ASSESSING LABORATORY REPORT WRITING SKILLS OF FIRST ENTERING BACHELOR OF SCIENCE STUDENTS

by

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DEDICATION

This study is dedicated to my parents, Rodney and Shirley Veldtman, my brother Prof. Gruschen Veldtman, my son Joshua and my two nephews Hugo and Rafe.

DECLARATION

I declare that '**ASSESSING LABORATORY REPORT WRITING SKILLS OF FIRST ENTERING BACHELOR OF SCIENCE STUDENTS'** is my own work, that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

<u>Helga Delene Veldtman</u> <u>31/12/2020</u>

Full names **Date**

……………………..

Signature

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ABSTRACT

Conventional laboratory report writing skills present an enormous challenge to first entering science students including the Bachelor of Science (BSc) students at Sefako Makgatho Health Sciences University (SMHSU). First entering students are expected to meet essential tertiary discourse requirements and standards consistent with their scientific community. The purpose of this study was to explore how content lecturers in cognate departments assess laboratory report writing skills of first entering BSc students. The research design was exploratory and a mixed approach was used. Students sat for a criterion-referenced test and interviews were conducted with content lecturers to collect data; quantitative basic statistical interrogation of the basic data points and post interview analysis were performed. Some of the key findings of this exploration was that most first entering BSc students are in a dire situation regarding the laboratory report writing genre; they are unable to communicate comprehensive and intelligible information in the written laboratory reports. Thus, content lecturers and English language lecturers from the Department of Language Proficiency (DLP) need to strategically collaborate in order to improve the performance of first entering BSc students.

ABBREVIATIONS AND ACRONYMS

ACT	-	American College Test
ANC	-	African National Congress
BMSB	-	Basic Medical Sciences Building
BSc	-	Bachelor of Science
CA	-	Continuous Assessment
CBI	-	Content-Based Instruction
CLI	-	Content and Language Integration
CU	-	Comprehensive University
CUs	-	Comprehensive Universities
CHASU	-	Comprehensive Health and Allied Sciences University
CLI	-	Content and Language Integration
DLP	-	Department of Language Proficiency
DoH	-	Department of Health
DoHET	-	Department of Higher Education and Training
EAP	-	English for Academic Purposes
ECP	-	Extended Curriculum Programme
ED	-	English Department
EFAL	-	English First Additional Language
EGP	-	English for General Purposes
EHL	-	English Home Language
ELSCs	-	English Language Support Courses
EP	-	English Proficiency
ESP	-	English for Specific Purposes
GE	-	General English
GISA	-	Global Integrated Scenario-based Assessment
HE	-	Higher Education
HEI	-	Higher Education Institution
HELC	-	Health Education and Life Competencies

HL	-	Home Language
HoD	-	Head of Department
IC	-	Interim Council
ICL	-	Integrated Content and Language
IHL	-	Institutions of Higher Learning
IM	-	Interim Management
IQ	-	Intelligence Quotient
JTT	-	Joint Technical Team
L1	-	First Language Students
L2	-	Second Language Students
LT	-	Laboratory Technicians
LOA	-	Learning Oriented Assessment
LOAM	-	Learning Oriented Assessment Model
LP	-	Language Proficiency
LR	-	Laboratory Report
LRs	-	Laboratory Reports
LRW	-	Laboratory report writing
LRWSs	-	Laboratory report writing skills
LWS	-	Laboratory writing skills
MA	-	Means Analysis
MEDUNSA	-	Medical University of South Africa
NA	-	Needs Analysis
NHIP	-	National Health Insurance Policy
NBT	-	National Benchmark Tests
NWG	-	National Working Group
NQF	-	National Qualification Framework
PQM	-	Programme Qualification Mix
SA	-	South Africa
SAT	-	Scholastic Aptitude Test
SAQA	-	South African Qualifications Authority

