the structures of the programme, whilst others laboured through their first year of study within the programme, often failing one or more modules. This posed the question: are there specific factors that determine the success, or lack thereof, of a student within the access programmes? Additionally, should such factors exist, are they the same for access programme students and main stream students? Furthermore, since the different groups in the access programme are relatively small (on average thirty two students per group), the researcher had the opportunity to interact on a more personal level with the students, which led to the observation that students within the access programmes, were increasingly struggling with mental health problems. The researcher therefore opted to undertake a research study in order to identify some of the

factors that influence the academic success of students within the access programmes and, for comparative reasons, the main stream programme, as well as to establish the level of mental health issues among students in these different programmes. Given the fact that the study involved humans and that the fallible researcher is unable to fully escape subjectivity in the research approach, although striving to unravel the reality in an objective way, the research approach was based on the post-positivist paradigm.

An evidence-based, non-experimental *ex post facto* quantitative research was done. An "[e]vidence-based inquiry is the search for knowledge using systematically gathered empirical data" (McMillan & Schumacher, 2010:6). In *ex post facto* research, the effect of conditions established prior to the research on the dependent variable is investigated. Therefore, no intervention took place during the study itself (McMillan & Schumacher, 2010:224). The choice of a quantitative research study was supported by the fact that a quantitative approach provided the means to eliminate the confounding influence of other variables that were not identified as the focus of the current study. Furthermore, an in depth evaluation of existing literature on similar research studies (Eisenberg, Gollust, Golberstein & Hefner, 2007; Hamad, Fernald, Karlan & Zinman, 2008; Deroma, Leach & Leverett, 2009; Tavakolizadeh & Qavam, 2011; Hysenbegasi, Hass & Rowland; Mega, Ranconi & De Beni, 2014; Beiter, Nash, McCrady, Rhoades, Linscomb, Clarahan & Sammut, 2015; Van Nguyen, Laohasiriwong, Saengsuwan, Thinkhamrop & Wright, 2015; Hamid & Singaram, 2016), also supported the choice of a quantitative approach. In terms of Tight's categorisation of possible themes of study in higher education (cited in Bitzer & Wilkinson, 2009:387), this study can be classified as a student experience study.

1.5 RESEARCH DESIGN AND METHODOLOGY

A comprehensive discussion regarding the design and methodology of this research study is provided in Chapter Five. In the next few paragraphs, a synopsis of the design and methodology of the study is provided.

1.5.1 Identifying the Variables

In Section 1.4, an explanation was provided regarding the choice of focus in this research study. A myriad of factors might influence the success, or lack thereof, of students within

the access programmes and main stream programme, and the researcher had to make a decision regarding which of these possible factors to investigate within this study. The choice was made to evaluate the effect of the application of self-regulated learning strategies, as well as the incidence of depression, on students' academic success. This does not mean that other factors or variables, which were not analysed further, are of less importance. In Section 3.2, for example, the relation between depression and variables such as ethnicity, age, gender and socio-economical background as highlighted in other studies, are discussed. These variables, that were not the focal point of this study, could be the focus of future research, as is suggested in the final Chapter of this thesis. In the current study, they were accounted for in the analyses of the results as confounding variables, as highlighted in the next paragraph.

1.5.1.1 The confounding variables

Confounding variables are variables that may influence the actual relationship between the dependent and independent variables. These include gender, age, language, study programme, ethnicity and psychosocial well-being. To avoid a false positive error, the confounding variables were statistically controlled by building them into the design as independent variables. Confounding variable data were measured by means of a Biographical Information Questionnaire (Appendix B), and psychosocial well-being was described as a score on the Psychosocial Well-being Scale (Appendix C) (Viljoen, 2012:163-183).

1.5.1.2 The dependent variable

The dependent variable in this study was the academic performance of all students (access programme as well as mainstream students) who had registered for the first-year Biology module (BLGY1513) for the first time. The final mark for this module was used as a measurement. For the purpose of this study, however, it is described as a score.

1.5.1.3 The independent variables

Two independent variables were researched in this study, namely depression and self-regulated learning. The level of depression was measured using the short version of the

Depression, Anxiety and Stress Scales (DASS-21) as seen in Appendix D (Lovibond & Lovibond, 1995). Self-regulated learning was investigated using the Motivated Strategies for Learning Questionnaire (MSLQ), seen in Appendix E (Pintrich, Smith, Garcia & McKeachie, 1993:801-813).

1.5.2 Sampling

All of the students in the access and mainstream programmes who had registered for the first-year Biology module (BLGY1513) for the first time were used as a convenience sample in the study. Convenience, non-probability sampling (and, by implication, non-random sampling) involves the selection of an easily accessible group of subjects. Convenience sampling was used in this study since it served the fundamental purpose of the research (McMillan & Schumacher, 2010:137).

1.5.3 Data Collection

The final mark for a first-year Biology module was used to measure the dependent variable, namely academic performance. This mark was obtained from the coordinator of the module.

The participating students completed the following questionnaires[11] during the same week at the end of March 2017:

- Biographical questionnaire;
- Socio-economic questionnaire;
- Motivated Strategies for Learning Questionnaire (MSLQ); and
- Short version of the Depression Anxiety and Stress Scales (DASS-21).

[11] A questionnaire is also called a measuring instrument.

1.5.4 Analysis of Results

Descriptive statistics as well as inferential statistics (including multiple regression) were employed to analyse the data obtained by means of the four measuring instruments. This was done in collaboration with the UFS Statistical Consultation Unit (SCU).

1.5.5 Measuring Instruments

1.5.5.1 Biographical Questionnaire

The Biographical Questionnaire enabled the researcher to obtain information regarding the age, gender, home language and ethnicity of the students who took part in the research. The biographical background, as well as the psychosocial well-being, were confounding variables and were assessed and controlled.

1.5.5.2 Psychosocial Well-being Questionnaire

The semantic differential scale designed by Viljoen (2012:163-183) for measuring the psychosocial well-being of students was used. The validity and reliability of this questionnaire have been established in previous research studies (Viljoen, 2012:163-183). Childhood and present psychosocial circumstances were evaluated. The following dimensions regarding the students' childhood years were assessed by means of the questionnaire:

- emotional support (three questions);
- socio-economic situation (three questions);
- environment conducive to learning (four questions); and
- presence of depression symptoms in students or their relatives while growing up (four questions).

The students' present psychosocial well-being was assessed by means of five questions in the questionnaire. These questions covered aspects with respect to the financial situation, love life, relationship with family members, experience of depression symptoms and concerns regarding the HIV status of students.

1.5.5.3 Motivated Strategies for Learning Questionnaire (MSLQ)

The MSLQ (Pintrich et al., 1993:801-813) was used to determine the extent to which self-regulated learning techniques were applied by individual students while completing the first-year Biology module. The MSLQ is a self-report Likert-type instrument consisting of two sections. The first, consisting of 31 questions, assesses the motivational position of the student, while the second, comprising 50 items, assesses the self-regulating learning strategies of a student, and is further subdivided into three categories:

- cognitive strategies;
- metacognitive strategies; and
- resource management.

The items on the MSLQ are scored on a 7-point Likert scale, ranging from 1 (not at all true of me) to 7 (very true of me). The test is a reliable instrument with good internal consistency (Pintrich et al., 1993:811; Cook, Thompson & Thomas, 2011:1238).

1.5.5.4 Short version of the Depression, Anxiety and Stress Scales (DASS)

The DASS is a self-report questionnaire consisting of three scales, namely depression, anxiety and stress. Two versions of the questionnaire are available, namely a longer version consisting of 42 items (14 items per scale) and a shorter version, known as DASS-21 (Lovibond & Lovibond, 1995; Psychology Foundation of Australia, 2014). The DASS-21 is a 21-item self-report Likert-type inventory that can be completed in 10 minutes. This shorter version was used in the current study since it takes a shorter period of time to complete and is considered superior to the longer version (McDowell, 2006:313-319). DASS-21 consists of three self-report scales (seven items per scale), measuring depression, anxiety and stress. The depression scale in the DASS-21 shows psychometric adequacy and internal consistency (Sinclair, Siefert, Slavin-Mulford, Stein, Renna & Blais, 2012:276; Weiss, Aderka, Lee, Beard & Björgvinsson, 2015:224) as well as construct validity and reliability (Henry & Crawford, 2005:238; Weiss, Aderka, Lee, Beard & Björgvinsson, 2015:225). The DASS-21 can be utilised to quantitatively measure depression levels in normal populations (Henry & Crawford 2005:238).

1.6 ETHICAL CONSIDERATIONS

The necessary permission was obtained from the Human Research Ethical Clearance Committee of the UFS to proceed with the study. The researcher complied with all the rules and regulations as endorsed by this committee. This included the following:

- All participants were fully informed about the aim of the research being conducted and the necessary consent form was signed by all. The benefits of the study were also outlined.
- All participants gave their free and informed consent to participate in the research.
- Everything possible was done to ensure the confidentiality and privacy of the participants.
- Precautionary measures were taken to ensure that no harm was caused to any of the participants while conducting of the research.
- The researcher acted pro-actively to minimise the risk to vulnerable participants by withdrawing from presenting Chemistry modules to the participants for the duration of the study.
- There was no conflict of interest that could undermine the integrity of the research.
- Deception was not employed during the execution of this study.
- The researcher remained objective and truthful in terms of the results obtained in the study.

1.7 SIGNIFICANCE OF THE STUDY

The value of the study lies in its aim to investigate the role of self-regulated learning strategies and depression in the academic performance of students in the access and mainstream programmes of the Faculty of Natural and Agricultural Sciences at the UFS. If the role of these two factors in academic performance can be confirmed, steps can be taken to enhance the positive factors and to diminish the negative factors. These steps can then be included in other modules presented at the UFS. Furthermore, comparison of the results obtained with regard to the access and mainstream programmes and subsequent employment of positives could enhance the learning experience of both groups. Lastly, not much research has been done in terms of the link between depression

and self-regulated learning techniques. This study therefore makes a meaningful contribution in this regard.

1.8 CONCEPT CLARIFICATION

This section provides explanations for, or definitions of, concepts used in this research.

Access Programmes (AP): The University Access Programme (UAP) and extended curriculum programmes are referred to collectively as access programmes (AP).

BLGY1513: This is the course code for a first-year, first semester introductory Biology module offered on National Qualifications Framework (NQF) Level 5 to AP and mainstream students.

Depression: This refers to feelings of severe despondency and dejection (Oxford dictionaries, 2014).

Short form of the Depression, Anxiety and Stress Scales (DASS-21): The DASS-21 is a 21-item self-report Likert-type inventory that comprises three self-report scales (seven items per scale), measuring depression, anxiety and stress (Lovibond & Lovibond, 1995; Psychology Foundation of Australia, 2014).

Extended curriculum programme: This is a programme that provides students with the means to gain access to higher institution programmes when they have only some, but not all, of the competencies or required performance levels needed to enter such programmes.

Higher Certificate (HCert): This is a foundation-orientated Higher Certificate (UFS Access Programmes, 2016) that is to replace the current UAP at the UFS, providing at least 120 credits at Level 5 of the NQF.

Motivated Strategies for Learning Questionnaire (MSLQ): The MSLQ (Pintrich et al., 1993:801-813) is a self-report Likert-type instrument consisting of two sections. The first

assesses an individual's motivational position, while the second assesses self-regulating learning strategies.

Psychosocial Well-Being Scale: This is a semantic differential scale, designed by Viljoen (2012:163-183), and is used to measure the psychosocial well-being of students. Childhood and present psychosocial circumstances are evaluated.

Self-regulated learning (SRL): Self-regulated learning refers to the "self-directive processes and self-beliefs that enable learners to transform their mental abilities, such as verbal aptitude, into an academic performance skill, such as writing" (Zimmerman, 2008:166).

University Access Programme (UAP): This is a programme offering students who were unable to obtain admission to the university as a result of not having met the entrance requirements, an alternative way of gaining access.

1.9 OUTLINE OF THE STUDY

Chapter 1: Overview of the study
Chapter 2: The need for access programmes at South African universities
Chapter 3: Depression
Chapter 4: Self-regulated learning
Chapter 5: Research design and methodology
Chapter 6: Results and discussion of results
Chapter 7: Conclusions, recommendations and limitations

1.10 CONCLUSION

This first chapter of the thesis provided a brief overview of the study. In the chapters that follow, all aspects will be discussed in detail. Chapter 2 highlights the reasons for the establishment of access programmes at South African universities and provides a historical overview of these programmes at the UFS. The current position and future of these programmes at the UFS, as well as a comparison between access and mainstream programmes at the UFS, will also be provided.

CHAPTER TWO
THE NEED FOR ACCESS PROGRAMMES AT SOUTH AFRICAN UNIVERSITIES

2.1 INTRODUCTION

This chapter emphasises the reasons for the introduction of access programmes at South African higher education institutions, and focuses on the articulation gap between secondary and higher education. Furthermore, the state of the South African schooling system, the low percentage of matric[12] candidates who qualify for admission to bachelor's degree studies, low completion rates in regulation time of students at higher education institutions and the high first-year attrition rate at higher education institutions will be discussed. Lastly, an overview of the access programmes offered at the UFS, with special emphasis on access programmes within the Faculty of Natural and Agricultural Sciences, will also be presented.

2.2 THE NEED FOR ACCESS PROGRAMMES: ARTICULATION GAP BETWEEN SCHOOL AND HIGHER EDUCATION PROGRAMMES

Spaull (2013:57) states that "South African schools as they currently stand do not, and arguably cannot, impart to pupils the foundational knowledge and skills they should be acquiring at school". The South African schooling system is, in many respects, dysfunctional. The academic literacy shortcomings experienced by South African students are highlighted in a 2013 report commissioned by Umalusi[13] (Madiba, 2013:7). Nearly 60% of South African school children are unable to read with comprehension by the end of Grade 3 (Van der Berg, Spaull, Wills, Gustafsson & Kotzé, 2016:5). The Mathematics content knowledge of 79% of Grade 6 Mathematics teachers in South African public schools is below the required level (Venkat & Spaull, 2015:126). To complicate matters further, most teachers in South African primary schools teach only about 50% of the total yearly scheduled lessons (Van der Berg et al., 2016:28). Scott, Yeld and Hendry

[12] Matric or matriculation in South Africa refers to the final year of high school before entrance to a higher education institution is considered.
[13] Umalusi is the quality assurance agency for general and further education and training.

(RSA CHE, 2007:32-36) illustrate the severity of this problem by means of the following three examples:

- Only a low percentage of learners who enter the schooling system in Grade 1 eventually reach Grade 12. Over 1.6 million children entered Grade 1 in 1995, of whom only 34% reached Grade 12 and only 5% of whom went on to obtain a Senior Certificate with endorsement, enabling them to apply to a tertiary institution.
- The success of candidates in Mathematics and Science is often used as a measure of the condition of a country's schooling system. During the 2003 Trends in International Mathematics and Science Study (TIMSS[14]), South Africa's performance in Grade 8 Mathematics and Science was the worst of the 50 participating countries from all over the world, including other African countries.
- A study initiated by Umalusi in 2004 found that there was a decrease in the standard of examination papers offered during the 2003 Senior Certificate examination.

The results of the 2011 and 2015 TIMSS Grade 8 assessments in Mathematics and Science (administered in South Africa at Grade 9 level) showed that the Grade 8 learners from 55 of the 56 participating countries still outperformed the South African Grade 9 learners (Reddy, Prinsloo, Arends, Visser, Winnaar, Feza, Rogers, Janse van Rensburg, Juan, Mthethwa, Ngema & Maja, 2011:4-5; Mullis, Martin, Foy & Hooper, 2015). In other words, of the 57 countries who had participated in the TIMSS assessments in both 2011 and 2015, South Africa ranked second last. Even though South Africa has shown the biggest improvement of all participating countries in the TIMSS assessments in Mathematics and Science from 2003-2015, South Africa is still an under-performing country (Zuze, Reddy, Visser, Winnaar & Govender 2017:11, 22). In the 2016 World Economic Forum's Global Information Technology Report (World Economic Forum, 2016:233), the standard of Mathematics and Science education in South Africa is ranked as the worst in the world. The 2016 Progress in International Reading Literacy Study (PIRLS[14]) was conducted in 50 countries, including South Africa, and assessed the reading comprehension of Grade 4 learners. South Africa was the lowest-performing country, with roughly 78% of the Grade 4 learners not having had basic reading skills by

[14] The International Association for the Evaluation of Educational Achievement (IEA) is located at the USA Boston College's Lynch School of Education and Human Development. The Association regularly conducts international comparative assessments of student achievement in Mathematics and Science (TIMMS), as well as reading literacy (PIRLS – Progress in International Reading Literacy Study).

the end of their Grade 4 school year (Howie, Combrinck, Tshele, Roux, McLeod Palane & Mokoena, 2017:11).

The problematic South African schooling system is one of the contributing factors to the existence of an articulation gap between secondary education and higher education (RSA DoE, 1997:2.32; RSA CHE, 2013a:60). The articulation gap is "the mismatch or discontinuity between the exit level of secondary education and the entry level of higher education" (RSA CHE, 2013a:60). A low number of candidates qualifying for higher education studies, high first-year attrition rates and low completion rates in regulation time (RSA CHE, 2007:42-43) substantiate the perception that an articulation gap exists between school and higher education programmes.

Table 2.1 provides a summary of the number of learners who passed the NSC examination and who met the requirements for bachelor's degree studies from 2009-2018 (RSA DBE, 2013:51-52; RSA DBE, 2019:48-49). In general, since 2009, there has been a gradual increase in the number of candidates who qualify for admission to bachelor's degree studies. However, in terms of percentages, by 2018, only a third of the candidates who had written the NSC examination qualified for admission to bachelor's degree studies. Furthermore, even if a student qualifies, this does not mean that he or she meets the additional admission requirements set by the faculties of higher education institutions offering SET programmes (RSA CHE, 2007:24). As a result, the percentage of students who do qualify for admission to SET programmes are even lower than the percentages provided in Table 2.1. This low percentage of candidates who qualify for admission to bachelor's degree studies serves as a *first indicator* of the articulation gap that exists between secondary and higher education.

Table 2.1: The overall national performance in the NSC examination and the number of candidates qualifying for admission to bachelor's degree studies, 2009-2018 (RSA DBE, 2013:51-52; RSA DBE, 2019:48-49)

Year	Total wrote	Total achieved	Total % achieved	Total qualified for admission to bachelor's degree studies	Total % qualified for admission to bachelor's degree studies
2009	552073	334716	60.6	109697	19.9
2010	537543	364513	67.8	126371	23.5
2011	496090	348114	70.2	120767	24.3
2012	511152	377829	73.9	136047	26.6
2013	562112	439779	78.2	171755	30.6
2014	532860	403874	75.8	150752	28.3
2015	644536	455825	70.7	166263	25.8
2016	610178	442547	72.5	162374	26.6
2017	534484	401307	75.1	153610	28.7
2018	512735	400632	78.1	172043	33.6

A *second indicator* of the articulation gap between secondary and tertiary education is the high first-year attrition rate. Roughly, a quarter of first-year contact students (excluding the University of South Africa, Unisa) do not continue with their second year of study due to fact that they either drop out or fail their first year of study (RSA CHE, 2016a:145). Table 2.2 shows the national first-year attrition statistics for the 2006 first-time entering cohort.

Table 2.2: National first-year attrition, overall and according to population group (%): 2006 first-time entering cohort (Excluding Unisa) (RSA CHE, 2013a:44)

	African	Coloured	Indian	White	All
Contact three-year degrees	24%	34%	26%	22%	24%
Contact four-year degrees	22%	23%	27%	19%	21%

Low completion rates in regulation time reflected in cohort studies conducted by the CHE serves as a *third indicator* of the articulation gap that exists between secondary and higher education programmes. Only about 50% of all candidates who enter higher education diploma and degree studies eventually obtain a qualification. Of these, approximately 30% obtain their qualification in regulation time. The attrition rate for three- and four-year diploma and degree programmes at contact institutions is in the order of 40% by the end

of regulation time. It is estimated that about 45% of contact students (diploma and degree studies) never obtain a first qualification (RSA CHE, 2016a:95,145,146). Tables 2.3 to 2.8 reflect some of the results of the cohort studies conducted by the CHE, demonstrating the fact that completion rates in regulation time are disappointingly low.

Table 2.3: National throughput rates for three-year degrees, all ethnicity groups (all higher education institutions offering a three-year degree, excluding Unisa), n = 3 years (RSA CHE, 2015:79; RSA CHE, 2016b:79; RSA CHE, 2019:79)

Year of intake	% graduated (non-accumulative)				% graduated in 6 years (accumulative)
	In n years	In n+1 years	In n+2 years	In n+3 years	
2006	30%	18%	8%	3%	60%
2007	29%	19%	9%	4%	60%
2008	30%	18%	8%	3%	59%
2009	26%	17%	8%	3%	54%
2010	30%	18%	8%	3%	59%
2011	29%	18%	8%	3%	58%
2012	29%	18%	8%	3%	58%

Table 2.4: National throughput rates for four-year degrees, all ethnicity groups (all higher education institutions offering a four-year degree, excluding Unisa), n = 4 years (RSA CHE, 2015:79; RSA CHE, 2016b:79; RSA CHE, 2019:79)

Year of intake	% graduated (non-accumulative)			% graduated in 6 years (accumulative)
	In n years	In n+1 years	In n+2 years	
2006	30%	18%	8%	56%
2007	29%	19%	9%	57%
2008	42%	15%	6%	63%
2009	40%	14%	6%	60%
2010	44%	15%	6%	65%
2011	44%	15%	6%	65%
2012	45%	15%	5%	65%

Table 2.5: National throughput rates according to ethnicity group within regulation time for three-year degrees (all higher education institutions offering a three-year degree, excluding Unisa) (RSA CHE, 2013b:61; RSA CHE, 2014b:63; RSA CHE, 2015:63; RSA CHE, 2016b:63; RSA CHE, 2017:63; RSA CHE, 2018:63; RSA CHE, 2019:63)

Year of intake	African	Coloured	Indian	White
2006	20%	20%	26%	43%
2007	19%	23%	26%	42%
2008	23%	25%	27%	43%
2009	20%	20%	25%	39%
2010	19%	17%	17%	31%
2011	24%	23%	27%	43%
2012	23%	24%	29%	45%

Table 2.6: National throughput rates according to ethnicity group within regulation time for four-year degrees (all higher education institutions offering a four-year degree, excluding Unisa) (RSA CHE, 2013b:63; RSA CHE, 2014b:64; RSA CHE, 2015:64; RSA CHE, 2016b:64; RSA CHE, 2017:64; RSA CHE, 2018:64; RSA CHE, 2019:64)

Year of intake	African	Coloured	Indian	White
2006	30%	28%	31%	47%
2007	33%	34%	33%	48%
2008	38%	37%	38%	51%
2009	38%	35%	31%	48%
2010	26%	33%	27%	44%
2011	42%	39%	40%	51%
2012	44%	38%	42%	54%

Table 2.7: National throughput rates for three-year degrees in Science, all ethnicity groups (all higher education institutions offering a three-year degree, excluding Unisa), n = 3 years (RSA CHE, 2013b:70; RSA CHE, 2014b:72; RSA CHE, 2015:72; RSA CHE, 2016b:71; RSA CHE, 2017:71; RSA CHE, 2018:71; RSA CHE 2019:71)

Year of intake	% graduated (non-accumulative)				% graduated in 6 years
	In n years	In n+1 years	In n+2 years	In n+3 years	
2006	23%	17%	7%	3%	50%
2007	23.5%	16.9%	7.7%	3.0%	51.1%
2008	25%	16%	8%	3%	52%
2009	21%	16%	8%	3%	47%
2010	24%	17%	8%	3%	52%
2011	21%	18%	9%	3%	51%
2012	22%	18%	8%	3%	52%

Table 2.8: National throughput rates for four-year degrees in Engineering, all ethnicity groups (all higher education institutions offering an Engineering degree, excluding Unisa), n = 4 years (RSA CHE, 2013b:73; RSA CHE, 2014b:74; RSA CHE, 2015:75; RSA CHE, 2016b:75; RSA CHE, 2017:76; RSA CHE, 2018:74; RSA CHE, 2019:75)

Year of intake	% graduated (non-accumulative)			% graduated in 6 years
	In n years	In n+1 years	In n+2 years	
2006	23%	18%	7%	48%
2007	22.2%	19.0%	10.2%	51.4%
2008	23%	17%	11%	52%
2009	23%	17%	11%	52%
2010	23%	18%	11%	52%
2011	21%	19%	10%	50%
2012	22%	18%	10%	50%

One of the roles of higher education institutions envisaged by the CHE is to address this articulation gap (as previously highlighted) between secondary and higher education (RSA CHE, 2013a:28,67). In the 1997 White Paper 3 – A Programme for Higher Education Transformation (RSA DoE, 1997:2.32,2.34), the need to expand the provision and funding of bridging and access programmes at higher education institutions to address the articulation gap between secondary school and higher education, is expressed.

The aim of access programmes is firstly to facilitate access to higher education institutions for talented students who, mainly due to historical disadvantages, do not meet all the entrance requirements of a higher education institution. Secondly, these programmes must provide the necessary academic basis to overcome the articulation gap between secondary school and higher education (RSA CHE, 2013a:71). These access or extended curriculum programmes have been funded by the DHET through foundation grants since 2004 (RSA DHET, 2014:311). Currently, funding restricts the number of new-intake students who can be accommodated in these programmes to 15% of the total yearly intake (RSA CHE, 2013a:72; RSA DHET 2014:326).

The success rate[15] of first-year students in extended curriculum programmes at all universities, excluding Unisa, for the period 2007 to 2011 was 78% for the foundation

[15] Success rate is defined as the "percentage of students enrolled for a course who passed that course (or module)" (RSA CHE, 2013a:74)

modules and 69% for the regular or mainstream modules for which these students had been registered. For continuing or returning foundation students,[16] the success rate for the period 2007 to 2011 was 68% for foundation modules and 69% for regular or mainstream modules (RSA CHE, 2013a:76,77). In Table 2.9, a comparison is made between the success rates of foundation students and all undergraduate students (including foundation students, which is only about 15% of the total body of first-year students, making the results useful for comparison purposes) for 2010 and 2011.

Table 2.9: Comparison between success rates of foundation students and all first-time entering students in regular or mainstream modules for 2010 and 2011 (RSA CHE, 2013a:78)

	First-time entering foundation students	Continuing foundation students	All first-time entering students
2010	66%	68%	75%
2011	69%	72%	76%

Table 2.9 shows that the success rate of foundation students compares favourably with that of the whole first-time entering student body. Furthermore, statistics show that foundation students (both first-time entering and continuing) in SET programmes had a 66% success rate for regular modules in 2011, as compared to the 72% success rate of all first-time entering undergraduates (RSA CHE, 2013a:79). Garraway (2009) provides a number of success stories from the foundation/extended programmes at various higher education institutions. In some of these programmes, the extended programme students even outperformed the mainstream students (Garraway, 2009:11,28,47). Thus, it can be concluded that the extended curriculum programmes are indeed successful in terms of reducing the articulation gap between secondary school and higher education.

The success of extended programmes at various higher education institutions contributed to the recommendation by the CHE to restructure the undergraduate curriculum at higher education institutions (RSA CHE, 2013a:91). The curriculum restructuring will address the articulation gap between secondary and higher education. It can also help to resolve the dilemma of low graduation and high dropout rates. The proposed restructuring includes a recommendation to extend the formal time of existing three-year degrees and diplomas, as well as four-year professional bachelor degrees, by one year. *In effect, this*

[16] Continuing or returning foundation students are those who successfully completed their first year in the extended curriculum programme and return to a higher education institution for a second year of study.

is a recommendation to move the majority of undergraduate students to an extended programme.

2.3 ACCESS PROGRAMMES AT THE UFS

At the UFS, the admission requirements for admission to a bachelor's degree in most faculties are (UFS, 2020:29):

- an NSC with an endorsement that allows entrance to degree studies (before 2009 it was referred to as university exemption);
- an admission point (AP) of 30. There are exceptions for certain programmes where either a higher AP is a requisite or a lower AP is admissible;
- an applicant must meet all the minimum admission requirements for the programme in which he or she intends to enrol. However, meeting the minimum requirements does not mean that admission to that programme is guaranteed, since space in each programme is limited;
- a minimum achievement level of 50% must be obtained for the selected UFS language of instruction, namely Afrikaans or English (Afrikaans is only available as a language of instruction in a limited number of programmes); and
- participation in the Academic and Quantitative Literacy (AQL) test of the National Benchmark Test Project. Students who perform poorly in the Academic Literacy component of these tests must register for an additional academic language course in their first year of study.

Since 2009, the broad entrance requirements for programmes of the Faculty of Natural and Agricultural Sciences (the SET programmes) at the UFS are (UFS, 2019:20-24):

- an NSC with an endorsement that allows entrance to degree studies;
- a minimum AP score of 30;
- a minimum performance level of 4 (50%) for an official language of instruction;
- a minimum performance level of 5 (60%) for Mathematics (for certain programmes, a higher level is required);
- a minimum performance level of 5 (60%) for Life Sciences, and a minimum performance level of 4 (50%) for Physical Sciences; and

- participation in both the Academic and Quantitative Literacy (AQL) test and Mathematics (MAT) test of the National Benchmark Test Project.

For certain programmes in the Faculty, there are *additional* specific entrance requirements, which many prospective students do not meet. Arguably, this is due to the poor schooling system. To broaden accessibility to the UFS, the university introduced its Need for Education and Elevation (NEED) Programme in 1993 with 73 learners in collaboration with 10 higher education institutions. Due to the negative political connotation of the name of this programme, the name was changed to the Residential Career Preparation Programme (CPP) in 1994 and, in 2010, it was changed to the University Preparation Programme (UPP).

Some of the study options within the UPP (with the exception of Education and Natural Sciences) were transformed into a foundation-orientated Higher Certificate (HCert) in 2017, in collaboration with certain Technical and Vocational Education and Training (TVET) Colleges in the Free State Province (UFS Access Programmes, 2016). All modules within this Higher Certificate are offered at an NQF Level 5. The aim is to eventually change all other study options within the UPP (now called the University Access Programme, UAP[17]) which are not yet offered as a Higher Certificate to a foundation-orientated Higher Certificate. The long-term plan is to achieve national extension of the Higher Certificate and, eventually, transferral of the programme to TVET colleges. Graduates of the Higher Certificate will then have the opportunity to continue with degree, diploma or certificate studies at various South African higher education institutions, offering an effective path of articulation between TVET Colleges and other higher education institutions. The necessity for this kind of articulation has been expressed in the White Paper for Post-School Education and Training (RSA DHET, 2013:26, 28, 70).

Four fields of study within the UAP are available to students, namely Economic and Management Sciences, Human and Social Sciences, Education and Natural and Agricultural Sciences. This programme is a one-year bridging programme enabling students, who complete it successfully, to continue with their higher education studies

[17] Due to the transformation of most study options within the UPP into foundation-orientated Higher Certificates in 2017, the UPP was renamed the University Access Programme (UAP).

either at the UFS or at another higher education institution. To enter this programme, the following admission requirements must be met (UFS, 2020:33):

- an NSC that allows entrance to diploma or higher certificate studies or an NCV (Level 4);
- a minimum AP of 18 (or 20, for some of the options);
- Four subjects with a minimum achievement level of 3 (40% to 49%); and
- a minimum achievement level of 3 (40%) for the official language of instruction.

The UAP offers two choices within Natural and Agricultural Sciences, namely UAP (Natural Sciences) and UAP (Agricultural Sciences). To qualify for enrolment in the UAP (Natural Sciences), the following additional criteria must be met (UFS, 2019:20-24):

- a minimum achievement level of 3 (40%) for Grade 12 Mathematics; and
- a minimum achievement level of 3 (40%) for Grade 12 Life Sciences or Physical Sciences.

The additional criteria for the UAP (Agricultural Sciences) are:

- a minimum achievement level of 2 (30%) for Grade 12 Mathematics; or
- a minimum achievement level of 5 (60%) for Grade 12 Mathematical Literacy.

Over the years, the curriculum for the UAP (Natural Sciences) has been expanded significantly. When Natural Sciences, as a field of study, was initially introduced to the then CPP, students registered for only two modules, namely one Chemistry module and one Mathematics module. Today students in the UAP (Natural Sciences) register for at least 12 modules, namely:

- five Chemistry semester modules, one of which is a practical module;
- two Biology semester modules;
- two Mathematics semester modules;
- a Computer Literacy semester module;
- an English Academic Literacy year module; and

- a Skills and Competencies in Lifelong Learning year module.

The UAP is not merely an access programme to higher education studies; students also obtain credits for some of the academic modules that they complete successfully during the bridging year. The UAP of the UFS is presented at a number of sites, including Bloemfontein (UFS South Campus), Maluti Technical and Vocational Education and Training TVET College (Bethlehem and Kwetlisong Campuses), Goldfields TVET College (Welkom Campus), Flavius Mareka TVET College (Sasolburg Campus) and the South Cape TVET College in Oudtshoorn. Currently, on the South Campus of the UFS, a maximum of 80 students are allowed into both the UAP (Natural Sciences) and the UAP (Agricultural Sciences) per annum. From 1998 to 2017, the number of degrees (all faculties) that have been obtained at the UFS by students who started their higher education studies in the UAP include: nine MBChB degrees, three PhD degrees, 45 master's degrees, 391 honours degrees and 4659 first degrees (UFS, 2018:9).

Unfortunately, there are several students who have obtained an NSC that allows for entrance to degree studies but who do not meet all the requirements of the mainstream programmes of the UFS. For example, either the minimum AP score of 30 was not met or the minimum achievement level set for the language of instruction was not met. To accommodate this group of students, the UFS began to introduce four- and five-year Extended Curriculum Programmes in a number of faculties (including Natural and Agricultural Sciences) in 2005. Initially, the Bachelor of Science Extended Curriculum Programme students of the Faculty of Natural and Agricultural Sciences were accommodated on the University's Bloemfontein Campus. Since 2011, these students have been accommodated on the South Campus of the UFS, and have been sharing classes with the UAP students. Since 2014, the Bachelor of Science Extended Curriculum Programme has been offering four programme options, namely:

A) Chemistry, Mathematics and Biology;
B) Mathematics and Finances;
C) BSc (Agricultural Sciences); and
D) B (Agricultural Sciences).

Admission requirements for these four options are as follows (UFS, 2019:20-24):

- an NSC that allows entrance to degree studies or an equivalent qualification;
- a minimum AP of 22 (24 for BSc [Agricultural Sciences]);
- a minimum achievement level of 4 (50%) for the official language of instruction;
- a minimum achievement level of 3 (40%) for Grade 12 Mathematics for Options A, B and C;
- a minimum achievement level of 2 (30%) for Grade 12 Mathematics or a minimum achievement level of 5 (60%) for Mathematical Literacy if the AP score is above 26 for Option D;
- a minimum achievement level of 3 (40%) for Life Sciences or Physical Sciences for Option A; and
- a minimum achievement level of 3 (40%) for Life Sciences, Agricultural Science or Physical Sciences for Option C.

Since 2011, students who choose Options A or C register for the same modules in their first year of study as the UAP (Natural Sciences) students. For comparative reasons, this study only focuses on these two options within the Bachelor of Science Extended Curriculum Programme. For simplification, in the rest of this thesis the UAP and Extended Curriculum Programme are referred to collectively as the special access programme or simply, the access programme. Table 2.10 presents the number of students registered for the UAP (Natural Sciences) and Bachelor of Science Extended Curriculum programme (Options A and C) from 2011 to 2019 on the UFS South Campus.

Table 2.10: Number of students registered for the UAP (Natural Sciences) and BSc Extended Programme (Options A and C) from 2011-2019 on the UFS South Campus

Year	UAP (Natural Sciences)	BSc Extended Curriculum Programme (Options A and C)	Total
2011	74	112	186
2012	92	148	240
2013	75	197	272
2014	116	190	306
2015	74	219	293
2016	53	275	328
2017	47	266	313
2018	76	216	292
2019	64	173	237

Table 2.11 summarises the broad entrance requirements of the Mainstream and Extended Curriculum Programmes (Options A and C) of the Faculty of Natural and Agricultural Sciences, as well as those of the UAP (Natural Sciences) at the UFS.

Table 2.11: Broad entrance requirements of the Mainstream and Extended Programmes (Options A and C) of the Faculty of Natural and Agricultural Sciences and the UAP (Natural Sciences) at the UFS

Requirements in terms of:	Programme		
	Mainstream*	**Extended Curriculum Programme (Options A and C)**	**UAP**
NSC	With endorsement that allows entrance to degree studies	With endorsement that allows entrance to degree studies	With endorsement that allows entrance to diploma or higher certificate studies
AP score	Minimum of 30	Minimum of 22 (or 24**)	Minimum of 20
Language of instruction	Minimum achievement level of 4	Minimum achievement level of 4	Minimum achievement level of 3
Mathematics	Minimum achievement level of 5	Minimum achievement level of 3	Minimum achievement level of 3
Life Sciences / Physical Sciences	Both must be offered;*** minimum achievement level of 5 for Life Sciences and minimum achievement level of 4 for Physical Sciences	Either Life Sciences or Physical Sciences; minimum achievement level of 3 for Life Sciences or minimum achievement level of 3 for Physical Sciences	Either Life Sciences or Physical Sciences; minimum achievement level of 3 for Life Sciences or minimum achievement level of 3 for Physical Sciences

*Some programmes within the Faculty require higher AP scores and/or Mathematics marks

**Minimum AP score of 24 required for Bachelor of Science (Agriculture) extended programme

***Some programmes are excluded.

From the previous discussion it is clear that over the last 25 years, the UFS has made a conscious effort to assist more candidates to obtain a higher education qualification. This is reflected by the various special access programmes that have been implemented by the UFS. The aim of these special access programmes is twofold: firstly, to provide access to a higher education institution to candidates who do not meet all the requirements for

mainstream programmes; and, secondly, to provide students enrolled in these programmes with maximum support in order to ensure that they will be successful in their studies. The UFS has made significant progress in the development and implementation of these special access programmes. However, this is an undertaking that has not reached completion. The special access programmes are continuously being evaluated and changed in order to improve the learning experience of the students in these programmes and to increase the success thereof. It is with this intention that the current study was conducted.

The UFS strives for the complete development of the students registered in all of the programmes offered at the institution. This implies academic development, as well as emotional and mental development. In terms of academic development, the UFS has come a long way. The focus now needs to fall on the emotional and mental aspects of the students. This study aims to provide the UFS with information regarding the academic, mental and emotional well-being of a group of first-year students in the Faculty of Natural and Agricultural Sciences at the UFS. Moreover, it aims to make recommendations on how to improve the support offered to students on this level since the expansion of access to higher education must be broadened to embrace the idea of providing access to academic success.

2.4 CONCLUSION

This chapter presented an overview of one of the motives that led to the establishment of access programmes at South African universities, namely the articulation gap between secondary school and university. A summary of the history, structure and evolution of access programmes at the UFS was also provided. In the following chapter, a description of depression as an illness and the prevalence thereof in the general population and, specifically, among the student community, will be presented.

CHAPTER THREE
DEPRESSION

3.1 INTRODUCTION

Over the last few decades, the focus of higher education in South Africa has been mainly on broadening access and on improving student throughput. However, it is necessary to consider the well-being of students holistically. Not only should attention be focused on the academic performance of students, but their emotional and psychological well-being should also be evaluated and safeguarded. For many students, leaving home for the first time causes a considerable amount of anxiety and stress since the support structure usually provided by the family is far removed. Moreover, first-year students are required to take responsibility for their own decisions. In addition, the workload is much greater than at school and often students struggle financially. As highlighted in the previous chapter, a large percentage of first-year students entering higher education institutions are disadvantaged due to the poor schooling they received. Many first-year students are also first-generation students and, subsequently, their families expect a great deal from them. Furthermore, the age of onset of many mental disorders falls within the timespan in which young people attend higher education institutions (McGorry, Purcell, Goldstone & Amminger, 2011:302; De Girolamo, Dagani, Purcell, Cocchi & McGorry, 2012:48; De Lijster, Dierckx, Utens, Verhulst, Zieldorff, Dieleman & Legerstee, 2017:244).

The happy, fun-loving image that comes to mind when thinking about student life is thus not always a true representation. In the last few years, some studies have been undertaken to ascertain the level of psychological well-being of students at South African higher education institutions (Van Zyl & Rothmann, 2012:593; Kotzé & Kleynhans, 2013:51; Young & Campbell, 2014:359; Jonker, Koekemoer & Nel, 2015:815; Bantjes, Kagee, McGowan & Steel, 2016:429). Evaluating the level of depression among a group of first-year students at the UFS has also been identified as an important focal point of this study. Depression will be elucidated in the next paragraph.

3.2 WHAT IS DEPRESSION?

The word ‘depression’ has its origins in the Latin word *deprimere* which means to “press down”. Depression is defined as feelings of severe despondency and dejection (Oxford Dictionaries, 2014) and manifests in various forms, from the experiencing of mild symptoms to severe depression. Symptoms of depression include the following (National Collaborating Centre for Mental Health (NCCMH), 2010:18-19,628-639; Torpy, Burke & Glass, 2010; APA, 2013:160-165; World Health Organisation (WHO), 2015: Chapter 5 F32):

- feeling of sadness, depressed mood;
- loss of interest in and enjoyment of activities;
- feeling tired most of the time (reduced energy);
- loss of feeling of self-worth (lowered self-esteem), unrealistic feeling of guilt;
- suicidal thoughts that can escalate into suicidal attempts;
- loss of concentration or inability to focus;
- feeling anxious or agitated, or feeling immobilised;
- change in sleeping patterns (more sleep or less sleep);
- increased or decreased appetite with associated weight gain or weight loss;
- irritability;
- tearfulness;
- withdrawal from society;
- flaring up of previously-experienced illnesses or pains;
- decreased sex drive or libido;
- feeling of helplessness; and
- loss of confidence.

Differences of opinion concerning the classification of depressive disorders, however, still exist (Jacob, 2009:279-285; NCCMH, 2010:23,628). The APA’s classification of a major depressive disorder and the WHO-classification of depressive episodes show similarity. In both cases, a person suffering from depression may be classified as suffering from mild, moderate or severe depression, depending on the degree of functional impairment, the presenting symptoms, as well as the duration and severity of the symptoms (NCCMH,

2010:629-631; APA, 2013:160-162; WHO, 2015: Chapter 5 F32). It is clear that those who suffer from depression may be drastically impaired in terms of their daily functioning; causing problems in their personal development, workplace, relationships and studies. A high prevalence of depression among a country's population can eventually have an effect on the economy of that country as a result of absenteeism from work and the burden placed on the provision of medical services (Wittchen, Beesdo, Bittner & Goodwin, 2003:390). The WHO (2012:1) states that depression is the major cause of incapacity worldwide and is one of the main contributors to worldwide disease figures.

Major depressive disorder is the most prevalent lifetime disorder (Kessler, Berglund, Demler, Jin, Merikangas & Walters, 2005:595). A first episode of major depression can occur at any age, but the probability thereof shows a marked increase with the onset of puberty. On average, the onset of a first episode of major depression is usually in the mid-twenties. Individuals presenting with chronic depressive symptoms have a decreased chance of full recovery after treatment. Sufferers who experienced a first episode of major depression at a young age, those who have had a severe episode of depression, and those who have experienced more than one depressive episode, tend to relapse after recovery (Wittchen, Beesdo, Bittner & Goodwin, 2003:384-393; Katon, Unützer & Russo, 2010:23; NCCMH, 2010:19, APA, 2013:165).

Depression among females is one-and-a-half to three times more prevalent from the onset of adolescence as compared to males (NCCMH, 2010:22, APA, 2013:165; Faravelli, Scarpato, Castellini & Sauro, 2013:1302). However, from the late teens onwards, there is not such a marked difference in prevalence rates between males and females (Eisenberg, Gollust, Golberstein & Hefner, 2007:539). The incidence of *major* depressive disorder, however, remains higher in females (WHO, 2012:1; APA, 2013:167). As a rule, the incidence of depression symptoms is higher among individuals from a socio-economically disadvantaged background (Brown, Meadows & Elder, 2007:1308; Hamad, Fernald, Karlan & Zinman, 2008:543; Wickrama, Noh & Elder, 2009:158; Miller & Taylor, 2012:434-435; Torikka, Kaltiala-Heino, Rimpelä, Marttunen, Luukkaala & Rimpelä, 2014:9). Ethnicity group is also indicative of depression symptoms experienced by young adults (Brown, Meadows & Elder, 2007:1306-1307; Miller & Taylor, 2012:434-435).