SBA	-	Scenario-based Assessment
SBAT	-	Smarter Balanced Assessment Test
SC	-	Senior Certificate
SC	-	Social Constructivism
SE	-	Standard English
SI	-	International System of Units
SMU	-	Sefako Makgatho University
SMHSU	-	Sefako Makgatho Health Sciences University
SR	-	Scientific Report
SST	-	School of Science and Technology
ST	-	Standardised Test
STs	-	Standardised Tests
TREC	-	Turfloop Research Ethical Committee
UC	-	University Council
UL	-	University of Limpopo
UNIN	-	University of the North
U.S.	-	Unites States
WTP	-	Ways of thinking and practicing
ZPD	-	Zone of proximal development

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CHAPTER 1

INTRODUCTION

1. 1 BACKGROUND AND MOTIVATION

First entering Bachelor of Science (BSc) students are expected to adapt to a discipline-specific environment within a given university discourse community. Hence, writing within a scientific discourse convention becomes an important field of interest especially for students who register for a BSc degree for the first time at SMHSU. This implies that, amongst other things, the students are expected to write laboratory reports in respect of experiments conducted. Such reports should meet the necessary requirements with regard to tertiary level disciplinary writing.

SMHSU is a Higher Education Institution (HEI) which falls under the category of traditional public universities (SMU NEWS, 2015). It can be classified as a stand-alone health sciences university, the first ever in SA. There are 21 stand-alone universities in SA. Stand-alone universities are defined as 'universities that are not related to a parent system, have at least one medical school, and do not offer a comprehensive set of academic programmes such as liberal arts or engineering' (Vagelos 2002: 38).

To date, assessing science tasks remains challenging to language lecturers (cf. Ngoepe, 2017a). It is therefore against this background that the aim of the study is to assess laboratory report writing of first entering Sefako Makgatho Health Sciences University (SMHSU) BSc students and to explore how content subject lecturers assess laboratory report writing.

The Department of Language Proficiency (DLP), which is a service-rendering department of other departments at SMHSU, is located within the School of Science and Technology (SST)- and offers General English (GE) to first entering BSc students. The students in the SST at SMHSU are expected to acquire and develop discipline specific academic writing skills. This augurs well for the teaching of support courses such as English for Academic Purposes (EAP) and English for Specific Purposes (ESP) to BSc students (cf. Ngoepe, 2017b: 187). These language courses would be conducive for opportunities to assess ways in which students could implement and improve their laboratory report writing abilities within the functional context of the sciences at tertiary level. However, the report writing foundation laid at school level in a science context, places an even higher premium on laboratory report writing skills of first entering BSc students at SMHSU since most of them are Second Language (L2) students whose First Language (L1) is not English. Therefore, laboratory report writing skills are essential academic skills which will help phase in first entering students into tertiary level disciplinary writing, with prescribed academic requirements.

In South Africa (SA), education for most black secondary school learners takes place in L2 mostly at under-resourced schools. Additionally, the intake of first entering BSc students at SMHSU comprises, by and large, black students from similar circumstances. The lack of required language proficiency standards and tertiary level demands amongst disadvantaged students affect their academic performance. Thus, most black students whose Home Language (HL) is not English have not yet reached adequate proficiency levels that would enable them to cope with the written English as used in academic discourse (Tshotsho, 2014: 425; cf. Table 2). In this regard, the acquisition of laboratory report writing skills poses a challenge to SMHSU BSc students and they are expected to master laboratory report writing skills in order to progress academically in a science context.

Laboratory report writing, like other written genres, has distinct purposes, forms and recognised structures (Gillet, Hammond & Martala, 2009: xix). However**,** laboratory report writing skills of first entering BSc students at SMHSU have always posed great challenges, especially to those students whose L1 is not English. Given that SMHSU offers tuition in all the disciplines in a single medium which is English warrants an investigation of laboratory report writing skills of first entering BSc students (cf. Table 3; Ngoepe, 2020: 230).

In support of this, Parkinson et al. (2007: 443) assert that the laboratory report-genre is the most frequent genre written by undergraduate science students. It is thus important for first entering BSc students at SMHSU to master these essential skills. Implicitly a genre-based approach to teaching academic writing can be advocated for. Therefore, the students' laboratory report writing skills will be assessed within the framework of the conventions of scientific writing.

Learning-oriented assessment seeks to circumvent some of the problems in the interplay between summative and formative assessment by focusing on stimulating productive student learning (Carless, 2015: 13). The apex of assessment is represented by the assessment tasks that students carry out as part of the courses for their degree programmes. Assessment tasks strongly influence how students direct their efforts and kinds of approaches that they prefer (Carless, 2015: 7).

1.2 RESEARCH PROBLEM

In South Africa, education for most black secondary school learners takes place in an L2 mostly at under-resourced schools. This group of learners is highlighted since the student intake of first entering BSc students at SMHSU comprises by and large black students from similar circumstances. Such lack amongst disadvantaged students affects their academic performance. Thus, most black students whose Home Language (HL) is neither English nor Afrikaans, have not yet reached adequate proficiency levels that would enable them to cope with the written English as used in academic discourse (Tshotsho, 2014: 425). In this regard acquisition of laboratory report writing skills poses a challenge to SMHSU BSc students as well. Students must master laboratory report writing in order to progress academically, in a science context.

Laboratory report writing, like other written genres, has distinct purposes, forms and recognised structures (Gillet, Hammond & Martala, 2009: xix). Laboratory report writing skills of first entering BSc students at SMHSU have always posed great challenges, especially to those students whose mother tongue is not English. Given that SMHSU offers tuition in all the disciplines in a single medium which is English, warrants investigating this research problem pertaining to assessing laboratory report writing skills of first entering BSc students.

In support of this, Parkinson et al. (2007: 443) assert that the laboratory report-genre is the most frequent genre written by undergraduate science students. It is thus important for first entering BSc students at SMHSU to master these essential laboratory report writing skills. Therefore, a genre-based approach to teaching academic writing can be advocated for. This implies that students' laboratory report writing skills will be assessed within the framework of conventions of scientific writing.

1.3 PURPOSE OF STUDY

1.3.1 Aim

The aim of this study is to assess laboratory report writing skills of SMHSU first entering BSc students.

1.3.2 Objectives

The objectives of the study are:

- to assess written laboratory reports of first entering BSc students at SMHSU.
- to establish how SMHSU content subject lecturers assess first entering students' laboratory report writing skills.
- to suggest how laboratory report writing skills could be assessed.

1.4 SIGNIFICANCE OF THE STUDY

The findings of this study can enhance laboratory report writing skills of first entering SMHSU BSc students who already come to university with the genre-specific writing deficiencies. The findings can also foster guidelines for curriculum development among content subject- and language lecturers in respect of laboratory report writing skills for first entering BSc students and SMHSU.

Since the DLP does not seem to have a language policy, it is therefore anticipated that the results of this study could make recommendations that would inform guidelines that might help shape the essential language policy (see 2.2.5). The envisaged policy would address specific writing needs of students such as laboratory report writing skills in line with an ESP learner-centred approach (cf. 3.5).

Since English language support courses aimed at specific disciplines such as English for Science Students, English for Medicine, and so on are not taught at SMHSU, in the long term, this study will help to bring about essential changes in this regard.

CHAPTER 2

ASSESSING WRITING IN A SCIENCE CONTEXT

2.1 INTRODUCTION

Assessing in context is at the core of discipline specific teaching and learning. Lecturers teaching English language support courses need relevant skills to assess discipline specific tasks that students carry out. This could strategically be done in collaboration with content lecturers in cognate departments. Prior to the summative assessment, formative assessment can help bring students as well as lecturers closer to their goal posts as there are different types of assessments and there is room for feedback as well as improvement in the execution process.