The most obvious value of the preceding literature review on depression for the current study lies in the fact that a higher incidence of depression in adolescent years and among individuals from a socio-economically disadvantaged background, was established.

3.3 RELATIONSHIP BETWEEN DEPRESSION AND ANXIETY

The prevalence of chronic depressive symptoms may also point towards the presence of other disorders, including anxiety disorders (APA, 2013:165). The relationship between anxiety and depression has been investigated in numerous studies, and a high comorbidity (above 50%) between depression and anxiety has been established (Kaufman & Charney, 2000:72; Merikangas, Zhang, Avenevoli, Acharyya, Neuenschwander & Angst, 2003:996; Wittchen, Beesdo, Bittner & Goodwin, 2003:387; Flannery-Schroeder, 2006:S136; Vaccarino, Evans, Sills & Kalali, 2008:1012). The severity of mental disorders relates to comorbidity (Kessler, Chiu, Demler & Walters, 2005:625; Flannery-Schroeder, 2006:S136; Vaccarino, Evans, Sills & Kalali, 2008:1012), and suicide risk shows a marked increase in patients suffering from depressive and comorbid anxiety disorders (Kaufman & Charney, 2000:73; Wittchen, Beesdo, Bittner & Goodwin, 2003:388). The onset of most anxiety disorders occurs at an earlier age (childhood, adolescence or early adulthood) than that of depressive disorders (Wittchen, Beesdo, Bittner & Goodwin, 2003:385). Some anxiety disorders in childhood or early adolescence might be indicative of the possible onset of major depressive disorder later in life (Stein, Fuetsch, Muller, Höfler, Lieb & Wittchen, 2001:255; Merikangas, Zhang, Avenevoli, Acharyya, Neuenschwander & Angst, 2003:998; Wittchen, Beesdo, Bittner & Goodwin, 2003:387; Flannery-Schroeder, 2006:S137; Beesdo, Bittner, Pine, Stein, Höfler, Lieb & Wittchen, 2007:909; Bittner, Egger, Erkanli, Costello, Foley & Angold, 2007:1180; Hettema, 2008:311; Jacobson & Newman, 2014:443). However, Keenan, Feng, Hipwell and Klostermann (2009:1174) did not find a relationship between early anxiety and later depression.

There is also some disagreement among researchers regarding the independence of these two disorders. Some researchers have concluded that, because of the overlap between symptoms associated with these disorders, as well as the high level of comorbidity and the fact that both disorders often respond to the same medication, it should actually be classified as a single disorder (Merikangas, Zhang, Avenevoli,

Acharyya, Neuenschwander & Angst, 2003:998; Wittchen, Beesdo, Bittner & Goodwin, 2003:388; Flannery-Schroeder, 2006:S137). Alternatively, it has been proposed that a new category of disorder, namely mixed anxiety-depression, be introduced (Barlow & Campbell, 2000:59). It has also been suggested that the treatment of anxiety disorders early in life may prevent the onset of depressive disorders later in life (Wittchen, Beesdo, Bittner & Goodwin, 2003:388; Flannery-Schroeder, 2006:S138 - S140; Beesdo, Bittner, Pine, Stein, Höfler, Lieb & Wittchen, 2007:909; Jacobson & Newman, 2014:443). Others argue that there are still sufficient distinguishing traits between the two disorders to justify the classification of separate disorders (Wittchen, Beesdo, Bittner & Goodwin, 2003:388; Flannery-Schroeder, 2006:S137; Moffitt, Caspi, Harrington, Milne, Melchior, Goldberg & Poulton, 2007:449; Beesdo, Pine, Lieb & Wittchen, 2010:53-55). The APA (2013:155-233) and the WHO (2015: Chapter 5 F30-F48) classify depression and anxiety as two separate disorders with various subdivisions. However, the WHO-classification (2015: Chapter 5 F41.2) does make provision for a mixed anxiety and depressive disorder when symptoms of both are presented but neither is predominant.

3.4 PREVALENCE OF DEPRESSION AMONG THE SOUTH AFRICAN POPULATION

Unfortunately, in South Africa, the identification and treatment of mental disorders, including depression, are not a priority (Burns, 2011:104; Docrat, Lund & Chisholm, 2019:8). One large population-based mental health epidemiological survey, known as the South African Stress and Health (SASH) study, was conducted in South Africa from 2002 to 2004 (Williams, Herman, Kessler, Sonnega, Seedat, Stein, Moomal & Wilson, 2004:135). This study was executed as part of the WHO's World Mental Health (WMH) 2000 initiative, which had the following six goals:

- to determine the relationship between torture and mental health in South Africa;
- to evaluate the global prevalence of mental disorders and to obtain data regarding the prevalence and severity of specific mental disorders, as well as the standard of services available and barriers to the treatment of these disorders in South Africa;
- to compare the incidence of psychiatric disorders among the United States Black population to that of the South African Black population, given the history of discrimination against Black people in both these countries;

- to obtain an idea of the psychological impact of HIV/AIDS on the South African adult population in view of the fact that Sub-Saharan Africa has the highest incidence of HIV/AIDS;
- to investigate the effect of the Truth and Reconciliation Commission (TRC) on mental health; and
- to evaluate the gender differences in mental health in South Africa.

No follow-up study has since been undertaken and the South African Department of Health (SA DoH) bases all of its recommendations and planning on this particular survey which was carried out more than a decade ago. The study found that the lifetime prevalence of mental health disorders in South African adults was 30.3% (with a projective lifetime risk of 47.5%) and a 12-month prevalence of 16.5% (Herman, Stein, Seedat, Heeringa, Moomal & Williams, 2009:339-344). Major depressive disorder was the most common 12-month mental disorder (4.9%). Of the cases with a 12-month prevalence of major depressive disorder, 20.3% were classified as mild, 45.4% as moderate and 34.3% as severe. In terms of geographical differences, the Free State Province had the second highest 12-month prevalence of common mental disorders, with only the Western Cape Province showing a higher prevalence rate. The Free State Province showed the highest lifetime prevalence of mood disorders (14.6%) of all nine South African provinces. South African females are 1.75 times more prone to experience depression during their lifetime compared to their male counterparts and, over a 12-month period, females are 2.17 times more likely to experience a major depressive episode compared to males. Furthermore, the survey revealed that adults with a lower level of education are more prone to suffer from major depression (over a 12-month period, they are 2.11 times more likely to experience major depression and, in terms of lifetime prevalence, they are 3.70 times more likely to do so) (Tomlinson, Grimsrud, Stein, Williams & Myer, 2009:369-370).

In the WMH survey, the projected lifetime risk for any mental health disorder in the participating countries ranged from 18.0% in China to 55.3% in the United States. The projected lifetime risk for any mental health disorder in South Africa is 47.5%. The projected lifetime risk for a mood disorder in the participating countries ranged from 7.3% in China to 31.5% in the United States. In South Africa, this risk is 20.0% (Kessler et al., 2007:172). Apart from South Africa, the only other African country to participate in the WMH survey was Nigeria. In South Africa, one in six South Africans had a DSM-IV mental

disorder over a 12-month period. In comparison, the figure for Nigeria was one in seventeen. Regarding lifetime mental disorders, only one in ten Nigerians presented with lifetime DSM-IV mental disorders as compared to one in three South Africans (Herman, Stein, Seedat, Heeringa, Moomal, & Williams, 2009:343).

In South Africa, mental health falls under the South African Department of Health's (SA DoH) Primary Health Care programme. With the high prevalence rate of diseases, such as HIV/AIDS and tuberculosis, it is understandable that these diseases are health priorities and that many of the Department's resources are directed towards their treatment. However, this comes at the expense of other ailments such as mental illness. Studies have shown that the underfunding of the treatment of mental illness by the South African Government has a tremendous impact on the economy of the country (Lund, Myer, Stein, Williams & Flisher, 2013:848-850; Bateman, 2015:7). It also undermines the treatment outcomes of antiretroviral drugs. Living with HIV doubles a person's risk of suffering from depression, whereas treating depression whilst administering antiretroviral drugs leads to an improved CD4 cell count (Bateman, 2015:7). The SA DoH uses the SASH study to plan their future actions regarding mental health. Currently, only 25% of the 16.5% of cases with a 12-month prevalence receive treatment. The aim is to increase the treatment percentage to 35% of the total number of cases with a 12-month prevalence rate by 2018/2019 (RSA DoH, 2014/15-2016/17; RSA DoH, 2014/15-2018/19).

3.5 PREVALENCE OF DEPRESSION AMONG UNIVERSITY STUDENTS

University students have a large number of stress factors with which to cope, including separation from home, workload, performance pressure, financial problems, sexual and social issues and lack of sleep. Constant stress or a stressful major life event may eventually lead to depression and anxiety disorders, but the relationship between stress and depression is also reciprocal; depression can lead to increased stress symptoms (Slavich & Auerbach, 2018:379-381). A number of studies have been conducted at overseas universities to establish the prevalence of depression and/or anxiety among students (Eisenberg, Gollust, Golberstein & Hefner, 2007:537; Lindsey, Fabiano & Stark, 2009:1006; Zivin, Eisenberg, Gollust & Golberstein, 2009:183; Eisenberg, Hunt & Speer, 2013:61; Ibrahim, Kelly, Adams & Glazebrook, 2013:394; Lisznyai, Vida, Németh & Benczur, 2014:60; Beiter, Nash, McCrady, Rhoades, Linscomb, Clarahan & Sammut,

2015:92). In these studies, it has been established that about a third of the student population evaluated had depression symptoms with between 11% and 18% of the participants showing moderate to severe symptoms. Bitsika and Sharpley (2012:391) also found comorbidity of anxiety and depression in approximately one third of a sample of Australian university students.

The negative relationship between depression and poor academic performance among students has been well researched at a number of higher education institutions worldwide (Hysenbegasi, Hass & Rowland, 2005:150; Deroma, Leach & Leverett, 2009:328; Othieno, Okoth, Peltzer, Pengpid & Malla, 2014:123; De Luca, Franklin, Yueqi, Johnson & Brownson, 2016:538; Bruffaerts, Mortier, Kiekens, Auerbach, Cuijpers, Demyttenaere, Green, Nock & Kessler, 2018:101). A relationship between pre-matriculation onset of depression and university student attrition has also been found by Auerbach et al. (2016:2955). However, suffering from depression not only impedes academic performance, but students suffering from depression also show a higher incidence of poor health, cigarette smoking, and drug and alcohol abuse (Lindsey, Fabiano & Stark, 2009:1004-1005; Othieno, Okoth, Peltzer, Pengpid & Malla, 2014:123-124).

In South Africa, mental health surveys have focused mainly on children, and recent studies to determine the incidence of depressive orders among university students are scarce. The results obtained before or shortly after the establishment of democracy in 1994 are problematic since higher education institutions were not representative of all population groupings (being classified as White or Black institutions). A study conducted by Bowman and Pane (2011:143) at the University of the Witwatersrand showed that 11.5% of students from all population groupings receiving counselling presented with depression. The study further showed that there are large differences in the reasons why different population groupings seek counselling. Black, Coloured and Indian students were more inclined to seek counselling regarding academic issues, while White students were more inclined to seek counselling regarding depression problems. The results only reflect the percentage of students suffering from depression who do seek help; many students do not make use of counselling services offered by higher education institutions and, subsequently, remain unaccounted for.

More recently, one South African public university (Stellenbosch University) formed part of an international WHO World Mental Health Surveys International College Student Project, which included nineteen colleges/universities across eight countries (Auerbach, Mortier, Bruffaerts, Alonso, Benjet, Cuijpers, Demyttenaere, Ebert, Green, Hasking & Murray, 2018:624). The aim of the study was, inter alia, to estimate the prevalence of common mental disorders (including major depression) among first-year college students. From the study it emerged that about one third of the participants from the various colleges in different countries presented with at least one of the DSM-IV anxiety, mood or substance disorders. For the whole cohort of participants, major depressive disorder was identified as the most prevalent mental disorder, with 21.2% lifetime prevalence and 18.5% 12-month prevalence, followed by generalised anxiety disorder, with 18.6% lifetime prevalence and 16.7% 12-month prevalence.

3.6 CONCLUSION

As was reported in Section 1.4, the researcher observed an increase in mental health problems among the access programme students with which she interacted over a period of more than two decades. This observation led to the researcher's decision to focus, in the current study, on the prevalence of depression among a group of students registered in the Faculty of Natural and Agricultural Sciences of the UFS during 2017. In Chapter 3, further support for this decision was offered in the form of an in depth literature study which highlighted the worldwide problem, South Africa included, of mental disorders and specifically depression. The literature study presented in Unit 3 showed that the incidence of depression, as a mental illness, is rife under the student population worldwide and does have a major impact on student life and possibly on student academic performance as well. The need for studies to determine the prevalence of mental illness among South African university students has come to the fore in this chapter since such studies are scarce. In the next chapter, an in-depth description of the concept of self-regulated learning, as the second independent variable in the study, will be provided.

CHAPTER FOUR
SELF-REGULATED LEARNING

4.1 INTRODUCTION

In the current study, the researcher not only focused on the incidence of mental health problems among a group of UFS students as highlighted in the previous chapter, but also focused on researching the application of self-regulated learning techniques in a specific academic module in an effort to answer the question posed in Section 1.4: are there specific factors that determine the success, or lack thereof, of a student within the access programmes and, should such factors exist, are they the same for access programme students and main stream students? The choice of self-regulated learning techniques as focal point in this study is supported by the large number of research studies that have confirmed the important role that self-regulated learning techniques play in terms of academic success (Kitsantas, Winsler & Huie, 2008:60; Broadbent & Poon, 2015:11; Ning & Downing, 2015:1340; DiFrancesca, Nietfeld & Cao, 2016:234; Dörrenbächer & Perels, 2016a:238; Sun, Xie & Anderman, 2018: 49). The concept of self-regulation was first introduced by Bandura (1986), who defines it as "the exercise of influence over one's own motivation, thought processes, emotional states and patterns of behaviour" (1994:2). In addition, Zimmerman (1989:329) introduced the idea of self-regulated academic learning, stating that "To qualify specifically as self-regulated in my account, students' learning must involve the use of specified strategies to achieve academic goals on the basis of self-efficacy perceptions". Zimmerman's description of SRL focuses on three important components: learning strategies, academic goals and self-efficacy. Learning strategies are courses of action employed to obtain knowledge and skills, and include actions, such as organising information, self-evaluation, rehearsing and memorising, and review of study material. These strategies are self-employed by an individual to ensure the achievement of pre-set academic goals. This process is dependent on the individual learner's level of self-efficacy or self-belief in his or her own ability. Academic goals may include striving for good subject grades, obtaining academic qualifications and eventual satisfactory employment. Different academic goals will have different timespans for achievement. To be a self-regulated learner, a certain level of metacognitive, motivational

and behavioural involvement in the learning process is thus required (Zimmerman, 1989:329).

4.2 DIFFERENT THEORIES ON SELF-REGULATED LEARNING

Different self-regulated learning theories are described in the literature. Seven of these (operant theory, phenomenological theory, social cognitive theory, information processing, volition theory, sociocultural theory and the cognitive constructivist theory) are highlighted by Zimmerman (2001:1) and will be explored in the following pages. The models of self-regulated learning proposed by Boekaerts, referred to as Boekaerts' Structural Model and Dual Processing Model of Self-Regulated Learning (Boekaerts, 1996:101; Boekaerts & Cascallar, 2006:202; Panadero, 2017:4–10), are also included because her contribution to the subject of self-regulated learning is significant. Moreover, her theories include many aspects of other theories on self-regulated learning.

4.2.1 Operant Theory

Skinner (1953:59), the originator of operant psychology, detailed that self-controlled or self-regulated behaviour is determined by the environment and that this behaviour can be studied by means of scientific methods. In other words, it is observable and measurable. Operant theorists are of the opinion that self-regulated behaviour is triggered by either positive or negative external reinforcement or stimuli (reward or punishment) (Gaitero, Román & Garcia, 2016:53). These stimuli can be either antecedent to the behaviour (called discriminative stimuli) or a consequence of behaviour (called consequent stimuli) (Mace, Belfiore & Hutchinson, 2001:40-41).

Positive reinforcement leads to change with regard to a particular response to a specific situation. For example, if a teacher praises a learner for good behaviour while the teacher is out of the class, it is likely that the learner will also behave in future when the teacher is not present. Negative reinforcement has the opposite effect because of the nature thereof. For example, if a learner is reprimanded for bad behaviour while a teacher is out of the class, it is likely that the learner will not misbehave in the teacher's future absence in order to prevent a repeat of the scolding (Mace, Belfiore & Hutchinson, 2001:40-41). When applying this to the act of learning, it is clear that positive outcomes (for example, good

test results) will lead to the repetition of prior learning strategies that resulted in a positive outcome. If outcomes are a disappointment, the learner will re-think his or her learning strategies to improve future outcomes. Self-reward (immediate or delayed) will be linked to positive outcomes.

From the operant theory perspective, self-regulation in learning is characterised by the demonstration of self-control to forego immediate gratification. The self-regulated learner would rather focus on obtaining greater gratification at a later stage by concentrating on the here and now of the task at hand (Mace, Belfiore & Hutchinson, 2001:42). For instance, instead of going out for coffee with a friend, the self-regulated learner would rather prepare for an upcoming test which could lead to better academic results and, ultimately, to obtaining an academic qualification. In the learning process, a self-regulated learner will thus consider the consequences of his or her possible actions and make a conscious decision as to which action would yield the best outcome.

Operant researchers have identified different sub-processes of self-regulation, including self-monitoring, self-instruction and self-reinforcement (Mace, Belfiore & Hutchinson, 2001:43-57, Reynolds, William & Miller, 2003:59-61). The first of these sub-processes, namely self-monitoring, entails the self-recording of one's own behaviour. These recordings include, among others, written descriptions of behaviour, frequency counts, duration of a behaviour or a set of behaviours (for example, time spent studying for a test) and time-sampling. Time-sampling involves segmenting an observation period into shorter time-intervals and noting the frequency of a specific behaviour within the smaller interval.

Self-instruction, the second sub-process of self-regulation, renders discriminative stimuli to the learner. These stimuli give rise to specific responses or sequential acts that bring about reinforcement and can either be an arrangement of the environment to ensure reinforcement or a set of rules used by the learner to direct behaviour (Mace, Belfiore & Hutchinson, 2001:48-50). Putting a reminder on his or her phone to take his or her student card along when writing an exam, serves as an example of a learner's arrangement of the environment and acts as self-instruction to ultimately comply with the exam rules. The idea of self-instruction by setting rules for oneself can be demonstrated by means of the following practical example. In the Chemistry modules for which the UAP and Bachelor

of Science extended students are registered in their first year of study, it is expected of them to calculate the value of a specific variable, for example the pressure of a system. The student can set and adhere to the following rules:

- Read attentively through the question;
- Identify the unknown variable (the subject that the question is about);
- Underline all relevant information;
- Write the relevant information, as well as the identified unknown variable, on the exam script;
- Identify the appropriate formula needed to calculate the unknown variable and write it on the script;
- Rewrite the formula, if necessary, to get the unknown variable alone on one side;
- Calculate the value of the unknown variable;
- Make sure that units are included in the answer, if applicable; and
- Decide whether the numerical value with the unit is a sufficient answer or whether further explanation is required.

The set of rules can then be memorised by the student and self-evaluated after receiving feedback on the exam. Perhaps the learner forgot to add the unit to the answer and, as a result, lost a mark. This will act as reinforcement to follow each of the self-determined rules more closely during the next Chemistry exam. As a result, the set of rules is a form of self-instruction.

The third sub-process of self-regulation, from an operant theorist's perspective, is self-reinforcement. Self-reinforcement entails providing oneself with some form of reinforcement or reward if a pre-determined end goal or behaviour is achieved. This self-reinforcement enhances the chances of similar responses or behaviours in future (Reynolds, William & Miller, 2003:61; Davis, Mason, Davis, Mason & Crutchfield, 2016:198). For example, a learner may set him- or herself the task of studying attentively for 40 minutes. If this is achieved, the learner can reward him- or herself with a 20-minute break in front of the television. This self-reinforcement may then lead to the learner studying for 40-minute intervals without interruption in the future.

In summary, the operant theory of self-regulation emphasises the importance of reinforcement or stimuli in the learning process. Furthermore, self-monitoring, self-instruction and self-reinforcement play an integral role in the self-regulation of the learning process.

4.2.2 Phenomenological Theory

Of primary importance in the phenomenological theory is the subjective self-perception of a learner (McCombs, 2001:67). This theory can also be called the "self"-theory since the "self" is at the centre thereof. Contrary to the operant theory, where the influence of the external environment and objective, scientific observation are key, in the phenomenological theory, self-perception and personal, subjective experience are central to the learning process. William James (1892:online) was one of the first psychologists to develop a theory of the self in the late nineteenth century and is considered one of the founders of phenomenology (McCombs, 2001:74; Taylor, 2010:126). According to the phenomenological theory, the role of self-belief in the learning process is to generate the impetus or motivation to begin with and complete certain learning activities. Hence, this motivation is intrinsic in nature. The choosing of specific learning activities is directed by the individual learner's self-belief and personal goals. Learners with a positive self-belief are more prone to being self-regulated learners. However, if the self-concept is negative, the learning experience causes anxiety within the learner, which leads to lower motivation levels and avoidance of the learning task. It is therefore crucial that educators support learners in the development of a positive self-concept (Zimmerman, 2001:13; Zaky, 2018:52).

Self-beliefs are organised in self-structures which are built over time by self-system processes (McCombs, 2001:84). These self-structures can be classified as either global or domain-specific. In terms of learning, the global self-concept refers to the learner's self-belief that he or she does have the confidence, ability and skills to self-regulate the learning process. This is reminiscent of the words of the Little Engine that Could by Burl Ives:

> "I think I can, I think I can, I think I have a plan
> And I can do 'most anything if I only think I can."

A domain-specific self-concept refers to having the self-belief to tackle and successfully complete a task in a specific learning area, for example, Mathematics or Geography. Self-system processes build self-structures or self-concepts. Important self-processes that are key to the development of self-regulated learning are self-awareness, self-monitoring and self-evaluation. The process of self-evaluation is particularly important in self-regulated learning since self-evaluation eventually leads to the implementation of other self-regulated processes, such as planning and goal-setting (McCombs. 2001:84-94; Zimmerman, 2001:14).

The phenomenological theory shares a connection with the next theory under discussion, namely the social cognitive theory, in the sense that both emphasise the role of the "self" or the individual in determining the outcome of the learning process.

4.2.3 Social Cognitive Theory

The social cognitive theory of self-regulated learning has its origins in Albert Bandura's social learning theory (Bandura, 1986). It is based on an agentic view; the individual has influence over and contributes to the events that take place in his or her life (Bandura, 1989:1175; 2012:11). From a social cognitive viewpoint, self-regulation in learning by an individual is not a general approach to learning in that the application of self-regulated techniques varies according to the subject or task at hand. In other words, not all learning done by a learner is necessarily self-regulated (Schunk, 2001:125-126). The social cognitive theory proposes a triadic model of self-regulated learning (Bandura, 2012:11-12; Zimmerman, 2013:137-138), namely intrapersonal covert processes (for example, goal setting, planning and memorising), behavioural events (for example, keeping and reviewing records, monitoring and self-evaluation) and environmental factors (for example, creating an environment conducive to learning by isolating or eliminating noise, seeking social assistance). These three forms of self-regulation are interdependent. In accordance with the social cognitive theory, effective self-regulation is driven by three sub-factors, namely self-monitoring or self-observation, the judgemental process and self-reaction. Again, these sub-factors are interlinked (Bandura, 1991:249-257; Schunk, 2001:130-134).

Through the first of the three sub-factors identified by the social cognitive theory as driving force, namely self-observation, the information needed for the setting of feasible goals and the monitoring of progression in reaching those set goals, is gathered. Self-observation also assists with self-diagnosis. By self-observing patterns in thought and behaviour that lead to specific negative reactions, a conscious effort to change these patterns can improve the overall well-being of an individual. Self-observation also has self-motivational advantages. This is closely linked to goal setting and the achievement of the set goals. Observing progress in the process of attaining one's goals and accomplishing one's achievements acts as motivation to persevere (Bandura, 1991:250-253).

Connected to self-observation is the second sub-factor of the social cognitive theory of learning, namely the judgemental process. The observation of certain thinking and behavioural processes must be judged or assessed based on certain personal standards in goal attainment before action can be taken (Bandura, 1991:253-256). This action, or self-reaction, follows the judgement process and is the third sub-factor. Self-reaction comprises self-reward for progress made in the achievement of set goals, or for putting actions in place that will address disappointing results or progress. As a rule, human beings strive for the completion of a task to the best of their ability. These self-rewards drive and motivate an individual to the point of task completion (Bandura, 1991:256-257). From a social cognitive perspective, personal self-regulation is driven by self-efficacy. Self-efficacy is a component of the intrapersonal covert function (Bandura, 2012:11). According to Bandura (1989:1175; 1991:257; 1994:71-81; 2012:11), self-efficacy is the belief in one's ability to control one's own emotions, thoughts and responses, as well the self-belief that one can control external factors that might influence one's life. Self-efficacy influences all the sub-functions of self-regulation. It has a determining effect on an individual's choices, success and endurance in difficult situations in life, and determines how well a person is able to cope with life stressors. An individual with a high level of self-efficacy will embrace difficult situations as challenges. They bounce back quickly after disappointing results and are subsequently more predisposed to achieving success in life. However, the self-efficacy of a student during the execution of a learning task is influenced by past experiences. To illustrate, previous successes in the same field of study may bolster the student's self-efficacy for the current task whereas previous failures may have a negative effect on the student's self-efficacy (Cook & Artino, 2016:1005-1006).

A lack of self-efficacy is a contributing factor in the development of anxiety and depression symptoms. Individuals with insufficient self-efficacy tend to give up easily and are prone to dwelling on their failures (Bandura, 1989:1177). Self-efficacy can be developed in four ways (Bandura, 1994:72-74):

- self-experience – being successful in adverse conditions creates self-belief in an individual regarding his or her own abilities;
- success of peers – witnessing the success of one's equals can be beneficial to an individual's self-belief;
- verbal motivation by others; and
- minimising stress reactions, negative moods and adverse physical symptoms.

Self-efficacy is crucial for academic success at the higher education level. Being a student at a higher education institution means having to be mature enough to take responsibility for one's own learning. A high level of critical thinking and self-analysis is expected from students at these institutions. Students with a high level of self-efficacy have the self-discipline to do what is necessary to reach set goals – even if it means missing out on the fun! These learners stay focused and are not side-tracked by disruptive thoughts or short-term gratification. In other words, they have a positive future time perspective (Bembenutty, 2011:4-6).

In summary, the social-cognitive theory acknowledges the roles of an individual's self-observation and self-evaluation in the learning process, as well as the interactions with the environment and other individuals or groups. Cognition dictates the reaction of the student to these interactions, and self-efficacy is ultimately the driving force behind the successful completion of a learning task.

4.2.4 Information Processing Theory

This theory stems from the development of electronic computers and guidance systems for the Second World War in the first half of the twentieth century (Zimmerman, 2001:15). Human cognitive function is explained using computer terms, such as memory stores and information processing. The human memory is described in terms of encoding (comparable to a computer's keyboard), storage (hard drive) and retrieval (software)

(Feldman, 2013:213). Information is sent from a “sender” in symbolic form (for example, words in a lecture or the characters in a written document) to the receiver (the learner). The symbols received must be processed by the receiver. Processing can be challenging, depending on the complexity of the symbols (Winne, 2001:154).

According to the multi-store or Atkinson-Shiffrin model, there are three different types of memory in the brain, namely sensory memory; working memory, of which the short-term memory forms part; and long-term memory (Winne, 2001:154; Bernstein, Penner, Clarke-Stewart & Roy, 2006:241; Feldman, 2013:214). In the sensory memory, all stimuli (auditory, visual, smell, taste and touch) are received and retained with great accuracy for a very short period (from a fraction of a second to two or three seconds). The sensory memory has a very large capacity and is divided into five parts, that is, one for each sense. The sensory memory filters incoming information, some of which is passed on to the short-term memory. Information that is not passed on to the short-term memory is then lost (Bernstein et al., 2006:243; Feldman, 2013:214-215). Only limited amounts of information can be passed on from the sensory memory to the short-term memory. Information that is stored in the short-term memory is grouped into “chunks” of information. Miller (1956:81-97) proposed that the capacity of the short-term memory is equal to seven plus or minus two chunks. A chunk can consist of a single unit (for example, a single letter or digit) or a group of related units (for example, five letters make up the word ‘learn’, but the word can be stored as a single chunk) (Bernstein et al., 2006:244; Feldman, 2013:216). These chunks of information can be held in the short-term memory for a period of fifteen to twenty seconds. The chunks of information can be new information from the sensory memory or older material retrieved from the long-term memory. The role of the working memory is two-fold: firstly, the storing of chunks of information in the short-term memory and, secondly, the processing or manipulation of information (Bernstein et al., 2006:244). For information to be stored in the long-term memory, elaborate rehearsal of the information needs to take place in the working memory. Elaborate rehearsal not only means repeating information, but the information must also be ordered or organised in some way (Feldman, 2013:217). This is an important aspect of the learning process. For example, making use of mind maps or flow diagrams when studying can ensure storage of the information in the long-term memory.

Information stored in the long-term memory is permanent. The long-term memory has a huge capacity, but the retrieval of information from the long-term memory can sometimes prove to be difficult. The long-term memory can be subdivided into declarative memory and procedural memory (Feldman, 2013:219). Factual information (for example, names and dates) are stored in the declarative memory whereas skills and habits are stored in the procedural memory. Information stored in the long-term memory forms a network which consists of nodes of information which, in turn, are connected or linked to other nodes. The links are crucial for the retrieval of information from the long-term memory (Winne, 2001:155). When new information is stored in the long-term memory, new links are created. Information is retrieved from the long-term memory by spreading activation (Winne, 2001:155; Bernstein et al., 2006: 251). When thinking about a specific topic, that topic is activated in the network of the long-term memory together with the links associated with that specific topic. This information is then placed in the working memory for information processing (Winne, 2001:155-157).

Self-regulated learning, from the information processing theory's point of view, is a four-stage process (Winne, 2001:164; Winne & Baker, 2013:4; Winne, 2018:3-4). During Phase One, the learner inspects the environment (both external and internal) for resources and limitations that will affect the execution of the task. The external environment includes access to resources, time constraints and environment noise. The internal environment refers to cognitive conditions and includes interest in the topic, self-efficacy and prior-knowledge about the subject matter addressed by the task. Phase Two is characterised by goal setting, which relates to the standards used to meta-cognitively measure the progress made during the process of task completion, as well as measuring the final product against specific standards. Goal-setting forces learners to devise plans in order to reach these goals. When these plans are put into action, Phase Three is engaged. This phase refers to the actual execution of the task whilst keeping the standards as set in Phase Two in mind. During Phase Three, adjustments can be made to strategies and goals. In addition, related information, which can be utilised in the completion of the task, is transferred from the long-term memory to the working memory. In Phase Four (which is an optional phase), the whole process is revised meta-cognitively, and plans are devised to improve the execution of similar tasks in the future.

The information processing theory is an abstract and modern take on self-regulated learning, and compares the human mind to the workings of modern-day computers. Given its exciting nature, this theory is drawing the attention of present-day researchers, particularly in terms of the theory of learning. Therefore, it is expected that a great deal of future research will focus on this theory.

4.2.5 Volition Theory

Volition can be described as the self-will or willpower of an individual to decide on a course of action to obtain a set goal and to act on the decision by using action-control strategies, overcoming obstacles along the way. The concept of volition in self-regulation in modern times is largely attributed to Julius Kuhl (Corno, 2001:193). Volition is a crucial aspect of self-regulation but is different from motivation. Motivation to self-regulate is controlled by a person's determination to achieve a goal. The key determinants of motivation are expectations and incentives. Motivation alone is not a guarantee for goal achievement. Volition comes into play when there are obstacles or hindrances that need to be overcome on the road to goal attainment. It refers to the conscious will of a person to implement self-regulation strategies in order to overcome the said obstacles or hindrances (Oettingen, Schrage & Gollwitzer, 2015:104-105). In research on volition, a distinction is made between top-down and bottom-up processes of volition. Whereas top-down volition processes are determined by the goals set by the individual, bottom-up volition processes are influenced by the environmental stimuli that force the individual to adjust his or her volitional reaction (Oettingen, Schrage & Gollwitzer, 2015:105).

At the core of Julius Kuhl's (2000:667-668) Personality Systems Interaction Theory (PSI) on motivation and self-regulation is volition action. Affect (an individual's mood or feelings) also plays a vital role in this theory and can influence the cognitive processes involved in self-regulation. Consequently, self-regulation can be improved by exercising self-control in reaction to affect. The role of volition or will in the PSI theory is described as two top-down forms of will or volition modes, namely self-control and self-maintenance (Kuhl & Koole, 2004:415-420).

In an educational setting, learners can be guided by an educator to improve their own volition. An example of such an intervention is the schooling of learners in applying mental

contrasting (Oettingen, Schrage & Gollwitzer, 2015:106). Mental contrasting is a volitional self-regulating strategy and involves the visualisation of attaining set goals, as well as that of current obstacles and difficulties hampering the achievement of these goals. If the expectation to achieve a goal is high, the learner will actively strive to overcome all hindrances to the attainment of the goal. However, if the expectation of success is low, he or she will abandon efforts to achieve the goal. This equates to a wise expenditure of energy. Another example of intervention by an educator to improve learners' volition is to teach them to apply implementation intention effects (Oettinger, Schrage & Gollwitzer, 2015:109). Implementation intention is the formulation of if-then plans in advance to overcome hindrances that might prevent a learner from starting with goal achievement, to continue once the process of goal achievement has started, and to disengage from the entire process if it proves to be unattainable. For example, an adult learner can formulate the following if-then plan: "If the pursuit of my goal to obtain a qualification starts to have a negative influence on my child's school performance, then I will abandon the goal for now." Research has shown that the application of implementation intentions increases the rate of goal attainment (Gollwitzer & Sheeran, 2006:69,98,109; Oettinger, Schrage & Gollwitzer, 2015:110). Applying both mental contrasting and implementation intentions to achieve set goals is even more effective than the application of only one of the two techniques (Oettinger, Schrage & Gollwitzer, 2015:112-113).

The volition theory shares a connection with the phenomenological and social cognitive theories in the sense that this theory also considers the role of the individual (in this case, the individual's willpower) as fundamental to self-regulated learning. The individual's self-belief (the phenomenological theory) and his or her own choices and decisions (the social cognitive theory) play a key role in the learning process.

4.2.6 Sociocultural Theory

The sociocultural theory is closely associated with the Russian psychologist, Lev Vygotsky. For this reason, it is sometimes also referred to as the Vygotskian theory of cognitive development. Lev Vygotsky's political views shaped his psychological perspective and led to his development of a Marxist psychology (Ratner, 1998:455-456; McCaslin & Hickey, 2001:227-230). Vygotsky was born in 1896 and grew up during the Russian Revolution. Until his untimely death in 1934, he was a keen supporter of the

Russian Revolution, Marxism and socialism. For Vygotsky (1986:36), "…the true direction of the development of thinking is not from the individual to the social, but from the social to the individual". According to Wertsch (1991:19-29), there are three fundamental ideas evident in all of Vygotsky's writings. Firstly, genetic analysis to understand mental processes is of great importance. In other words, both the origin and evolution of these processes must be taken into consideration when trying to understand the nature of these processes. Secondly, higher cognitive functioning originates in the individual's social life. Thirdly, the individual makes use of tools, such as language, to interact with the world (these tools act as mediators between the individual and the rest of the world).

Vygotsky recognised the role of biological processes in the early psychological development of the child. In a new-born, biological processes are of primary importance in terms of psychological development. As the child becomes older, the role of biological processes becomes less important while the role of social experience assumes primary importance. This transition is called the "sociogenesis of psychological phenomena" (Ratner, 1998:459-460). The role of biological processes is a determinant of lower processes in a child, such as smiling or crying. These lower processes are intuitive reactions to stimuli and do not involve cognitive functions. To move from low-level interactions to more advanced interactions with the external world, a cultural and social restructuring needs to take place. Social experiences and stimuli lead to the development of the cortex as well as the advancement of memory (Vygotsky & Luria, 1930/1993, cited in Ratner, 1998: 459-462).

Vygotsky also considered cognitive development and learning as social processes since both are the result of social interactions between the child and a more knowledgeable person in an effort to find solutions to problems (Feldman, 2013:422). Learning takes place when a learner is confronted with a task that is beyond his or her capabilities or knowledge level. This is called the zone of proximal development or ZPD (Vygotsky, 1978:85-91). The missing information that falls within the ZPD needs to be supplied by a peer, a parent or a teacher for the learner to successfully master the new task. This assistance is called scaffolding. Learning and cognitive development are only possible if there are interactions with other individuals within a society or culture. Once the task is mastered with the assistance of others, the learner is able to do similar tasks in future on his or her own (McCaslin & Hickey, 2001:236-237). The ZPD is the means by which a

learner develops higher cognitive abilities, which then forms the basis for self-regulated learning. Externally, culture and society shape the learner and enable him or her to become self-regulated. The learner plays an active role in the learning process, which suggests that for learning to take place, interaction between the learner and a more knowledgeable person must take place. Moreover, during this interaction, language and speech are of cardinal importance.

In summary, from a sociocultural or Vygotskian point of view, self-regulation is initiated by an external source. Self-regulated learning can only take place after a learner has been guided by a more knowledgeable person (peer, parent or teacher) to acquire knowledge and expertise in a certain field. This step is crucial for a learner's cognitive development. Once this has been accomplished, the learner can self-regulate the completion of similar tasks in future without the help or assistance of others. The role of the teacher or lecturer is thus paramount to the development of self-regulating skills (Zimmerman, 2001:28).

4.2.7 Cognitive Constructivist Theory

John Dewey is the founder of constructivism (Juhary, 2013:541). According to this theory on learning, learners learn by constructing their own knowledge and understanding of a topic from their own experiences, prior knowledge and interaction with learning resources. These learning resources include teachers, lecturers and learning materials. Dewey highlighted four educational key points:

- A learner builds new knowledge by utilising past experiences. Not all experiences are educational. Part of the educator's role is to help the learner to identify the previous experiences that are helpful to construct new knowledge about a specific topic. Subsequently, learning is the broadening of existing knowledge.
- Learners learn by doing, and are not passive spectators in the learning process. There must be a shift away from educator-centred education to learner-centred education.
- Learning should have a purpose and meaning for the present as well as the future. There should be a link between different learning experiences, which Dewey referred to as "a continuous spiral".

- Critical thinking by a learner is of key importance to the learning process. A learner must have the ability to be critical and inquisitive, and information should not be believed without questioning or further investigation. This process leads to the building of new knowledge.

Dewey was criticised by some scholars who believed that his view of education leads to poorly-disciplined learners. Over the years, various branches of constructivism have developed. Two principal constructivist theories that have emerged are cognitive constructivism and social constructivism. Social constructivism (or the sociocultural or Vygotskian theory) was discussed in the previous section.

The development of the cognitive constructivist theory is mainly attributed to Jean Piaget (Schcolnik, Kol & Abarbanel, 2006:13; Powell & Kalina, 2009:242; Amineh & Asl, 2015:10), who identified four different stages of intellectual development in humans. While the sequence of the stages is the same for all individuals, the age of onset of a new stage can differ. The thinking and reasoning processes differ between the four stages (Juhary, 2013:543; Powell & Kalina, 2009:242). A learner must be at a certain intellectual level (determined by the stage of intellectual development that he or she is in) to grasp or learn certain material or concepts. If the concept is of a higher intellectual level than that of the learner, he or she will be unable to master it.

Piaget recognised three fundamental processes of intellectual growth, namely assimilation, accommodation and equilibration (Powell & Kalina, 2009:243; Juhary, 2013:543; Roustaee, Kadir & Asimiran, 2014:147). Assimilation refers to the building of new knowledge based on existing knowledge. Accommodation is the restructuring of existing knowledge to accommodate new knowledge. Equilibration is then the establishment of a balance between assimilation and accommodation until the learner has made the necessary cognitive adjustments to be comfortable with the new knowledge.

The educator must understand that not all learners in a class are at the same stage of intellectual development. Thus, the pace of learning will vary between different learners. For this reason, the educator must adjust his or her teaching to accommodate different learners. In contrast to social constructivism, cognitive constructivism focuses on the individual learner's ability to acquire new knowledge and to build on existing knowledge.

Acquiring knowledge is therefore an internal process and knowledge is not transferred from the environment or society as suggested by social constructivism (Roustaee, Kadir & Asimiran, 2014:147).

While reflecting on the above description of cognitive constructivism, it can be concluded that self-regulation is at the core of this theory. Not all learners have the ability to apply self-regulating learning techniques to the same extent since not all are at the same stage of intellectual development. Self-regulation strategies are obtained and developed by means of personal invention and instruction by, for example, a teacher or a lecturer (Paris, Byrnes & Paris, 2001:259). Learners may apply self-regulation techniques to be held in higher esteem by others since the outcome of applying self-regulation techniques usually leads to better performance. Self-regulation can, however, also be applied in life situations other than learning. A learner may self-regulate his or her actions and behaviours in such a way as to fit in with a specific group or type.

Higgins (1991, cited in Paris, Byrnes & Paris, 2001:260) proposes that children go through different stages in terms of their self-representation. In early childhood, the child is directed by the goals and levels of achievement set for him or her by others. Following this early stage is a middle stage during which the child sets ideals and goals for him- or herself. This does sometimes lead to low self-esteem and depression if the child is unable to meet these expectations. This can lead to adjustments in self-regulatory actions, for example, lowering expectations and avoiding social gatherings.

Paris, Byrnes and Paris (2001:254-258) blend social and cognitive constructivism to provide a more modernistic view of self-regulation and constructivism. The main points of this blended constructivist view are as follows:

- Even if the learning process is an individual, internal process, these self-regulating processes are shaped by society and other role players, such as peers, parents and teachers.
- Personal, practical experience forms part of the learning process. However, these practical experiences are constructed based on the examples set by communities, society and the school system. Societal and school practices influence the learner's self-regulating processes. For example, the assessment practices of an

educational institution, such as a school or university, directs the self-regulation techniques applied by a learner in order to comply with the assessment procedures. Teaching practices also influence the learning strategies that are applied. In an education system where there is a great deal of support and encouragement for learners to develop critical thinking and self-regulation skills, learners are more successful in the application of self-regulation in their learning. On the other hand, in teaching environments where learners are encouraged to assume a passive role, they do not necessarily develop the necessary skills to become self-regulated in their learning.

- Group pressure has a significant effect on the self-regulative maturity of a learner. Within the group, a sense of self is developed. The behaviours of other members of a group are imitated and a sense of self-worth and ability (positive or negative) is established which, in turn, impacts a learner's ability to self-regulate.
- A learner's self-analysis in terms of his or her ability to self-regulate is a personal action which is directed by his or her past as well as by what he or she envisages for the future. However, the feedback received from peers and educators impact this process.
- New learning is built on experiences and entails the adaptation of existing knowledge. This is a subjective process which can lead to misconception or misunderstanding.

In summary, from a cognitive constructivist point of view, self-regulation focuses on strategies or theories that a learner develops in order to learn or complete a task. Existing strategies or theories are adjusted and built on each time a new field of study or skill needs to be mastered (Zimmerman & Schunk, 2001:299-300). The individual learner's ability to acquire new knowledge and to build on existing knowledge take centre stage as opposed to the social constructivist view that knowledge is transferred from the environment or society to the learner.

4.2.8 Boekaerts' Models

According to Monique Boekaerts (1996:101), self-regulated learning is a constructive and goal-directed process. She developed two models of self-regulated learning, namely the

structural model and the adaptive learning model which evolved into the dual processing model (Panadero, 2017:4-10).

4.2.8.1 Boekaerts' structural model

In the structural model, Boekaerts (1996:102-104) proposes two regulatory systems of self-regulated learning, namely a cognitive information regulatory system and a motivational-emotional system, each of which consists of three components as described below.

4.2.8.1.1 The cognitive system

This system consists of (1) domain-specific knowledge and skills, (2) cognitive strategies, and (3) cognitive self-regulatory strategies.

(1) In the acquisition of new domain-specific knowledge, interaction with prior knowledge pertaining to that particular domain plays an important part (in other words, a constructivist outlook). However, a learner must have the capacity and will to self-evaluate his or her prior knowledge and to self-adjust or restructure it if necessary.
(2) Cognitive strategies (automatic and consciously self-controlled) refer to cognitive processes used by a learner during the actual learning process or during the completion of an assignment or task. This includes strategies, such as rehearsal and summarisation, as well as the ability to recall relevant prior-knowledge and skills. A self-regulated learner is able to adapt and expand cognitive strategies that were utilised in a specific knowledge domain for another knowledge domain. This is necessary since cognitive strategies that worked in the acquisition of knowledge in one domain cannot necessarily be applied directly to knowledge acquisition in other domains.
(3) Cognitive self-regulatory strategies refer to strategies activated to achieve set goals. This involves the depiction of a learning goal and modifying it if necessary, the devising of plans to reach the set goal and changing these if necessary and, lastly, the monitoring of progress along the path of goal achievement.

4.2.8.1.2 The motivational-emotional system

The motivational-emotional system consists of the following levels: (1) motivational beliefs and theory of mind, (2) motivational strategies, and (3) motivational self-regulatory strategies.

(1) A learner constructs certain theories of mind (that is, cognitive theories) and theories of self. Only some domain-specific theories of mind and self are activated during a learning session. These theories can be classified into three categories. The first includes the views and attitudes (likes, dislikes) of a learner regarding the tasks within a specific learning domain. The second includes the individual's subjective perceptions regarding what is required of the self to perform well within a certain domain. The third includes strategic beliefs and the learner's perceptions regarding his or her capacity to master a specific area of a learning domain. An example is a learner's preconceived idea that he or she is not good at Maths. This final category can have a significant influence on a learner's motivation and can act as a determent to positive behaviour.

(2) A learner will have a positive attitude towards a task if he or she is intrinsically motivated, confident in the learning set-up and interested in the learning material or subject area. Such a learner will then put in a greater amount of effort to complete the learning task as opposed to those who do not exhibit these qualities. Learners with a positive attitude will effectively apply positive motivation strategies during the learning task (in other words, they will be self-regulated). Positive strategies are those that are consciously and unconsciously deployed to contravene negative attitudes and emotions during the learning process. They can also be externally enforced, for example, by a parent offering a reward if a learner completes a task successfully. Such external control can, however, have a negative effect on a learner's ability to develop his or her own strategies and is thus not conducive to self-regulatory behaviour.

(3) Motivational self-regulatory strategies include:

- the capacity of the learner to form a clear image of his or her own individual goals;
- the ability to connect the goal intention to a plan of action; and

- the monitoring and adjustment of the learning process as progress is made along the path of goal achievement (that is, volition control).

The two regulatory systems of self-regulated learning as proposed in Boekaerts' (1996:104) structural model (that is, the cognitive information processing system and the motivational-emotional system) are interconnected. In fact, they are "two sides of the same coin" (Boekaerts 1996:104). The structural model emphasises the domain-specific elements of self-regulation, and is used in the training of teachers, development of new measuring instruments for research and in the designing of intervention programmes (Panadero, 2017:5). However, most of Boekaerts' research has focused on the following model, namely the dual processing model.

4.2.8.2 Boekaerts' dual processing model

Goals and emotions are at the heart of the dual processing self-regulation model (Boekaerts & Cascallar, 2006:202; Panadero, 2017:6-10), which describes two possible pathways that can be chosen during the learning process. One pathway (the growth-pathway) is goal-driven, which means that the learner puts effort and energy into pursuing a goal that is important to him or her. Boekaerts and Cascallar (2006:202) describe this path as top-down self-regulation. However, if a learner is more concerned with his or her own well-being than with the pursuit of goals in specific learning conditions or accomplishing a specific domain task, he or she will focus primarily on the negative aspects of the learning environment with the result that his or her self-regulation system will break down in the process. This latter pathway is called the well-being pathway and is characterised by cue-driven or bottom-up self-regulation; energy is squandered to prevent a repetition of negative experiences. A learner is able to switch between the well-being and growth pathways. For instance, if a learner started out on the growth pathway but recognises that he or she will not be successful, he or she can switch to the well-being pathway. Similarly, a learner can be re-directed (internally or externally) from the well-being pathway to the growth pathway (Panadero, 2017:6). The proposed dual pathways of Boekaerts' dual processing model are supported by Pekrun, Goetz, Titz and Perry (2002:98-100), who found that positive emotions (that is, academic enjoyment, hope and pride) correlated positively with learners' motivation, effort, applied learning strategies and academic achievement. In contrast, negative emotions (that is, boredom and

hopelessness) correlated negatively with learners' motivation, effort and academic achievement, and positively with task-irrelevant thinking. Negative academic emotions were also predictive of learners' inclination to drop university courses or to drop out of university.

In summary, Boekaerts' models of self-regulated learning focus on the interconnectedness of cognition, motivation and emotion in domain-specific learning processes. She has contributed significantly, both as an individual and in collaboration with other researchers, to a better understanding of self-regulated learning processes.

4.3 CONCLUSION

In this chapter, a summary of the concept of self-regulated learning and some of the theories related to it have been provided. The concept of self-regulated learning is a popular research topic not only in the field of education, but also in the fields of psychiatry and sociology. It is, however, impossible to address all of the viewpoints on self-regulated learning in this thesis. Thus, only a few were selected to provide a context for the study. It is clear that the notion of self-regulated learning is evolving. Perhaps a single model encompassing all of the important aspects of the current models of self-regulated learning will emerge in the future. Given the post-positivist paradigm of the current study and the methodological approach chosen, the researcher did show an inclination towards the operant theorist's approach. However, since the current study did not only research the cognitive aspects of learning, but also focused on the motivational, emotional and metacognitive aspects, the social cognitive theory as well as Boekaerts' duel processing model were also endorsed in this study. In the next chapter, a description of the different measuring instruments used to evaluate the levels of self-regulated learning and depression among the students in the focus group of this study is provided.

CHAPTER FIVE
RESEARCH DESIGN AND METHODOLOGY

5.1 INTRODUCTION

In this study, as highlighted in Section 1.4, an evidence-based non-experimental *ex post facto* quantitative research approach, constructed on a post-positivistic paradigm, was followed. The focus of Chapter Five is to explain the design and methodology of this research study by elaborating on the variables identified as well as describing the sampling, data collection, analyses of results, measuring instruments and ethical considerations relevant to this study.

5.2 VARIABLES IN THE STUDY

The variables in a research study can be defined as aspects of the research that can have different values (quantitative variables) or groupings (categorical variables) (Johnson & Christensen, 2012:38). For example, age (a quantitative variable) can have different values, but ethnicity (a categorical variable) may be categorised according to Black, Coloured, Asian, Indian and White. Furthermore, variables can be categorised as independent or dependent variables. A variable that can influence or change another (called the dependent variable) is called the independent variable (Johnson & Christensen, 2012:40). Identifying the dependent and independent variables in a research study is one of the primary steps when identifying the research topic. A third type of variable, called a confounding or extraneous variable, is one that can influence the outcomes of a research study (Johnson & Christensen, 2012:41-42), but which is not one of the variables identified as part of the study. Confounding variables must be controlled in a research study to level out the effect thereof in the results obtained. The different variables identified for the current study are discussed below.

5.2.1 The Dependent Variable

The dependent variable in this study was the academic performance of all students (access programme students as well as mainstream programme students) registered for

the first time for the first-year Biology module, BLGY1513. The final module mark for this module was used as a means of measurement and is described as a score in this study. This final mark was obtained from the coordinator of the module at the end of the first academic semester of 2017 upon completion of all assessments.

5.2.2 The Independent Variables

Two independent variables were researched in this study, namely self-regulated learning and depression. Self-regulated learning was investigated using the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1993:801-813), while the level of depression was scored by means of the short version of the Depression, Anxiety and Stress Scales (DASS-21) (Lovibond & Lovibond, 1995).

5.2.3 The Confounding Variables

The confounding variables identified and controlled to avoid a false positive error were gender, age, language, study programme, ethnicity and psychosocial well-being. Confounding variable data was measured by means of a Biographical Questionnaire, and psychosocial well-being was described as a score on the Psychosocial Well-being Scale.

5.3 SAMPLING

The target population for this study comprised all students who had registered for the BLGY1513 module at the UFS in 2017 for the first time. Set criteria as well as circumstances on the day of data collection led to convenience, non-probability sampling. These criteria/circumstances were as follows:

- Only students who had registered for the BLGY1513 module in 2017 for the first time and who had attended class on the day of data collection participated in the study;
- Students had to be eighteen years or older to participate; and
- Participation was voluntary.

In the mainstream programme, 568 students registered for the BLGY1513 module at the beginning of 2017. This included repeaters. A total of 204 students (that is, 35.92%) participated in the study. The low participation rate is attributed to the fact that class attendance on the day of data collection was not particularly good. Moreover, the students had not been informed beforehand that the study was to be conducted. Furthermore, both the Afrikaans and English classes were scheduled in the 12:00-13:00 time slot and, whereas the Afrikaans lecturer requested that the data collection be done at the beginning of the session, the English lecturer asked that this be done at the end of the session. Consequently, a high number of students who did attend the Afrikaans class completed the questionnaires. However, many students who had attended the English class opted not to participate, instead preferring to leave for their lunch break. As stated above, all students younger than eighteen years, as well as those who were repeating the module, were excluded from participation.

At the beginning of 2017, a total of 313 students registered for the BLGY1513 module in the access programme (all first-time students since no repeaters can be accommodated on the UFS South Campus due to limited facilities). Of the total number of students registered for BLGY1513 in the access programme in 2017, 246 (78.95%) participated in the study. Again, students who were younger than eighteen years were not invited to participate. The high participation rate is due to the fact that class attendance in the access programme is compulsory and a high percentage of students (both Afrikaans and English) who attended the class on the day of data collection was willing to participate in the study.

5.4 DATA COLLECTION

Prior to data collection, a pilot study was conducted to ensure that the questions in the different questionnaires were easily understandable, and to determine the average time needed by students to complete all four questionnaires, namely a biographical and a socio-economic questionnaire, the MSLQ, and the short version of the Depression, Anxiety and Stress Scales (DASS-21). All of the questionnaires combined consisted of 126 questions. Seven students, all of whom started their studies in the access programme and who were busy with their second academic year of study, were approached to participate in the pilot study. All seven students found the questions of the different

questionnaires easy to understand and it took them between 19 and 38 minutes to complete all of the questionnaires. Thus, it was established that 60 minutes would be sufficient to explain the purpose of the study to the students and for the students to complete the questionnaires.

Data collection took place during the last week of March 2017 (27-30 March 2017). This period was chosen based on a number of factors:

- Ethical clearance from the UFS for conducting the study was only obtained in February 2017 after the application was submitted in September 2016.
- No important tests were scheduled to be written by the target group just prior to or during this period which could have influenced students' stress and anxiety levels.
- By this time, students were settled into their programme of choice.
- Following the disruption of the 2016 academic year due to the Fees Must Fall movement, no disruptions were experienced in 2017 up to the last week of March. Academic disruption prior to data collection was therefore not an extraneous factor that needed to be considered.

Permission was obtained from all relevant role players to conduct the data collection. Since the programme for the BLGY1513 contact sessions for the chosen week was extremely full, arrangements were made to collect the data during other module sessions. On the Bloemfontein Campus, permission was obtained from the Chemistry lecturers who were responsible for the Chemistry module (CHEM1514) to use a portion of their class sessions to collect the data from the mainstream students. This was feasible since all students who had registered for BLGY1513 were also registered for CHEM1514. Both the Afrikaans and English CHEM1514 groups had a class session on Wednesday, 29 March from 11:10-13:00. Part of the session is normally used to write tests. However, since no test had been scheduled, permission was granted for the data collection to be done. The data collection from the Afrikaans group was conducted at the beginning of the session whereas data was collected from the English group at the end of the session.

On South Campus, the ten different access programme groups did not have any joint contact sessions. For this reason, the data collection was done during the students' life-long learning sessions, which were scheduled during different time slots from Monday, 27

March to Thursday, 30 March. The life-long learning lecturers granted permission for the collection of data to proceed during these contact sessions.

The researcher was responsible for the data collection. Prior to data collection, the researcher explained the purpose of the study as well as the rationale behind the different questionnaires to each group. Students who were eighteen years and older and who had registered for the BLGY1513 module for the first time were invited to participate in the study. Those students who were willing to participate in the study, were asked to sign a consent form (Appendix A). In 2017, the year during which this study was conducted, the UFS had a total of 39 638 registered students, speaking 38 different home languages (UFS Institutional Information systems, 2020, personal communication, 17 March), of which eleven are official languages. Since all the questionnaires used in this study were pre-existing questionnaires that were only available in English and since it would have been a monumental task to translate the questionnaires (even if an effort was made to do such translations only into the official languages), it was decided that all students would complete English questionnaires. Furthermore, providing students with English questionnaires is in line with the UFS language policy which was approved in 2016 (UFS, 2016b). According to the UFS language policy, English is the primary medium of instruction and communication at the UFS, although in some instances, Afrikaans is still used as a parallel medium of instruction. In the programmes identified to form part of this study, Afrikaans is still used as tuition language, therefore the distinction between Afrikaans and English groups as described in the previous Section. The researcher was available to answer any questions while the questionnaires were completed by the different groups, including questions relating to the interpretation of items on the questionnaires.

5.5 ANALYSIS OF RESULTS

Cronbach alpha values were calculated to determine the reliability of the different questionnaires.[18] These values were obtained using the CORR procedure in the Statistical Analysis Software (SAS[19]). Descriptive statistics (for both the demographic and

[18] A questionnaire in this thesis is also referred to as a measuring instrument.
[19] SAS (Statistical Analysis Software) was developed by the SAS Institute, an American multinational developer of analytics software.

questionnaire data) were calculated by means of the SAS procedures TABULATE and FREQ, and represented graphically using IBM Statistical Package for Social Sciences (SPSS) software.[20] Inferential statistical analyses that were performed included correlation coefficients, independent-samples t-tests, ANCOVA and linear regression. Correlation coefficients and associated p-values between the different variables were determined using the CORR procedure in SAS. All other inferential statistical analyses were done using IBM SPSS software. This includes the independent-samples t-tests, ANOVA and ANCOVA analyses, post-hoc tests, testing the assumptions for multiple regression as well as multiple linear regression analyses. Initial SAS analyses were conducted by the UFS SCU. These results were repeated and expanded by the researcher using the IBM SPSS software in order to familiarise herself with the data set and all statistical procedures.

5.6 MEASURING INSTRUMENTS

When deciding on using a measuring instrument (questionnaire in the current study), it is important to establish the validity and reliability thereof. Validity, in a broad sense, can be described as the ability of a measuring instrument to measure what it is supposed to measure. McDowell (2006:30) defines validity as "the range of interpretations that can be appropriately placed on a measurement score". According to this definition, validity is a characteristic of the interpretation of research results rather than of the results themselves.

Reliability is a measure of the consistency of a measuring instrument. Three aspects are important regarding reliability. Firstly, reliability pertains to the repeatability of the instrument (test-retest reliability). The question is whether the researcher will obtain the same results if the test is retaken by the same participants, given that the conditions stay the same. Secondly, similar questions measuring a specific construct (for example, depression) should produce the same score. This is called the internal consistency of the measuring instrument. Lastly, the measuring instrument should display inter-rater reliability, meaning that different raters or researchers evaluating the same participant and using the same measuring instrument should obtain the same results (McDowell, 2006:39-45). The validity and reliability of the Psychosocial Well-being Questionnaire, MSLQ and

[20] IBM SPSS statistics is a software package for statistical analysis in research and business.

DASS-21 have been confirmed by other researchers (Pintrich et al., 1993:811-812; McDowell, 2006:316-317; Viljoen, 2012:177-178) and motivated the use of these instruments in the current study[21]. A short description of each of these measuring instruments were provided in Section 1.5.5, and these descriptions are expanded on below.

5.6.1 Biographical Questionnaire

The purpose of the Biographical Information Questionnaire (Appendix B) used in this study was to obtain biographical information for each of the participants. This includes information regarding a participant's age, gender and ethnicity. The information obtained by means of this questionnaire enabled the researcher to create a profile of the data set by using descriptive statistical techniques. Furthermore, the constructs, age, gender and ethnicity, may have had an unintended influence on the results obtained in the research and must be accounted for in the analyses as confounding variables.

5.6.2 Psychosocial Well-being Questionnaire

The psychosocial background of participants may have an effect on his or her independent and dependent variable scores. For that reason, psychosocial background was identified as another confounding variable in this study. To determine the psychosocial well-being of the participants, the semantic differential scale developed by Viljoen (2012:163-183) was used (Appendix C). The first part of the scale measures the environment in which the participants were raised (that is, emotional support while growing up, socio-economic circumstances, learning environment experienced as a child and incidence of depression among close family members). The latter part measures the present circumstances of participants (that is, current financial position, relationship problems, occurrence of depression and concerns regarding HIV/AIDS status). A six-point Likert scale is used in the questionnaire, ranging from 1 to 6, with possibilities provided to the right and left of these numbers. All of the questions were constructed as positive questions to make understanding easier. The first part of the questionnaire, which relates to the childhood

[21] A further motivation for the use of the specific measuring instruments, is the fact that all of them are in the public domain and no prior permission for the use of the instruments are needed. This being said, the researcher did cite the compiler(s) of the different instruments.

years, consists of fourteen questions while the latter part (concerning the participant's current situation) comprises five questions. Lower values per question correspond with positive psychosocial experiences.

5.6.3 Short Version of the Depression, Anxiety and Stress Scales

The Depression, Anxiety and Stress Scales (DASS) is a self-report questionnaire in the public domain consisting, as the name suggests, of three scales for depression, anxiety and stress. Two versions of the questionnaire are available, namely a longer version consisting of 42 items (fourteen items per scale) and a shorter version, known as DASS-21, consisting of 21 items (seven items per scale) (Psychology Foundation of Australia, 2014). The questionnaire was developed by Lovibond and Lovibond (1995). In this study, the shorter, 21-item version (Appendix D), was used. Not only does it take less time to complete, but the validity and reliability thereof have also been confirmed. It is also considered to be superior to the longer version (McDowell, 2006:313-319). Also, given the fact that the questionnaire is in the public domain and that it can be utilized by non-clinical researchers (Psychology Foundation of Australia, 2014), this instrument was selected above other instruments available to assess the presence of depressive symptoms (for example, the Beck Depression Inventory-II). The items on the DASS-21 are scored on a four-point Likert scale, ranging from 0 (did not apply to me at all) to 3 (applied to me very much/most of the time). Participants are required to reflect on the extent to which each item applies to them over the last week. The sum of the item scores per scale is determined and multiplied by two to compare the score with the full DASS-42 Questionnaire categorisation provided by Lovibond and Lovibond (1995). Depression, anxiety and stress are then categorised as normal, mild, moderate, severe or extremely severe.

5.6.4 The Motivated Strategies for Learning Questionnaire (MSLQ)

The formal development of the MSLQ started in 1986 by a team of researchers from the National Centre for Research to Improve Postsecondary Teaching and Learning (NCRIPTAL) and the School of Education at the University of Michigan (Pintrich, Smith, Garcia & McKeachie, 1991:iv). The questionnaire was improved and refined over a period of five years after which the final version was presented. The final version of this

questionnaire was used in this study (Appendix E). The MSLQ is course- or module-specific and results may differ depending on the module selected for scrutiny. Therefore, no norms are provided with the questionnaire. According to Pintrich et al. (1991:3), this questionnaire is based on a "general cognitive view of motivation and learning strategies". As a result, the questionnaire can be divided into two parts, namely a motivation segment (consisting of 31 items), and a learning strategies segment (consisting of 50 items). The motivation segment comprises six scales. Three scales evaluate a value component, two an expectancy component and one an affective component. The learning strategies segment can be divided into two parts, namely evaluation of the use of cognitive and metacognitive strategies by students (five scales) and the management of different resources by students (four scales). The items on the MSLQ are scored on a seven-point Likert scale, ranging from 1 (not at all true of me) to 7 (very true of me).

The six scales appearing in the motivation section of the MSLQ are:

- value component: intrinsic goal orientation (four items), denoted by M1;
- value component: extrinsic goal orientation (four items), denoted by M2;
- value component: task value (six items), denoted by M3;
- expectancy component: control of learning beliefs (four items), denoted by M4;
- expectancy component: self-efficacy for learning (eight items), denoted by M5; and
- affective component: test anxiety (five items), denoted by M6.

The five scales of the cognitive and metacognitive learning strategies section are:

- rehearsal (four items), denoted by L1;
- elaboration (six items), denoted by L2;
- organisation (four items), denoted by L3;
- critical thinking (five items), denoted by L4; and
- metacognitive self-regulation (twelve items), denoted by L5.

Lastly, the four scales of the resource management learning strategies section entail the following:

- time and study environment (eight items), denoted by L6;
- effort regulation (four items), denoted by L7;
- peer learning (three items), denoted by L8; and
- help seeking (four items), denoted by L9.

A short description of each scale is offered below.

Value component: intrinsic goal orientation

Goal orientation represents a student's perception of the purpose of a learning activity. An intrinsic goal orientation represents the perception that a learning activity is an end in itself, and that partaking in it will lead to mastering the subject material and provide an opportunity for self-growth (Pintrich et al., 1991:9; Credé & Phillips, 2011:338; Nielsen, 2018:2of 19).

Value component: extrinsic goal orientation

With an extrinsic goal orientation towards a specific learning activity, external factors and approval are of prime importance. The learning activity is a means to an end, and good marks, incentives or approval from peers or society is the ultimate goal (Pintrich et al., 1991:10; Credé & Phillips, 2011:338; Nielsen, 2018:2of 19).

Value component: task value

Task value represents a student's appraisal of a specific learning task in terms of whether it is thought-provoking, significant, interesting and advantageous to the future. Students also consider whether it is of importance to perform well in the task and how laborious it is (Pintrich et al., 1991:11; Credé & Phillips, 2011:338; Green, Conlon & Morrissey, 2017:113; Lee, Watson & Watson, 2019:32).

Expectancy component: control of learning beliefs

This component relates to a student's perception regarding the outcomes of a learning activity – if studying is undertaken with vigour, it will ensure positive results, irrespective of extrinsic factors (for example, the teacher's efforts) (Pintrich et al., 1991:12; Cook, Thompson & Thomas, 2011:1231). If a student believes that his or her own effort will determine the outcome, it serves as a motivation for focused and effective learning.

Expectancy component: self-efficacy for learning and performance

The expectancy component deals with two aspects, namely self-efficacy and the expectation of the student to perform well (Pintrich et al., 1991:13). Self-efficacy refers to a student's belief that he or she possesses the necessary ability and skills to successfully complete a task (Green, Conlon & Morrissey, 2017:114).

Affective component: test anxiety

Test anxiety is believed to comprise at least two main elements, namely a worry element and an emotionality element (Pintrich et al., 1991:15; Steinmayr, Crede, McElvany & Wirthwein, 2015:3; Sperling, Reeves, Gervais & Sloan, 2017:2296). The worry element relates to negative cognition or thoughts regarding academic achievement. The emotionality element relates to the affective-physiological manifestation of test anxiety, for example, fast breathing, sweaty palms, tense muscles and nervousness. Numerous studies have shown the negative effect of test anxiety on academic achievement (Bembenutty, 2008:128; Thomas, Cassady & Heller, 2017:45; Von der Embse, Jester, Roy & Post, 2018:490).

Cognitive and metacognitive strategies: rehearsal

Rehearsal is a cognitive activity involving the reciting of learning material, leading to the storage of information in the short-term or working memory only. As a result, this process does not contribute to deep learning, real comprehension of learning material or interconnecting new information with prior knowledge (Pintrich et al., 1991:19; Bembenutty, 2008:125). Nonetheless, this learning strategy can be successfully employed in the mastering of specific study material, for example, memorising names of different chemical elements on the periodic table. Research has shown that as a learning strategy, rehearsal does have a positive correlation with academic performance (Dent & Koenka, 2016:461).

Cognitive and metacognitive strategies: elaboration

In contrast with rehearsal, which is considered to be surface learning, elaboration is considered to be a deep-processing cognitive strategy which facilitates the formation of links between old and new information and making connections between different fields of learning (Pintrich et al., 1991:20; Ben-Eliyahu & Linnenbrink-Garcia, 2015:20). Elaboration strategies include the construction of analogies, information summarisation

and concept mapping. Elaboration strategies ensure the storage of information in the long-term memory.

Cognitive and metacognitive strategies: organisation

Similar to elaboration, organisation of learning material is a deep-processing strategy (Dent & Koenka, 2016:433). Organisational strategies (for example, highlighting key phrases, creating flowcharts or graphic organisers) help the learner to focus on the most important aspects of the learning material and to form links between different aspects of it (Pintrich et al., 1991:21).

Cognitive and metacognitive strategies: critical thinking

The fourth and last cognitive strategy assessed by the MSLQ is critical thinking. According to Pintrich et al. (1991:22), critical thinking involves the application of prior knowledge to unravel current problems and critically evaluate new situations. Differences of opinion exist on whether critical thinking is subject-related. Some educational researchers believe that this strategy is developed and applied differently in each individual field of study (Hattie & Donoghue, 2016:10) while others deem that critical thinking has both subject-specific and general components (Hyytinen, Toom & Postareff, 2018:133).

Cognitive and metacognitive strategies: metacognitive self-regulation

According to Zimmerman (1989:329), “Metacognitive refers to decision-making processes that regulate the selection and the use of various forms of knowledge”. Metacognition is considered to be a higher-order cognitive process consciously instigated and managed by an individual (Roebers, 2017:33). In the learning process, metacognition refers to conscious and deliberate reflection on the learning activity, which entails continuous monitoring and control of the activity to ensure maximum success. In the MSLQ, the focus is on the self-regulating features of metacognition and the metacognitive control of the learning activity (Pintrich et al., 1991:23). The self-regulating features of metacognition comprise three processes, namely planning (for example, goal setting and task analysis), monitoring (for example, self-testing) and regulating (that is, the constant regulation of cognitive activities).

Resource management strategies: time and study environment

Effective time management, planning of learning activities and ensuring an organised and quiet study environment are important strategies in self-regulated learning (Pintrich et al., 1991:25). According to Thibodeaux, Deutsch, Kitsantas and Winsler (2017:8), effective planning of one's time prevents procrastination, with the latter being counteractive in terms of self-regulation. In tertiary education settings, in particular, students have more control over their study environment as well as more freedom to ensure that their surroundings, while studying, are beneficial to the learning process (for instance, choosing a quiet spot in the library or arranging his or her own desk neatly before commencing with a study activity) (Pintrich, 2004:400). However, this is not always the case while still at school, where a teacher might control the learning environment.

Resource management strategies: effort regulation

As a resource management strategy, effort regulation refers to the persistence in a learning activity notwithstanding distractions or learning material that is perceived to be boring or difficult to master (Dunn, Lo, Mulvenon & Sutcliffe, 2012:313).

Resource management strategies: peer learning

Pintrich (2004:400) notes that peer interaction is becoming part of many modules or courses, for example in the form of group work or group learning tasks that are done as part of a course or module's assessment. Hence, social interaction has become a necessity in many courses or modules. Peers can be considered as a resource for learning if utilised correctly and effectively. The MSLQ has included a scale for peer learning to establish whether this resource does indeed contribute to better academic achievement (Pintrich et al., 1991:28).

Resource management strategies: help seeking

The last of the resource management strategies assessed by the MSLQ is help seeking (Pintrich et al., 1991:29). Help seeking, which also involves social interaction, refers not only to asking lecturers and teachers for help with regard to difficulties experienced in academic work, but also asking one's peers. Students are not always eager to seek help from others, fearing that help seeking may be seen as an admittance to inability. Students who are self-regulated learners are more inclined to seek help when needed (Karabenick & Dembo, 2011:33).

5.7 ETHICAL RESEARCH

When embarking on any research study, the ethical conduct of the researcher must be irreproachable. It is expected of a researcher to act with integrity, honesty and trustworthiness. Furthermore, any human participants involved in a study, should be treated with dignity and respect. No researcher conduct research with the deliberate intention to harm the individuals who have agreed to participate in a study. That being said, the researcher is a fallible human being with his or her own notion of what ethical research is. Israel and Hay (2006: 12-22) elaborate on different approaches towards ethics in research. These include consequentialism (the actions of the researcher is justifiable if it leads to the greater good of the rest of mankind), non-consequentialism or a deontological approach (ethical conduct of the researcher is based on doing the right thing, not necessarily what is to the benefit or good to the rest of mankind), virtue ethics (the moral character of the researcher takes centre-stage, and not necessarily their actions) and principlism (or biomedical ethics). Given all the different individual viewpoints among researchers regarding ethical research, it is imperative that an academic institution like the UFS should have rules and regulations that must be adhered to by the researchers within the institution, and that institutional bodies, in this case the Human Research Ethical Clearance Committee of the UFS, monitor and guide the researcher in terms of the ethical aspects of research. This is important for the protection of both the researcher and the participant, but also in terms of the liability of the institution itself.

As was noted in Section 1.6, the necessary permission to proceed with this study was obtained from the Human Research Ethical Clearance Committee of the UFS. Furthermore, the researcher complied with all of the rules and regulations as endorsed by said committee as explained in Section 1.6. This included the mitigation of harm or the risk of harm to participants, obtaining consent from participants to participate in the research, ensuring the confidentiality and anonymity of participants to the best of the researcher's ability, and avoiding the exploitation of vulnerable participants.

5.8 CONCLUSION

Chapter Five provided a review of the research design and methodology employed in this study. This discussion included the different variables that were identified, a description

of the sampling procedure, data collection and analyses, as well as the measuring instruments utilised. The chapter concluded with a reflection on the ethical aspects of research. The content of Chapter Five provides the background for the next chapter which presents a detailed report of the results obtained in this study.

CHAPTER SIX

RESULTS AND DISCUSSION OF RESULTS

6.1 INTRODUCTION

In the previous five chapters, an overview of the research as well as a theoretical outline of the key concepts underpinning the study were provided. The research questions, as well as the aims and objectives, were articulated. Furthermore, the paradigmatic framework of the study was explained, and the research design and methodology clarified. In this chapter, the different research questions as postulated in Chapter One will be addressed through the presentation and statistical analyses of the data collected for this study. This chapter commences with an assessment of the internal consistency of the various questionnaires used by evaluating the Cronbach alpha coefficients obtained by other researchers, as well as that obtained in the current research. Both descriptive statistics and the results obtained from the inferential statistical methods used will be presented. Lastly, the different research questions posed in the study will be answered and discussed based on the results obtained.

6.2 INTERNAL CONSISTENCY OF QUESTIONNAIRES: CRONBACH'S ALPHA

The reliability of a measuring instrument is a reflection of the consistency thereof. In other words, consistency pertains to whether the instrument produces the same results each time it is administered (McMillan & Schumacher, 2010:179; Tavakol & Dennick, 2011:53). One method for testing the reliability of a measuring instrument is by determining the internal consistency thereof in terms of Cronbach's alpha coefficient (α) (McMillan & Schumacher, 2010:182; Tavakol & Dennick, 2011:53). Internal consistency indicates the correlation between the different items in a scale or subscale, and signifies the extent to which the different items measure the same concept. The value of Cronbach's alpha varies between 0 (no consistency) and 1 (high consistency). A value of 0.7 or higher is generally considered an indication of good internal consistency (Nunally, 1967 & 1978 cited in Streiner, 2003:103; Cohen, Manion & Morrison, 2007:506). Very high Cronbach alpha values ($\alpha > 0.95$) do not necessarily indicate a positive result. Instead, this could suggest that some of the items are redundant.

All of the questionnaires used in this study are pre-existing questionnaires, and the internal consistency thereof has been determined in various studies. The semantic differential scale for measuring the psychosocial well-being of students was designed by Viljoen (2012:163), and the Cronbach alpha values reported for this scale substantiate its reliability (Viljoen, 2012:177; Keyser, 2013:100). The reliability of the Motivated Strategies for Learning Questionnaire (MSLQ) has also been proven by research studies conducted in different countries, including South Africa (Pintrich, Smith, Garcia & McKeachie, 1993:808; Keyser, 2013:100; Sadi & Uyar, 2013:26; Baumgartner, Spangenberg & Jacobs, 2014:105; İlker, Arslan & Demirhan, 2014:831; Kassab, Al-Shafei, Salem & Otoom, 2015:30; Van Nguyen, Laohasiriwong, Saengsuwan, Thinkhamrop & Wright, 2015:64; Hamid & Singaram, 2016:105). However, it should be noted that the Cronbach alpha values for some of the subscales in the MSLQ are quite low.

The Cronbach alpha values for all three DASS-21 subscales (Depression, Anxiety and Stress) reflect high internal consistency as reported in numerous international research studies (Henry & Crawford, 2005:231; Crawford, Garthwaite, Lawrie, Henry, MacDonald, Sutherland & Sinha, 2009:171; Osman, Wong, Bagge, Freedenthal, Gutierrez & Lozano, 2012:1328; Sinclair, Siefert, Slavin-Mulford, Stein, Renna & Blais, 2012:269; Lovell, Nash, Sharman & Lane, 2015:136; Weiss, Aderka, Lee, Beard & Björgvinsson, 2015:222; Schofield, O'Halloran, McLean, Forrester-Knauss & Paxton, 2016:136; Coker, Coker & Sanni, 2018:140). Regrettably, determination of the internal consistency of the DASS-21 used in South African studies is lacking.

The Cronbach alpha values for the different questionnaires were calculated as part of this study and are reflected in the sections below. Cronbach alpha values were obtained using the CORR procedure in SAS as explained in Section 5.5 in the previous chapter. The raw and standardised Cronbach alpha values were determined throughout all analyses. Raw Cronbach alpha values are based on item covariance whereas standardised values are based on item correlation. In this study, only small differences between the raw and standardised values were found in all of the analyses. For this reason, and to facilitate an understanding of the data presented, only the standardised values are presented in the tables. In terms of the execution of the reliability tests, all respondents with missing data values were discarded by utilising the "nomiss option" in SAS. Table 6.1 shows the

percentage of the total number of respondents discarded for the different questionnaires and their subscales.

Table 6.1: Percentage of total number of respondents discarded for different questionnaires and their subscales

Questionnaire/subscale	Number of respondents discarded (N_{total} = 439)	Respondents discarded (%)
Psychosocial Background Questionnaire: Childhood	21	4.8%
Psychosocial Background Questionnaire: Present Situation	8	1.8%
Psychosocial Background Questionnaire: Overall	25	5.7%
Psychosocial Background Questionnaire: Adapted (Items 16 and 19 omitted)	23	5.2%
DASS Questionnaire: Depression	10	2.3%
DASS Questionnaire: Anxiety	14	3.2%
DASS Questionnaire: Stress	13	3.0%
DASS Questionnaire: Overall	33	7.5%
MSLQ: M1	5	1.1%
MSLQ: M2	3	0.7%
MSLQ: M3	2	0.5%
MSLQ: M4	7	1.6%
MSLQ: M5	66	15%
MSLQ: M6	7	1.6%
MSLQ: Motivation total	83	18.9%
MSLQ: L1	3	0.7%
MSLQ: L2	8	1.8%
MSLQ: L3	4	0.9%
MSLQ: L4	5	1.1%
MSLQ: L5	6	1.4%
MSLQ: L6	4	0.9%
MSLQ: L7	5	1.1%
MSLQ: L8	3	0.7%
MSLQ: L9	4	0.9%
MSLQ: Learning Strategies total	30	6.8%

With the exception of MSLQ: M5, the total percentage discarded for all other subscales was below 5%. The MSLQ subscale M5 consists of eight items.[22] However, 66 participants (15%) did not respond to one or more of the eight items on this subscale. Further evaluation showed that, of the eight items on this subscale, one (Item 31) had

[22] An item refers to a question within a questionnaire or subscale of a questionnaire.

been poorly answered by the respondents. In total, 62 participants (14.1%) did not respond to this item. The Cronbach alpha values obtained for the M5 subscale and overall motivation scale with Item 31 included and omitted are provided in the following table.

Table 6.2: Cronbach alpha values for the M5 subscale and overall motivation scale, with Item 31 included and omitted

Questionnaire/subscale	Number of respondents discarded (N_{total} = 439)	Respondents discarded (%)	$\alpha_{standardised}$
MSLQ: M5 (Item 31 included)	66	15%	0.864
MSLQ: M5 (Item 31 omitted)	4	0.9%	0.847
MSLQ: Motivation total (Item 31 included)	83	18.9%	0.844
MSLQ: Motivation total (Item 31 omitted)	23	5.2%	0.836

From Table 6.2 it is clear that the exclusion of Item 31 had only a small effect on the Cronbach alpha values, which confirms the reliability of MSLQ: M5. Due to the small effect of Item 31 on the Cronbach alpha values, it was decided that it would not be discarded in further analyses.

6.2.1 The Psychosocial Background Questionnaire

The psychosocial well-being of the participants was evaluated using the Psychosocial Background Questionnaire (Appendix C) developed by Viljoen (2012:163-183). A detailed description of this questionnaire was provided in Chapter 5, Section 5.6.2. The questionnaire, which consists of nineteen items, is divided into two parts. While the first part (Items 1-14) focuses on the participants' childhood years, the second part (Items 15-19) relates to their present psychosocial situation. The Cronbach alpha values obtained for the Psychosocial Background Questionnaire are shown in Table 6.3.

Table 6.3: Standardised Cronbach alpha values for the Psychosocial Background Questionnaire

	Number of items	Cronbach's Alpha Coefficient
Childhood	14	0.8778
Present	5	0.5817
Overall	19	0.8781

The low Cronbach alpha value for the Psychosocial Background Questionnaire subscale: present situation (Table 6.3, $\alpha_{standardised}$ = 0.5817) requires further investigation and is discussed later. The effect of each individual item on the observed Cronbach alpha coefficient for the overall Psychosocial Background Questionnaire was determined by calculating the alpha value with one item deleted at a time. Table 6.4 shows the effect of individually-deleted items on the overall Cronbach alpha value of the Psychosocial Background Questionnaire. For example, the removal of Item 1 from the equation resulted in the Cronbach alpha value changing from 0.8781 (Table 6.3) to 0.8662.

Table 6.4: Effect of individual items on standardised Cronbach alpha values for the overall Psychosocial Background Questionnaire with $\alpha_{standardised}$ = 0.8781

Deleted item	Correlation with total, r	Alpha
1	0.6572	0.8662
2	0.6154	0.8677
3	0.5763	0.8691
4	0.5331	0.8706
5	0.5307	0.8707
6	0.4797	0.8725
7	0.5382	0.8705
8	0.5097	0.8715
9	0.5574	0.8698
10	0.3850	0.8758
11	0.5602	0.8697
12	0.5090	0.8715
13	0.3978	0.8754
14	0.6830	0.8653
15	0.4127	0.8749
16	0.1797	0.8828
17	0.5534	0.8699
18	0.4741	0.8727
19	0.1823	0.8827

Table 6.4 indicates that none of the individual items has a notable weakening effect on the overall Cronbach alpha value of the Psychosocial Background Questionnaire. Even after the removal of Item 16, which shows the lowest correlation with the total (r = 0.1797), the change in the Cronbach alpha was only 0.0047 ($\alpha_{standardised}$ = 0.8781 with Item 16 included, $\alpha_{standardised}$ = 0.8828 with Item 16 excluded). Subsequently, it was decided that none of the items would be discarded at this point.

The low Cronbach alpha value for the Psychosocial Background questionnaire subscale: present situation (Table 6.3, $\alpha_{standardised}$ = 0.5817) might be due to the lower number of items (5) since this value is sensitive to the number of items, and increases or decreases according to the number of items included (Streiner 2003:102; Tavakol & Dennick, 2011:53; Panayides, 2013:688). To evaluate other factors that might have impacted the Cronbach alpha value of the Psychosocial Background Questionnaire: present situation, further analyses were carried out. Firstly, the effect of individually-deleted items or variables on the Cronbach alpha value of the Psychosocial Background Questionnaire: present situation was investigated (Appendix F, Table F1). Secondly, to determine whether the alpha values differed according to study programme or ethnicity, the analysis was repeated for the different study programmes as well as for the two ethnic groups, namely Black and White. Of the total number of participants (439) only sixteen belonged to the Coloured and Indian ethnic groups. Therefore, the analyses for these two groups were omitted from this specific analysis. The results obtained are shown in Table F2 (Appendix F). Tables F3 and F4 (Appendix F) demonstrate the effect of deleted items on the Cronbach alpha values obtained for the Psychosocial Background questionnaire: present situation for the two study programmes and two selected ethnic groups. Following these analyses, no significant differences in the $\alpha_{standardised}$ values were observed for the different ethnic groups ($\alpha_{standardised}$ = 0.5564 for the White ethnic group and $\alpha_{standardised}$ = 0.5482 for the Black ethnic group). Study programme did have an effect on the $\alpha_{standardised}$ value, with $\alpha_{standardised}$ = 0.6263 for the mainstream programme and $\alpha_{standardised}$ = 0.5581 for the access programme. Furthermore, when the analyses were repeated without Item 19, an increase in the Cronbach alpha values for the Psychosocial Background Questionnaire subscale (present situation) was observed. Table 6.5 presents the effect of Item 19 on the Cronbach alpha values for the total group as well as for the two ethnic groups and different study programmes.

Table 6.5: Effect of Item 19 on standardised Cronbach alpha values for the Psychosocial Background Questionnaire: present situation

	$\alpha_{standardised}$ (Item 19 included)	**$\alpha_{standardised}$ (Item 19 excluded)**
Total group	0.5817	0.6246
White ethnic group	0.5564	0.6058
Black ethnic group	0.5482	0.6133
Mainstream programme	0.6263	0.6719
Access programme	0.5581	0.6039

Once Item 19 had been omitted, the effect of Item 16 on the Cronbach alpha value also became apparent (Tables F5 to F8, Appendix F). For the total group, the Cronbach alpha value for the Psychosocial Background questionnaire: present situation changed from 0.5817 to 0.6466 following the omission of both Items 16 and 19.

Based on these results, it was decided that the Psychosocial Background Questionnaire would be adapted to include seventeen items (with Items 16 and 19 omitted) and that it would not include any subscales that would distinguish between childhood years and present situation. This decision was further supported by the fact that the average age of the participants was only 18.83 at the time of participation, which meant that they had barely transitioned out of their childhood years. The standardised Cronbach alpha value obtained for this adapted Psychosocial Background Questionnaire was 0.8882, which reflects a high level of consistency.

6.2.2 The DASS-21 Questionnaire

As conveyed in Section 5.6.3 of Chapter Five, the shorter, 21-item version of the Depression, Anxiety and Stress Scales (known as DASS-21, Appendix D) was used in this study. The DASS-21 Questionnaire has three subscales, namely Depression (Items 3, 5, 10, 13, 16, 17 and 21), Anxiety (Items 2, 4, 7, 9, 15, 19 and 20) and Stress (Items 1, 6, 8, 11, 12, 14 and 18). The sum of the item scores per subscale is determined and multiplied by two to compare the score with the full DASS-42 Questionnaire categorisation provided by Lovibond and Lovibond (1995). Depression, anxiety and stress are then categorised as normal, mild, moderate, severe or extremely severe. The Cronbach alpha values obtained in this study for the DASS-21 Questionnaire are shown in Table 6.6.