The aim in this chapter is to mainly discuss assessments, academic genres, writing in a science community, Sefako Makgatho Health Sciences University (SMHSU) and the role of theory in this study.

2.2 ASSESSMENTS

Assessments are tools used to collect information, give feedback to students and to determine whether students have reached an agreed level of proficiency to proceed to the next level. To this extent assessment purposes can be varied and are of major importance in academic contexts (de Chazal, 2014: 291).

There are two main purposes for assessment; that is, evaluation of student learning against some pre-set, possibly external standard often towards the end of a course of study and discovery of student strengths and weaknesses during the course of study, with a view to guiding and enhancing learning (cf. Ngoepe, 2017(a); 2.2.5).

Positive developments in respect of student assessment in Higher Education (HE) over the past two decades include a greater variety in terms of assessment tasks, greater transparency in assessment criteria and growing awareness of developing effective feedback processes (Carless, 2015:1) Thus, some hybrid assessment, which assesses integrated content and language would be ideal in a language support course context (Barrett, 2014: 74). Further, when language and content lecturers assess what they teach in concert, they tend to benefit from the enriching experience. However, students stand to benefit more from such an experience (Ngoepe, 2017a:

172; see Appendix A). In this study, language lecturers will assess how science content lecturers assess laboratory reports of SMHSU BSc first entering students. This presupposes collaboration among language and content lecturers.

According to Tomanek, Talanquer and Novodvorsky (2008: 1115), classroom assessments refer to activities undertaken by both teachers and students in order to provide information to be used as feedback to modify teaching and learning activities. The strength of assessments lies therein, as it can reveal and support learning. Kang, Thompson & Windschitl (2014: 675) argue that this is dependent on the extent to which student responses to tasks authentically reflect their thinking and understanding

A necessary stage in in-house or local assessments is the development of assessment criteria, which are statements of achievement that need to be developed alongside the development of the curriculum and the syllabus (de Chazal, 2014:302; cf. Assessment Criteria).

An effective curriculum involves all stakeholders in the process of design. Communication skills must be ensured in curricula through long-standing collaborations between discipline academics in science and engineering as well as language and literacy specialists (Drury & Muir, 2014: 81). The main stakeholders are science lecturers and BSc students in this study (Drury & Muir, 2014: 81; cf. Ngoepe, 2017: 172; see Appendix A; Appendix B). Language lecturers support the main stakeholders in the science endeavour.

In addition to assessment practices, there are also various assessment types which include, but are not limited to summative assessments, formative assessments, classroom assessments, alternative assessments, teacher-based assessments, performance assessments, scenario-based assessment (SBA) and learning-oriented assessments. Each has its own distinctive purposes. Such types of assessment practices used in the classroom can have a major impact on students' learning and academic achievement (Broadbent, Panadero & Boud, 2018: 3).

Quality assessment can have a greater positive impact on student learning than any other intervention. Its primary purpose is to promote learning and to show evidence of how students are progressing according to defined standards throughout a period of learning as well as achievement at the end of the learning period (Teachers' guide to assessment, 2016:5).

Moreover, the fundamental purposes of assessments are to establish and understand where students are in an aspect of their learning at the given time of assessment, clarify what students know, understand and can do, and to progress a student to the required standard of achievement at the end of the year or band of development (Teachers' guide to assessment, 2016:6).

Lecturers can identify gaps in knowledge, set learning goals and gauge the level of support needed to ensure that all students achieve through the relevant assessment types. To this extent collaboration is key. When lecturers collaborate to plan, design and deliver assessments, as well as have the opportunities to compare and discuss students' work, they manage to improve their understanding of learning goals and assessment criteria. They also develop greater understanding into where students are at in their learning. Importantly, all assessment information about students should form a continuous feedback loop to the lecturer. Therefore, to develop assessment knowledge and expertise, institutions of learning should provide opportunities for lecturers to collaborate and participate in professional dialogue and collegial work and with the main focus on assessment practices (Teachers' guide to assessment, 2016:7; cf. Ngoepe, 2020).