Table 6.6: Cronbach's alpha values for the DASS-21 Questionnaire

	Number of items	Cronbach's alpha coefficient
Depression	7	0.8592
Anxiety	7	0.7872
Stress	7	0.8045
Overall	21	0.9209

All of the Cronbach alpha values obtained for the DASS-21 Questionnaire (subscales and overall) show good internal consistency, with values between 0.78 and 0.93 (Table 6.6).

Although satisfactory Cronbach alpha values were obtained, it is good practice to test the importance of each item on the subscale. Table 6.7 shows the effect of individually-deleted items or variables on the Cronbach alpha value for depression (one of the identified independent variables in this study).

Table 6.7: Effect of individual items on Cronbach alpha values for the DASS-21 Questionnaire: Depression ($\alpha_{standardised}$ = 0.8592)

Deleted item	Correlation with total	Alpha
3	0.6212	0.8400
5	0.4967	0.8572
10	0.6484	0.8362
13	0.5723	0.8469
16	0.6658	0.8337
17	0.7041	0.8282
21	0.6746	0.8324

From Table 6.7 it is clear that no individual item has a noteworthy weakening effect on the internal consistency of the scale for depression. Hence, it may be concluded that this subscale is a reliable instrument. The same result was obtained for the stress and anxiety subscales (Tables F9 and F10, Appendix F).

6.2.3 The Motivated Strategies for Learning Questionnaire (MSLQ)

The Motivated Strategies for Learning Questionnaire or MSLQ (Appendix E) evaluates students' levels of motivation with regard to a specific course as well as their inclination to apply different learning strategies as described in detail in Chapter Five, Section 5.6.4. This questionnaire consists of two sections, namely a motivational section containing six subscales and a learning strategy section consisting of nine subscales. Some of the items on the learning strategy subscales are reversed and were reverse-coded prior to conducting the analyses. These include:

- Items 33 and 57 (subscale L5: metacognitive self-regulation);
- Items 52, 77 and 80 (subscale L6: time and study environment);
- Items 37 and 60 (subscale L7: effort regulation); and
- Item 40 (subscale L9: help seeking).

The effects of individual items on the Cronbach alpha values for the overall MSLQ: Motivation and the overall MSLQ: Learning strategies are presented in Tables F11 and F12 (Appendix F), respectively. The standardised Cronbach alpha values obtained for the different subscales testing students' level of motivation (M1-M6), as well as those evaluating their application of learning strategies (L1-L9), are shown in Table 6.8.

Table 6.8: Subscales and Cronbach alpha values for the MSLQ: Motivation and MSLQ: Learning strategies

	Number of items	Items on MSLQ	Alpha
M1: Intrinsic goal orientation	4	1, 16, 22, 24	0.4670
M2: Extrinsic goal orientation	4	7, 11, 13, 30	0.5325
M3: Task value	6	4, 10, 17, 23, 26, 27	0.8119
M4: Control of learning beliefs	4	2, 9, 18, 25	0.4290
M5: Self-efficacy	8	5, 6, 12, 15, 20, 21, 29, 31	0.8641
M6: Test anxiety	5	3, 8, 14, 19, 28	0.7451
Motivation: Overall	31		0.8443
L1: Rehearsal	4	39, 46, 59, 72	0.6025
L2: Elaboration	6	53, 62, 64, 67, 69, 81	0.7310
L3: Organisation	4	32, 42, 49, 63	0.6367
L4: Critical thinking	5	38, 47, 51, 66, 71	0.7100
L5: Metacognitive self-regulation	12	33, 36, 41, 44, 54, 55, 56, 57, 61, 76, 78, 79	0.7582
L6: Time and study environment	8	35, 43, 52, 65, 70, 73, 77, 80	0.6040
L7: Effort regulation	4	37, 48, 60, 74	0.5952
L8: Peer learning	3	34, 45, 50	0.6373
L9: Help seeking	4	40, 58, 68, 75	0.5863
Learning Strategies: Overall	50		0.9123

The Cronbach alpha values obtained for some of the subscales reflected in Table 6.8 were not ideal ($\alpha < 0.7$). This was especially true for motivation subscales 1, 2 and 4 (M1, M2 and M4) and learning strategies subscales 1, 3, 6, 7, 8 and 9 (L1, L3, L6, L7, L8 and L9). As previously stipulated, the low Cronbach alpha values may be attributed to the lower number of items per subscale. However, further analyses were undertaken. Table 6.9 shows the effect of individually-deleted items on the Cronbach alpha value for the MSLQ: Motivation and MSLQ: Learning strategies subscales.

Table 6.9. Effect of individual items on Cronbach alpha values for MSLQ subscales

Subscale	Deleted item	Correlation with total	Alpha
M1 ($\alpha_{standardised}$ = 0.4670)	1	0.2983	0.3659
	16	0.3149	0.3493
	22	0.2763	0.3875
	24	0.1831	0.4746
M2 ($\alpha_{standardised}$ = 0.5325)	7	0.3363	0.4461
	11	0.3484	0.4355
	13	0.3528	0.4315
	30	0.2443	0.5240
M3 ($\alpha_{standardised}$) = 0.8119	4	0.5190	0.7941
	10	0.4217	0.8146
	17	0.6183	0.7721
	23	0.5573	0.7857
	26	0.6906	0.7556
	27	0.6377	0.7677
M4 ($\alpha_{standardised}$ = 0.4290)	2	0.2150	0.3844
	9	0.1714	0.4273
	18	0.2919	0.3046
	25	0.2811	0.3161
M5 ($\alpha_{standardised}$ = 0.8641)	5	0.6634	0.8419
	6	0.6327	0.8454
	12	0.5676	0.8527
	15	0.6070	0.8483
	20	0.6488	0.8436
	21	0.6051	0.8485
	29	0.5926	0.8499
	31	0.5861	0.8507
M6 ($\alpha_{standardised}$ = 0.7451)	3	0.4805	0.7107
	8	0.4848	0.7092
	14	0.5222	0.6953
	19	0.5205	0.6959
	28	0.5346	0.6907
L1 ($\alpha_{standardised}$ = 0.6025)	39	0.3965	0.5212
	46	0.4416	0.4859
	59	0.3681	0.5429
	72	0.3263	0.5739
L2 ($\alpha_{standardised}$ = 0.7310)	53	0.4436	0.6999
	62	0.4525	0.6973
	64	0.4924	0.6856
	67	0.3926	0.7144
	69	0.5204	0.6773
	81	0.4913	0.6859
L3 ($\alpha_{standardised}$ = 0.6367)	32	0.4022	0.5776
	42	0.4049	0.5758
	49	0.3645	0.6039
	63	0.4959	0.5092

Table 6.9: (Continued)

Subscale	Deleted item	Correlation with total	Alpha
L4 ($\alpha_{standardised}$ = 0.7100)	38	0.4239	0.6792
	47	0.4418	0.6721
	51	0.4825	0.6554
	66	0.5167	0.6412
	71	0.4692	0.6609
L5 ($\alpha_{standardised}$ = 0.7582)	33	0.2924	0.7533
	36	0.4254	0.7381
	41	0.4097	0.7399
	44	0.3618	0.7454
	54	0.4257	0.7380
	55	0.5360	0.7249
	56	0.2993	0.7525
	57	0.1879	0.7648
	61	0.3989	0.7411
	76	0.4527	0.7349
	78	0.4987	0.7294
	79	0.4335	0.7371
L6 ($\alpha_{standardised}$ = 0.6040)	35	0.3424	0.5597
	43	0.4575	0.5239
	52	0.2639	0.5830
	65	0.2386	0.5903
	70	0.4048	0.5405
	73	0.1548	0.6140
	77	0.2596	0.5843
	80	0.3154	0.5678
L7 ($\alpha_{standardised}$ = 0.5952)	37	0.4292	0.4820
	48	0.2601	0.6099
	60	0.3732	0.5261
	74	0.4485	0.4664
L8 ($\alpha_{standardised}$ = 0.6373)	34	0.3961	0.6080
	45	0.4414	0.5465
	50	0.5049	0.4561
L9 ($\alpha_{standardised}$ = 0.5863)	40	0.1507	0.6722
	58	0.3421	0.5347
	68	0.5054	0.4007
	75	0.5077	0.3987

From Table 6.9 it is clear that no individual item has a considerable weakening effect on the overall internal consistency of any of the subscales. Perhaps with the exception of Item 40 in L9, no other individual items had a substantially decreasing effect on the subscales' Cronbach alpha values. To evaluate any potential effects caused by study programme or ethnic group, the analysis was repeated for programme- and ethnicity effect. Again, due to the small number of participants from the Coloured and Indian ethnic

groups, these two groups were omitted from these specific analyses. The results obtained are shown in Table F13, Appendix F. The effect of individually-deleted items on the Cronbach alpha values obtained for the different study programmes as well as for the two ethnic groups, namely Black and White, were also evaluated (Tables F14-F22, Appendix F). The only notable elevation in the Cronbach alpha values (an increase of 10% or more), after evaluating the effect caused by study programme and ethnic group (Table F13), were observed for M4, L1 and L7. For all three of these subscales, the Cronbach alpha value obtained for the White ethnic group was more than 10% greater than that of the total group. However, it was only for L7 that the Cronbach alpha value for the White ethnic group ($\alpha_{standardised}$ = 0.7022) did indeed surpass a value of 0.7, which is indicative of good internal consistency.

In conclusion, the effect of individual items (except Item 40 in L9) on the Cronbach alpha values were generally not noteworthy. Furthermore, although these low subscale α-values are not ideal, they do compare with those obtained in other studies utilising the MSLQ (Pintrich, Smith, Garcia & McKeachie, 1993:808; Jacobson & Harris, 2008:425; Kassab, Al-Shafei, Salem & Otoom, 2015:30; Van Nguyen, Laohasiriwong, Saengsuwan, Thinkhamrop & Wright, 2015:64; Hamid & Singaram, 2016:105). It was therefore decided that none of the individual items on the MSLQ would be rejected. Any effects related to the different study programmes and ethnic groups were addressed in further analyses since these variables (together with psychosocial background, language of instruction, age and gender) were adjusted for as confounding variables in the inferential statistics discussed in a later section. The next section presents the descriptive statistics used in this study.

6.3 DESCRIPTIVE STATISTICS

Descriptive statistics are used to describe, organise and summarise a sample data set, often by making use of charts, graphs and tables in order to facilitate an understanding of the data set (Heiman, 2011:20-21). In the sample utilised for the current study, nine students had no mark for the Biology module and two had suspended their studies during the semester, therefore obtaining an implausible mark of less than 10%. Consequently, these individuals were excluded from all analyses, including the descriptive statistics. In the Biographical Information Questionnaire (Appendix B), the question regarding whether

a student was a first-generation student or not was misunderstood by many of the students and was therefore not used in any of the analyses. Other missing questionnaire data were handled as follows. If a participant did not respond to any of the questions in a particular section of the overall questionnaire (that is, Psychosocial Well-being, DASS-21 or MSLQ) or a subsection thereof, that participant was not included in the evaluation of the descriptive statistics of a specific variable (for example, the overall analysis of depression). If a candidate did not respond to some of the questions in a section or subsection, his or her contribution was dealt with in one of two ways. Where section or subsection question averages were at play (psychosocial background and the MSLQ subsections), a candidate's average, despite some missing responses, was determined by calculating the average of the non-missing items. Where questionnaire or subscale totals were at play (DASS subsections), a specific candidate's total for a section or subsection was calculated by determining the average of the non-missing items, multiplied by the number of items (including missing items) in the section or subsection.

6.3.1 Descriptive Statistics for Confounding Variables

6.3.1.1 Categorical confounding variables

The distribution of the total sample (N = 439) per study programme is reflected in Figure 6.1. Here, it can be seen that out of a total of 439 students who participated in the study (both study programmes), 56.04% were access programme students and 43.96% were mainstream programme students.

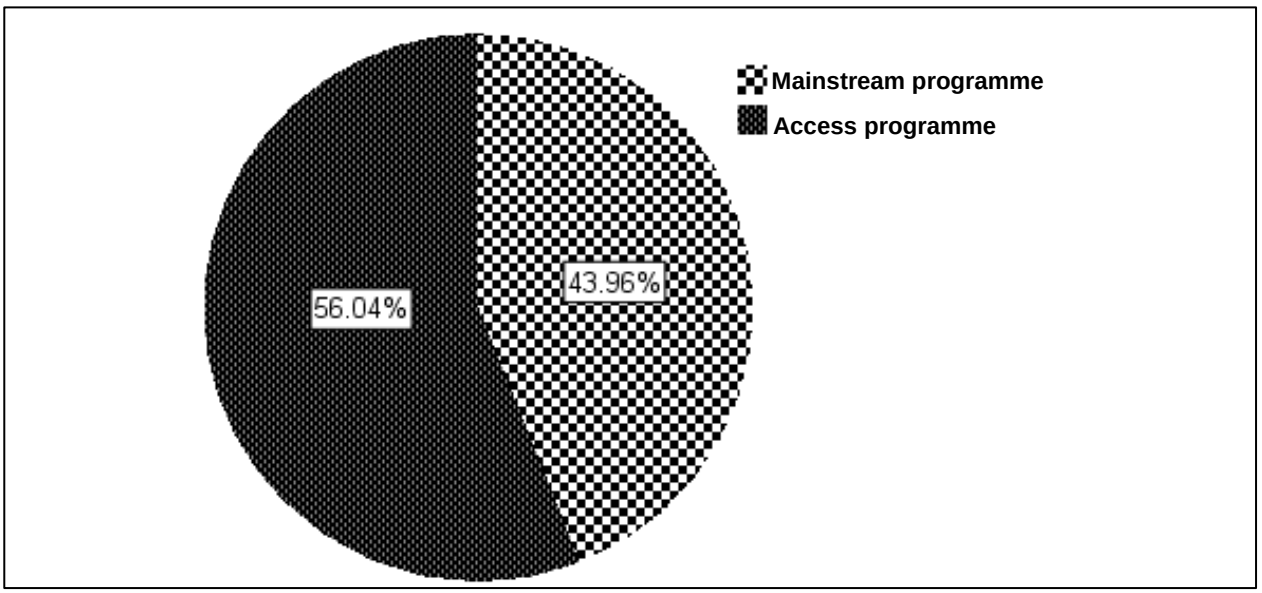


Figure 6.1: Distribution of total sample per study programme

The number of participants (N) and percentages (%) for the categorical confounding variables, namely gender, language and ethnicity, are provided per study programme in Figures 6.2-6.4. The data is also presented in Tables F23 and F24 in Appendix F. The gender distribution (Figure 6.2) shows the same tendency for the two study programmes, with roughly 10% more female participants than male participants in both study programmes.

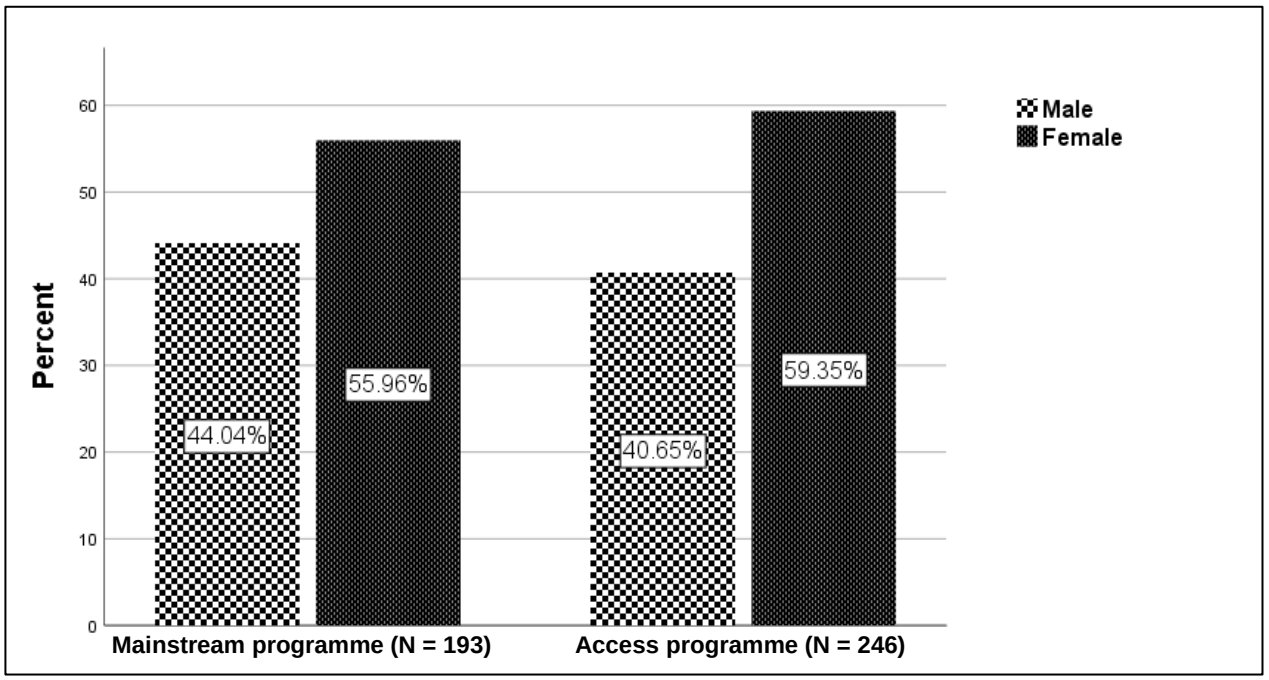


Figure 6.2: Gender distribution according to study programme

Figure 6.3 illustrates the language distribution of the two study programmes, showing that it differed significantly. For instance, in the mainstream programme, more than a third of the participants' language of instruction was Afrikaans while this percentage was below 7% in the access programme.

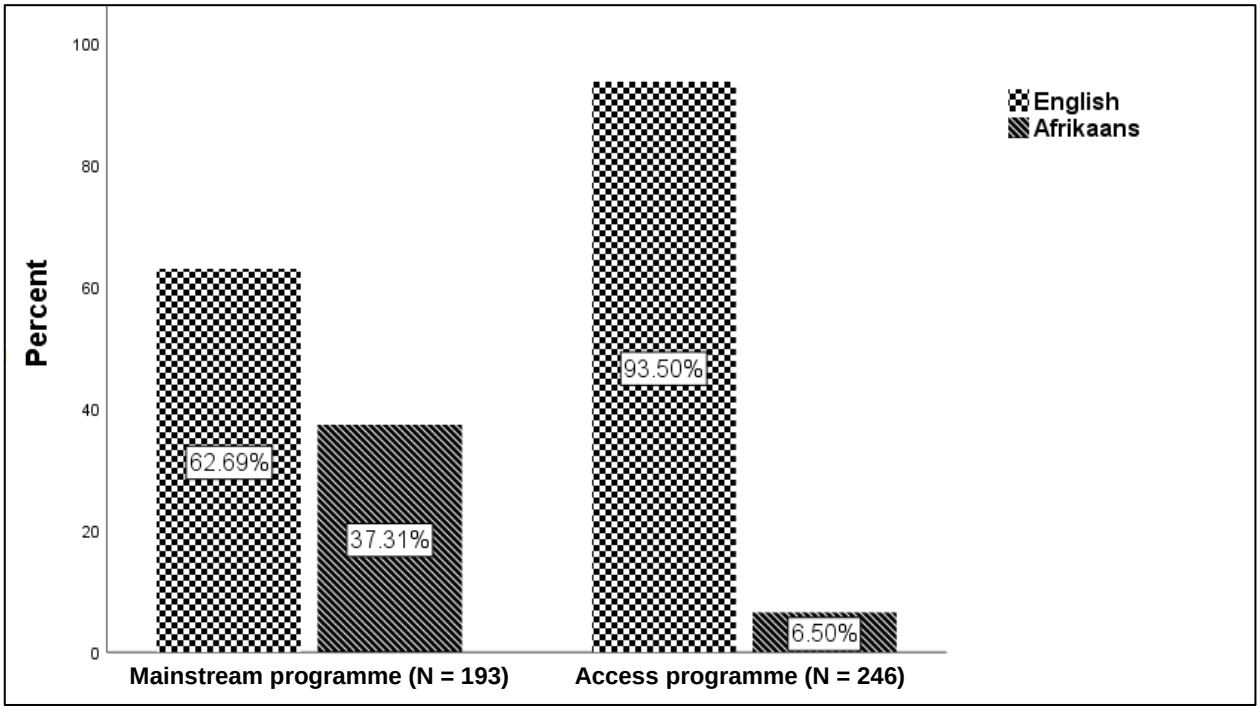


Figure 6.3: Language distribution according to study programme

With regard to the distribution of ethnic groups (Figure 6.4), the combined representation from the Coloured, Asian and Indian ethnic groups was below 4% of the total number of participants in both study programmes. The distribution in terms of White and Black African participants differed significantly for the two study programmes in that nearly half of the participants in the mainstream programme were White whereas in the access programme, only 10.57% of the participants were White. It must be kept in mind that this distribution represents the student sample who participated in the study, and not necessarily the ethnic distribution of the entire group (both study programmes) who registered for the BLGY1513 module in 2017. The sampling procedure and data collection were described in Sections 5.3 and 5.4.

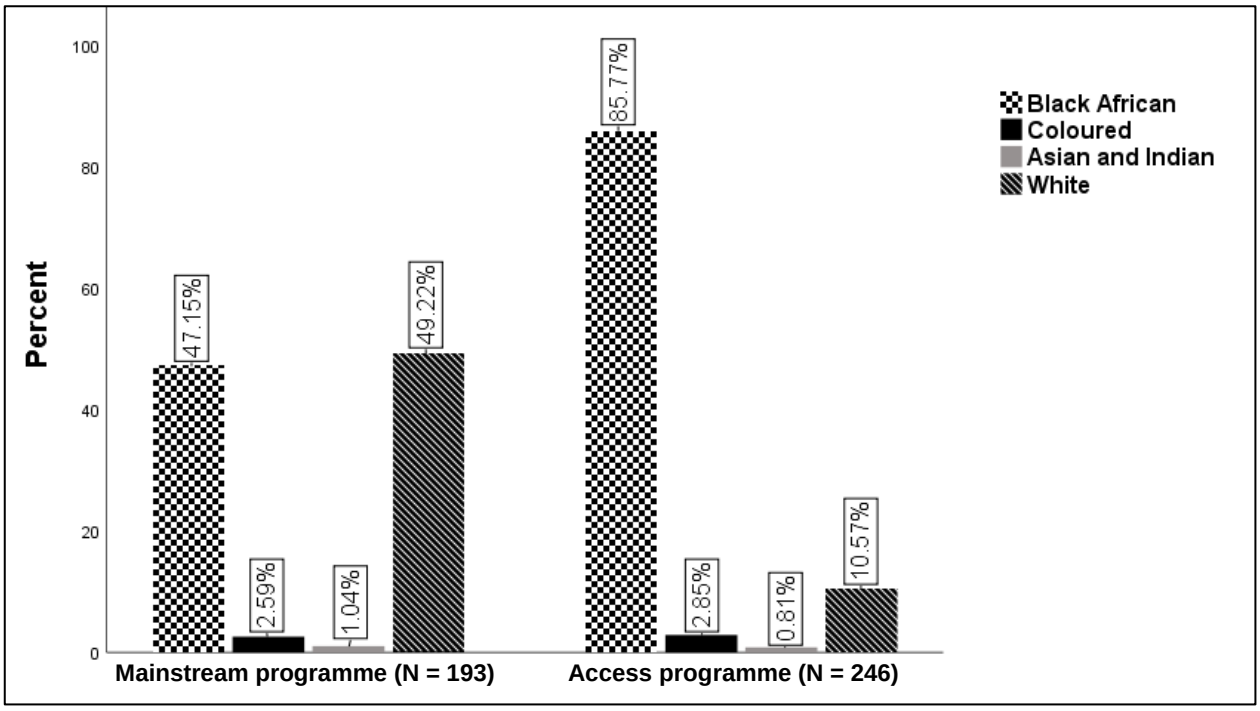


Figure 6.4: Ethnic group distribution according to study programme

6.3.1.2 Quantitative confounding variables

The distribution of the quantitative confounding variables, namely age and psychosocial background, according to study programme are reflected in Figures 6.5 and 6.6. Figure 6.5 shows that the average age of the participants in the two programmes did not differ much, with $\bar{X}$ = 18.65 years for the mainstream programme and $\bar{X}$ = 18.98 years for the access programme. Due to ethical considerations, only students who were eighteen years of age or older at the time of the data collection were invited to participate since parental consent is needed for the participation of students who are younger than eighteen years of age. For both study programmes, the majority of the participants were eighteen years of age at the time of data collection, with more students in the access programme being nineteen years of age or older compared to those in the mainstream programme. The age distribution of the participants according to study programme and of the total sample are also displayed in Table F25, Appendix F.

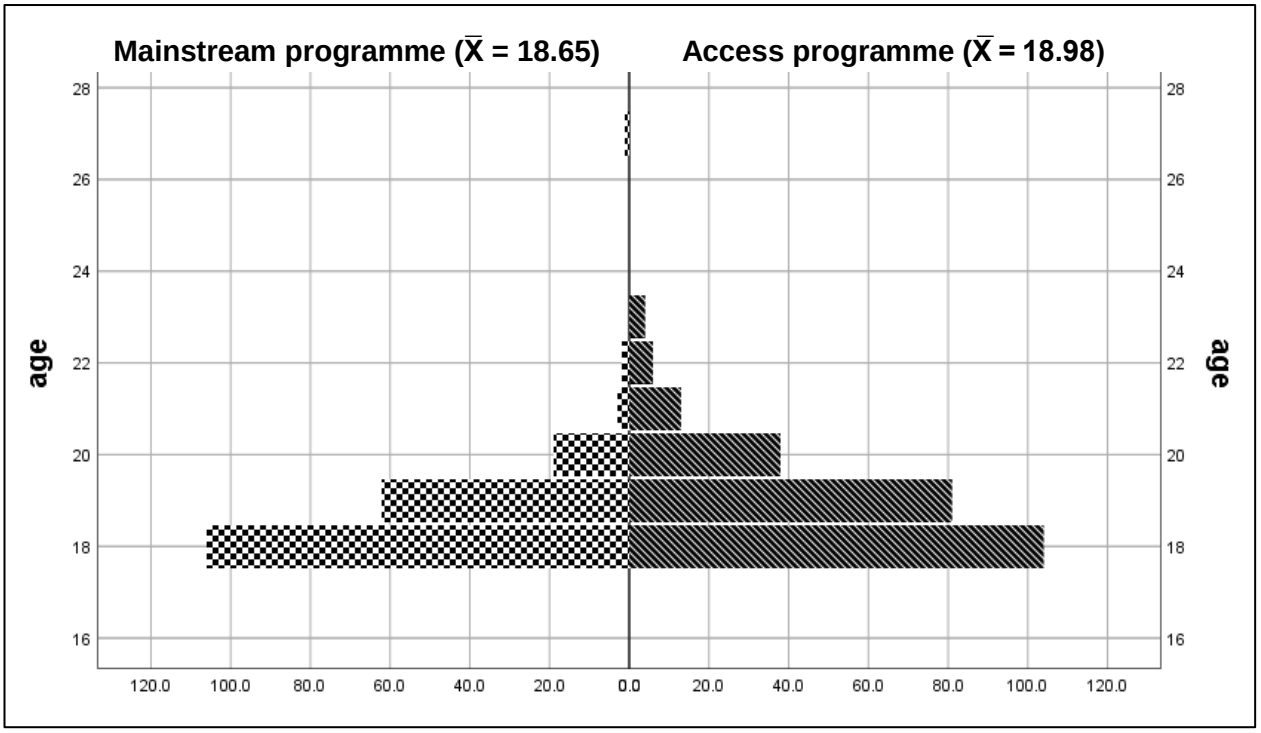


Figure 6.5: Age distribution according to study programme

Figure 6.6 presents a comparison between the mean scores of the two study programmes for the Psychosocial Background Questionnaire (Questions 16 and 19 omitted). Lower values per question correspond with positive psychosocial experiences. When looking at this figure, it is worth noting that there is a striking similarity between the profile of the graphs for the two study programmes and the high mean value for Question 15 ("my financial situation worries me"). Furthermore, at first glance, it seems as though the mean values of some of the questions (Questions 5, 6, 12, 13 and 18) differ substantially between the two study programmes. However, t-tests,[23] calculated to statistically compare the difference between the mean values of the two study programmes for each question showed no statistically significant difference between the mean values of the two study programmes for any of the questions evaluated (p[24] ≥ 0.05 for all seventeen questions). The clear difference between the averages of some of the questions for the two study programmes is due to the small interval chosen for the y-axis. The overall mean of all of the questions for the access programme was 2.35, and for the mainstream

[23] A t-test is an inferential statistical method used to compare the means of two groups and to determine whether a difference in the mean values of the two groups is statistically significant. T-tests are discussed in more detail in Section 6.4.2.

[24] The p-value is an indication of statistical significance. If $p < 0.05$, there is a statistically significant difference in the mean values. P-values are discussed in more detail in Section 6.4.

programme, the overall mean was 2.25, which is also not statistically significant when compared using a t-test (p = 0.225).

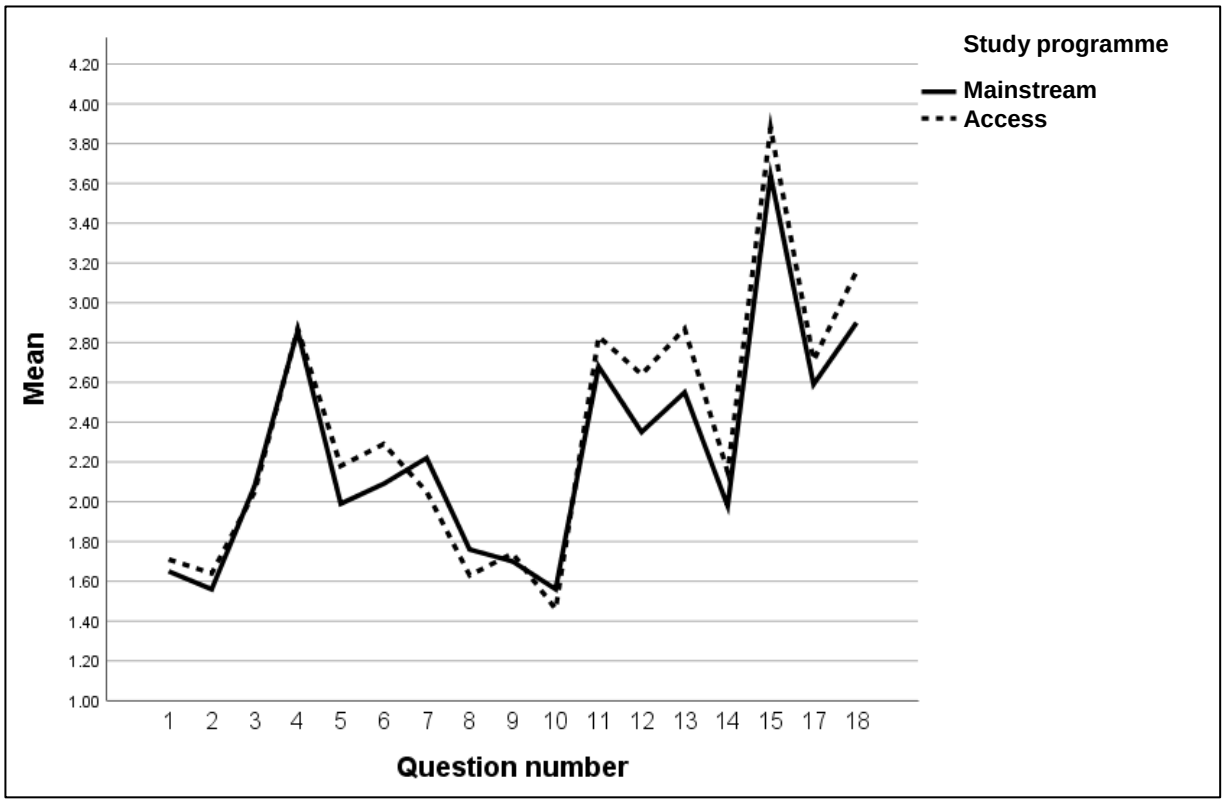


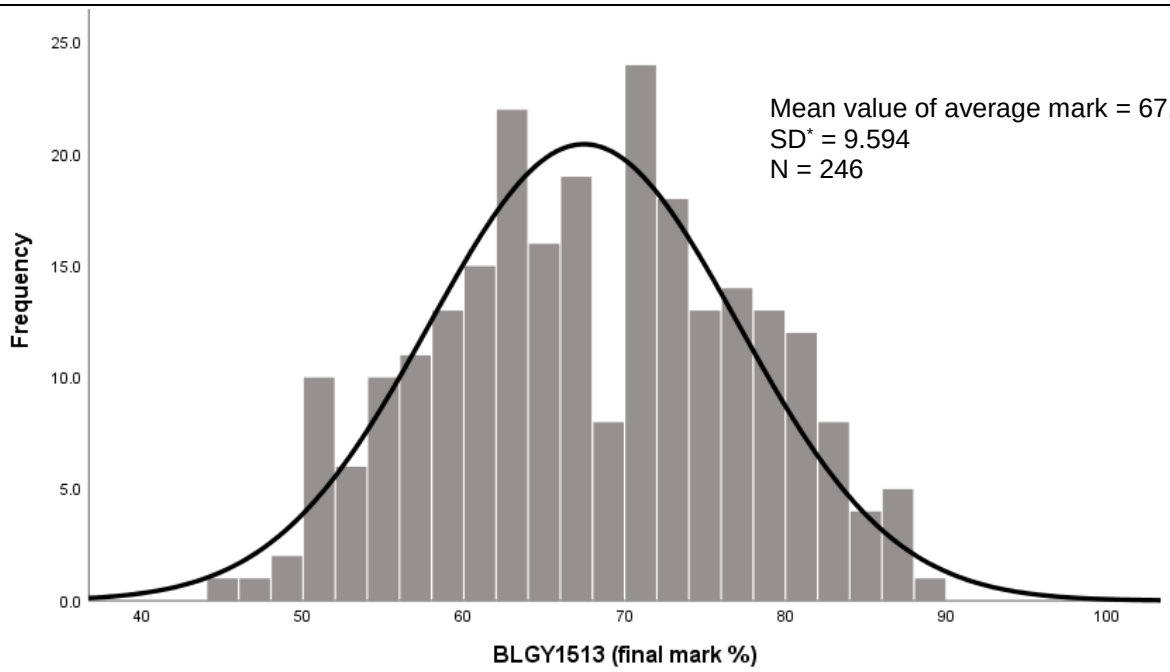
Figure 6.6: Adjusted Psychosocial Background Questionnaire: Question mean according to study programme

In Table F26 (Appendix F), the descriptive statistics of the adjusted Psychosocial Background Questionnaire for the two study programmes are compared. The mean is slightly larger in comparison with the median for the total group as well as for the two individual study programmes. This reflects a positive skewness. In other words, as far as this questionnaire is concerned, more participants had an average score below the mean of the total group while fewer participants had an average score above the mean of the total group. A lower average score relates to more positive psychosocial well-being. Thus, more students exhibited positive psychosocial well-being compared to the number of students displaying negative psychosocial well-being.

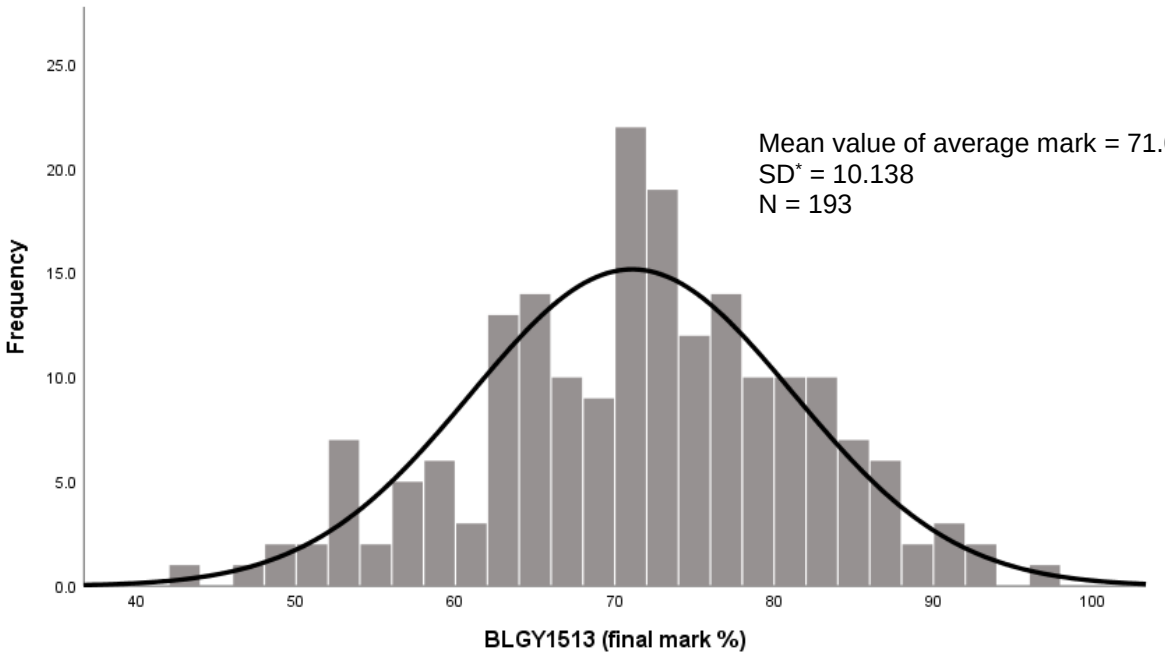
6.3.2 Descriptive Statistics for the Dependent Variable: Final Mark for the BLGY1513 Module

Figure 6.7(a) shows the BLGY1513 final mark distribution for the access programme whereas Figure 6.7(b) represents the final mark distribution for the mainstream

programme. The average final mark of access programme students (67.47%) was only 3.62% lower than that of mainstream programme students (71.09%). This is encouraging considering that the scholastic academic history of the students in the access programme is behind that of their peers in the mainstream programme.



(a)



(b)

***SD = standard deviation, reflecting the amount of variation of the set of values**

Figure 6.7: Final BLGY1513 mark distribution for (a) the access programme and (b) the mainstream programme

When examining Figures 6.7(a) and (b), it appears as though there are two distinct distributions regarding the marks (below 70% and above 70%) for both study programmes. This could be attributed to the fact that the BLGY1513 module is a promotion module. Hence, students who obtain a semester mark of 70% or above are exempted from the examination and their semester mark is their final mark. This acts as an incentive to encourage students to strive towards obtaining a semester mark of 70% or higher. Students who do not obtain 70% must write the examination. This may lead to lower motivation levels, leading to lower final marks. Figure 6.8 provides a comparison between the final BLGY1513 marks obtained by students from the two study programmes.

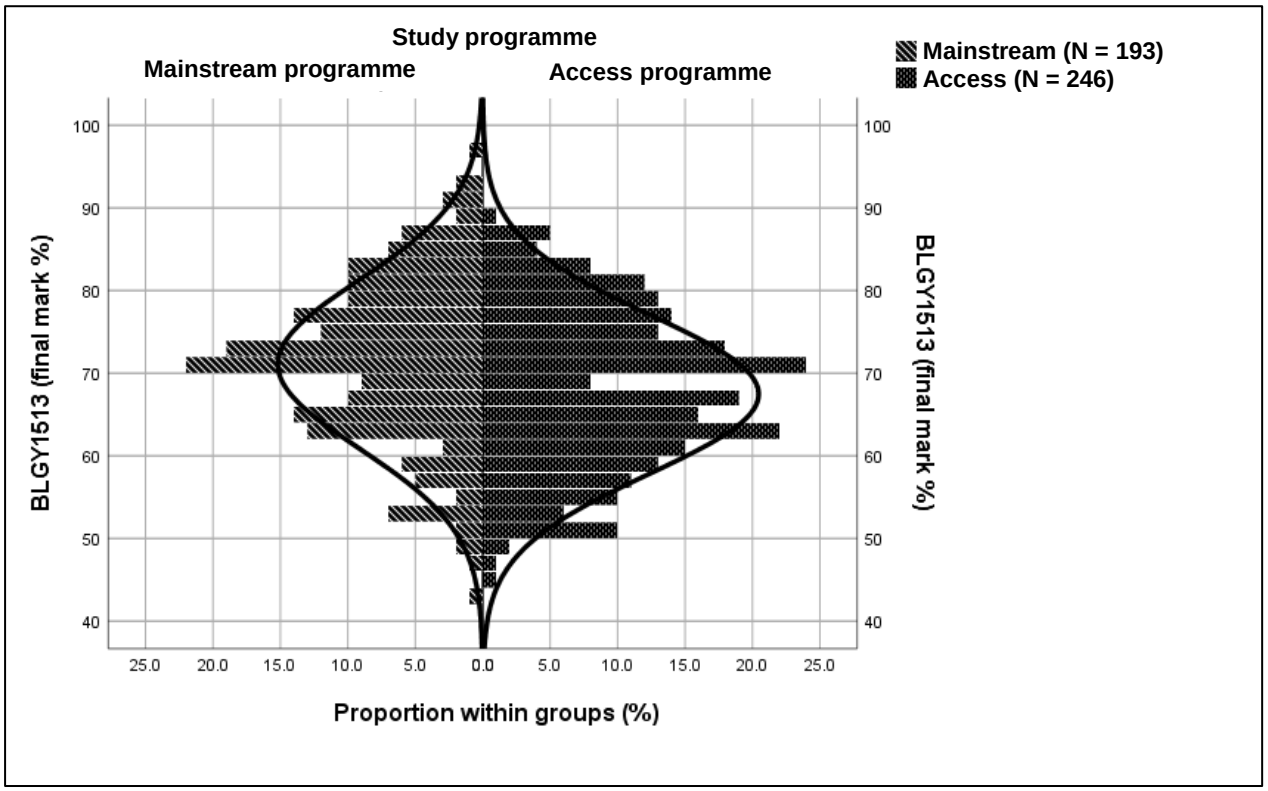


Figure 6.8: Comparison between the final BLGY1513 marks of the two study programmes

Figures 6.7 and 6.8 demonstrate that a higher percentage of students in the mainstream programme obtained a final mark of 70% or above (and were subsequently promoted) compared to those in the access programme. In fact, in the mainstream programme, 35.8% were promoted while in the access programme, the promotion percentage was 25.6%. Overall, 30.1% of the participants promoted the BLGY1513 module. The highest result achieved in the mainstream programme was 96% whereas the highest mark obtained in the access programme was 89%. There was also more variation in the marks

of the mainstream programme students (SD = 10.138) compared to the variation in marks of those in the access programme (SD = 9.594). Notably, only a small percentage of students in both study programmes obtained a final mark below 50% (thus failing the module). The final mark distribution according to study programme and overall are also presented in Table F27 (Appendix F).

6.3.3 Descriptive Statistics for the Variable: Depression

Depression is one of the independent variables on which this study is based. However, since there is a relationship between depression, anxiety and stress, as highlighted in Sections 3.3 and 3.5, the descriptive statistics on anxiety and stress are also provided. When using the shortened version of the DASS Questionnaire (DASS-21), the score for each case must be multiplied by two in order to compare the score with the full DASS-42 Questionnaire categorisation provided by Lovibond and Lovibond (1995). Depression, anxiety and stress are then categorised as normal, mild, moderate, severe or extremely severe according to the groupings represented in Table 6.10.

Table 6.10: DASS-42 Questionnaire categorisation of depression, anxiety and stress

	Depression	Anxiety	Stress
Normal	0 - 9	0 - 7	0 - 14
Mild	10 - 13	8 - 9	15 - 18
Moderate	14 - 20	10 - 14	19 - 25
Severe	21 - 27	15 - 19	26 - 33
Extremely severe	28+	20+	34+

Due to the fact that some candidates did not respond to all of the questions in the various categories, the missing data was dealt with as described at the beginning of this section. This posed a problem since some of the participants' totals fell between the indicated groupings (for example, a total of 13.2 for depression). To address this problem, the grouping of the different subscales was dealt with as shown in Table 6.11.