2.2.1 Types of assessments

According to Carless (2015: 2), assessments have to include formative assessment for learning and summative assessment for certification. The main aim herein is to equip students with immediate tasks for lifelong learning. Further, other types of assessments include, but are not limited to the following: diagnostic, formative, summative, norm-referenced, criterion-referenced, ipsative, confirmative and learning-oriented learning.

2.2.1.1 Diagnostic or pre-assessments

With this kind of assessment, it is important to know the kind of students one is creating an instruction for, even before creating the instruction. Diagnostic or pre-assessments are used to assess a student's strengths, weaknesses, knowledge and skills prior to instruction (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10637). In a similar vein, diagnostic assessments can help identify students' current knowledge of a subject, their skills set and capabilities as well as clarify any misconceptions prior to teaching taking place. If lecturers know beforehand what students' strengths and weaknesses are, they can help them plan what to teach and how to teach (Teachers' guide to assessment, 2016:10).

Diagnostic assessments are useful before creating any instruction and helps to show what kind of students lecturers teach. Lecturers can then plan their own instruction. Examples of diagnostic assessments include pre and post-tests, self-assessments, interviews observations and polling (Prasanthi & Vas 2019:95).

2.2.1.2 Formative assessments

Formative assessments are defined as formal or planned assessments that are aligned with a specific curricular framework or goal, are planned in advance by the teacher as part of a lesson or unit - and involve activities or tasks that usually result in a structured performance (Tomanek, Talanquer & Novodvorsky, 2008:1115). Because formative assessments are also linked to student learning, they are also known as assessments for learning (Nicol & MacFarlane-Dick, 2006). Formative assessment requires continuous evaluation which is to be accompanied by sufficient quality feedback information for students. Role, frequency, format and feedback are some of the formative assessment features characterised by this assessment type (Broadbent, Panadero & Boud, 2018: 5).

Formative assessment should be contextualised and as it aims to build a comprehensive picture of learners' characteristics. One of its salient features is that it is an integral part of the learning process which takes place several times during a course, rather than only at the end. Importantly too, formative assessment improves student outcomes such as increased academic performance, self-regulated learning also known as self-efficacy and so on (Broadbent, Panadero & Boud, 2018: 4). Of importance too is that assessments have to attend to the learning process and substantive content domain (Boud, 2000).

In the first attempt of developing instruction, formative assessments are used and measure small parts of the instruction. The goal is to monitor student learning to provide feedback. Formative assessment helps to identify the initial gaps in the instructions. Based on feedback, the lecturer should know what to focus on for further expansion of the instruction (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10637).

Furthermore, formative assessment is an integrated part of teaching, learning and assessment. This type of assessment is characterized by an iterative nature which provides opportunities to develop more in-depth views about how students learn and adapt (Teachers' guide to assessment, 2016: 9).

Moreover, formative assessments give an insight into the knowledge students possess for taking a test. Its goal is to monitor student learning to provide feedback while learning is taking place. It also helps to identify the strengths and weaknesses of students as well as check the quality of material used by the lecturer. To this effect formative assessments serve as a pre-test to determine where lecturers can improve their instructional material (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10638). Its primary focus now is to identify areas that may need improvement (Teachers' guide to assessment, 2016:9).

Formative assessment is used to assess a student's performance during instruction and for finding growth over a time. It occurs at regular intervals throughout the instruction process, until it is done. This type of assessment monitors the student's learning to provide feedback during the course. Student observations, quizzes, homework, peer reviews, informal presentations, think or pair share, visual thinking strategies and quiz feedback are some of the examples (Prasanthi & Vas 2019:95).

2.2.1.3 Summative assessment

Summative assessments are used for grading purposes to enable comparisons between learners and to ensure standards are met. They are beneficial for comparing learners, they happen infrequently with feedback that focusses on the completed assessment event (Broadbent, Panadero & Boud, 2018: 3). However, Carroll (2017: 28) suggests that when most people think of language assessments, they generally recall the standardised formats of high-stakes, large-scale examinations. In many

Higher Education (HE) institutions this type of assessment still prevails as summative assessments. In the past, these assessments were widely recognised for providing valid and reliable measures of test-taker knowledge. Summative assessment is used to signify competence. It also contributes to a student's grade in a course, module, level, or degree. Grades are outcomes of summative assessments and indicate if a student has a satisfactory level of knowledge or skills gain. Thus, a student's readiness can be determined in respect of his or her readiness to progress to the next level or course in the curriculum. This is especially useful for purposes of reporting students' progress to parents, authorities and tertiary institutions (Teachers' guide to assessment, 2016:9).

Moreover, summative assessment also assesses the extent to which the most important outcomes at the end of the instruction have been reached. In this way, it measures the effectiveness of learning reactions on the instruction and the long-term benefits. Such benefits are determined by following students who attend a lecturer's course or who have written their tests. This enables lecturers to determine whether and how students use the learned knowledge, skills and attitudes. Depending on the time frame, summative assessments can also be referred to as confirmatory evaluation, that is an extensive form of summative evaluation (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10637).

Summative assessments typically measure students' achievement at the end of an instruction cycle. It is used to find mastery and performance levels. Examples include high stake tests such as mid examinations and end university exams (Prasanthi & Vas 2019: 95).

2.2.1.4 Norm-referenced assessment

Norm-referenced assessments are preliminary assessments for comparing achievement of an examinee to a large group of examinees, in the same grade, for example. The representative group is known as a norm group. As such, norms measure the growth in a student's attainment and compares his or her level of attainment with the levels reached by other students and norm group (Muthaiyan & Ananthi, 2020:606).

Norm-referenced assessments also refer to standardized assessments that are designed to compare and rank test takers in relation to one another. The development of these assessments can be expensive and time consuming. They can also indicate whether test takers performed better or worse than a hypothetical average student. This is done by comparing scores against the performance results of a statistically selected group of test takers who are of the same age or grade level and who have already taken the exam. The design of these assessments thus provides a measure of performance that is interpretable in terms of an individual's relative standing to the norm group. The norm group comprises examinees at the local, provincial, or national level (Muthaiyan & Ananthi, 2020: 609).

Furthermore, norm-referenced assessments provide important information about student learning in a general category of competencies. They differentiates students as well as identify those with specific educational needs which require specialized assistance or learning environments. These assessments are therefore objective evaluation methods which minimize bias and favouritism when educational decisions are made (Muthaiyan & Ananthi, 2020:609).

Norm-referenced assessments are used for a variety of purposes. For example, for academic progress, marking course assignments, determining readiness for grade promotion, or identifying the need for additional academic support (Muthaiyan & Ananthi, 2020:608). Notably, the merits of norm-referenced assessments are amongst others, to get a reliable rank ordering of test takers with respect to their achievement, to select the best of the applicants for a particular programme or course and to find out how effective they are in comparison to other possible programmes (Muthaiyan & Ananthi, 2020:609).

Lecturers find norm-referenced assessments useful because it helps them to view students in terms of a bell curve, which can lead the to lower academic expectations for certain groups of students, English language learners or minority groups (Muthaiyan & Ananthi, 2020:608). These assessments are therefore designed to sort and rank students on a curve, and not to determine if they meet a standard or criterion (Prince, 2016:24).