Table 6.11: Adjusted DASS-42 Questionnaire categorisation of depression, anxiety and stress

	Depression	Anxiety	Stress
Normal	[0 - 10)	[0 - 8)	[0 - 15)
Mild	[10 - 14)	[8 - 10)	[15 - 19)
Moderate	[14 - 21)	[10 - 15)	[19 - 26)
Severe	[21 - 28)	[15 - 20)	[26 - 34)
Extremely severe	[28 - ∞)	[20 - ∞)	[34 - ∞)

The "[" bracket means to include whereas the ")" bracket means to exclude.

One of the aims of this study was to compare the prevalence of depression among access programme students with that among mainstream students. A comparison between the incidence rates of depression per category of the two study programmes is shown in Figure 6.9.

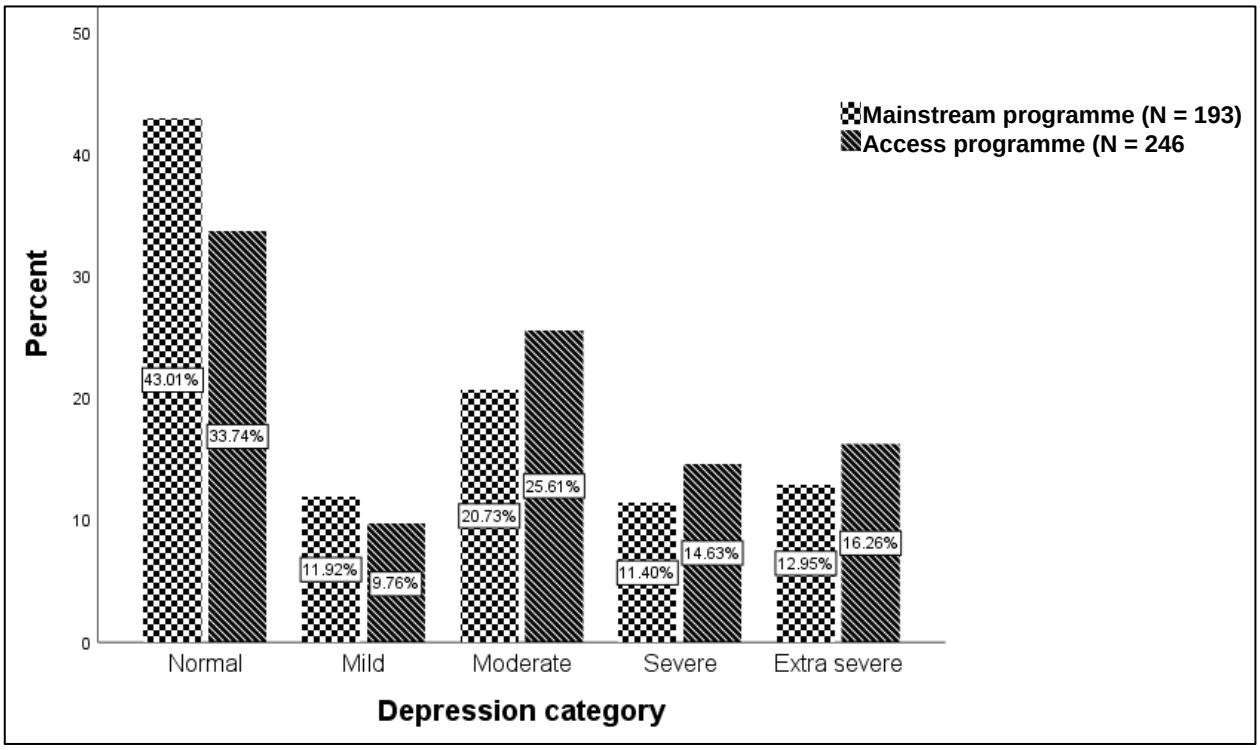


Figure 6.9: Comparison between the incidence rates of depression per category of the two study programmes

As seen in Figure 6.9, the incidence of moderate to extremely severe depression was very high for both study programmes (56.5% for the access programme and 45.08% for the mainstream programme). Although anxiety and stress per se were not identified as focal

points in this study, the descriptive statistics for both are also included here since studies have shown that there is a relationship between depression, anxiety and stress, as highlighted in Sections 3.3 and 3.5. This study has also found statistically significant correlations between depression, anxiety and stress, which will be further discussed in Section 6.4.1. Figure 6.10 compares the prevalence of anxiety among access programme students with that of students in the mainstream programme.

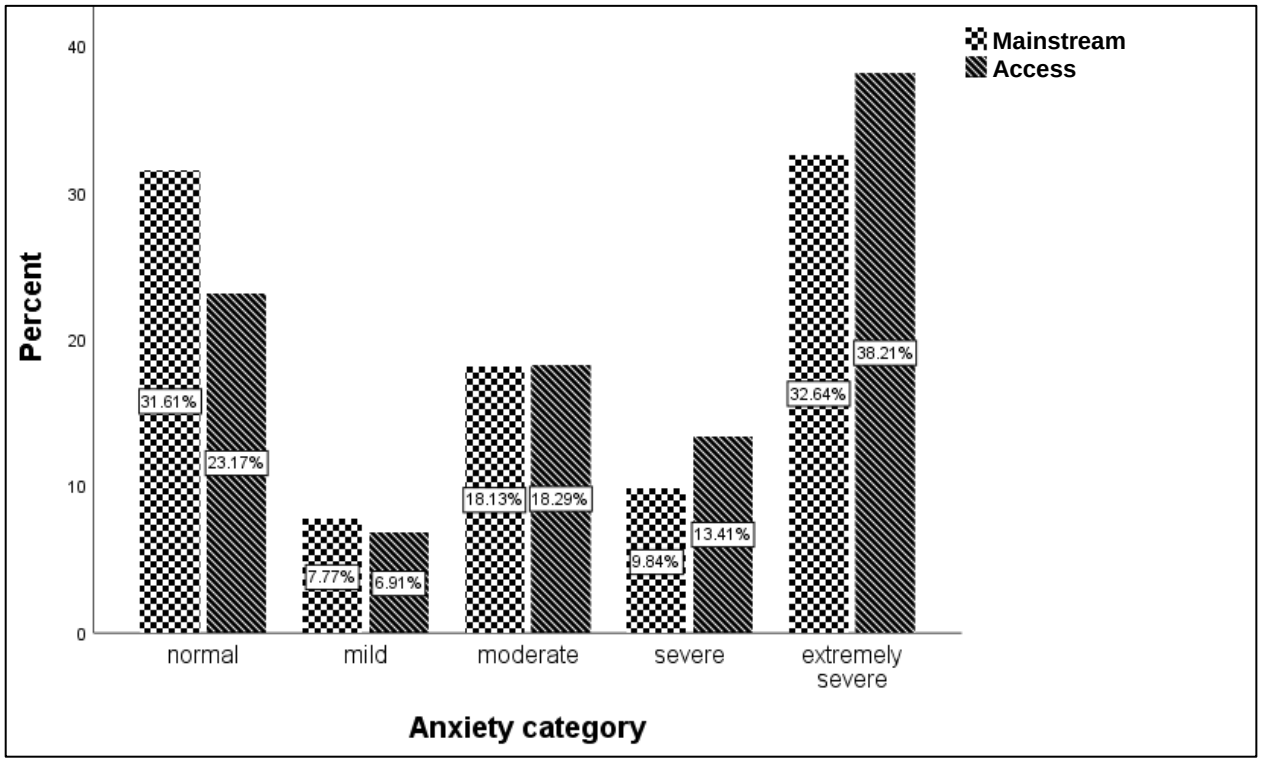


Figure 6.10: Comparison between the incidence rates of anxiety per category of the two study programmes

Anxiety levels, as depicted in Figure 6.10, were even higher than depression levels; whereas 69.91% of the participants in the access programme were in a state of moderate to extremely severe anxiety, this percentage for the mainstream programme was lower at 60.61%. It is rather disconcerting that more than half of the students who experienced moderate to extremely severe anxiety were actually in the extremely severe category for both study programmes. Research has shown that high levels of anxiety may be a precursor to depression (Batterham, Christensen & Calear, 2013:913).

In Figure 6.11, the stress levels for the two study programmes are compared. Although moderate to extremely severe stress levels were also high (45.52% for the access

programme and 40.94% for the mainstream programme), the percentage of participants who fell into the extremely severe category was low (5.28% for the access programme and 6.74% for the mainstream programme). A possible reason for this might be the timing of the conducting of the research. During the time of the completion of the questionnaires, no imminent major assessments had been scheduled for either study programme.

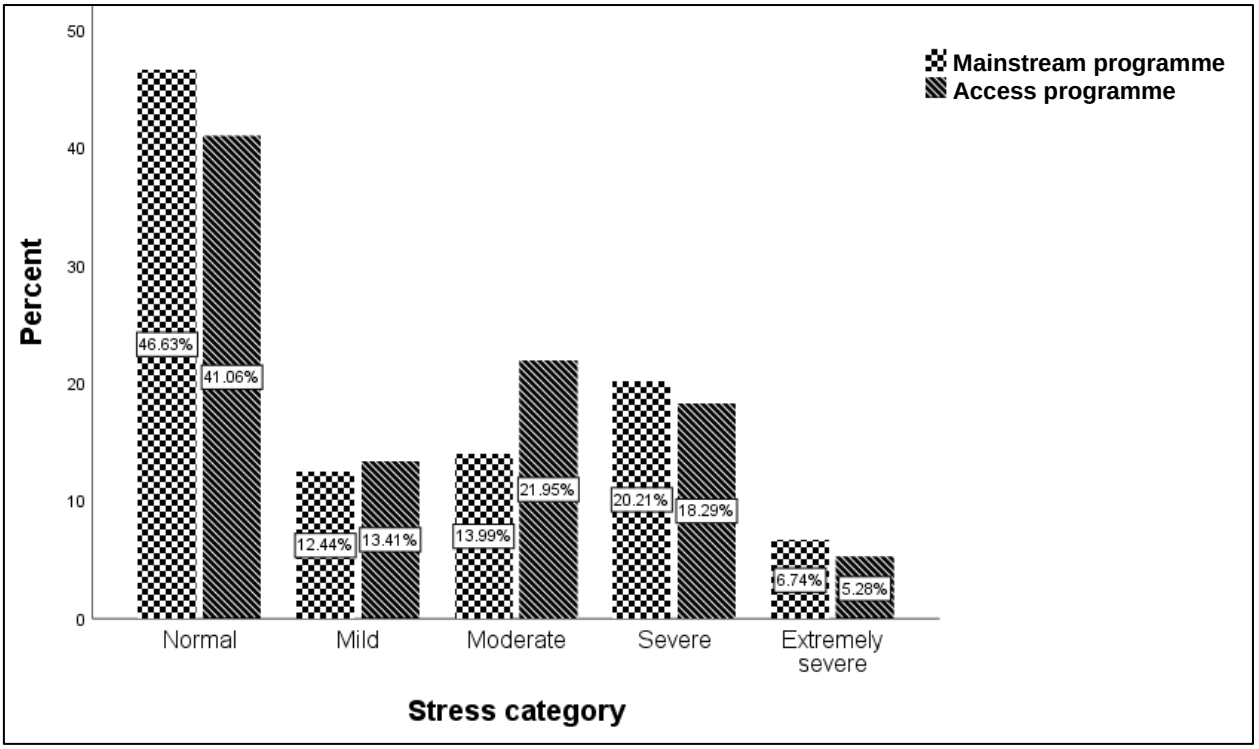


Figure 6.11: Comparison between the incidence rates of stress per category of the two study programmes

Closer inspection of Figures 6.9, 6.10 and 6.11 led to the conclusion that not all is well in terms of the students' mental health in both study programmes. The depression, anxiety and stress ratings and distribution of scores according to study programme are also reflected in Tables F28, F29, F36, F37, F44 and F45 in Appendix F. As a matter of interest, the depression, anxiety and stress ratings and distribution of scores according to gender (Tables F30, F31, F38, F39, F46, F47), ethnicity (Tables F32, F33, F40, F41, F48, F49) and language of instruction (Tables F34, F35, F42, F43, F50, F51) are also provided in Appendix F.

6.3.4 Descriptive Statistics for the Motivated Strategies for Learning Questionnaire (MSLQ)

The Motivated Strategies for Learning Questionnaire (MSLQ) is an instrument designed to evaluate a learner's motivation levels and utilisation of different learning strategies. The two sections (motivation level and application of learning strategies) are subdivided into different subscales. The Motivation section consists of six subscales, namely intrinsic goal orientation (4 items), extrinsic goal orientation (4 items), task value (6 items), control of learning beliefs (4 items), self-efficacy for learning and performance (8 items) and lastly, test anxiety (5 items). The different motivation subscales are described in more detail in Table 6.12.

Table 6.12: Description of the different motivation subscales of the MSLQ

Motivation subscale	Description
M1: Intrinsic goal orientation	Degree to which a student perceives him- or herself to be participating in a task for reasons, such as challenge, curiosity and mastery
M2: Extrinsic goal orientation	Degree to which a student perceives him- or herself to be participating in a task for reasons, such as grades, rewards, performance, evaluation by others and competition
M3: Task value	Students' perceptions of the course material in terms of interest, importance and utility
M4: Control of learning beliefs	Students' beliefs that their efforts to learn will result in positive outcomes
M5: Self-efficacy for learning and performance	Assess expectancy for success (performance expectations) and self-efficacy (self-appraisal of one's ability to master a task)
M6: Test anxiety	Consists of two components, namely a worry component (negative thoughts that disrupt performance) and an emotionality component (the affective and physiological arousal aspects of anxiety)

A high mean score (maximum of 7) relates to positive goal orientation, value beliefs pertaining to a course and students' beliefs about their skill to succeed in a course. However, a high mean score for subscale M6 relates to heightened test anxiety. A comparison between the motivational subscales of the MSLQ of the two study programmes is provided in Figure 6.12.

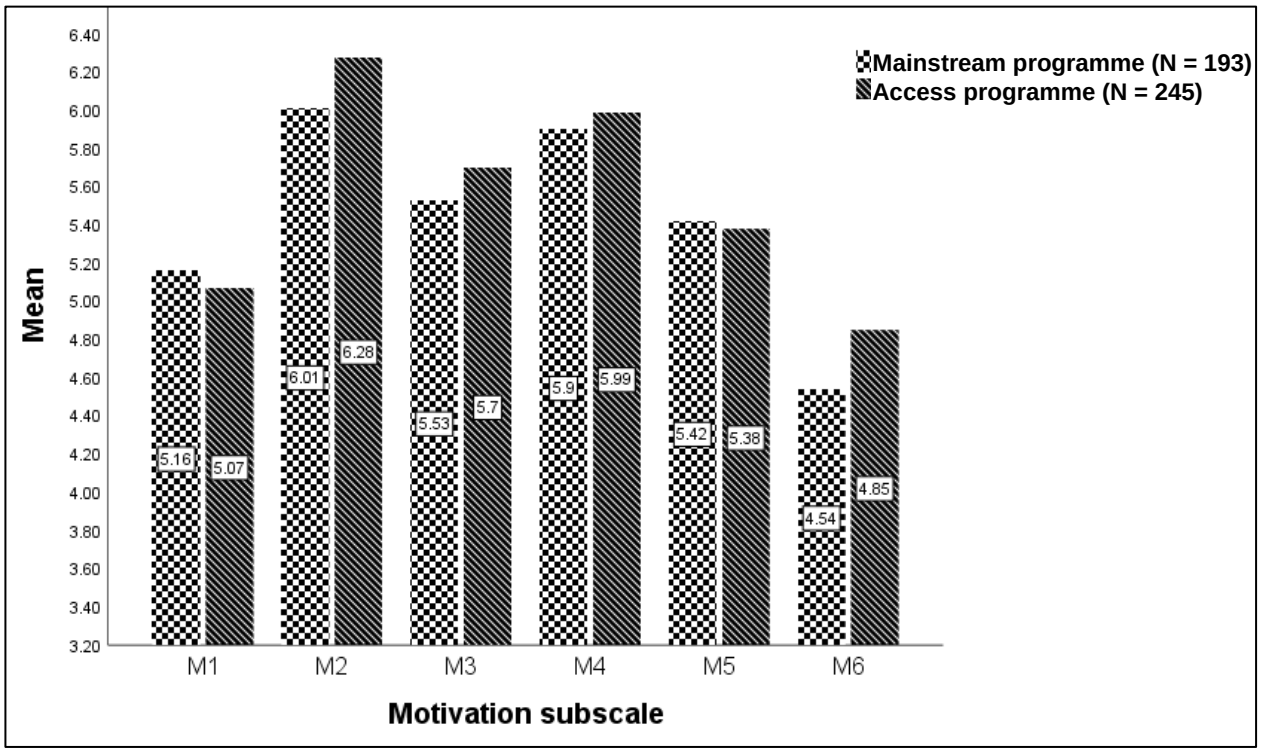


Figure 6.12: Comparison between the motivational subscale means of the MSLQ of the two study programmes

An examination of Figure 6.12 led to the conclusion that there were only small differences in the mean values of the different motivational subscales between the two study programmes, with the mean value of four of the six subscales slightly higher for the access programme than for the mainstream programme. These differences will be further evaluated for statistical significance by means of inferential statistics in Section 6.4.2.3.

The Learning Strategies section of the MSLQ consists of nine subscales, namely Rehearsal (four items), Elaboration (six items), Organisation (four items), Critical Thinking (five items), Metacognitive Self-regulation (twelve items), Time and Study Environment (eight items), Effort Regulation (four items), Peer Learning (three items) and Help Seeking (four items). The first five subscales (Rehearsal, Elaboration, Organisation, Critical

Thinking and Metacognitive Self-regulation) are grouped as cognitive and metacognitive strategies while the last four subscales (time and study environment, effort regulation, peer learning and help seeking) are grouped as resource management strategies. The different learning strategy subscales are described in more detail in Table 6.13.

Table 6.13: Description of the different learning strategy subscales of the MSLQ

Learning strategy subscale	Description
L1: Cognitive and metacognitive strategies: rehearsal	Rehearsal involves the reciting or naming of items from a list to be learned; information is activated in the working memory.
L2: Cognitive and metacognitive strategies: elaboration	Elaboration strategies (for example, summarising and note-taking) help the student to store information in the long-term memory.
L3: Cognitive and metacognitive strategies: organisation	Organisation strategies help the student to select relevant information and to construct connections between information.
L4: Cognitive and metacognitive strategies: critical thinking	The degree to which a student applies previous knowledge to new situations
L5: Cognitive and metacognitive strategies: metacognitive self-regulation	Planning (for example, goal setting), monitoring (for example, self-testing) and regulating (continuous adjustment of cognitive activities)
L6: Resource management strategies: time and study environment	Management of time and the study environment
L7: Resource management strategies: effort regulation	Commitment to task completion even if there are difficulties or distractions
L8: Resource management strategies: peer learning	Interaction with peers regarding course work can have a positive effect on achievement.
L9: Resource management strategies: help seeking	Seeking help from peers and instructors when experiencing difficulty in understanding course material can lead to higher student achievement.

A high mean score (maximum of 7) for a learning strategy subscale is indicative of an elevated tendency to apply the specific learning strategy. A comparison between the learning strategy subscale scores of the MSLQ of the two study programmes is provided in Figure 6.13. When examining Figure 6.13, it seems as though there were only small differences in the mean values of the different learning strategy subscales between the

two study programmes, with the mean value of six of the nine subscales slightly higher for the access programme than for the mainstream programme. These differences were also evaluated for statistical significance by means of inferential statistics (see Section 6.4.2.3).

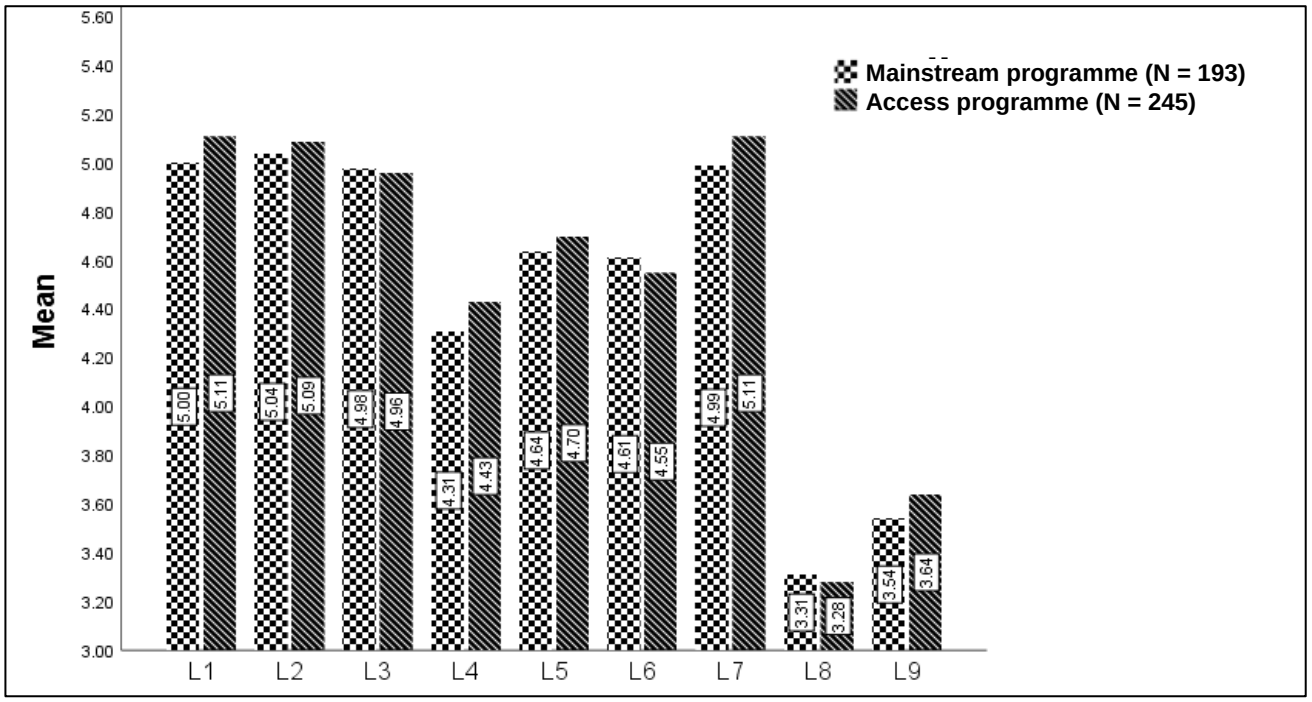


Figure 6.13: Comparison between the learning strategy subscales of the MSLQ for the two study programmes

In Section 6.3, the obtained descriptive statistics for this study have been represented in the form of charts and graphs while detailed values are shown in the tables in Appendix F. In summary, an inspection of the descriptive statistics led to the following conclusions:

- The overall distribution of the participants in terms of the two study programmes was 56% in the access programme and 44% in the mainstream programme.
- In both programmes, the number of female participants in the sample was higher than that of male participants; in the access programme, the number of female participants was 11% higher than that of male participants; and in the mainstream programme, there were 19% more female participants than male participants.
- The number of English-speaking participants was significantly higher than that of Afrikaans-speaking participants in both programmes. In the access programme, only 6.50% of the participants in this study were Afrikaans-speaking and in the mainstream programme, this percentage was 37.31%.

- A comparison of the ethnic group distribution of the two study programmes showed a similarity in terms of the low percentage (below 4% for both study programmes) of Asian and Indian participants. However, the distribution of Black and White participants differed significantly for the two study programmes. In the mainstream programme, the percentages of Black and White participants were almost equal, but in the access programme, the number of Black participants was nearly eight times more than that of White participants.
- The difference in the average age of the participants in the two study programmes was not very large; for the mainstream programme, the average age of participants was 18.65 years and for the access programme, the average participant age was 18.98 years.
- The overall mean scores with regard to the responses to the Psychosocial Background Questionnaire were comparable for the two study programmes, with the mean value for the access programme students being 2.35, and 2.23 for those in the mainstream programme. The positive skewness observed in terms of the results of this questionnaire for both study programmes showed that more students in both programmes displayed positive psychosocial well-being and that fewer students demonstrated negative psychosocial well-being.
- The average final mark for the Biology module, BLGY1513, was higher for participants in the mainstream programme (71.09%) than for those in the access programme (67.47%). For both study programmes, only a small percentage of the participants failed the module (only four participants per study programme).
- The incidence of moderate to extremely severe depression was high for both study programmes (56.5% for the access programme and 45.08% for the mainstream programme). However, the percentage of candidates suffering with severe to extremely severe depression was higher for the access programme (30.89%) than for the mainstream programme (24.35%).
- Moderate to extremely severe anxiety levels were high for both study programmes (60.61% for the mainstream programme and 69.91% for the access programme), with severe and extremely severe anxiety levels at 42.48% for the mainstream programme and 51.62% for the access programme.
- Stress levels among students in the access programme were higher than among those in the mainstream programme, with 45.52% of access programme participants experiencing moderate to extremely severe stress levels as compared

to 40.94% for mainstream programme participants. The percentage of participants who experienced severe to extremely severe stress levels was slightly higher for the mainstream programme (26.95%) than for the access programme (23.57%).

- The mean scores for the different motivational subscales and learning strategies subscales on the MSLQ were very similar for the two study programmes as illustrated in Figures 6.12 and 6.13. For the majority of the subscales, the mean score for the access programme was slightly higher than that for the mainstream programme (exceptions were observed for subscales M1, M5, L3, L6 and L8). The largest difference between the two study programmes was seen for subscale M6 (test anxiety), with a mean value of 4.85 for the access programme and 4.54 for the mainstream programme. This subscale (M6) is the only subscale in the MSLQ where a high score has a negative connotation in that it is indicative of high test anxiety.

In the next section, the focus shifts to the inferential statistical results of the study, which include correlation coefficients, independent-samples t-tests, ANOVA and linear regression.

6.4 INFERENTIAL STATISTICS

Descriptive statistics are used to learn more about the sample data; inferential statistics consist of various methods used to draw conclusions about the characteristics of populations based on the sample data (Keller, 2006:3; Heiman, 2011:21). Types of inferential statistical tests include linear regression analysis, analysis of variance (ANOVA), analysis of covariance (ANCOVA), t-tests and correlation analysis.

When experimental results are evaluated, the researcher needs to ask whether the results obtained may be attributed to chance. Similarly, in the statistical analyses of research results, hypothesis testing is used to determine the probability that a result obtained may be attributed to chance (Lane, Scott, Hebl, Guerra, Osherson & Zimmer, n.d.:369). In the current study, the researcher theorised that suffering from depression does indeed have an effect on students' academic performance. If the researcher predicts that students who suffer from depression will obtain lower final module marks compared to those who do not suffer from depression, the prediction is called a hypothesis (Field, 2009:4). A distinction

is made between a null hypothesis (denoted by H_0) and an alternative hypothesis (denoted by H_1). A hypothesis that proposes that a result obtained is purely due to chance is called the null hypothesis (Lane et al., n.d.:373). In the above example, the null hypothesis is that depression has no effect on the academic achievement of students who suffer from depression. The hypothesis that is accepted if the null hypothesis is proven to be false, is called the alternative hypothesis (Lane et al., n.d.:374). In the example used, the alternative hypothesis is that depression does indeed influence academic achievement. While the alternative hypothesis cannot be proven statistically, it is possible to determine the statistical probability that specific research results were obtained by chance, that is, that the null hypothesis is true (Field, 2009:27). Conventionally, it is accepted that the null hypothesis is true when the statistical evaluation of results shows that the probability of obtaining these results due to chance, is greater than 0.05 (Lane et al., n.d.:375). This probability value of 0.05 (or 5%) is called the significance level or α level. If the null hypothesis is found to be false and, subsequently, rejected (probability ≤ 0.05), the result is said to be statistically significant (Lane et al., n.d.:375) and the alternative hypothesis is accepted. When conducting statistical significance tests, the probability value obtained for a specific set of results is called the p-value. This value is compared to the significance value of 0.05 (or 5%) to determine whether a null hypothesis is rejected or not. Throughout all the analyses in the current research, the 5% significance level was used to indicate statistical significance.

6.4.1 Statistical Correlations

Correlation between two variables does not mean that they have a causal relationship. Rather, it indicates how closely the data display an increasing or decreasing trend (Taylor, 1990:38; Altman & Krzywinski, 2015:899; Samuel & Okey, 2015:26). Hence, the correlation coefficient measures the strength of association between two variables. If there is a linear trend, Pearson's correlation (r) is used as a measure of correlation whereas Spearman's correlation (s) is used as a measure of correlation in cases where the trend is not necessarily linear (Altman & Krzywinski, 2015:899). In the current study, both Spearman's and Pearson's correlations were determined. However, since very small differences between the two values were obtained, the researcher decided to continue with Pearson's correlation.

Pearson's correlation coefficient ranges between -1 and +1. A coefficient of +1 is indicative of a perfect positive correlation whereas a correlation coefficient of -1 points to a perfect negative correlation. A coefficient of 0 signifies that there is no relationship between two variables (Durlak, 2009:922; Samuel & Okey, 2015:23). In terms of the correlation coefficient, it is important to give an indication of the statistical significance thereof (that is, the p-value) since large correlation coefficients can also be generated using random data (Altman & Krzywinski, 2015:900). The p-values associated with correlation coefficients indicate whether the correlation is indeed statistically significant. As previously explained, a p-value of less than 0.05 indicates a significant relationship between two variables, at a 5% significance level. There is no direct relationship between the correlation coefficient and the p-value obtained since a small, medium or large correlation coefficient can relate to a small p-value (Durlak, 2009:918). The reason for this is twofold, namely the variation in the data and the influence of the sample size on the p-value.

In the social and psychological sciences, as well as educational research, the correlation coefficients obtained are often quite low ($|r| < 0.30$)[25] (Meyer, Fin, Eyde, Kay, Moreland, Dies, Eisman, Kubiszyn & Reed, 2001:133; Durlak, 2009:923; Cohen, 1988:78). It is important to note that even small or weak correlation coefficients obtained in the social sciences and educational studies can be considered important (Meyer et al., 2001:74; Durlak, 2009:923). Cohen (1988:77-81; 1992:157) suggests that $|r| = 0.10$ be considered a small or weak effect size, $|r| = 0.30$ a medium effect size and $|r| = 0.50$ a large effect size. However, Cohen himself states that these conventions are not cast in stone (Cohen, 1988:79). It is important to take into consideration the area of research, as well as other relevant studies, when interpreting correlation coefficient values. Hemphill (2003:78-79) offers empirical guidelines for the interpretation of correlation coefficients based on the literature on psychological assessment and treatment. These guidelines are provided in Table 6.14. Hemphill does, however, also caution that such empirical guidelines are, to some degree, artificial.

[25] $|r|$ represents the absolute value of r, that is, the positive numerical value of the number, for example $|-x| = x$.

Table 6.14: Empirical guidelines for the interpretation of correlation coefficients (Hemphill, 2003:78-79)

Empirical guideline in terms of |r|	Relationship strength
|r| < 0.20	Weak
0.20 < |r| < 0.30	Medium
|r| > 0.30	Large

Taking the above into consideration, |r| values with a magnitude equal to or larger than 0.1 and with $p \leq 0.05$ are considered significant in the current study. The following empirical distinctions are made based on the guidelines offered by Hemphill (2003:78-79): $0.100 \leq |r| < 0.200$ are considered small or weak correlations, $0.200 \leq |r| < 0.300$ are considered medium strength correlations, and $0.300 \leq |r|$ are considered strong correlations.

In order to address the research questions posed in this study, correlation coefficients and their associated p-values were calculated for the different variables for the total dataset (Table F52, Appendix F) as well as for the separate study programmes (Tables F53 and F54, Appendix F). To determine these values, the CORR procedure in the Statistical Analysis Software (SAS) was used. In order to simplify the representation of the results, only the r-values are provided in Tables F52-F54. Here, the correlation coefficients that are significant ($|r| \geq 0.1$; $p \leq 0.05$) are colour-coded according to significance. Abbreviations used in Tables F52-F54, as well as those appearing in all subsequent tables in this chapter, are the same as those used in Tables 6.12 and 6.13 for the different MSLQ subscales. Other abbreviations used are as follows:

FM or FM(B) – final mark for the module, BLGY1513;
FM(C) – final mark for the module, CHEM1532;
Psyc – psychosocial wellness: adapted;
D – DASS: Depression;
A – DASS: Anxiety; and
S – DASS: Stress.

Although depression as a predictor of academic performance was investigated in this study, the full DASS-21 Questionnaire, which not only evaluates the depression of the

participants but also their levels of anxiety and stress, was utilised. The results of the anxiety and stress subscales were not analysed further, but it is interesting to note from Tables F53 and F54 (Appendix F) that there was a strong, statistically significant positive correlation ($r > 0.6$; $p \leq 0.05$) between the three subscales for both study programmes. It is also noticeable from the MSLQ correlation data represented in these two tables that there was a statistically significant positive relationship between the different self-regulated learning strategy dimensions (L1-L9) for both study programmes, with the highest correlation for both study programmes between L2 and L5. For the sake of clarity, the correlations (with p-values) between the dependent variable (that is, the final mark for the BLGY1513 module) and the independent variables (depression and self-regulation subscales) are summarised in Table 6.15. The correlations and p-values for the whole group as well as the two separate study programmes are provided, with significant correlations ($|r| \geq 0.1$, $p \leq 0.05$) shaded in blue.

Table 6.15: Correlations (r) (with corresponding p-values) between final mark and the independent variables depression (D) and motivated strategies for learning (M1-M6; L1-L9)

	Final BLGY1513 mark correlation					
	Total group (N = 439)		Access programme (N = 246)		Mainstream programme (N = 193)	
	r	p	r	p	r	p
D	–0.139	0.004	–0.176	0.006	–0.058	0.419
M1	0.127	0.008	0.128	0.046	0.111	0.124
M2	–0.072	0.131	0.038	0.556	–0.131	0.070
M3	0.103	0.031	0.160	0.012	0.069	0.339
M4	0.124	0.009	0.104	0.105	0.174	0.016
M5	0.277	<0.001	0.291	<0.001	0.265	<0.001
M6	–0.224	<0.001	–0.199	0.002	–0.221	0.002
L1	0.063	0.186	0.029	0.656	0.126	0.081
L2	0.191	<0.001	0.220	0.001	0.170	0.018
L3	0.134	0.005	0.113	0.077	0.159	0.027
L4	0.053	0.267	0.051	0.423	0.078	0.283
L5	0.202	<0.001	0.238	<0.001	0.178	0.013
L6	0.261	<0.001	0.254	<0.001	0.267	<0.001
L7	0.322	<0.001	0.341	<0.001	0.332	<0.001
L8	–0.068	0.158	0.002	0.975	–0.161	0.026
L9	0.036	0.448	–0.013	0.834	0.111	0.124

Table 6.16 further simplifies the information presented in Table 6.15 by indicating all significant correlations in terms of positive or negative associations.

Table 6.16: Significant associations between the final BLGY1513 mark and the independent variables depression and motivated strategies for learning

	Final BLGY1513 mark significant correlation					
	Total group		Access programme		Mainstream programme	
	Positive association	Negative association	Positive association	Negative association	Positive association	Negative association
Depression		✓		✓		
M1	✓		✓			
M3	✓		✓			
M4	✓				✓	
M5	✓		✓		✓	
M6		✓		✓		✓
L2	✓		✓		✓	
L3	✓				✓	
L5	✓		✓		✓	
L6	✓		✓		✓	
L7	✓		✓		✓	
L8						✓

To assist in addressing the research question, “Is there an association between depression and self-regulated learning?” the correlations between the variable depression and the different self-regulation subscales for the whole group as well as the two separate study programmes, together with their corresponding p-values, are summarised in Table 6.17, with significant correlations ($|r| \geq 0.1$, $p \leq 0.05$) once again shaded in blue.

Table 6.17: Correlations (r) between depression and the motivated strategies for learning subscales (M1-M6; L1-L9), and their corresponding p-values

	Depression correlation					
	Total group (N = 439)		Access programme (N = 246)		Mainstream programme (N = 193)	
	r	p	r	p	r	p
M1	–0.113	0.018	–0.105	0.102	–0.113	0.117
M2	0.097	0.042	0.035	0.588	0.137	0.057
M3	–0.121	0.011	–0.131	0.040	–0.129	0.074
M4	–0.036	0.456	0.021	0.746	–0.120	0.097
M5	–0.224	<0.001	–0.235	<0.001	–0.209	0.004
M6	0.409	<0.001	0.361	<0.001	0.454	<0.001
L1	–0.023	0.637	–0.039	0.548	–0.013	0.862
L2	–0.120	0.012	–0.170	0.007	–0.056	0.439
L3	–0.091	0.058	–0.094	0.141	–0.085	0.238
L4	–0.015	0.759	0.006	0.924	–0.054	0.458
L5	–0.152	0.001	–0.186	0.003	–0.117	0.105

Table 6.17: (Continued)

	Depression correlation					
	Total group (N = 439)		Access programme (N = 246)		Mainstream programme (N = 193)	
	r	p	r	p	r	p
L6	–0.269	<0.001	–0.310	<0.001	–0.212	0.003
L7	–0.223	<0.001	–0.310	<0.001	–0.125	0.082
L8	–0.024	0.618	–0.047	0.459	0.010	0.892
L9	–0.169	<0.001	–0.181	0.004	–0.165	0.022

Table 6.18 further simplifies the information presented in Table 6.17 by indicating all significant correlations in terms of positive or negative associations.

Table 6.18: Significant associations between depression and the motivated strategies for learning subscales

	Depression significant correlation					
	Total group		Access programme		Mainstream programme	
	Positive association	Negative association	Positive association	Negative association	Positive association	Negative association
M1		✓				
M3		✓		✓		
M5		✓		✓		✓
M6	✓		✓		✓	
L2		✓		✓		
L5		✓		✓		
L6		✓		✓		✓
L7		✓		✓		
L9		✓		✓		✓

Following the analyses of Tables 6.15-6.18, the following was observed regarding the ***total group***. There was a significant correlation between the final BLGY1513 mark and depression, as well as between the final BLGY1513 mark and nine of the fifteen motivated strategies for learning subscales (that is, M1, M3, M4, M5, M6, L2, L3, L5, L6 and L7). These correlations were predominantly positive except for the association between the final BLGY1513 mark and depression, as well as the association between the final BLGY1513 mark and M6 (test anxiety), which was negative. This implies that, for the total group, higher levels of depression and test anxiety did, in fact, correlate with lower academic achievement. Furthermore, for the total group, significant negative correlations

between depression and eight of the motivated strategies for learning subscales (that is, M1, M3, M5, L2, L5, L6, L7 and L9) were observed, but there was a significant positive association between depression and test anxiety (M6). As a result, it can be concluded that higher depression levels go hand-in-hand with increased test anxiety.

For the ***access programme participants***, there were significant positive associations between the final BLGY1513 mark and seven of the motivated strategies for learning subscales (that is, M1, M3, M5, L2, L5, L6 and L7). There was a significant negative association between the final BLGY1513 mark and both depression and test anxiety (M6) for the access programme participants. Seven of the motivated strategies for learning subscales (M3, M5, L2, L5, L6, L7 and L9) showed a negative association with depression for the access programme participants, while a positive association between depression and test anxiety (M6) was observed for this group of students.

Regarding the ***mainstream programme participants***, positive associations between the final BLGY1513 mark and seven of the motivated strategies for learning subscales (that is, M4, M5, L2, L3, L5, L6 and L7) were observed, with a negative association between the final BLGY1513 mark and M6 (test anxiety), as well as L8 (Peer Learning). A negative correlation between depression and three of the motivated strategies for learning subscales (that is, M5, L6 and L9) was noted for this group of participants, with a positive association between depression and test anxiety (M6).

In conclusion, differences between the two study programmes (access programme and mainstream programme) regarding significant correlations were perceived in terms of:

- the correlation between academic performance and depression (significant correlation for access programme participants but not for mainstream programme participants);
- the correlation between academic performance and self-regulated learning dimensions M1 and M3 (significant correlation for access programme participants but not for mainstream programme participants);
- the correlation between academic performance and self-regulated learning dimensions M4, L3 and L8 (significant correlation for mainstream programme participants but not for access programme participants); and

- the correlation between depression and self-regulated learning dimensions M3, L2, L5 and L7 (significant correlation for access programme participants but not for mainstream programme participants).

The correlations between depression, self-regulated learning strategies and academic performance were taken a step further by testing these in a second academic module, namely the chemistry module CHEM1532. Since this module is not offered to mainstream programme students, the correlation values were only determined for the access programme. There was a strong correlation ($r = 0.526$, $p < 0.001$) between the two modules CHEM1532 and BLGY1513. Correlation coefficients and associated p-values for these two modules are shown in Table 6.19, with FM(B) representing the final mark for the BLGY1513 module and FM(C) representing the final mark for the CHEM1532 module.

Table 6.19: Pearson correlation coefficients (r); Access programme (N = 246), (CHEM1532 final mark included)

	FM(B)	FM(C)	Psyc	D	A	S	M1	M2	M3	M4	M5	M6	L1	L2	L3	L4	L5	L6	L7	L8	L9
FM(B)	1	0.526	-0.211	-0.176	-0.201	-0.158	0.128	0.038	0.160	0.104	0.291	-0.199	0.029	0.220	0.113	0.051	0.238	0.254	0.341	0.002	-0.013
FM(C)		1	-0.085	-0.187	-0.180	-0.205	0.089	0.018	0.040	-0.032	0.100	-0.172	-0.047	0.100	-0.052	-0.008	0.112	0.133	0.206	0.001	0.004

Key: Statistically significant r-values with $p \leq 0.05$

$0.100 \leq |r| < 0.200$

$0.200 \leq |r| < 0.300$

$0.300 \leq |r|$

Table 6.19 illustrates that there was a significant negative correlation between academic achievement and depression, as well as between academic achievement and test anxiety (M6), for both modules. Furthermore, significant positive correlations between academic achievement and learning strategy dimensions L6 (Time and Study Environment) and L7 (Effort Regulation) were seen for both modules. However, the significant positive correlations observed between academic achievement in the BLGY1513 module and learning strategy dimensions M1, M3, M5, L2 and L5 were not observed for the CHEM1532 module. This reiterates the fact that the MSLQ is course- or module-specific and that results will differ depending on the module selected for scrutiny, as discussed in Section 5.6.4.

Some of the secondary questions posed in this study relate to a comparison between the access programme students and the mainstream programme students with regard to

different aspects. In order to address these questions, independent-samples t-tests were computed to compare the sample means of the two study programmes, the results of which are presented and discussed in the next section.

6.4.2 Independent-samples T-tests: Comparing the Two Study Programmes

A t-test can be used to compare two group means. Since the means of quantitative variables for two different groups of participants (access programme students and mainstream programme students) were compared, independent-samples t-tests, using SPSS statistics, were computed. A comparison between the means of the two study programmes in terms of the final Biology mark, depression levels and the fifteen self-regulated learning dimensions is presented below. A p-value of less than 0.05 indicates a significant difference between the mean values of the two study programmes.

6.4.2.1 Independent-samples t-test: Comparison between the final BLGY1513 marks of the two study programmes

The results of the independent-samples t-test, performed to compare the mean scores (final BLGY1513 marks) of the participants from the two study programmes, are provided in the following table.

Table 6.20: Results of the independent-samples t-test used to compare the mean scores (final BLGY1513 marks) of the participants from the two study programmes

	N	Mean	Standard deviation	p-value
Mainstream programme	193	71.09	10.138	<0.001
Access programme	246	67.47	9.594	

Table 6.20 shows that there was a significant difference between the mean scores (final BLGY1513 marks) of the access programme participants and the mainstream programme participants. Furthermore, it indicates that the mainstream programme students performed better academically compared to the access programme students.

6.4.2.2 Independent-samples t-test: Comparison between the depression scores of the two study programmes

The results of the independent-samples t-test, performed to compare the mean depression scores of the participants from the two study programmes, are presented in Table 6.21.

Table 6.21: Results of the independent-samples t-test to compare the mean depression scores of participants from the two study programmes

	N	Mean	Standard deviation	p-value
Mainstream programme	193	13.584	10.383	0.032
Access programme	246	15.756	10.620	

There was a significant difference between the mean depression scores of access programme and mainstream programme participants. On average, these results show that the depression scores of the mainstream programme participants were lower than those of the access programme participants.

6.4.2.3 Independent-samples t-test: Comparison between the self-regulated learning dimensions of the two study programmes

The results of the independent-samples t-tests, performed to compare the mean scores of the participants from the two study programmes with regard to the self-regulated learning dimensions, are summarised in Table 6.22. Self-regulated learning dimensions that demonstrate a significant difference between the mean values of the two study programmes are highlighted in blue. Table 6.22 shows that there are only statistically significant differences between the mean values of self-regulated learning dimensions M2 (extrinsic goal orientation) and M6 (test anxiety) of participants from the two different study programmes. None of the other thirteen self-regulated learning dimensions showed a significant difference between the mean scores of the two study programmes. The statistically significant differences between the level of extrinsic goal orientation (M2) and test anxiety (M6) of the two study programmes were due to the lower mean values for extrinsic goal orientation and test anxiety observed for the mainstream programme participants as compared to those for the access programme participants.

Table 6.22: Results of the independent-samples t-tests to compare the mean scores of the participants from the two study programmes with regard to the self-regulated learning (SRL) dimensions

SRL Dimension	Mainstream programme		Access programme		p-value
	Mean	SD*	Mean	SD*	
M1	5.163	0.977	5.067	0.999	0.311
M2	6.008	0.926	6.275	0.785	0.001
M3	5.530	1.084	5.698	1.088	0.113
M4	5.902	0.893	5.995	0.863	0.275
M5	5.418	0.976	5.385	1.050	0.739
M6	4.537	1.460	4.846	1.385	0.024
L1	5.000	1.197	5.108	1.202	0.350
L2	5.041	1.056	5.087	1.153	0.664
L3	4.983	1.269	4.956	1.199	0.818
L4	4.307	1.241	4.432	1.226	0.289
L5	4.642	0.943	4.698	0.943	0.540
L6	4.613	0.947	4.551	0.912	0.492
L7	4.995	1.251	5.106	1.228	0.349
L8	3.311	1.458	3.281	1.494	0.832
L9	3.543	1.365	3.641	1.338	0.451

*SD = standard deviation

When conducting research, it is important to ensure that the internal validity thereof is sustained. Confounding variables may jeopardise the internal validity of a study and must be accounted for. Confounding variables are those that are not studied intentionally but which can influence and distort the relationship between the variables identified in a study (Skelly, Dettori & Brodt, 2012:9). Age, gender, ethnic group, study programme, psychosocial background and language were identified as possible confounding variables in the current study. The following section explores the effect of the confounding variables on academic achievement, depression and self-regulated learning.

6.4.3 The Effect of Confounding Demographic Variables on Academic Achievement, Depression and Self-regulated Learning

SPSS multiple regression analyses were conducted to determine the effect of the confounding variables on depression, self-regulated learning and the final mark obtained for the BLGY1513 module. In order to perform a multiple linear regression, all the variables are assumed to be quantitative (continuous), though, in practice this is not

always the case. In this study, the confounding variables, which are qualitative or categorical rather than quantitative, include gender, ethnic group, study programme and language. In order to incorporate qualitative variables into a regression model, so-called dummy variables need to be defined for each qualitative variable. For qualitative confounding variables consisting of two categories only (for example, male and female; Afrikaans and English, access programme and mainstream programme), creating the dummy variables is simple since the codes 0 and 1 can be used to denote the two categories in each case. However, in this study, the qualitative variable, ethnicity, has four categories which required a great deal more consideration before dummy variables could be defined. Only a few of the participants belonged to the Coloured (N = 12) and Indian/Asian (N = 4) ethnic groups. A one-way analysis of variance (ANOVA) was executed to determine the differences between the final marks of the various ethnic groups (the independent variable) for the BLGY1513 module (the dependent variable). The results showed that there was a significant difference between the final marks of the various ethnic groups ($p<0.001$). A Scheffé Test showed that there were significant differences between the final marks of White and Black African students, as well as between those of White and Coloured students, but not between those of White and Indian/Asian students. Thus, White and Indian/Asian students were grouped together as a single ethnic group in further analyses. The Scheffé Test results also showed that there was no significant difference between the Black African and Coloured ethnic groups. Consequently, the Black African and Coloured ethnic groups were grouped together. This simplified the construction of dummy variables since ethnic group was reduced to only two groups (White and Indian/Asian on the one hand, and Black African and Coloured on the other).

For a multiple regression analysis to be valid, certain assumptions must be met (Field, 2009:220-251; Walters, 2011:92-117). These assumptions were tested for all multiple regression analyses that were conducted and were largely met. As an example, the results obtained for the assumptions tested before multiple regression analysis was done to determine the effect of the confounding variables on the final mark (the dependent variable), are discussed below.

Assumption 1: There is a linear relationship between the dependent variable and the independent variables. This was determined by drawing scatterplots of the

dependent variable (final mark) against each of the continuous independent confounding variables (age and psychosocial background). This assumption could not be tested for the categorical confounding variables (ethnicity, gender, language and study programme) since all of these variables only have two possible dummy values. The two scatterplots drawn (Figures 6.14 and 6.15) do not indicate any non-linearity.

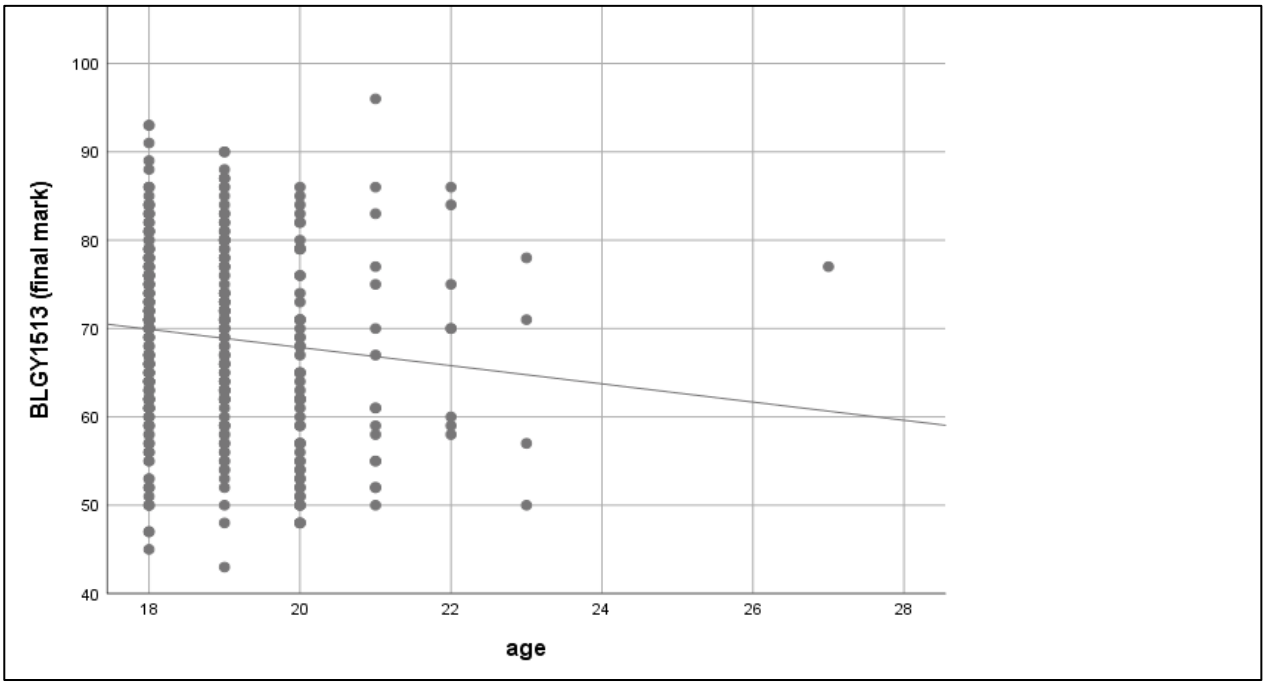


Figure 6.14: Scatterplot of the final BLGY1513 mark against age

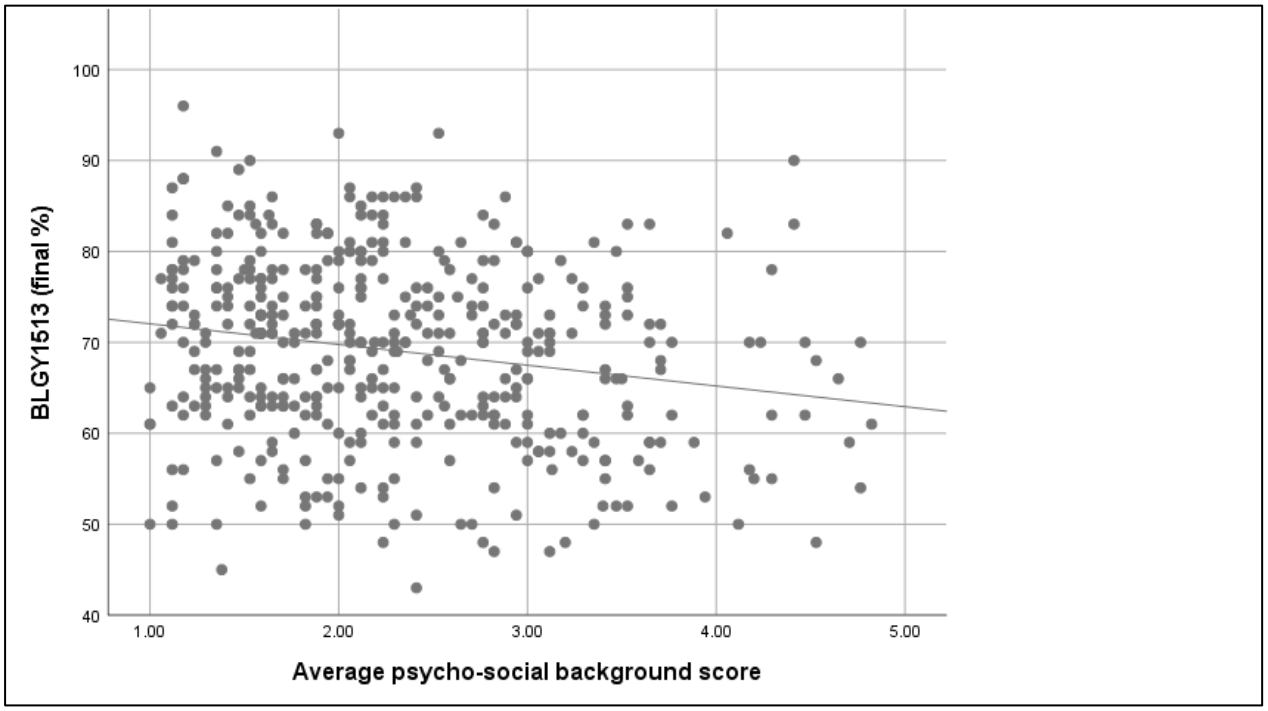


Figure 6.15: Scatterplot of the final BLGY1513 mark against psychosocial well-being score

Assumption 2: There is no multicollinearity in the data. Multicollinearity implies that there are strong relationships between the independent variables, in this case, the different confounding variables. This was assessed by determining the tolerance and Variance Inflation Factor (VIF). To meet this assumption, the tolerance scores should be above 0.2, and the VIF scores well below 10. The VIF values were all below 10 (the largest being 2.375) and the tolerance values were all above 0.2 (the smallest being 0.421), showing that there was no multicollinearity in the data and that the second assumption had been met.

Assumption 3: The values of the residuals (difference between actual dependent variable value and predicted value) are independent. This assumption was tested by determining the Durbin-Watson statistic, where a value close to 2 indicates that the third assumption is met. The Durbin-Watson value obtained was 2.083.

Assumption 4: The residuals are equally distributed – homoscedasticity. This assumption was tested by plotting the standardised residuals of the dependent variable (BLGY1513) obtained from the model against the predicted standardised dependent variable values (BLGY1513 final marks) of the model (Figure 6.16). A cone or fan shape shows that this assumption has not been met. Since this was not the case, it is assumed that this assumption was met.

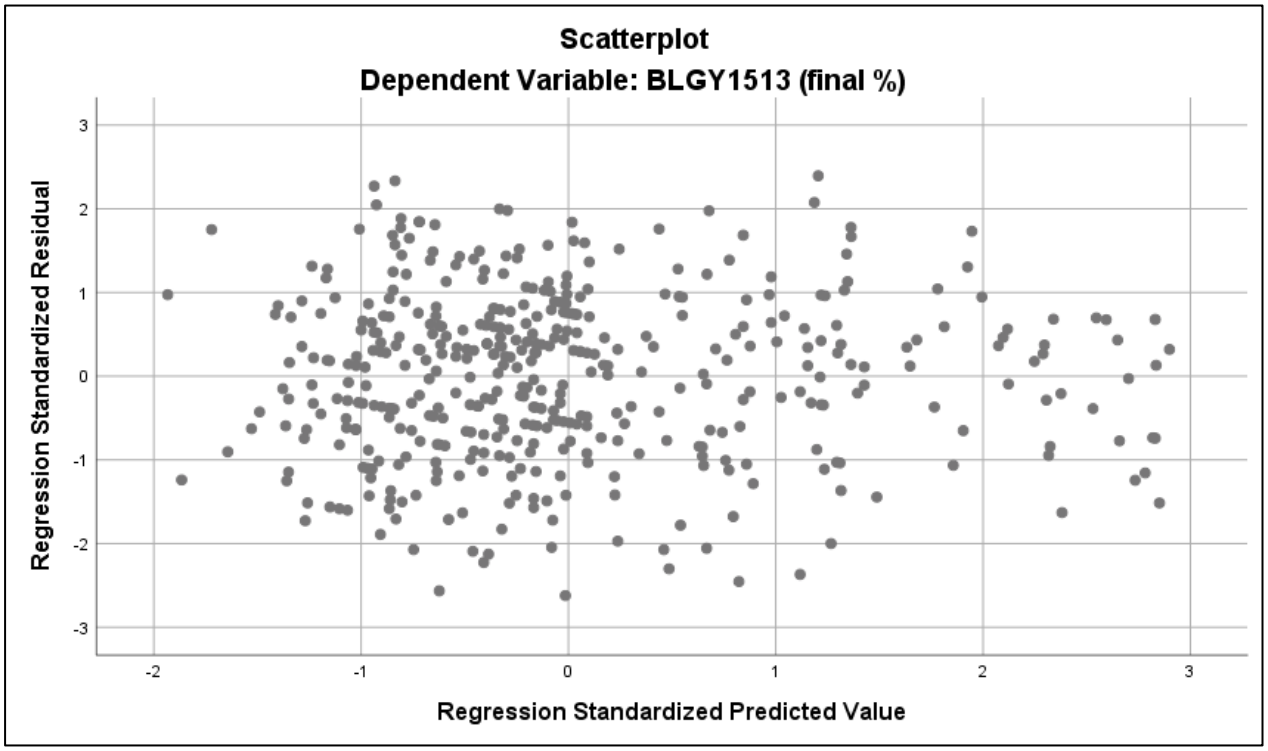


Figure 6.16: Scatterplot of standardised residuals of the dependent variable against the predicted standardised dependent variable values

Assumption 5: The values of the residuals of the regression follow a normal distribution. This assumption is tested by drawing a probability-probability (P-P) plot or histogram. The dots in the P-P plot should lie close to the diagonal line to confirm a normal distribution, and the histogram should show a normal distribution. Both techniques were applied to test for normality and the outputs (Figures 6.17 and 6.18) show that in general, the residuals do indeed follow a normal distribution and that the model fits the data well. The slight deviation from the straight line on the P-P plot in Figure 6.18 is possibly due to the abnormal distribution of the final mark observed around 70% (Figure 6.7) which is due to the fact that BLGY1513 is a promotion module as explained in Section 6.3.2. The deviation is not large, and the values are still clustered around a straight line. Therefore, it can be concluded that Assumption 5 was met.

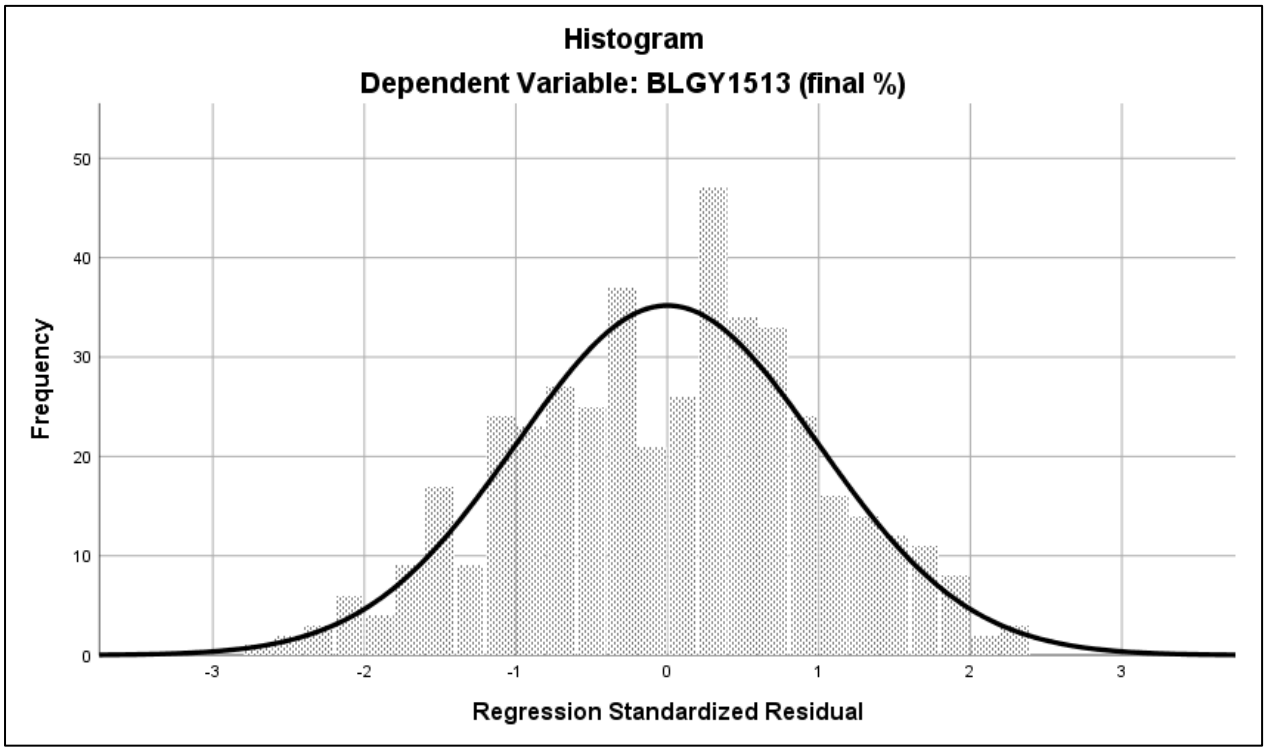


Figure 6.17: Histogram to confirm normal distribution of residual values

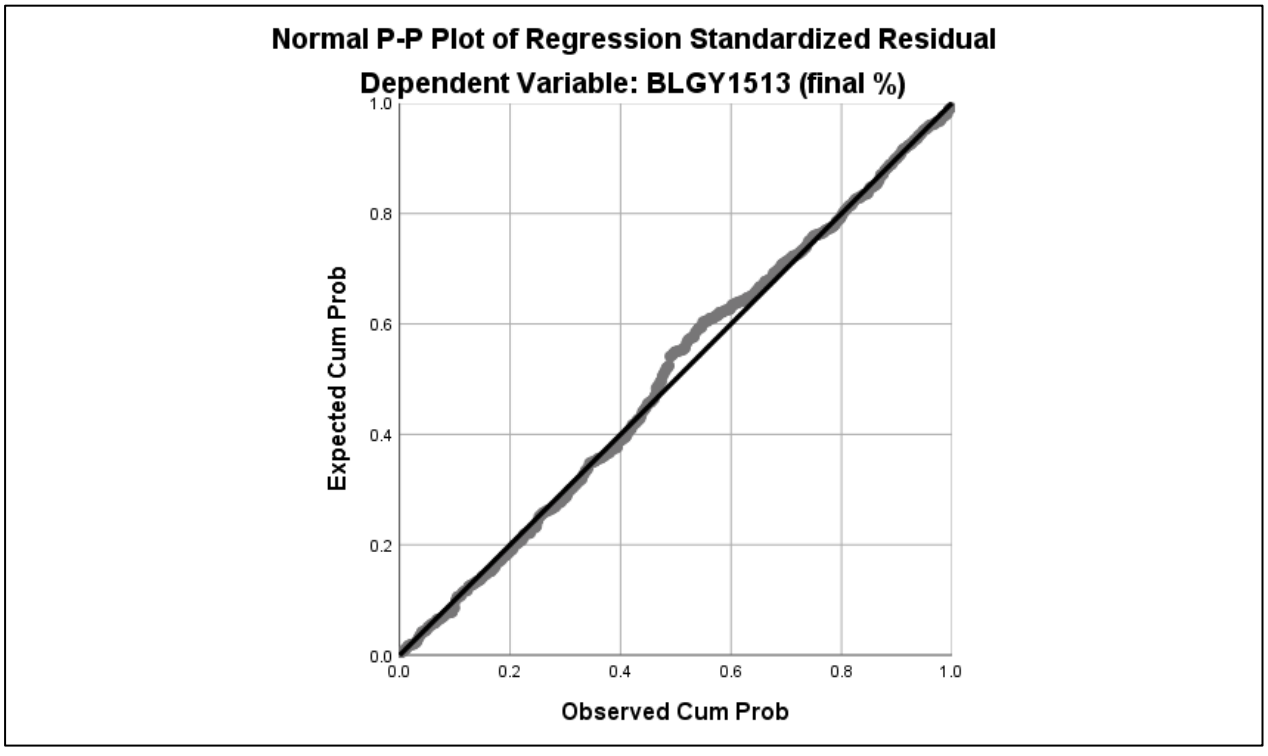


Figure 6.18: P-P plot to confirm normal distribution of residual values

Assumption 6: There are no significant unusual data points (outliers, leverage and influential points). This assumption is tested by determining Cook's Distance. These values should be below 1 to confirm that there are no unusual data points. All values obtained for the individual cases were well below 1, confirming that this assumption was met.

Having tested the assumptions prior to performing each multiple linear regression analysis, and largely having met the assumptions for all analyses, the researcher was able to proceed with the linear regression analyses to determine the effect of the confounding variables on the final BLGY1513 mark, as well as on depression and self-regulated learning.

6.4.3.1 The effect of the confounding variables on the dependent variable (final mark)

The effect of the confounding variables on the final BLGY1513 mark was determined by using the stepwise selection method in SPSS regression analysis. The confounding variables that were found to make a significant contribution to the final mark are shown in Table 6.23. Dummy variables assigned to qualitative variables in order to conduct the multiple regression analysis were as follows:

Ethnic group: Black/Coloured = 0; White/Asian/Indian = 1;
Language: English = 0; Afrikaans = 1;
Gender: Male = 0; Female = 1; and
Study programme: Access programme = 0; Mainstream programme = 1.

Table 6.23: Results of regression analysis (stepwise selection method) with dependent variable BLGY1513 (Final %), N = 438

Independent variable	Coefficient ($\widehat{B}$)	t*	p
Ethnic group EG)	11.006	7.364	<0.001
Language (LAN)	–5.828	–3.471	0.001
Gender (GEN)	2.408	2.685	0.008
Psychosocial background (PSYC)	–1.130	–2.057	0.040

R^2 = 0.167; Intercept = 68.317

*t = test statistics value, the coefficient divided by its standard error, used to determine the p-value

These results show that ethnic group, language, gender and psychosocial background were significant predictors of the final BLGY1513 mark. Subsequently, the final BLGY1513 mark, abbreviated as FM(B), can be predicted by ethnicity, language, gender and psychosocial background by the formula:

$$FM(B) = 68.317 + 11.006(EG) - 5.828(LAN) + 2.408(GEN) - 1.130(PSYC).$$

A predicted final BLGY1513 mark could thus be determined for each of the participants in the study. For example, one of the participants in the study obtained a final BLGY1513 mark of 70%. The candidate is a Black African female and her language of tuition was English. Her psychosocial well-being score was 2.76. Applying the formula obtained from the regression analysis above yields the following predicted final BLGY1513 mark:

$$FM(B) = 68.317 + 11.006(0) - 5.828(0) + 2.408(1) - 1.130(2.76) = 67.6$$

The direction of influence is positive for ethnicity and gender, and negative for language and psychosocial background. Age and study programme were not significant predictors of the final mark. This is further demonstrated by the results obtained for a linear regression (forward selection method), which show that both age and study programme are individually non-significant if the effects of all other predictors are held constant (Appendix F, Table F55). The overall model fit was $R^2 = 0.167$, meaning that the 16.7% variance in the final mark can be explained by four of the confounding variables, namely ethnicity, language, gender and psychosocial background. From the results, it follows that the final mark of the White and Indian/Asian ethnic group was, on average, 11.01% higher than that of the Black African and Coloured ethnic group, while holding all other variables fixed. It is also apparent that the final mark of Afrikaans-speaking participants was, on average, 5.83% lower than that of English-speaking participants, and that females, on average, performed 2.41% better than males. Regarding the psychosocial background, for each increase of 1 in the average score obtained on the Adjusted Psychosocial Background questionnaire, the final mark decreased by 1.13% on average, while holding all other variables fixed. Note that a higher average score on the Psychosocial Background Questionnaire correlated with adverse psychosocial conditions. Hence, a higher average score on the Psychosocial Background Questionnaire correlated with a lower final mark. Of the four confounding variables with significant predictor value, ethnicity had the greatest

influence on the final mark ($\hat{B}$ = 11.006, p < 0.001), followed by language ($\hat{B}$ = -5.828, p = 0.001), then gender ($\hat{B}$ = 2.408, p = 0.008) and, lastly, psychosocial background ($\hat{B}$ = -1.130, p = 0.040).

6.4.3.2 The effect of the confounding variables on depression

The results obtained for the confounding variables that made a statistically significant contribution towards predicting depression in the multiple regression model are shown in Table 6.24.

Table 6.24: Results of regression analysis (stepwise selection method) with depression as the dependent variable, N = 438

Independent variable	Coefficient ($\hat{B}$)	t	p
Psychosocial background (PSYC)	5.801	10.642	<0.001
Gender (GEN)	2.662	2.977	0.003
Ethnic group (EG)	-2.154	-2.111	0.035

R^2 = 0.256; Intercept = 0.516

Of the six independent variables (age, gender, ethnic group, study programme, psychosocial background and language), age, language and study programme were not significant contributors in terms of predicting depression in the multiple regression model. By contrast, psychosocial background, gender and ethnicity were significant contributors in terms of predicting depression. Psychosocial background was the strongest predictor ($\hat{B}$ = 5.801, p < 0.001), followed by gender ($\hat{B}$ = 2.662, p = 0.003) and, lastly, ethnic group ($\hat{B}$ = -2.154, p < 0.035). The depression score (D) of an individual can be predicted by psychosocial background, gender and ethnic group by means of the following formula:

$$D = 0.516 + 5.801(PSYC) + 2.662(GEN) – 2.154(EG)$$

The R^2 value shows that the three independent variables that served as significant predictors explain 25.6% of the variation in depression. Psychosocial background and gender were positively associated with depression. For each increase of 1 in the average score obtained on the Adjusted Psychosocial Background Questionnaire, the depression score increased by 5.801, on average, provided that all other variables remained constant. This positive association makes sense given that higher average scores on the

Psychosocial Background Questionnaire correlated with adverse psychosocial conditions. The results also imply that, on average, females showed a higher level of depression than males, while keeping all other variables constant. Regarding ethnicity, which shows a negative association with depression, it can be concluded that, on average, the depression score of the White and Indian/Asian ethnic group was 2.154 lower than that of the Black African and Coloured ethnic group, considering the dummy variables used.

6.4.3.3 The effect of the confounding variables on self-regulated learning

The effect of the six confounding variables (age, gender, ethnic group, study programme, psychosocial background and language) on each of the motivation subscales was determined by performing multiple regression analyses, using the stepwise selection method. The results are shown in Table 6.25.

Table 6.25: Results of regression analysis (stepwise selection method) with different motivation subscales as dependent variables, N = 439

Motivation subscale	Independent variable (significant predictors)	Coefficient ($\widehat{B}$)	t	p
M1	None			
M2 (R^2 = 0.099) (Intercept = 6.325)	Ethnic group Language	-0.373 -0.300	-2.819 -2.012	<0.001 0.045
M3 (R^2 = 0.028) (Intercept = 5.714)	Language	-0.455	-3.550	<0.001
M4	None			
M5 R^2 = 0.035) (Intercept = 5.904)	Language Psychosocial background	-0.415 -0.182	-3.325 -3.092	0.001 0.002
M6 R^2 = 0.089) (Intercept = 3.772)	Psychosocial background Gender Ethnic group	0.352 0.402 -0.382	4.335 3.019 -2.515	<0.001 0.003 0.012

None of the six confounding variables had a significant contributing effect on the prediction of the level of intrinsic goal orientation (M1) and control of learning beliefs (M4). Of the six confounding variables, neither age nor study programme made a significant contribution to any of the six motivational subscales. It should be noted that all interpretations of a specific variable should be seen in the context of keeping all other variables constant.

Ethnic group and language did have an influence on motivational subscale M2 (extrinsic goal orientation, that is, the extent to which students perceive themselves as participating in a task for reasons related to grades, rewards, performance, evaluation by others and competition). On average, the Afrikaans-speaking students demonstrated a lower degree of extrinsic goal orientation compared to the English-speaking students. The White/Asian/Indian ethnic group's score was 0.373 points lower, on average, on the extrinsic goal orientation subscale than that of the Black/Coloured ethnic group. With regard to M3 (task value, that is, perceptions of the course material in terms of interest, importance and utility), only language was seen to make any significant contribution. On average, the Afrikaans-speaking students' score was 0.455 points lower on the task value subscale than that of the English-speaking students. Both language and psychosocial background were identified as making a significant contribution towards the prediction of self-efficacy for learning and performance (M5). On average, the Afrikaans-speaking group achieved a lower score for self-efficacy than the English-speaking group of students. A higher score on the Psychosocial Background Questionnaire correlated with lower self-efficacy; a higher score on the Psychosocial Background Questionnaire was indicative of more adverse psychosocial conditions. M6 (test anxiety) was found to be significantly affected by psychosocial background, ethnic group and gender. The more adverse the psychosocial conditions, the higher the test anxiety. On average, female participants showed a higher test anxiety than their male counterparts, while keeping all other variables constant. On average, the White/Asian/Indian ethnic group displayed lower test anxiety than the Black/Coloured group.

The effect of the six confounding variables (age, gender, ethnic group, study programme, psychosocial background and language) on each of the different learning subscales, obtained by means of multiple regression analyses using the stepwise selection method, are shown in Table 6.26.

Table 6.26: Results of regression analysis (stepwise selection method) with different learning subscales as dependent variables, N = 438

Learning subscale	Independent variable (significant predictors)	Coefficient ($\widehat{B}$)	t	p
L1 (R^2 = 0.021) (Intercept = 4.868)	Gender	0.346	3.024	0.003
L2 (R^2 = 0.023) (Intercept = 4.879)	Gender	0.336	3.177	0.002

Table 6.26: (Continued)

Learning subscale	Independent variable (significant predictors)	Coefficient ($\widehat{B}$)	t	p
L3 (R^2 = 0.073) (Intercept = 5.714)	Gender	0.673	5.873	<0.001
L4 (R^2 = 0.017) (Intercept = 3.955)	Psychosocial background	0.186	2.711	0.007
L5 (R^2 = 0.020) (Intercept = 4.521)	Gender	0.267	2.958	0.003
L6 (R^2 = 0.068) (Intercept = 4.800)	Psychosocial background	-0.175	-3.266	0.001
	Ethnic group	0.266	2.656	0.008
	Gender	0.185	2.101	0.036
L7 (R^2 = 0.036) (Intercept = 5.188)	Gender	0.371	3.132	0.002
	Psychosocial background	-0.148	-2.150	0.032
L8	None			
L9 (R^2 = 0.013) (Intercept = 4.012)	Psychosocial background	-0.181	-2.401	0.017

None of the six confounding variables had a significant contributing effect on the resource management strategy: peer learning (L8). Gender had a significant effect on six of the nine learning strategies, namely L1 (cognitive and metacognitive strategies: rehearsal), L2 (cognitive and metacognitive strategies: elaboration), L3 (cognitive and metacognitive strategies: organisation), L5 (cognitive and metacognitive strategies: metacognitive self-regulation), L6 (resource management strategies: time and study environment) and L7 (resource management strategies: effort regulation). For all six of these learning strategy subscales, female participants scored higher than their male counterparts, on average, while keeping all other variables constant. Psychosocial background was a significant contributor in terms of predicting learning strategies L4 (cognitive and metacognitive strategies: critical thinking), L6 (resource management strategies: time and study environment), L7 (resource management strategies: effort regulation) and L9 (resource management strategies: help seeking). While psychosocial background was negatively associated with L6, L7 and L9, interestingly, it was positively associated with L4. This

means that, on average, students with an adverse psychosocial background applied previous knowledge to new situations to a larger degree than those with a more favourable psychosocial background. Apart from gender and psychosocial background, ethnic group was also a significant contributor in terms of predicting L6 (management of time and study environment). On average, the White/Indian/Asian group showed a higher tendency to manage their time and study environment compared to the Black/Coloured group.

In the next section, a final selection model for predicting academic achievement is introduced. This final model was created while taking into consideration all of the confounding variables, as well as depression and the different self-regulated learning dimensions.

6.4.4 Final Selection Model for Determining the Effect of Depression and Self-regulated Learning on Academic Achievement

In the final analysis, an all-inclusive SPSS multiple regression analysis following a stepwise selection approach was performed. This included all of the different variables (that is, the final BLGY1513 mark as dependent variable, and depression, motivation and learning strategies as well as the six confounding variables as independent variables). The six confounding variables were included in the analysis since previous analyses (Section 6.4.3) showed that the confounding variables had an effect on the final mark, depression and learning strategies, though to a varied degree. Since anxiety and stress were not defined as independent variables in the study, and were also not significant predictors, it was decided that these two variables would be excluded when creating the final model. The final model, which is based on a multiple regression analysis following a stepwise selection approach, represents the “best” model (among all models considered) in that it consists of all the independent variables for the prediction of the dependent variable. Whereas a multiple regression analysis provided the researcher with a tool to study the effect of all possible independent variables on the dependent variable simultaneously, a simple linear regression only analysed one independent variable at a time in terms of its predictive value of a dependent variable. Performing simple regression analyses will not necessarily yield the same coefficients obtained in a multiple regression analysis. For example, a simple linear regression analysis to determine the predictive value of L6 in terms of the final BLGY1532 mark showed that L6 was significant in

predicting the final mark ($\hat{B}$ = 2.816; p < 0.001). However, in a multiple regression analysis which includes all independent variables at the same time, the predictive value of L6 in terms of the final mark becomes insignificant ($\hat{B}$ = 0.029; p = 0.618). In simple regression analysis to determine the predictive value of L6 in terms of the final BLGY1532 mark, all other predictors (apart from L6) *are ignored* in the analysis. In multiple regression, the coefficient of L6 represents the average effect of L6 on the final BLGY1513 mark when all other predictors *are held constant.* L6 acts as a surrogate for other variables with which it is correlated in the simple linear regression (James, Witten, Hastie & Tibshirani, 2013:74). This means that it receives credit for the predictive value of other independent variables, such as L7 (according to Table F52, Appendix F, the correlation between L6 and L7 is 0.563). In the multiple regression analysis, this false credit is eliminated. It is important to note that neither simple linear regression nor multiple linear regression proves that the predictors are necessarily causally related to the dependent variable.

The six assumptions that must be met for a valid multiple regression, as clarified in Section 6.4.3, were also tested for the final model analysis and all assumptions were met.

Assumption 1: There is a linear relationship between the dependent variable and the independent variables. This assumption could not be tested for the categorical confounding variables (ethnicity, gender, language and study programme) since all of these variables consisted of two possible dummy values only. The scatterplots for the dependent variable (final BLGY1513 mark) against the other continuous independent variables did not indicate any non-linearity. Figure 6.19 shows the scatterplot obtained when plotting the final mark against the depression score.

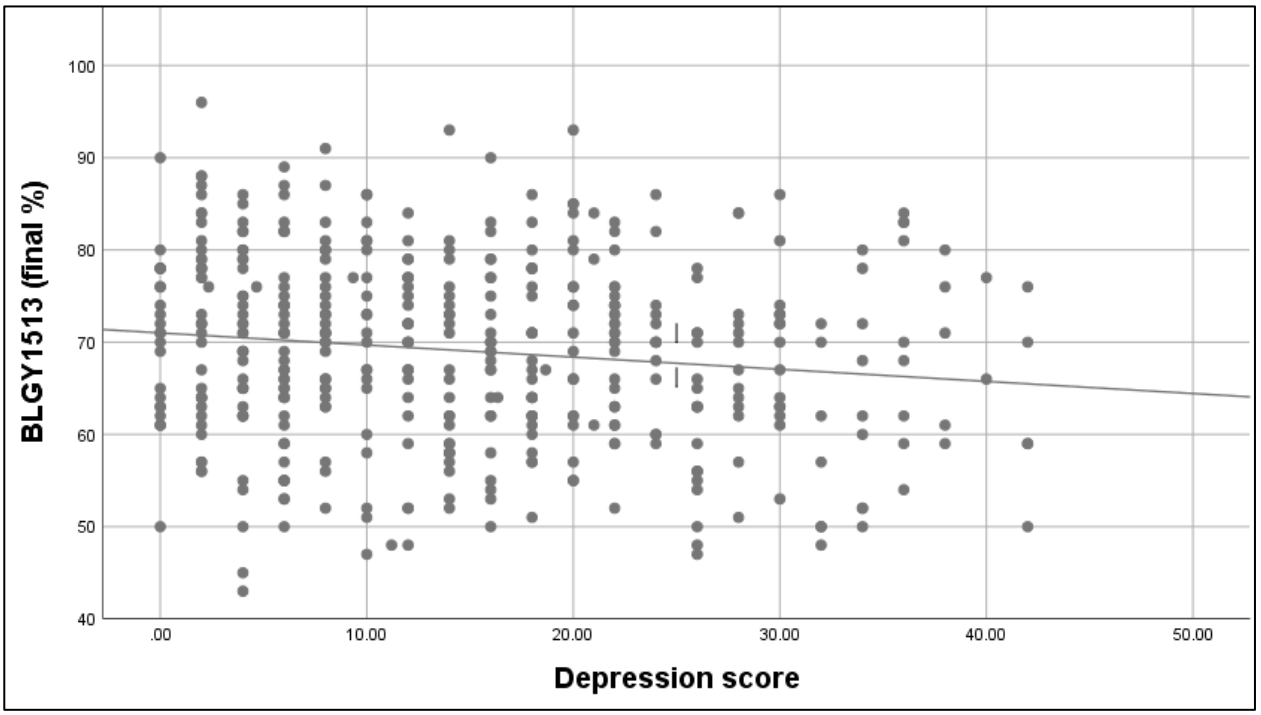


Figure 6.19: Scatterplot of the final BLGY1513 mark against the depression score

Assumption 2: There is no multicollinearity in the data. The VIF values were all below 10 (the largest being 2.383) and the tolerance values above 0.2 (the smallest being 0.420), showing that there was no multicollinearity in the data and that the second assumption had been met.

Assumption 3: The values of the residuals are independent. The Durbin-Watson value obtained was 2.054, which is close to a value of 2, indicating that the third assumption had been met.

Assumption 4: The residuals are equally distributed – homoscedasticity. Plotting the standardised residuals of the dependent variable obtained from the model against the predicted standardised dependent variable values of the model (Figure 6.20) did not create a cone or fan shape. Thus, this assumption had been met.

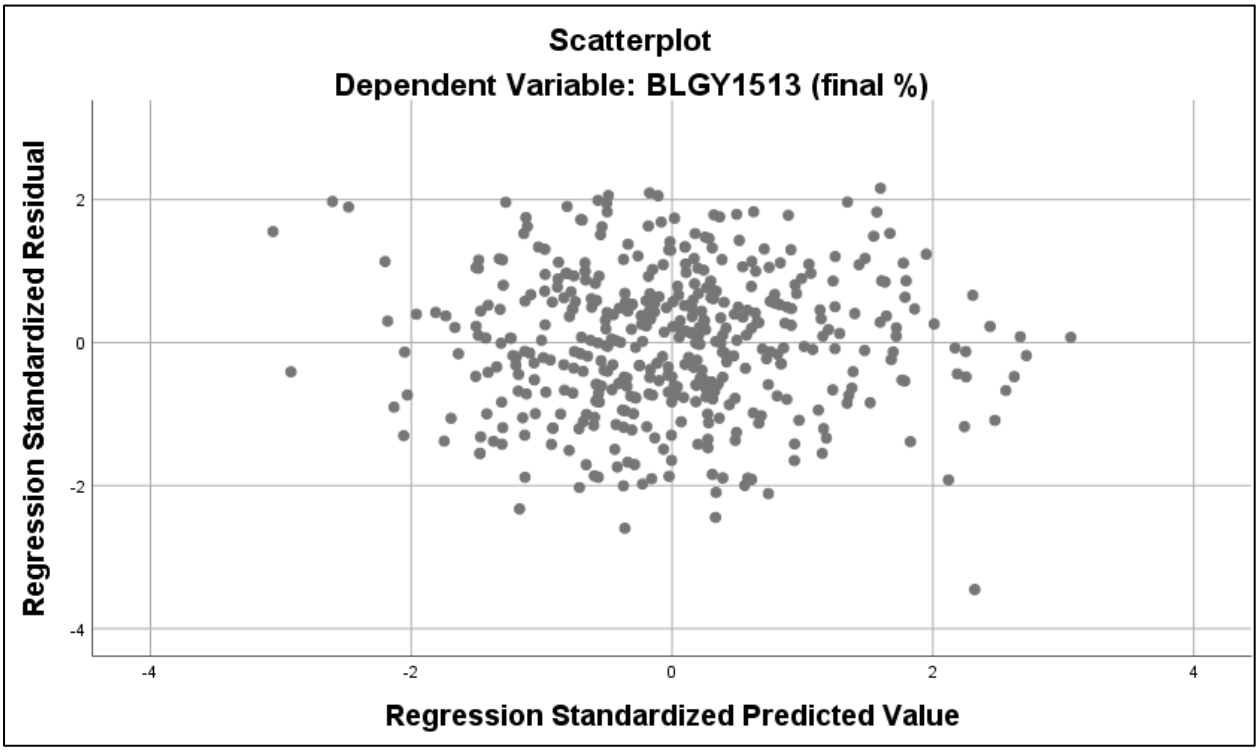


Figure 6.20: Scatterplot of standardised residuals of the dependent variable against the predicted standardised dependent variable values (final regression model)

Assumption 5: The values of the residuals of the regression follow a normal distribution. Both the histogram (Figure 6.21) and the probability-probability (P-P) plot (Figure 6.22) show that the residuals did indeed follow a normal distribution.

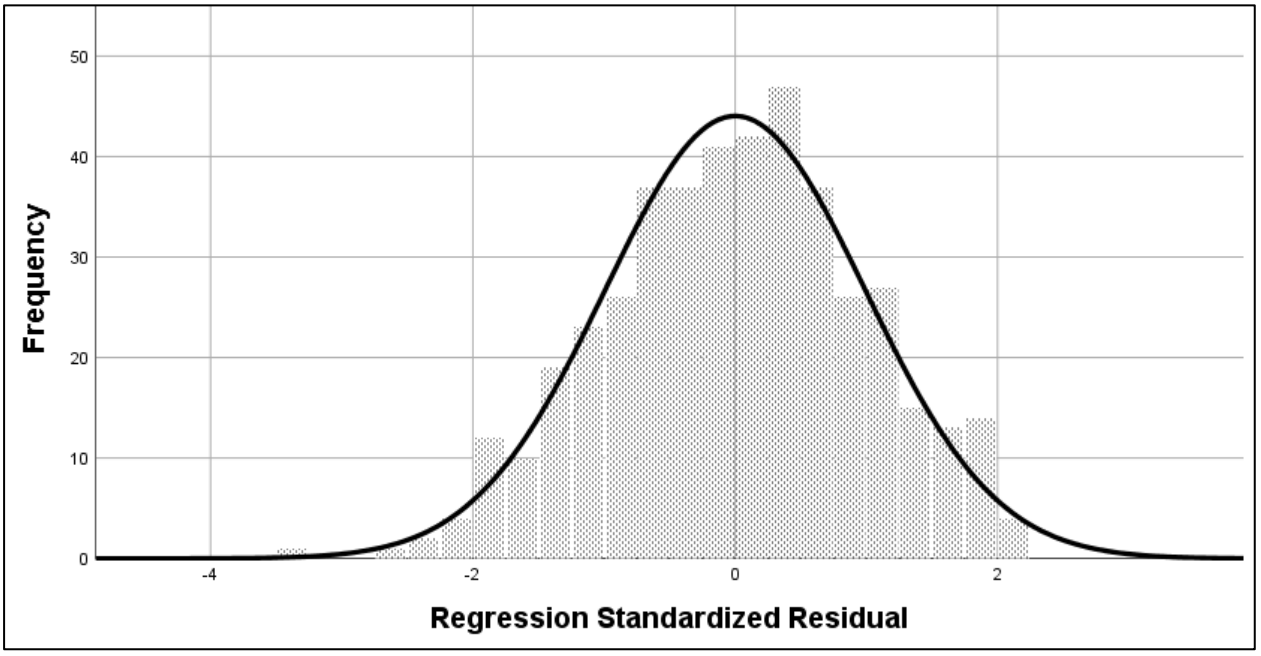


Figure 6.21: Histogram to confirm normal distribution of residual values of the final regression model

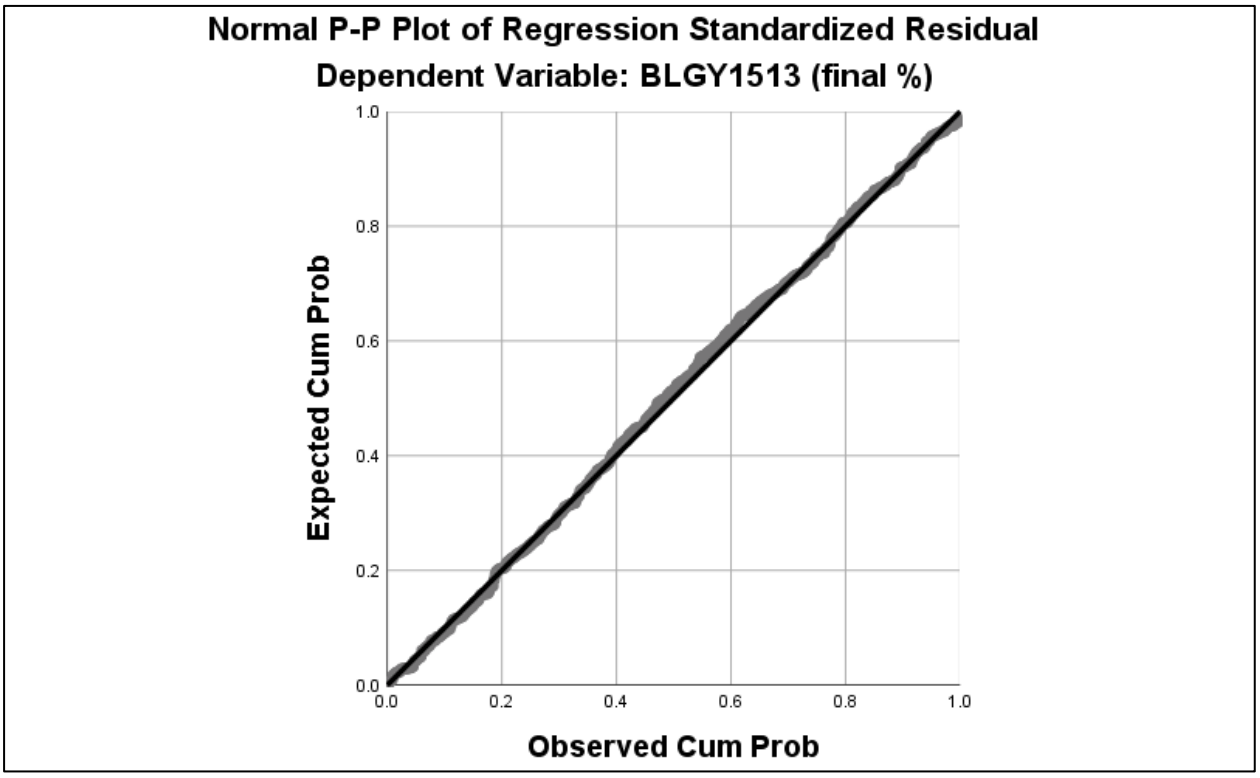


Figure 6.22: P-P plot to confirm normal distribution of residual values of the final regression model

Assumption 6: There are no significant unusual data points (outliers, leverage and influential points). The Cook's Distance values obtained were all well below 1, confirming that this assumption had been met.

In the final model obtained by means of multiple linear regression, the independent variables that were identified as statistically significant predictors of academic performance were gender, ethnicity, language, motivation subscale M5 and learning strategies L7 and L8. None of the other independent variables contributed significantly to the prediction of the dependent variable, namely the final BLGY1513 mark. The results for statistically significant predictors in the final model are shown in Table 6.27. According to these results, the final BLGY1513 mark (FM(B)) of an individual within the population could be predicted by ethnic group, L7, M5, L8, language and gender by means of the following formula:

FM(B) = 48.579 + 10.553(EG) + 1.758(L7) + 1.970(M5) – 0.746(L8) – 3.982(LAN) + 2.066(GEN)

Table 6.27: Final model of regression analysis (stepwise selection method) with dependent variable final BLGY1513 mark against all independent variables, N = 438

Independent variable	Coefficient ($\widehat{B}$)	t	p
Ethnic group (EG)	10.553	7.635	<0.001
Effort regulation (L7)	1.758	4.630	<0.001
Self-efficacy (M5)	1.970	4.296	<0.001
Peer learning (L8)	-0.746	-2.663	0.008
Language (LAN)	-3.982	-2.536	0.012
Gender (GEN)	2.066	2.444	0.015

R^2 = 0.284; Intercept = 48.579

This final model explained 28.4% of the variation in the final BLGY1513 mark, with ethnic group as the largest predictor. On average, the White and Indian/Asian ethnic group has a significantly higher predicted final mark (10.55% higher) than the Black African and Coloured ethnic group, holding all other variables fixed.

Learning strategy subscale L7 (resource management strategy: effort regulation) and motivation subscale M5 (expectancy component: self-efficacy for learning and performance) have comparable prediction values, with $\hat{B}$ = 1.758 , p <0.001 for L7 and $\hat{B}$ = 1.970, p < 0.001 for M5. The association between L7 and the final BLGY1513 mark, and the association between M5 and the final BLGY1513 mark, were both positive. This means that students with high effort regulation, that is, achieving study goals even under difficult circumstances or despite distractions, had a higher final BLGY1513 mark. For each increase of 1 on the L7 score, the increase in the BLGY1513 mark was, on average, 1.76%, keeping all other variables constant. Similarly, students with a high level of self-efficacy, that is, self-appraisal of their ability to master a task, had a higher final BLGY1513 mark. For each increase of 1 on the M5 score, the increase in the BLGY1513 mark was, on average, 1.97%, keeping all other variables constant. Surprisingly, there was a negative association between peer learning (L8) and the final BLGY1513 mark; albeit a small association, it was still significant. However, when performing a multiple regression analysis (forward selection method), this association became statistically insignificant. Finally, both language and gender were also identified as significant predictors of the final BLGY1513 mark in this final model. The predicted final mark of Afrikaans-speaking participants was, on average, 3.98% lower than that of the English-speaking participants

(keeping all other variables constant), and female participants performed 2.07% better on average.

In the final section of this chapter, the results obtained as represented in the previous sections, will be used to answer the research questions posed in this study.

6.4.5 Discussion of Research Questions

In order to make the discussion of the research questions more comprehensible, they are repeated here. The primary research question proposed in this study was formulated as follows: “Do depression and self-regulated learning predict academic achievement in a first-year Biology module at the UFS, and are these predictors associated?” This research question was subdivided into the following research questions:

- Is there an association between depression and self-regulated learning, and do these two constructs influence students’ academic performance in a first-year Biology module at the UFS?
- How does the influence of depression and self-regulated learning on academic achievement in a first-year Biology module compare between students in access programmes and those in mainstream programmes?
- How does the prevalence of depression among access programme students compare with that of mainstream students?
- Are mainstream students more prone to applying self-regulated learning techniques than those in access programmes?

In the discussion that follows, an attempt will be made to answer each of these research questions individually.

6.4.5.1 Research Question 1: Is there an association between depression and self-regulated learning and do these two constructs influence students’ academic performance?

Correlation coefficients obtained in this study (Tables 6.17 and 6.18) show that, for the total group, there were statistically significant negative correlations between depression

and self-regulated learning dimensions M1 (intrinsic goal orientation), M3 (task value), M5 (self-efficacy for learning and performance), L2 (cognitive and metacognitive strategies: elaboration), L5 (metacognitive self-regulation), L6 (time and study environment), L7 (effort regulation) and L9 (help seeking). These negative associations imply that lower depression levels correlate with increased utilisation of these identified self-regulated learning dimensions. There was a positive correlation between depression and one of the self-regulated learning dimensions, namely M6 (test anxiety), suggesting that students with higher levels of depression are more prone to exhibit higher levels of test anxiety.

A statistically negative correlation between depression and the final BLGY1513 mark (that is, academic performance) was observed for the total group as well as the access programme group (Tables 6.15 and 6.16), suggesting that for some students, depression may lead to poorer academic performance. This correlation was not observed for the mainstream programme students. However, the results of a Duncan's post-hoc test revealed that there was a statistically significant difference between the average final Biology mark obtained by the group of students experiencing extremely severe depression and those who had normal depression levels. The average Biology mark of the first group was 66.89% whereas the average Biology mark for the second group was 70.57%. Nevertheless, when considering all factors in the final model proposed in Section 6.4.4, the effect of other factors overshadowed the effect of depression on academic performance. Hence, depression did not emerge as a significant predictor of academic performance in the final model. During a correlation analysis, as is the case during simple linear regression, only two variables at a time are analysed to determine whether there is a statistically significant correlation. As explained in Section 6.4.4, depression may act as a surrogate for other variables with which it is also correlated, therefore receiving credit for the effect of other variables that do actually correlate with academic performance. In the final multiple regression analysis, all variables were considered and any false credit eliminated. Subsequently, the researcher is unable to conclude unequivocally that depression influences academic performance.

It was found that certain self-regulated learning dimensions do, in fact, influence students' academic performance (Tables 6.15 and 6.16). For instance, statistically significant positive correlations were observed between the academic performance of the total group and self-regulated learning dimensions, such as intrinsic goal orientation (M1), task value

(M3), control of learning beliefs (M4), self-efficacy for learning and performance (M5), cognitive and metacognitive strategy: elaboration (L2), cognitive and metacognitive strategy: organisation (L3), cognitive and metacognitive strategy: metacognitive self-regulation (L5), resource management strategy: time and study environment (L6) and resource management strategy: effort regulation (L7). The academic performance of the total group is, however, negatively influenced by the self-regulated learning dimension test anxiety (M6). However, taking all factors in consideration, the only self-regulated learning dimensions that emerged as significant predictors of academic performance in the final multiple regression model were resource management strategy: effort regulation (L7, positive association), self-efficacy (M5, positive association) and peer learning (L8, negative association).

6.4.5.2 Research Question 2: How does the influence of depression and self-regulated learning on academic achievement in a first-year Biology module compare between students in access programmes and those in mainstream programmes?

The following can be inferred by comparing the results of the two programmes (see the correlation results presented in Tables 6.15-6.18), that is, the access programme and mainstream programme:

- Depression has a statistically significant negative influence on the academic performance of access programme students, but there is no statistically significant influence of depression on the academic performance of the mainstream programme students.
- While the following self-regulated learning dimensions have a statistically significant positive association with the academic performance of access programme students, they do not have any statistically significant effect on the academic performance of mainstream programme students:
    - M1 (intrinsic goal orientation); and
    - M3 (task value).
- Self-regulated learning dimensions that have a statistically significant influence on the academic performance of mainstream programme students, but which do not

have any statistically significant effect on the academic performance of access programme students, are:

- M4 (control of learning beliefs), positive association;
- L3 (cognitive and metacognitive strategies: organisation), positive association; and
- L8 (resource management strategies: peer learning), negative association.

- Self-regulated learning dimensions that have a statistically significant association with the academic performance of both mainstream and access programme students are:
  - M5 (self-efficacy for learning and performance), positive association;
  - M6 (test anxiety), negative association;
  - L2 (cognitive and metacognitive strategies: elaboration), positive association;
  - L5 (cognitive and metacognitive strategies: metacognitive self-regulation), positive association;
  - L6 (resource management strategies: time and study environment), positive association; and
  - L7 (resource management strategies: effort regulation), positive association.

6.4.5.3 Research Question 3: How does the prevalence of depression among access programme students compare with that of mainstream students?

The results obtained by means of an independent-samples t-test performed to compare the mean depression scores of the two study programmes (Section 6.4.2.2) showed that there was a statistically significant difference between the average depression scores of the students from the two study programmes. The mean depression score of the mainstream programme students was 13.58 compared to that of the access programme students, which was 15.76. The descriptive statistics results (Section 6.3.3) also show that the percentage of students per study programme suffering from moderate to severe levels of depression was higher for access programme students than for mainstream programme students. However, the regression analysis performed to determine the predictors among the confounding variables (study programme included) of depression levels (Section 6.4.3.2) showed no statistically significant influence of study programme on depression levels. The effect of study programme on the overall depression score was

overshadowed by the confounding variables psychosocial background, gender and ethnicity.

6.4.5.4 Research Question 4: Are mainstream students more prone to applying self-regulated learning techniques than those in access programmes?

Table 6.22 provides a summary of the results of the different independent-samples t-tests conducted to compare the mean scores of the participants in the mainstream programme and those in the access programme with regard to the different self-regulated learning dimensions. From this table, it is clear that there was no significant difference between the students in two study programmes in terms of their application of self-regulated learning strategies. Only two of the fifteen dimensions showed a statistically significant difference between the two study programme groups, with access programme students obtaining a statistically significant higher score for dimensions M2 (extrinsic goal orientation) and M6 (test anxiety). Since extrinsic goal orientation focuses on external rewards (for example, status among peers, obtaining better marks than the rest of the group), the task at hand is only a means to an end. The access programme students also exhibited a higher level of test anxiety than the mainstream programme students. The results obtained for the regression analyses performed to determine the effect of all confounding variables (study programme included) on the different subscales of the motivation and learning strategies (Section 6.4.3.3) showed that the study programme did not have a statistically significant effect on any of the fifteen self-regulated learning dimensions, if all confounding variables were taken into account. Generally speaking, the answer to the last research question is therefore that mainstream students are not more prone to applying self-regulated learning techniques than those in access programmes.

6.5 CONCLUSION

In this chapter, the results of the statistical analyses of the data collected for this study were presented and discussed. Descriptive statistics were used to represent the data set by making use of charts, graphs and tables. Various inferential statistical methods, including linear regression analysis, t-tests and correlation analysis, were used to draw conclusions about the characteristics of the population based on the sample data. Based on the descriptive and inferential statistical findings, the research questions raised in this

research study were answered. The final chapter of this thesis (Chapter 7) presents an evaluation of the findings and provides recommendations based on the results obtained in Chapter 6. The limitations of the study, as well as further meaningful research, will also be identified in Chapter 7.

CHAPTER SEVEN
FINAL CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

7.1 INTRODUCTION

A large number of studies have been conducted either on the effect of depression on academic achievement, or on the effect of self-regulated learning strategies on academic achievement. However, few have researched the effect of both depression and aspects of self-regulated learning on academic achievement. The results obtained in the present study categorically reveal that levels of depression among students at a higher education institution in South Africa are of great concern. This is substantiated by the research results obtained by other studies conducted worldwide assessing the depression levels of higher education students (Field, Diego, Pelaez, Deeds & Delgado, 2012:199; Acharya, Jin & Collins, 2018:657; Lun, Chan, Ip, Ma, Tsai, Wong, Wong, Wong & Yan, 2018:466; Zhao & Zhang, 2018:920).

In this study, the absence of a statistically significant correlation between depression and academic achievement was observed for the mainstream group of first-year students who were registered for the BLGY1513 module. Similar results were obtained in other research studies (Breslau, Lane, Sampson & Kessler, 2008:714; Bahmani, Faraji, Faraji, Holsboer-Trachsler & Brand, 2017:S541; Wyatt, Oswalt & Ochoa, 2017:183). In contrast, other studies observed a significant negative correlation between depression and academic achievement similar to the effect observed for the access programme students in the current study who were registered for the BLGY1513 module (Hysenbegasi, Hass & Rowland, 2005:150; Keyes, Eisenberg, Perry, Dube, Kroenke & Dhingra, 2012:130; Mihăilescu, Diaconescu, Ciobanu, Donisan & Mihailescu, 2016:S284). However, since depression did not emerge as a significant predictor of academic performance in the final multiple regression model, it cannot be concluded that depression is indeed a predictor of lower academic performance.

Regarding self-regulated learning techniques, a myriad of research studies have confirmed the importance of specific self-regulated learning techniques in terms of academic performance (Kitsantas, Winsler & Huie, 2008:60; Broadbent & Poon, 2015:11; Ning & Downing, 2015:1340; DiFrancesca, Nietfeld & Cao, 2016:234; Dörrenbächer & Perels, 2016a:238; Sun, Xie & Anderman, 2018: 49). The positive impact of the self-regulated learning strategies, effort regulation and self-efficacy, in particular, as observed in the final model of this study on academic achievement, has also been identified in other studies (Kitsantas, Winsler & Huie, 2008:60; Sitzmann & Ely, 2011:431; Richardson, Abraham & Bond, 2012:370; Komarraju & Nadler, 2013:70; Broadbent & Poon, 2015:12; Honicke & Broadbent, 2016:21; Jung, Zhou & Lee, 2017:37; Sun, Xie & Anderman, 2018:49).

A limited number of studies (Mega, Ranconi & De Beni, 2014:128; Van Nguyen, Laohasiriwong, Saengsuwan, Thinkhamrop & Wright, 2015:65) have researched the relationship between self-regulated learning strategies, mental health and/or emotions and academic achievement, as explored in the current study. These studies also have found that negative emotions and/or depression negatively influence the application of self-regulated learning techniques and, consequently, have a negative impact on academic achievement.

7.2 CONCLUSION AND RECOMMENDATIONS OF THE STUDY

The principal aim of this study was to research the probability that depression and self-regulated learning predict the academic performance of students in a first-year Biology module at the UFS and to establish whether depression and self-regulated learning are associated. The study has shown that depression, self-regulated learning dimensions and academic performance are indeed interlinked. Certain self-regulated learning dimensions have a positive effect on academic achievement, and must be encouraged and developed in first-year students. Although the final multiple regression model did not show that depression had a statistically significant effect on academic performance, statistical analyses did, in fact, show that there was a negative correlation between depression and certain self-regulated learning strategies for both study programmes which, subsequently, indirectly influenced the academic achievement of students in both programmes.

First and foremost, the high levels of depression among first-year students in the Faculty of Natural and Agricultural Sciences must be further evaluated and the problem addressed. More should be done to evaluate the mental health of first-year students in this faculty and to support those presenting with mental health issues. On the Bloemfontein Campus, where the mainstream programme students attend classes, the Student Counselling and Development Support Service offers psychological counselling at no cost for registered UFS students. This service should be broadly advertised to new first-year students, and should actively campaign to counteract the negative perception that continues to exist regarding mental illness. Unfortunately, there is no counsellor available on a full-time basis on South Campus, where the access programme students attend classes. Currently, a counsellor, who is only available on Thursdays, is responsible for assisting approximately 1 700 access programme students on South Campus. A process is underway to appoint a counsellor on a full-time basis. However, given the results of this study, one full-time counsellor would not be sufficient in terms of having to deal with the mental health problems of all access programme students on the UFS South Campus.

A comparison between the average BLGY1513 marks of the two study programmes showed that, although there was a statistically significant difference between them, this difference was only 3.62%. In view of the academic results obtained by the access programme students, the team involved with the access programmes must be commended for its efforts to support these students in obtaining results that compare favourably with those of mainstream students. However, given the high incidence of depression among this group of students, a more balanced approach is needed. The weekly programme of the access programme students does not leave much time for relaxation and recreational activities as demonstrated by the timetables provided in Appendix F (Tables F56 and F57). Table F56 is the first semester timetable for one the access programme groups who partook in this study in 2017. Table F57 is the first semester timetable of a 2019 access programme group, showing that the access programme students' free time has been curtailed even more. Furthermore, it should be noted that Friday afternoons and some Saturday mornings are reserved for the writing of semester tests, and that an extra one-hour Chemistry session will be added as from 2020. Apart from limited leisure time, there is also not much opportunity for counselling, should a student need it. An in-depth evaluation of the modules for which access programme

students are registered during their first year of study is thus recommended. Interviewing students who completed their first year of study in the access programmes can also provide valuable insight into the shortcomings of the programme. The UFS Centre for Teaching and Learning could play a leading role in this regard. It might also be fruitful to liaise with other universities that have extended programmes in their Natural Sciences Faculties to learn from their experiences.

This study has also shown that particular learning strategy dimensions have a positive correlation with academic achievement. Studies have shown that learning strategies can be developed and enhanced, and different techniques to improve different self-regulated learning strategies are available in the literature (Zimmerman, 2002:69; Yong & Yeo, 2012:118; González-Pienda, Fernández, Bernardo, Núñez & Rosário, 2014:3; Dörrenbächer & Perels, 2016a:231; Dörrenbächer & Perels, 2016b:55; Ariel & Karpicke, 2018:52). It has even been suggested that depression can be combatted by encouraging self-regulated learning strategies (VanderLind, 2017:46). These techniques and interventions should be researched, adapted if necessary and implemented at first-year level at the UFS. There are compulsory modules for which mainstream programme students and access programme students are registered during their first year of study that lend themselves to such interventions. These include the UFS101 module (mainstream programme), and the life-long learning module, SCNS1508 (access programme). UFS101 is a well-structured module that covers different topics, such as study techniques, time management and goal setting. Mental health is also addressed in the curriculum, but only during the second semester. The researcher would like to suggest that the discussion on mental health be moved to the beginning of the year and that the development of specific learning strategies as identified in this research, especially self-efficacy and effort regulation, be addressed vigorously in the UFS101 module. It should be reiterated that one of the MSLQ subscales, namely test anxiety (M6), showed a significant negative correlation with academic achievement, and should also be addressed.

Lastly, it is recommended that the life-long learning module offered to the access programme students be replaced with the well-structured UFS101 module since many of the topics covered in the two modules overlap. This would mean that the access programme students need not register for the UFS101 module in their second year of

study. Furthermore, mainstream students who obtain 64% or more for the academic literacy component of the National Benchmark Tests (NBT) need not register for a language foundation module. However, for all access programme students it is compulsory to register for a language foundation module. It is recommended that the same rule be applied to both groups of students, which would provide those in the access programme who obtained 64% or more for academic literacy with more time for their other academic activities.

7.3 LIMITATIONS

The use of self-report questionnaires can pose a problem in terms of the truthfulness of the participants when completing the questionnaires, especially if the questions are of a sensitive nature. Questions on self-report questionnaires are also inflexible, therefore the items on the questionnaire does not always give the participants the freedom to express themselves or their emotions. Moreover, the DASS-21 questionnaire as well as the MSLQ were developed and tested for reliability and validity in the Western world. Given that South Africa, with its culturally diverse population, is not a first world country, using said questionnaires could have had an effect on the interpretation of the questions by the participants. Although the reliability of the questionnaires were established as part of this study by determining the Cronbach alpha coefficient, the validity, as established by other researchers in other countries, was not confirmed in this study by correlating the scores with a similar instrument. As was explained in Section 5.4, all the candidates did complete the questionnaires in English, which is, for most participants, their second language. This could also have led to poor understanding of some of the questions on the questionnaires, even though the researcher was available to answer questions during the completion of the questionnaires by the participants. Furthermore, this study was limited to first-year students in the Faculty of Natural and Agricultural Sciences at the UFS who were enrolled in a first-year Biology module. It is not necessarily true that the results obtained would be the same if repeated for another module within the Faculty of Natural and Agricultural Sciences at the UFS or for a module offered by another faculty of the UFS. The study was also limited to a single faculty of one university in South Africa with a unique student population. Therefore, it is not necessarily possible for the results to be extrapolated to the student populations of other universities. In this study, specific confounding variables were identified that might have an effect on the results obtained. There might be other

confounders, not included in the study, which could influence the results. Lastly, the study was restricted to a specific week within the academic calendar, suggesting that if the study had been conducted during a different time of year, the results could have been different.

7.4 FURTHER RESEARCH

The level of depression among all UFS students should be evaluated. Based on the current research, it is possible that depression is a problem among the total student population of the UFS. In-depth research to determine the reasons as to why depression levels among access programme students are much higher than that of mainstream students also necessitates further investigation. Since this study was restricted to first-year students in the Faculty of Natural and Agricultural Sciences at the UFS who were enrolled in a first-year Biology module, it makes sense to conduct a similar study with students in the same faculty, but where a more mathematically-orientated module is used to evaluate academic achievement, particularly in view of the fact that most students in both study programmes included in this study did, in fact, pass the BLGY1513 module. Similar studies can also be extended to other faculties of the UFS. It would also be interesting to conduct a similar study with another year group and to compare the results with those of the current study. Furthermore, since the question in the Biographical Information Questionnaire (Appendix B), regarding whether a student was a first-generation student or not, was misunderstood by many of the students, it was decided that it would not be used in any of the analyses. Rather, it is suggested that this question be rephrased and evaluated in future research since it could offer valuable information. In this study, the focus fell on investigating the effect of the application of self-regulated learning techniques on academic performance, as well as on the evaluation of the possible effect that depression might have on academic performance. Many other factors, for example ethnicity, could also have been identified as focus points. Given the history of South Africa, it would be enlightening to further evaluate the effect of ethnic grouping on academic performance as an independent variable. Lastly, there may be other factors (confounding variables) not identified in this study that may also significantly influence academic performance. It would be prudent to identify other possible factors that should be included as confounding variables in further studies.

7.5 CONCLUSION

As was conveyed in Section 3.5, recent studies to determine the incidence of depressive orders among South African university students are scarce. Also, few studies have been conducted in South Africa or elsewhere to research both the effect of depression and aspects of self-regulated learning on academic achievement (see Section 7.1). The current study has contributed meaningfully to the existent body of knowledge available on these topics. Particularly, this study has shown that depression, self-regulated learning dimensions and academic performance are indeed interconnected and that the group of students studied in this research did present with high levels of depression. It is recommended that the UFS, and in particular, the UFS Student Counselling and Development Support Service, must put more support structures in place to assist these students to improve their mental health. Additionally, it is clear that specific self-regulated learning dimensions have an effect on the academic performance of students. The UFS should make a conscientious effort to assist students to improve those self-regulated learning dimensions that can lead to improved academic performance. In this regard, the UFS101 team could play an integral role. Lastly, an in-depth evaluation by the UFS Centre for Teaching and Learning of the overloaded access programme is recommended.

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APPENDIX A

CONSENT FORM

DEPRESSION AND SELF-REGULATED LEARNING AS PREDICTORS OF FIRST-YEAR STUDENTS' ACADEMIC PERFORMANCE: A CASE STUDY

DECLARATION BY PARTICIPANT:

Participant student number										

A I, the undersigned, confirm that:

1. I have been asked to participate in the above-mentioned research survey carried out by Rina Meintjes, lecturer in the Department of Chemistry at the University of the Free State (UFS). The study will take place under the supervision of Dr S. Brüssow (Director: APS: Directorate for Institutional Research and Academic Planning) towards a PhD in Higher Education Studies at the UFS.

2. It has been explained to me that:

2.1. The purpose of the research survey is to collect information on the incidence of depression, as well as the application of self-regulated learning techniques, among mainstream and access programme first-year students in the Faculty of Natural and Agricultural Sciences of the University of the Free State. The effect of these two determinants on academic performance in a first semester, first-year Biology module will also be investigated. The results obtained by access programme students will be compared with those obtained by mainstream students. This will ensure that appropriate support can be developed in order to help students and to improve the pass rate of first-year students.

2.2. In order to carry out the research, all first-year students on the Bloemfontein and South Campuses of the UFS who are registered for the BLGY1513 module for the first time (in total approximately 900 students) are invited to participate in this study.

2.3. In order for the researcher to collect the information needed to carry out the research, I will be asked a number of questions regarding:

- biographical details;
- my psychosocial background;
- my motivated strategies for learning (by completing the Motivated Strategies for Learning Questionnaire or MSLQ); and
- my levels of depression, anxiety and stress (by completing the short version of the Depression, Anxiety and Stress Scales or DASS-21).

2.4. I will be asked to answer these questions once only and it will take approximately 45 minutes to answer all the questions.

2.5. I can refuse to participate in this research survey without giving a reason for doing so. If I refuse, it will not be held against me in any way.

2.6. By participating in this research survey, I will help to identify possible factors that can influence the academic performance of first-year students at the UFS, which may lead to the future enhancement of the learning experience of first-year students.

2.7. All information will remain confidential. Records that might identify me will only be available to people working on the study. No conscious effort will be made to connect a specific set of data to a participant and my name will not be recorded anywhere. The data collected may be used for future research that might be published in a journal, but individual participants will not be identifiable in such publications.

2.8. All completed questionnaires will be stored for five years in a locked filing cabinet in the office of the researcher for future research. Electronic information will be stored on a password-protected computer. Future use of the stored data will be subject to further Research Ethics review and approval where applicable. After five years, the completed questionnaires will be shredded.

2.9. I will receive no reward or payment for participating in this research and taking part in the research will not cost me anything.

2.10. The study has received written approval from the Education Ethics Committee of the UFS.

2.11. I understand that I will have no direct access to my individual survey results. However, I may contact the researcher, Rina Meintjes, if I am interested in the final research findings.

2.12. The information in this consent form was explained to me in English or Afrikaans and I confirm that I have a good command of the language used and understood the explanations. ***I understand that the questionnaires are in English only.*** I was also given the opportunity to ask questions about things I did not understand clearly.

2.13. I was under no pressure to take part in this research survey.

B I hereby agree voluntarily to take part in this research survey.

Signature: _____ Date: _____

TOESTEMMINGSVORM

DEPRESSION AND SELF-REGULATED LEARNING AS PREDICTORS OF FIRST-YEAR STUDENTS' ACADEMIC PERFORMANCE: A CASE STUDY

VERKLARING DEUR DEELNEMER:

Deelnemer se studentenommer										

A Ek, die ondergetekende, bevestig die volgende:

1. Ek is gevra om deel te neem aan die bogenoemde navorsingsondersoek wat uitgevoer word deur Rina Meintjes, lektor in die Department Chemie aan die Universiteit van die Vrystaat (UV). Die studie sal plaasvind onder die toesig van Dr. S. Brüssow (Direkteur: ABS: Direktoraat vir Institusionele Navorsing en Akademiese Beplanning) ter verkryging van 'n PhD in Hoër Onderwysstudies aan die UV.

2. Dit is aan my verduidelik dat:

2.1. Die doel van die navorsingsondersoek is om inligting te versamel rakende die voorkoms van depressie, asook die toepassing van selfgereguleerde leertegnieke, onder eerstejaarhoofstroomstudente en eerstejaartoegangsprogramstudente in die Fakulteit Natuur- en Landbouwetenskappe van die Universiteit van die Vrystaat. Die effek van hierdie twee determinante op die akademiese prestasie in 'n eerste semester, eerstejaar biologiemodule sal ook ondersoek word. Resultate verkry vir toegangsprogramstudente sal vergelyk word met resultate verkry vir hoofstroomstudente. Dit sal verseker dat geskikte ondersteuning ontwikkel kan word om studente te help wat kan lei tot die verbetering van die slaagsyfer van eerstejaarstudente.

2.2. Ten einde die uitvoer van die navorsing, word alle eerstejaarstudente op die Bloemfonteinkampus en die Suidkampus van die UV wat vir die eerste keer vir die BLGY1513 module geregistreer is (in total ongeveer 900 studente), uitgenooi om deel te neem aan hierdie studie.

2.3. Om die inligting te versamel wat nodig is om die studie uit te voer, sal ek ‘n aantal vrae gevra word aangaande:

- biografiese besonderhede;
- my psigososiale agtergrond;
- my gemotiveerde leerstrategieë (deur voltooiing van die “Motivated strategies for learning questionnaire” of MSLQ);
- my vlakke van depressie, angs en spanning (deur voltooiing van die verkorte weergawe van die “Depression Anxiety and Stress Scales” of DASS-21).

2.4. Ek sal gevra word om hierdie vrae eenmalig te beantwoord en dit sal ongeveer 45 minute neem om al die vrae te beantwoord.

2.5. Ek kan weier om deel te neem aan hierdie navorsingsondersoek sonder om ‘n rede te gee. As ek nie wil deelneem nie, sal dit op geen manier teen my gehou word nie.

2.6. Deur deel te neem aan hierdie navorsingsondersoek lewer ek ‘n bydrae tot die identifisering van faktore wat die akademiese prestasie van eerstejaarstudente aan die UV kan beïnvloed, wat kan bydra tot die toekomstige verbetering van die leerervaring van eerstejaarstudente.

2.7. Alle inligting sal as vertroulik hanteer word. Rekords wat my moontlik kan identifiseer sal slegs toeganklik wees vir persone wat betrokke is by die uitvoer van die studie. Geen bewuste poging sal aangewend word om ‘n spesifieke datastel te koppel aan ‘n deelnemer nie en my naam sal nêrens aangeteken word nie. Die data versamel kan vir toekomstige navorsing gebruik word met die oog op publisering in ‘n joernaal, maar individuele deelnemers sal nie identifiseerbaar wees in sodanige publikasies nie.

2.8. Alle voltooide vraelyste sal vir vyf jaar in ‘n toegesluite liasseerkabinet in die kantoor van die navorser gestoor word vir moontlike toekomstige navorsing. Elektroniese inligting sal gestoor word op ‘n wagwoord-beskermde rekenaar. Toekomstige gebruik van die gestoorde data is onderhewig aan verdere voorlegging aan en goedkeuring deur die navorsingsetiekkommittee. Na vyf jaar sal alle vraelyste versnipper word.

2.9. Ek sal geen belonging of betaling ontvang vir my deelname aan die navorsing nie en deelname sal my ook niks kos nie.

2.10. Die studie het geskrewe goedkeuring ontvang vanaf die Opvoedkunde Etiese Komitee van die UV.

2.11. Ek verstaan dat ek geen direkte toegang sal hê tot my individuele vraelysresultate nie maar dat ek die navorser, Mev. Rina Meintjes, kan kontak indien ek belang sou stel in die finale navorsingsbevindinge.

2.12. Die inligting in hierdie toestemmingsvorm is in Engels of in Afrikaans aan my verduidelik en ek bevestig dat ek oor voldoende taalbeheersing beskik wat betref die taal gebruik en die verduideliking verstaan. ***Ek verstaan dat die vraelyste slegs in Engels is.*** Ek is ook die geleentheid gegee om vrae te vra rakende punte wat ek dalk nie verstaan nie.

2.13. Ek was onder geen dwang om aan hierdie navorsingsondersoek deel te neem nie.

B Hiermee willig ek in om aan die navorsingsondersoek deel te neem.

Handtekening: _____ Datum: _____

APPENDIX B

BIOGRAPHICAL INFORMATION OF STUDENTS

Office use only

STUDENT NUMBER | | | | | | | | | | | 1 |

AGE IN YEARS | | Years | 2 |

Mark applicable block with **X**

GENDER | 1 Male | 2 Female | 3 |

ETHNIC GROUP | 1 Black | 2 Coloured | 3 Indian/ Asian | 4 White | 4 |

FIRST-GENERATION STUDENT* | 1 Yes | 2 No | 5 |

*You are a first-generation student if ***neither*** of your parents (or guardian, if applicable) attended a college or a university.

APPENDIX C

PSYCHOSOCIAL BACKGROUND OF STUDENTS

This instrument was designed to determine in what kind of environment you were raised, and what your circumstances are presently. Please read the questions carefully and answer as truthfully as you can. There are no right or wrong answers.

CHILDHOOD YEARS

Rate your childhood years by marking, for each question, the number that is closest to the description of that aspect of your childhood years (see possibilities provided to the left and right of the numbers provided). If neither possibility is exactly true of you, mark a number between 1 and 6 that is closest to your situation.

EMOTIONAL SUPPORT **Office use only**

1. While growing up, I experienced

love and support	1	2	3	4	5	6	abuse and neglect	6	

2. I grew up

being part of a family	1	2	3	4	5	6	missing family love	7	

3. The people in my family were

caring towards each other	1	2	3	4	5	6	often fighting and arguing	8	

SOCIO-ECONOMIC SITUATION

4. Regarding money, we were

comfortable	1	2	3	4	5	6	in distress	9	

5. The house we lived in was

big enough	1	2	3	4	5	6	crowded	10	

6. The neighbourhood we lived in was

respectable	1	2	3	4	5	6	not well regarded	11	

ENVIRONMENT CONDUCIVE TO LEARNING

7. The occupation of one or both of my parents or guardian filled me with

admiration	1	2	3	4	5	6	disapproval	12	

8. In my family, the opportunity to learn something new was regarded as

important	1	2	3	4	5	6	not important	13	

9. My parents/guardian made sure that I had the opportunity to experience books, magazines, dictionaries, TV and videos

Often	1	2	3	4	5	6	Never	14	

10. Regarding my further education, my parents or guardian

had high expectations	1	2	3	4	5	6	were/was not concerned about my future	15	

DEPRESSION **Office use only**

11. When I was growing up, I felt depressed and down.

Seldom	1	2	3	4	5	6	Often	16	

12. As a teenager, I felt that life was not worth living.

Seldom	1	2	3	4	5	6	Often	17	

13. Depression, anger or drinking was experienced by one of my blood relatives.

Seldom	1	2	3	4	5	6	Often	18	

14. I would rate my childhood as

happy	1	2	3	4	5	6	unhappy	19	

CHILDHOOD TOTAL

PRESENT SITUATION

Rate your present situation by marking, for each question, a number 1, 2, 3, 4, 5 or 6. If you totally disagree with the statement, mark 1. If you totally agree with the statement, mark 6. If the statement is more or less true of you, mark a fitting number between 1 and 6.

15. My financial situation worries me.

Disagree	1	2	3	4	5	6	Agree	20	

16. My love life is disappointing or non-existent.

Disagree	1	2	3	4	5	6	Agree	21	

17. My family members cause me to worry.

Disagree	1	2	3	4	5	6	Agree	22	

18. I often feel depressed.

Disagree	1	2	3	4	5	6	Agree	23	

19. I worry that I might contract HIV or AIDS.

Disagree	1	2	3	4	5	6	Agree	24	

PRESENT SITUATION TOTAL

QUESTIONNAIRE TOTAL

APPENDIX D

DASS-21

The DASS is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety and stress. Please read the questions carefully and answer as truthfully as you can. Mark a number 0, 1, 2 or 3, which indicates how much the statement applied to you ***over the last week***. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0. Did not apply to me at all
1. Applied to me to some degree, or some of the time
2. Applied to me to a considerable degree or a good part of time
3. Applied to me very much or most of the time

Office use

1. I find it hard to wind down.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	25	

2. I was aware of dryness of mouth.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	26	

3. I couldn't seem to experience any positive feeling at all.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	27	

4. I experienced difficulty in breathing (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion).

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	28	

5. I found it difficult to work up the initiative to do things.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	29	

6. I tended to over-react to situations.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	30	

7. I experienced trembling (e.g. in the hands).

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	31	

8. I felt that I was using a lot of nervous energy.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	32	

9. I was worried about situations in which I might panic and make a fool of myself.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	33	

10. I felt that I had nothing to look forward to.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	34	

11. I found myself becoming agitated.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	35	

12. I found it difficult to relax.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	36	

Office use

13. I felt down-hearted and blue.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	37	

14. I was intolerant of anything that kept me from getting on with what I was doing.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	38	

15. I felt I was close to panic.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	39	

16. I was unable to become enthusiastic about anything.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	40	

17. I felt I wasn't worth much as a person.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	41	

18. I felt that I was rather touchy.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	42	

19. I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat).

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	43	

20. I felt scared without any good reason.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	44	

21. I felt that life was meaningless.

Did not apply to me at all	0	1	2	3	Applied to me very much/most of the time	45	

DEPRESSION TOTAL	
ANXIETY TOTAL	
STRESS TOTAL	

APPENDIX E

MOTIVATED STRATEGIES FOR LEARNING QUESTIONNAIRE

This instrument was designed to assess your motivation and learning strategies for a university module or course ***(for the purpose of this study, the BLGY1513 module)***. Remember there are no right or wrong answers; simply answer as accurately as possible. If you think the statement is very true of you, mark 7; if a statement is not at all true of you, mark 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

Motivation

										Office use	
1.	In a class like this, I prefer course material that really challenges me so I can learn new things.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	46	
2.	If I study in appropriate ways, then I will be able to learn the material in this course.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	47	
3.	When I take a test, I think about how poorly I am doing compared to other students.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	48	
4.	I think I will be able to use what I learn in this course in other courses.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	49	
5.	I believe I will receive an excellent grade in this class.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	50	
6.	I'm certain I can understand the most difficult material presented in the readings for this course.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	51	
7.	Getting a good grade in this class is the most satisfying thing for me right now.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	52	
8.	When I take a test, I think about items on other parts of the test I can't answer.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	53	
9.	It is my own fault if I don't learn the material in this course.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	54	
10.	It is important for me to learn the course material in this class.										
	Not at all true of me	1	2	3	4	5	6	7	Very true	55	

11. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.

Not at all true of me	1	2	3	4	5	6	7	Very true	56	

12. I'm confident I can learn the basic concepts taught in this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	57	

13. If I can, I want to achieve better grades in this class than most of the other students.

Not at all true of me	1	2	3	4	5	6	7	Very true	58	

14. When I take tests, I think of the consequences of failing.

Not at all true of me	1	2	3	4	5	6	7	Very true	59	

15. I'm confident that I can understand the most complex material presented by the instructor in this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	60	

16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.

Not at all true of me	1	2	3	4	5	6	7	Very true	61	

17. I am very interested in the content area of this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	62	

18. If I try hard enough, then I will understand the course material.

Not at all true of me	1	2	3	4	5	6	7	Very true	63	

19. I have an uneasy, upset feeling when I take an exam.

Not at all true of me	1	2	3	4	5	6	7	Very true	64	

20. I'm confident that I can do an excellent job on the assignments and tests in this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	65	

21. I expect to do well in this class.

Not at all true of me	1	2	3	4	5	6	7	Very true	66	

22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.

Not at all true of me	1	2	3	4	5	6	7	Very true	67	

23. I think the course material in this class is useful for me to learn.

Not at all true of me	1	2	3	4	5	6	7	Very true	68	

24. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.

Not at all true of me	1	2	3	4	5	6	7	Very true	69	

25. If I don't understand the course material, it is because I didn't try hard enough.

Not at all true of me	1	2	3	4	5	6	7	Very true	70	

26. I like the subject matter of this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	71	

27. Understanding the subject matter of this course is very important to me.

Not at all true of me	1	2	3	4	5	6	7	Very true	72	

28. I feel my heart beating fast when I take an exam.

Not at all true of me	1	2	3	4	5	6	7	Very true	73	

29. I'm certain I can master the skills being taught in this class.

Not at all true of me	1	2	3	4	5	6	7	Very true	74	

30. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.

Not at all true of me	1	2	3	4	5	6	7	Very true	75	

31. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.

Not at all true of me	1	2	3	4	5	6	7	Very true	76	

MOTIVATION TOTAL

Learning Strategies

32. When I study the readings for this course, I outline the material to help me organise my thoughts.

Not at all true of me	1	2	3	4	5	6	7	Very true	77	

33. During class time, I often miss important points because I'm thinking about other things.

Not at all true of me	1	2	3	4	5	6	7	Very true	78	

34. When studying for this course, I often try to explain the material to a classmate or friend.

Not at all true of me	1	2	3	4	5	6	7	Very true	79	

35. I usually study in a place where I can concentrate on my course work.

Not at all true of me	1	2	3	4	5	6	7	Very true	80	

36. When reading for this course, I make up questions to help focus my reading.

Not at all true of me	1	2	3	4	5	6	7	Very true	81	

37. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do.

Not at all true of me	1	2	3	4	5	6	7	Very true	82	

38. I often find myself questioning things I hear or read in this course to decide whether I find them convincing.

Not at all true of me	1	2	3	4	5	6	7	Very true	83	

39. When I study for this class, I practise saying the material to myself over and over.

Not at all true of me	1	2	3	4	5	6	7	Very true	84	

40. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone.

Not at all true of me	1	2	3	4	5	6	7	Very true	85	

41. When I become confused about something I'm reading for this class, I go back and try to figure it out.

Not at all true of me	1	2	3	4	5	6	7	Very true	86	

42. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.

Not at all true of me	1	2	3	4	5	6	7	Very true	87	

43. I make good use of my study time for this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	88	

44. If course readings are difficult to understand, I change the way I read the material.

Not at all true of me	1	2	3	4	5	6	7	Very true	89	

45. I try to work with other students from this class to complete the course assignments.

Not at all true of me	1	2	3	4	5	6	7	Very true	90	

46. When studying for this course, I read my class notes and the course readings over and over again.

Not at all true of me	1	2	3	4	5	6	7	Very true	91	

47. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide whether there is good supporting evidence.

Not at all true of me	1	2	3	4	5	6	7	Very true	92	

48. I work hard to do well in this class even if I don't like what we are doing.

Not at all true of me	1	2	3	4	5	6	7	Very true	93	

49. I make simple charts, diagrams, or tables to help me organise course material.

Not at all true of me	1	2	3	4	5	6	7	Very true	94	

50. When studying for this course, I often set aside time to discuss course material with a group of students from the class.

Not at all true of me	1	2	3	4	5	6	7	Very true	95	

51. I treat the course material as a starting point and try to develop my own ideas about it.

Not at all true of me	1	2	3	4	5	6	7	Very true	96	

52. I find it hard to stick to a study schedule.

Not at all true of me	1	2	3	4	5	6	7	Very true	97	

53. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.

Not at all true of me	1	2	3	4	5	6	7	Very true	98	

54. Before I study new course material thoroughly, I often skim it to see how it is organised.

Not at all true of me	1	2	3	4	5	6	7	Very true	99	

55. I ask myself questions to make sure I understand the material I have been studying in this class.

Not at all true of me	1	2	3	4	5	6	7	Very true	100	

56. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.

Not at all true of me	1	2	3	4	5	6	7	Very true	101	

57. I often find that I have been reading for this class but don't know what it was all about.

Not at all true of me	1	2	3	4	5	6	7	Very true	102	

58. I ask the instructor to clarify concepts I don't understand well.

Not at all true of me	1	2	3	4	5	6	7	Very true	103	

59. I memorise keywords to remind me of important concepts in this class.

Not at all true of me	1	2	3	4	5	6	7	Very true	104	

60. When course work is difficult, I either give up or only study the easy parts.

Not at all true of me	1	2	3	4	5	6	7	Very true	105	

61. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	106	

62. I try to relate ideas in this subject to those in other courses whenever possible.

Not at all true of me	1	2	3	4	5	6	7	Very true	107	

63. When I study for this course, I go over my class notes and make an outline of important concepts.

Not at all true of me	1	2	3	4	5	6	7	Very true	108	

64. When reading for this class, I try to relate the material to what I already know.

Not at all true of me	1	2	3	4	5	6	7	Very true	109	

65. I have a regular place set aside for studying.

Not at all true of me	1	2	3	4	5	6	7	Very true	110	

66. I try to play around with ideas of my own related to what I am learning in this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	111	

67. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.

Not at all true of me	1	2	3	4	5	6	7	Very true	112	

68. When I don't understand the material in this course, I ask another student in this class for help.

Not at all true of me	1	2	3	4	5	6	7	Very true	113	

69. I try to understand the material in this class by making connections between the readings and the concepts from the lectures.

Not at all true of me	1	2	3	4	5	6	7	Very true	114	

70. I make sure that I keep up with the weekly readings and assignments for this course.

Not at all true of me	1	2	3	4	5	6	7	Very true	115	

71. Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.

Not at all true of me	1	2	3	4	5	6	7	Very true	116	

72. I make lists of important items for this course and memorise the lists.

Not at all true of me	1	2	3	4	5	6	7	Very true	117	

73. I attend this class regularly.

Not at all true of me	1	2	3	4	5	6	7	Very true	118	

74. Even when course materials are dull and uninteresting, I manage to keep working until I finish.

Not at all true of me	1	2	3	4	5	6	7	Very true	119	

75. I try to identify students in this class whom I can ask for help if necessary.

Not at all true of me	1	2	3	4	5	6	7	Very true	120	

76. When studying for this course, I try to determine which concepts I don't understand well.

Not at all true of me	1	2	3	4	5	6	7	Very true	121	

77. I often find that I don't spend very much time on this course because of other activities.

Not at all true of me	1	2	3	4	5	6	7	Very true	122	

78. When I study for this class, I set goals for myself in order to direct my activities in each study period.

Not at all true of me	1	2	3	4	5	6	7	Very true	123	

79. If I become confused while taking notes in class, I make sure I sort it out afterwards.

Not at all true of me	1	2	3	4	5	6	7	Very true	124	

80. I rarely find time to review my notes or readings before an exam.

Not at all true of me	1	2	3	4	5	6	7	Very true	125	

81. I try to apply ideas from course readings in other class activities, such as lecture and discussion.

Not at all true of me	1	2	3	4	5	6	7	Very true	126	

LEARNING STRATEGIES TOTAL

MSLQ QUESTIONNARE TOTAL

APPENDIX F

Table F1: Effect of individual items on Cronbach alpha values for the Psychosocial Background Questionnaire: present situation, $\alpha_{standardised}$ = 0.5817

Deleted item	Correlation with total	Alpha
15	0.3651	0.5118
16	0.2425	0.5782
17	0.4337	0.4722
18	0.5342	0.4110
19	0.1506	0.6246

Table F2: Standard Cronbach alpha values for the Psychosocial Background Questionnaire: present situation

Study programme		Ethnicity		Overall
Access	Mainstream	Black	White	
0.5581	0.6263	0.5482	0.5564	0.5817

Table F3: Effect of individual items on Cronbach alpha values for the Psychosocial Background Questionnaire: present situation for the mainstream programme ($\alpha_{standardised}$ = 0.6263) and access programme ($\alpha_{standardised}$ = 0.5581)

	Mainstream programme		Access programme	
Deleted item	Correlation with total	Alpha	Correlation with total	Alpha
15	0.4015	0.5615	0.3441	0.4874
16	0.3179	0.6030	0.2185	0.5588
17	0.4573	0.5326	0.4292	0.4356
18	0.5848	0.4628	0.4997	0.3904
19	0.1687	0.6719	0.1334	0.6039

Table F4: Effect of individual items on Cronbach alpha values for the Psychosocial Background Questionnaire: present situation for Black ethnic group ($\alpha_{standardised}$ = 0.5482) and White ethnic group ($\alpha_{standardised}$ = 0.5564)

	Black ethnic group		White ethnic group	
Deleted item	**Correlation with total**	**Alpha**	**Correlation with total**	**Alpha**
15	0.3192	0.4872	0.3867	0.4591
16	0.2317	0.5380	0.3442	0.4848
17	0.4136	0.4290	0.3726	0.4677
18	0.5379	0.3466	0.3741	0.4669
19	0.0917	0.6133	0.1256	0.6058

Table F5: Effect of individual items on Cronbach alpha values for the Psychosocial Background Questionnaire: present situation, $\alpha_{standardised}$ = 0.6246 (Item 19 omitted)

Deleted item	Correlation with total	Alpha
15	0.3857	0.5683
16	0.2727	0.6466
17	0.4425	0.5266
18	0.5290	0.4596

Table F6: Standard Cronbach alpha values for the Psychosocial Background Questionnaire: present situation (Item 19 omitted)

Study programme		Ethnicity		Overall
Access	**Mainstream**	**Black**	**White**	
0.5932	0.6702	0.6133	0.6058	0.6246

Table F7: Effect of individual items on Cronbach alpha values for the Psychosocial Background Questionnaire: present situation with Item 19 omitted for the mainstream programme ($\alpha_{standardised}$ = 0.6702) and the access programme ($\alpha_{standardised}$ = 0.5932)

	Mainstream programme		Access programme	
Deleted item	**Correlation with total**	**Alpha**	**Correlation with total**	**Alpha**
15	0.4488	0.6052	0.3396	0.5485
16	0.3584	0.6635	0.2266	0.6305
17	0.4453	0.6075	0.4401	0.4695
18	0.5595	0.5288	0.5074	0.4133

Table F8: Effect of individual items on Cronbach alpha values for the Psychosocial Background Questionnaire: present situation with Item 19 omitted for Black ethnic group ($\alpha_{standardised}$ = 0.6133) and White ethnic group ($\alpha_{standardised}$ = 0.6058)

	Black ethnic group		White ethnic group	
Deleted item	Correlation with total	Alpha	Correlation with total	Alpha
15	0.3657	0.5632	0.3535	0.5594
16	0.2540	0.6419	0.3798	0.5398
17	0.4218	0.5214	0.4136	0.5139
18	0.5483	0.4204	0.3959	0.5276

Table F9: Effect of individual items on Cronbach alpha values for the DASS-21 Questionnaire: anxiety ($\alpha_{standardised}$ = 0.7872)

Deleted item	Correlation with total	Alpha
2	0.3671	0.7875
4	0.5042	0.7619
7	0.4529	0.7717
9	0.5829	0.7465
15	0.6092	0.7413
19	0.4972	0.7633
20	0.5861	0.7459

Table F10: Effect of individual items on Cronbach alpha values for the DASS-21 Questionnaire: stress ($\alpha_{standardised}$ = 0.8045)

Deleted item	Correlation with total	Alpha
1	0.5060	0.7847
6	0.5203	0.7822
8	0.6238	0.7633
11	0.5720	0.7728
12	0.5710	0.7730
14	0.5513	0.7766
18	0.4209	0.7996

Table F11: Effect of individual items on Cronbach alpha values for the overall MSLQ: motivation ($\alpha_{standardised}$ = 0.8443)

Deleted item	Correlation with total	Alpha
1	0.3293	0.8407
2	0.3689	0.8395
3	-0.0697	0.8522
4	0.4703	0.8364
5	0.5129	0.8351
6	0.4488	0.8371
7	0.5320	0.8345
8	0.1375	0.8463
9	0.1082	0.8472
10	0.4282	0.8377
11	0.2380	0.8434
12	0.4994	0.8356
13	0.3888	0.8389
14	0.0771	0.8481
15	0.4107	0.8382
16	0.3285	0.8407
17	0.5524	0.8339
18	0.5371	0.8344
19	-0.0130	0.8506
20	0.4141	0.8381
21	0.5350	0.8345
22	0.5145	0.8351
23	0.4595	0.8368
24	0.2392	0.8434
25	0.1956	0.8446
26	0.5122	0.8352
27	0.5358	0.8344
28	0.1117	0.8471
29	0.4770	0.8362
30	0.2648	0.8426
31	0.4948	0.8357

Table F12: Effect of individual items on Cronbach alpha values for the overall MSLQ: learning strategies ($\alpha_{standardised}$ = 0.9123)

Deleted item	Correlation with total	Alpha
32	0.4584	0.9101
33	0.3635	0.9110
34	0.3824	0.9108
35	0.3454	0.9112
36	0.4239	0.9104
37	0.4144	0.9105

Table F12: (Continued)

Deleted item	Correlation with total	Alpha
38	0.2137	0.9125
39	0.3502	0.9112
40	-0.0950	0.9156
41	0.4145	0.9105
42	0.4328	0.9103
43	0.5828	0.9088
44	0.4097	0.9106
45	0.2972	0.9117
46	0.4449	0.9102
47	0.4202	0.9105
48	0.3501	0.9112
49	0.4567	0.9101
50	0.4036	0.9106
51	0.4204	0.9105
52	0.1946	0.9127
53	0.4737	0.9099
54	0.4443	0.9102
55	0.5317	0.9093
56	0.3402	0.9113
57	0.2377	0.9123
58	0.3985	0.9107
59	0.4403	0.9103
60	0.3676	0.9110
61	0.4120	0.9105
62	0.3890	0.9108
63	0.4672	0.9100
64	0.4759	0.9099
65	0.3260	0.9114
66	0.4493	0.9102
67	0.4811	0.9098
68	0.4398	0.9103
69	0.5787	0.9088
70	0.4997	0.9097
71	0.4700	0.9100
72	0.4424	0.9102
73	0.2108	0.9126
74	0.4734	0.9099
75	0.3561	0.9111
76	0.5004	0.9096
77	0.1826	0.9129
78	0.5051	0.9096
79	0.5019	0.9096
80	0.2270	0.9124
81	0.5307	0.9093

Table F13: Standardised Cronbach alpha values for subscales of MSLQ: motivation and MSLQ: learning strategies with low α-values (per study programme and ethnic group)

Subscale	Study programme		Ethnicity		Overall
	Access	Mainstream	Black	White	
M1	0.4393	0.5049	0.4894	0.3815	0.4670
M2	0.4645	0.5741	0.4281	0.5658	0.5325
M4	0.4255	0.4389	0.3883	0.5092	0.4290
L1	0.5881	0.6186	0.5829	0.6719	0.6025
L3	0.6150	0.6652	0.6322	0.6592	0.6367
L6	0.5930	0.6298	0.5692	0.6548	0.6040
L7	0.5810	0.6175	0.5654	0.7022	0.5952
L8	0.6320	0.6579	0.6353	0.6507	0.6373
L9	0.5458	0.6380	0.5722	0.6084	0.5863

Table F14: Effect of individual items on Cronbach alpha values for MSLQ subscale M1: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.5049)		($\alpha_{standardised}$ = 0.4393)		($\alpha_{standardised}$ = 0.4894)		($\alpha_{standardised}$ = 0.3815)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
1	0.3022	0.4284	0.2926	0.3224	0.3238	0.3809	0.1960	0.3267
16	0.3345	0.3986	0.2987	0.3160	0.3597	0.3459	0.2310	0.2880
22	0.3722	0.3629	0.2204	0.3958	0.2950	0.4083	0.2855	0.2253
24	0.1869	0.5288	0.1779	0.4370	0.1685	0.5212	0.1170	0.4098

Table F15: Effect of individual items on Cronbach alpha values for MSLQ subscale M2: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.5741)		($\alpha_{standardised}$ = 0.4645)		($\alpha_{standardised}$ = 0.4281)		($\alpha_{standardised}$ = 0.5658)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
7	0.3824	0.4814	0.2687	0.3907	0.2185	0.3795	0.3955	0.4552
11	0.3793	0.4839	0.2950	0.3648	0.2203	0.3777	0.4263	0.4287
13	0.3870	0.4775	0.2942	0.3656	0.2829	0.3128	0.2890	0.5417
30	0.2789	0.5630	0.2049	0.4510	0.2320	0.3658	0.2897	0.5412

Table F16: Effect of individual items on Cronbach alpha values for MSLQ subscale M4: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.4389)		($\alpha_{standardised}$ = 0.4255)		($\alpha_{standardised}$ = 0.3883)		($\alpha_{standardised}$ = 0.5092)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
2	0.2467	0.3690	0.1941	0.3996	0.1921	0.3421	0.2512	0.4809
9	0.1621	0.4513	0.1839	0.4097	0.1561	0.3800	0.2107	0.5154
18	0.2805	0.3343	0.3138	0.2745	0.2431	0.2863	0.4450	0.2995
25	0.2997	0.3143	0.2581	0.3344	0.2525	0.2758	0.3079	0.4307

Table F17: Effect of individual items on Cronbach alpha values for MSLQ subscale L1: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.6186)		($\alpha_{standardised}$ = 0.5881)		($\alpha_{standardised}$ = 0.5829)		($\alpha_{standardised}$ = 0.6719)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
39	0.3813	0.5611	0.4090	0.4850	0.3714	0.5059	0.4611	0.6001
46	0.4124	0.5381	0.4638	0.4399	0.4267	0.4610	0.5052	0.5703
59	0.4056	0.5432	0.3365	0.5420	0.3694	0.5075	0.4163	0.6300
72	0.3928	0.5527	0.2745	0.5884	0.2925	0.5669	0.4306	0.6203

Table F18: Effect of individual items on Cronbach alpha values for MSLQ subscale L3: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.6652)		($\alpha_{standardised}$ = 0.6150)		($\alpha_{standardised}$ = 0.6322)		($\alpha_{standardised}$ = 0.6592)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
32	0.4641	0.5859	0.3507	0.5771	0.3927	0.5766	0.4445	0.5884
42	0.3634	0.6522	0.4458	0.5060	0.3980	0.5727	0.4179	0.6063
49	0.4727	0.5800	0.2863	0.6224	0.3616	0.5984	0.4248	0.6017
63	0.4861	0.5708	0.5068	0.4579	0.4977	0.4992	0.4704	0.5705

Table F19: Effect of individual items on Cronbach alpha values for MSLQ subscale L6: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.6298)		($\alpha_{standardised}$ = 0.5930)		($\alpha_{standardised}$ = 0.5692)		($\alpha_{standardised}$ = 0.6548)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
35	0.3241	0.5981	0.3756	0.5349	0.3338	0.5171	0.3112	0.6329
43	0.4813	0.5530	0.4394	0.5143	0.4197	0.4877	0.4979	0.5837
52	0.3694	0.5854	0.1878	0.5920	0.2008	0.5602	0.4080	0.6079
65	0.2162	0.6272	0.2662	0.5688	0.1934	0.5625	0.3477	0.6236
70	0.3908	0.5794	0.4007	0.5268	0.3815	0.5009	0.4364	0.6004
73	0.2278	0.6241	0.1535	0.6019	0.1846	0.5652	0.1894	0.6629
77	0.3059	0.6031	0.2073	0.5863	0.2032	0.5594	0.3257	0.6292
80	0.2889	0.6077	0.3411	0.5458	0.3053	0.5265	0.2674	0.6439

Table F20: Effect of individual items on Cronbach alpha values for MSLQ subscale L7: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.6175)		($\alpha_{standardised}$ = 0.5810)		($\alpha_{standardised}$ = 0.5654)		($\alpha_{standardised}$ = 0.7022)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
37	0.4825	0.4824	0.3864	0.4904	0.4073	0.4443	0.5668	0.5878
48	0.2832	0.6285	0.2366	0.6050	0.1795	0.6230	0.5289	0.6123
60	0.3776	0.5619	0.3885	0.4888	0.3707	0.4752	0.3916	0.6961
74	0.4544	0.5043	0.4481	0.4394	0.4542	0.4036	0.4668	0.6512

Table F21: Effect of individual items on Cronbach alpha values for MSLQ subscale L8: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.6579)		($\alpha_{standardised}$ = 0.6320)		($\alpha_{standardised}$ = 0.6353)		($\alpha_{standardised}$ = 0.6507)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
34	0.4624	0.5698	0.3596	0.6437	0.3750	0.6309	0.4708	0.5402
45	0.4567	0.5774	0.4486	0.5228	0.4292	0.5581	0.4394	0.5828
50	0.4864	0.5374	0.5212	0.4173	0.5354	0.4051	0.4724	0.5381

Table F22: Effect of individual items on Cronbach alpha values for MSLQ subscale L9: study programme and ethnic group (Corr. = correlation with total)

Deleted item	Study programme				Ethnicity			
	Mainstream		Access		Black		White	
	($\alpha_{standardised}$ = 0.6380)		($\alpha_{standardised}$ = 0.5458)		($\alpha_{standardised}$ = 0.5722)		($\alpha_{standardised}$ = 0.6084)	
	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha	Corr.	Alpha
40	0.2362	0.6902	0.0932	0.6575	0.1025	0.6856	0.2607	0.6299
58	0.3254	0.6327	0.3558	0.4527	0.3362	0.5153	0.3059	0.5983
68	0.5967	0.4334	0.4387	0.3789	0.5094	0.3681	0.5219	0.4323
75	0.5482	0.4718	0.4764	0.3438	0.5195	0.3589	0.4848	0.4627

Table F23: Number of participants (N) and percentages (%) for the categorical confounding variables gender, study programme, ethnicity and language for the total sample (N = 439)

	Gender		Programme		Ethnicity				Language	
	Male	Female	Main-stream	Access	Black	Coloured	Indian/Asian	White	Afrikaans	English
N	185	254	193	246	302	12	4	121	88	351
%	42.1	57.9	43.0	56.0	68.8	2.7	0.9	27.6	20.1	79.9

Table F24: Number of participants (N) and percentages (%) for the categorical confounding variables gender, ethnicity and language per study programme

			Study programme	
			Access	Mainstream
Gender	Male	N	100	85
		%	40.65	44.04
	Female	N	146	108
		%	59.35	55.96
Ethnicity	Black	N	211	91
		%	85.77	47.15
	Coloured	N	7	5
		%	2.85	2.59
	Indian/Asian	N	2	2
		%	0.81	1.04
	White	N	26	95
		%	10.57	49.22
Language	Afrikaans	N	16	72
		%	6.50	37.31
	English	N	230	230
		%	93.50	62.69

Table F25: Age distribution of participants according to study programme and for the total sample

	N	mean	median	minimum	maximum	Standard deviation
Mainstream programme	193	18.65	18.00	18.00	27.00	1.01
Access programme	246	18.98	19.00	18.00	23.00	1.13
Total	439	18.83	19.00	18.00	27.00	1.09

Table F26: Psychosocial well-being of participants according to study programme and for the total sample

	N	mean	median	minimum	maximum	Standard deviation
Mainstream programme	193	2.25	2.06	1.00	4.82	0.86
Access programme	245	2.35	2.24	1.00	4.76	0.84
Total	438	2.30	2.12	1.00	4.82	0.85

Table F27: Final mark distribution of participants according to study programme and for the total sample

	N	mean	median	minimum	maximum	Standard deviation
Mainstream programme	193	71.09	71.00	43.00	96.00	10.14
Access programme	246	67.47	67.00	45.00	89.00	9.59
Total	439	69.06	70.00	43.00	96.00	9.99

Table F28: Depression rating according to study programme and for the total sample

		DASS-21 Depression rating					
		Normal (0-9)	Mild (10-13)	Moderate (14-20)	Severe (21-27)	Extremely severe (28+)	Total
Mainstream programme	**N**	83	23	40	22	25	193
	%	43.01	11.92	20.73	11.40	12.95	
Access programme	**N**	83	24	63	36	40	246
	%	33.74	9.76	25.61	14.63	16.26	
Total	**N**	166	47	103	58	65	439
	%	37.81	10.71	23.46	13.21	14.81	

Table F29: Distribution of depression scores according to study programme and for the total sample

	Distribution of participants' depression scores					
	N	mean	median	minimum	maximum	Standard deviation
Mainstream programme	193	13.58	12.00	0.00	42.00	10.38
Access programme	246	15.76	16.00	0.00	42.00	10.62
Total	439	14.80	14.00	0.00	42.00	10.56

Table F30: Depression rating according to gender

		DASS-21 Depression rating					
		Normal (0-9)	Mild (10-13)	Moderate (14-20)	Severe (21-27)	Extremely severe (28+)	Total
Male	**N**	75	22	46	16	26	185
	%	40.54	11.89	24.86	8.65	14.05	
Female	**N**	91	25	57	42	39	254
	%	35.83	9.84	22.44	16.54	15.35	
Total	**N**	166	47	103	58	65	439
	%	37.81	10.71	23.46	13.21	14.81	

Table F31: Distribution of depression scores according to gender

	Distribution of participants' depression scores					
	N	mean	median	minimum	maximum	Standard deviation
Male	185	13.88	12.00	0.00	42.00	10.19
Female	254	15.47	16.00	0.00	42.00	10.79
Total	439	14.80	14.00	0.00	42.00	10.56

Table F32: Depression rating according to ethnicity

		DASS-21 Depression rating					
		Normal (0-9)	Mild (10-13)	Moderate (14-20)	Severe (21-27)	Extremely severe (28+)	Total
Black	**N**	95	33	74	50	50	302
	%	31.46	10.93	24.50	16.56	16.56	
Coloured	**N**	3	1	1	2	5	12
	%	25.00	8.33	8.33	16.67	41.67	
Indian/Asian	**N**	1	0	1	1	1	4
	%	25.00	0.00	25.00	25.00	25.00	
White	**N**	67	13	27	5	9	121
	%	55.37	10.74	22.31	4.13	7.44	
Total	**N**	166	47	103	58	65	439
	%	37.81	10.71	23.46	13.21	14.81	

Table F33: Distribution of depression scores according to ethnicity

	Distribution of participants' depression scores					
	N	mean	median	minimum	maximum	Standard deviation
Black	302	16.26	16.00	0.00	42.00	10.44
Coloured	12	20.17	23.00	0.00	38.00	12.43
Indian/Asian	4	19.50	19.00	8.00	32.00	10.63
White	121	10.48	8.00	0.00	42.00	9.42
Total	439	14.80	14.00	0.00	42.00	10.56

Table F34: Depression rating according to language of instruction

		DASS-21 Depression rating					
		Normal (0-9)	Mild (10-13)	Moderate (14-20)	Severe (21-27)	Extremely severe (28+)	Total
Afrikaans	**N**	48	9	19	4	8	88
	%	54.55	10.23	21.59	4.55	9.09	
English	**N**	118	38	84	54	57	351
	%	33.62	10.83	23.93	15.38	16.24	
Total	**N**	166	47	103	58	65	439
	%	37.81	10.71	23.46	13.21	14.81	

Table F35: Distribution of depression scores according to language of instruction

	Distribution of participants' depression scores					
	N	mean	median	minimum	maximum	Standard deviation
Afrikaans	88	10.64	8.00	0.00	38.00	9.57
English	351	15.84	14.00	0.00	42.00	10.55
Total	439	14.80	14.00	0.00	42.00	10.56

Table F36: Anxiety rating according to study programme and for the total sample

		DASS-21 Anxiety rating					
		Normal (0-7)	Mild (8-9)	Moderate (10-14)	Severe (15-19)	Extremely severe (20+)	Total
Mainstream programme	**N**	61	15	35	19	63	193
	%	31.61	7.78	18.13	9.84	32.64	
Access programme	**N**	57	17	45	33	94	246
	%	23.17	6.92	18.29	13.41	38.21	
Total	**N**	118	32	80	52	157	439
	%	26.88	7.29	18.22	11.85	35.76	

Table F37: Distribution of anxiety scores according to study programme and for the total sample

	Distribution of participants' anxiety scores					
	N	mean	median	minimum	maximum	Standard deviation
Mainstream programme	193	14.32	12.00	0.00	40.00	10.01
Access programme	246	15.92	16.00	0.00	42.00	10.21
Total	439	15.22	14.00	0.00	42.00	10.14

Table F38: Anxiety rating according to gender

		DASS-21 Anxiety rating					
		Normal (0-7)	Mild (8-9)	Moderate (10-14)	Severe (15-19)	Extremely severe (20+)	Total
Male	**N**	59	16	32	17	61	185
	%	31.89	8.65	17.30	9.19	32.97	
Female	**N**	59	16	48	35	96	254
	%	23.23	6.29	18.90	13.78	37.80	
Total	**N**	118	32	80	52	157	439
	%	26.88	7.29	18.22	11.85	35.76	

Table F39: Distribution of anxiety scores according to gender

	Distribution of participants' anxiety scores					
	N	mean	median	minimum	maximum	Standard deviation
Male	185	13.87	12.00	0.00	38.00	9.75
Female	254	16.20	16.00	0.00	42.00	10.33
Total	439	15.22	14.00	0.00	42.00	10.14

Table F40: Anxiety rating according to ethnicity

		DASS-21 Anxiety rating					
		Normal (0-7)	Mild (8-9)	Moderate (10-14)	Severe (15-19)	Extremely severe (20+)	Total
Black	**N**	59	21	58	46	118	302
	%	19.54	6.95	19.21	15.23	39.07	
Coloured	**N**	2	2	1	1	6	12
	%	16.67	16.67	8.33	8.33	50.00	
Indian/Asian	**N**	1	0	1	0	2	4
	%	25.00	0.00	25.00	0.00	50.00	
White	**N**	56	9	20	5	31	121
	%	46.28	7.44	16.53	4.13	25.62	
Total	**N**	118	32	80	52	157	439
	%	26.88	7.29	18.22	11.85	35.76	

Table F41: Distribution of anxiety scores according to ethnicity

	Distribution of participants' anxiety scores					
	N	mean	median	minimum	maximum	Standard deviation
Black	302	16.67	16.00	0.00	42.00	10.01
Coloured	12	19.50	20.00	2.00	36.00	11.91
Indian/Asian	4	15.50	17.00	6.00	22.00	7.90
White	121	11.14	8.00	0.00	36.00	9.27
Total	439	15.22	14.00	0.00	42.00	10.14

Table F42: Anxiety rating according to language of instruction

		DASS-21 Anxiety rating					
		Normal (0-7)	Mild (8-9)	Moderate (10-14)	Severe (15-19)	Extremely severe (20+)	Total
Afrikaans	N	39	7	15	2	25	88
	%	44.32	7.95	17.05	2.27	28.41	
English	N	79	25	65	50	132	351
	%	22.51	7.11	18.52	14.25	37.61	
Total	N	118	32	80	52	157	439
	%	26.88	7.29	18.22	11.85	35.76	

Table F43: Distribution of anxiety scores according to language of instruction

	Distribution of participants' anxiety scores					
	N	mean	median	minimum	maximum	Standard deviation
Afrikaans	88	11.73	8.00	0.00	36.00	9.66
English	351	16.09	16.00	0.00	42.00	10.08
Total	439	15.22	14.00	0.00	42.00	10.14

Table F44: Stress rating according to study programme and for the total sample

		DASS-21 Stress rating					
		Normal (0-14)	Mild (15-18)	Moderate (19-25)	Severe (26-33)	Extremely severe (34+)	Total
Mainstream programme	N	90	24	27	39	13	193
	%	46.63	12.44	13.99	20.21	6.74	
Access programme	N	101	33	54	45	13	246
	%	41.06	13.41	21.95	18.29	5.28	
Total	N	191	57	81	84	26	439
	%	43.51	12.98	18.45	19.13	5.92	

Table F45: Distribution of stress scores according to study programme and for the total sample

	Distribution of participants' stress scores					
	N	mean	median	minimum	maximum	Standard deviation
Mainstream programme	193	17.42	16.00	0.00	42.00	10.10
Access programme	246	17.76	18.00	0.00	42.00	9.48
Total	439	17.61	18.00	0.00	42.00	9.75

Table F46: Stress rating according to gender

		DASS-21 Stress rating					
		Normal (0-14)	Mild (15-18)	Moderate (19-25)	Severe (26-33)	Extremely severe (34+)	Total
Male	N	91	26	33	33	2	185
	%	49.19	14.05	17.84	17.84	1.08	
Female	N	100	31	48	51	24	254
	%	39.37	12.20	18.90	20.08	9.45	
Total	N	191	57	81	84	26	439
	%	43.51	12.98	18.45	19.13	5.92	

Table F47: Distribution of stress scores according to gender

	Distribution of participants' stress scores					
	N	mean	median	minimum	maximum	Standard deviation
Male	185	15.91	16.00	0.00	38.00	9.08
Female	254	18,85	18.00	0.00	42.00	10.05
Total	439	17.61	18.00	0.00	42.00	9.75

Table F48: Stress rating according to ethnicity

		DASS-21 Stress rating					
		Normal (0-14)	Mild (15-18)	Moderate (19-25)	Severe (26-33)	Extremely severe (34+)	Total
Black	N	120	45	57	63	17	302
	%	39.74	14.90	18.87	20.86	5.63	
Coloured	N	2	1	3	5	1	12
	%	16.67	8.33	25.00	41.67	8.33	
Indian/Asian	N	1	1	2	0	0	4
	%	25.00	25.00	50.00	0.00	0.00	
White	N	68	10	19	16	8	121
	%	56.20	8.26	15.70	13.22	6.61	
Total	N	191	57	81	84	26	439
	%	43.51	12.98	18.45	19.13	5.92	

Table F49: Distribution of stress scores according to ethnicity

	Distribution of participants' stress scores					
	N	mean	median	minimum	maximum	Standard deviation
Black	302	18.22	18.00	0.00	42.00	9.61
Coloured	12	23.00	25.00	2.00	34.00	8.96
Indian / Asian	4	18.50	20.00	10.00	24.00	6.19
White	121	15.54	14.00	0.00	42.00	9.94
Total	439	17.61	18.00	0.00	42.00	9.75

Table F50: Stress rating according to language of instruction

		DASS-21 Stress rating					
		Normal (0-14)	Mild (15-18)	Moderate (19-25)	Severe (26-33)	Extremely severe (34+)	Total
Afrikaans	**N**	48	9	13	13	5	88
	%	54.55	10.23	14.77	14.77	5.68	
English	**N**	143	48	68	71	21	351
	%	40.74	13.68	19.37	20.23	5.98	
Total	**N**	191	57	81	84	26	439
	%	43.51	12.98	18.45	19.13	5.92	

Table F51: Distribution of stress scores according to language of instruction

	Distribution of participants' stress scores					
	N	mean	median	minimum	maximum	Standard deviation
Afrikaans	88	15.55	14.00	0.00	42.00	10.08
English	351	18.13	18.00	0.00	42.00	9.61
Total	439	17.61	18.00	0.00	42.00	9.75

Table F52. Pearson correlation coefficients (r); N = 439 Total dataset

	FM(B)	Psyc	D	A	S	M1	M2	M3	M4	M5	M6	L1	L2	L3	L4	L5	L6	L7	L8	L9
FM(B)	1	-0.194	-0.139	-0.163	-0.080	0.127	-0.072	0.103	0.124	0.277	-0.224	0.063	0.191	0.134	0.053	0.202	0.261	0.322	-0.068	0.036
Psyc		1	0.481	0.427	0.400	0.016	0.099	0.018	-0.008	-0.104	0.232	-0.034	-0.022	-0.117	0.129	-0.038	-0.212	-0.119	0.033	-0.114
D			1	0.656	0.705	-0.113	0.097	-0.121	-0.036	-0.224	0.409	-0.023	-0.120	-0.091	-0.015	-0.152	-0.269	-0.223	-0.024	-0.169
A				1	0.745	-0.017	0.143	0.012	0.027	-0.135	0.435	0.007	0.009	-0.037	0.090	-0.013	-0.162	-0.120	0.095	-0.049
S					1	-0.024	0.137	-0.042	0.033	-0.159	0.412	0.052	0.021	0.001	0.046	-0.001	-0.141	-0.095	0.045	-0.064
M1						1	0.310	0.519	0.324	0.471	-0.037	0.235	0.468	0.370	0.443	0.473	0.299	0.322	0.233	0.198
M2							1	0.354	0.272	0.267	0.267	0.283	0.275	0.217	0.264	0.289	0.081	0.156	0.168	0.033
M3								1	0.276	0.460	-0.056	0.256	0.476	0.344	0.407	0.427	0.287	0.349	0.193	0.171
M4									1	0.380	0.062	0.113	0.250	0.174	0.165	0.235	0.073	0.147	-0.053	-0.020
M5										1	-0.264	0.253	0.437	0.350	0.344	0.472	0.339	0.449	0.131	0.159
M6											1	0.004	-0.086	-0.029	-0.042	-0.070	-0.250	-0.276	0.017	-0.112
L1												1	0.495	0.573	0.363	0.555	0.401	0.310	0.322	0.270
L2													1	0.569	0.569	0.664	0.398	0.434	0.339	0.317
L3														1	0.359	0.583	0.450	0.408	0.268	0.206
L4															1	0.532	0.237	0.222	0.317	0.243
L5																1	0.537	0.548	0.322	0.300
L6																	1	0.563	0.212	0.280
L7																		1	0.120	0.177
L8																			1	0.545
L9																				1

Key: Statistically significant r-values with $p \leq 0.05$

$0.100 \leq |r| < 0.200$

$0.200 \leq |r| < 0.300$

$0.300 \leq |r|$

Table F53. Pearson correlation coefficients (r); Mainstream programme (N = 193)

	FM(B)	Psyc	D	A	S	M1	M2	M3	M4	M5	M6	L1	L2	L3	L4	L5	L6	L7	L8	L9
FM(B)	1	-0.159	-0.058	-0.092	0.011	0.111	-0.131	0.069	0.174	0.265	-0.221	0.126	0.170	0.159	0.078	0.178	0.267	0.332	-0.161	0.111
Psyc		1	0.508	0.467	0.433	-0.027	0.117	0.017	-0.084	-0.074	0.187	-0.059	0.041	-0.130	0.100	-0.033	-0.151	-0.043	0.050	-0.203
D			1	0.681	0.748	-0.113	0.137	-0.129	-0.120	-0.209	0.454	-0.013	-0.056	-0.085	-0.054	-0.117	-0.212	-0.125	0.010	-0.165
A				1	0.752	-0.084	0.114	-0.012	-0.128	-0.155	0.493	-0.082	-0.013	-0.065	0.039	-0.054	-0.158	-0.091	0.170	-0.076
S					1	-0.080	0.152	-0.061	-0.099	-0.152	0.439	0.017	0.024	-0.015	0.006	-0.005	-0.080	-0.025	0.076	-0.120
M1						1	0.367	0.586	0.334	0.494	-0.044	0.230	0.467	0.380	0.383	0.429	0.251	0.320	0.220	0.162
M2							1	0.419	0.248	0.278	0.245	0.266	0.276	0.180	0.313	0.242	0.021	0.145	0.220	0.016
M3								1	0.219	0.432	-0.069	0.230	0.525	0.366	0.370	0.400	0.294	0.352	0.201	0.119
M4									1	0.371	-0.032	0.137	0.212	0.083	0.122	0.201	0.028	0.139	-0.085	-0.046
M5										1	-0.272	0.293	0.438	0.315	0.326	0.436	0.255	0.399	0.091	0.121
M6											1	-0.004	-0.057	-0.084	-0.018	-0.062	-0.293	-0.276	0.148	-0.070
L1												1	0.494	0.589	0.349	0.587	0.419	0.313	0.253	0.263
L2													1	0.595	0.511	0.646	0.409	0.491	0.369	0.261
L3														1	0.320	0.589	0.455	0.473	0.306	0.239
L4															1	0.454	0.216	0.216	0.293	0.149
L5																1	0.561	0.602	0.294	0.307
L6																	1	0.580	0.126	0.287
L7																		1	0.091	0.157
L8																			1	0.564
L9																				1

Key: Statistically significant r-values with p ≤ 0.05

0.100 ≤ |r| < 0.200

0.200 ≤ |r| < 0.300

0.300 ≤ |r|

Table F54. Pearson correlation coefficients (r); Access programme (N = 246)

	FM(B)	Psyc	D	A	S	M1	M2	M3	M4	M5	M6	L1	L2	L3	L4	L5	L6	L7	L8	L9
FM(B)	1	-0.211	-0.176	-0.201	-0.158	0.128	0.038	0.160	0.104	0.291	-0.199	0.029	0.220	0.113	0.051	0.238	0.254	0.341	0.002	-0.013
Psyc		1	0.456	0.390	0.372	0.055	0.066	0.012	0.051	-0.126	0.262	-0.019	-0.072	-0.105	0.147	-0.045	-0.260	-0.188	0.021	-0.046
D			1	0.633	0.675	-0.105	0.035	-0.131	0.021	-0.235	0.361	-0.039	-0.170	-0.094	0.006	-0.186	-0.310	-0.310	-0.047	-0.181
A				1	0.742	0.039	0.152	0.021	0.142	-0.119	0.381	0.070	0.022	-0.012	0.123	0.015	-0.162	-0.149	0.042	-0.034
S					1	0.024	0.122	-0.029	0.146	-0.165	0.390	0.079	0.019	0.016	0.077	0.002	-0.192	-0.156	0.021	-0.018
M1						1	0.284	0.477	0.322	0.456	-0.022	0.243	0.471	0.362	0.496	0.511	0.335	0.329	0.242	0.230
M2							1	0.284	0.287	0.273	0.266	0.294	0.279	0.262	0.211	0.334	0.150	0.157	0.129	0.038
M3								1	0.317	0.485	-0.062	0.273	0.442	0.330	0.432	0.447	0.288	0.344	0.190	0.208
M4									1	0.390	0.133	0.090	0.277	0.253	0.195	0.260	0.114	0.151	-0.027	-0.002
M5										1	-0.258	0.226	0.438	0.378	0.360	0.501	0.403	0.488	0.160	0.188
M6											1	0.002	-0.114	0.021	-0.073	-0.084	-0.209	-0.288	-0.085	-0.155
L1												1	0.495	0.562	0.372	0.528	0.390	0.305	0.375	0.273
L2													1	0.553	0.612	0.678	0.393	0.393	0.319	0.358
L3														1	0.394	0.579	0.445	0.356	0.238	0.180
L4															1	0.593	0.258	0.225	0.336	0.316
L5																1	0.521	0.503	0.344	0.294
L6																	1	0.553	0.280	0.277
L7																		1	0.143	0.192
L8																			1	0.531
L9																				1

Key: Statistically significant r-values with $p \leq 0.05$

$0.100 \leq |r| < 0.200$

$0.200 \leq |r| < 0.300$

$0.300 \leq |r|$

Table F55: Results of regression analysis (forward selection method) with dependent variable BLGY1513 (Final %), N = 438

Independent variable	Coefficient ($\widehat{B}$)	t	p
Ethnic Group	10.480	6.809	<0.001
Language	–6.091	–3.608	<0.001
Gender	2.350	2.610	0.009
Psychosocial Background	–1.129	–2.009	0.045
Study programme	1.281	1.293	0.197
Age	–0.285	–0.678	0.498

R^2 = 0.171; Intercept = 73.347

Table F56: Timetable of an access programme group in 2017

Time / Period	Monday	Tuesday	Wednesday	Thursday	Friday
08:10 – 09:10	SCNS1508	CHEM1532	BLGY1513	MATD1534	MATD1534
09:10 – 10:00	SCNS1508	CHEM1532	BLGY1513	MATD1534	MATD1534
10:10 – 11:00	CHEM1412	MATD1534	BLGY1513	MATD1534	CHEM1532
11:10 – 12:00	CHEM1412	MATD1534	CHEM1412		
12:10 – 13:00					BLGY1513
13:10 – 14:00	CSIL1551	EALN1508	SCNS1508	EALN1508	BLGY1513
14:10 – 15:00	CSIL1551	EALN1508	SCNS1508	EALN1508	
15:10 – 16:00	CSIL1551	BLGY1513			
16:10 – 17:00	CSIL1551	BLGY1513			

Table F57: Timetable of an access programme group in 2019

Time / Period	Monday	Tuesday	Wednesday	Thursday	Friday
08:10 – 09:10	BLGY1513	CHEM1532	BLGY1513	MATD1534	MATD1534
09:10 – 10:00	BLGY1513	CHEM1532	BLGY1513	MATD1534	MATD1534
10:10 – 11:00	CHEM1552	MATD1534	BLGY1513	SCNS1508	CHEM1532
11:10 – 12:00	CHEM1552	MATD1534	CHEM1552	SCNS1508	
12:10 – 13:00					BLGY1513
13:10 – 14:00	CSIL1551	SCNS1508	EALN1508	CHEM PRAC	BLGY1513
14:10 – 15:00	CSIL1551	SCNS1508	EALN1508	CHEM PRAC	
15:10 – 16:00	CSIL1551	EALN1508		CHEM PRAC	
16:10 – 17:00	CSIL1551	EALN1508		CHEM PRAC	