Norm-referenced tests use a multiple-choice format, open ended and short answer questions. IQ tests and developmental-screening tests are among the most well-known norm-referenced tests and are used to determine eligibility for special education services (Muthaiyan & Ananthi, 2020:606). These tests also promote rote learning and memorization over more sophisticated cognitive skills such as writing, critical reading, analytical thinking, problem solving or creativity. Within the education system in SA, the National Senior Certificate (NSC) examinations is an example of a norm-referenced assessment. In this context, the performance in a particular year is normed to a norm group and attempts to answer the question whether learners are ready to exit the school system (Prince, 2016:24). Other examples are Scholastic Aptitude Test (SAT) and Intelligence Quotient (IQ) tests (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10637).

2.2.1.5 Criterion-referenced assessment

Criterion-referenced assessments are concise written descriptions of what students are expected to know and be able to do at a specific stage of their education (Muthaiyan & Ananthi, 2020:609). If a student's performance is measured against a fixed set of predetermined criteria or learning standards, it is referred to as a criterion-referenced assessment. These assessments are used to evaluate a specific body of knowledge or skill set (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10637).

Criterion-referenced assessments also evaluate the curriculum taught in a course and determine what students are expected to know and be able to accomplish at a specific stage of their education (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10637). Such assessments also check whether students have learned expected knowledge and skills. It also highlights if students have any learning gaps or academic deficits which needs recourse. These assessments can therefore evaluate the effectiveness of a course, academic programme or learning experience in the use of pre-assessments and post-assessments to measure learning progress over the duration of an instructional period (Muthaiyan & Ananthi, 2020: 611: cf. 3.4.1).

Examples of criterion-referenced tests include multiple-choice questions, true-false questions, or a combination of question types (Muthaiyan & Ananthi, 2020:609). In SA, the National Benchmark Tests (NBTs) are criterion-referenced assessments that are constructed to provide information about the level of a test-taker's performance in relation to clearly defined domains such a reading, writing and Mathematics, for example. These assessments are effective to determine the readiness of prospective students for the demands they will face in HE (Prince, 2016:24).

A criterion-referenced assessment involves absolute grading and measures students' performance against a goal, specific objectives or predefined performance standards. It focusses on what students are expected to know and be able to do at a specific stage of their education. Examples here include The Smarter Balanced Assessment Test I (SBAT) and American College Test (ACT) Test (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10637).

2.2.1.6 Ipsative assessment

Ipsative assessments have transcended into educational settings as an approach to measure individual student development to make students' progress explicit. It supports a cumulative understanding of performance developed over sequential tasks and activities.

Tasks that support ipsative assessment are designed to reflect governing principles as well as a macro view of capability. In this way the students can compare performances whilst building associated attitudes, skills and knowledge (Seery et al., 2019: 705).

The goal of ipsative assessments is to measure the performance of a student against previous performances of that same student. With this method, such a student should try to improve himself or herself by looking at their previous assessment results. These students do not compare themselves against other students. This method is effective in checking the progress of a student in terms of the improvement (onlineassessmenttool.com/knowledge-center/assessment-knowledge-center/what-are-the-types-of-assessment/item10637).

Furthermore, ipsative assessments are natural extensions of retrieval practices whereby an assessment is set up in such a way that the student has the objective of competing with and improving on their previous performances on the same assessment. The evidence of improvement derived from the ipsative approach promotes student engagement with developmental feedback as they can see its benefits for their attainment (Penn & Wells, 2018:71).

2.2.1.7 Confirmative assessment

Confirmative assessment is regarded as the new paradigm for continuous improvement and is an extension of summative assessment. It involves the process of collecting, examining and interpreting data and information to determine the continuing competence of students or the continuing effectiveness of instructional materials. This is done in order to determine if the instruction is still a success after a year, for instance, and if the way lecturers teach is still on point. Additionally, this kind of assessment builds on the findings and recommendations generated during formative and summative assessments (https://flylib.com/books/en/3.398.1.36/1/). It is therefore necessary to take this kind of assessment to check whether it is still a success after a year or not (Prasanthi & Vas 2019: 95). Hence the assessment of an experiment performed previously by first entering SMHSU BSc students. The students' laboratory reports will be assessed on the basis of an experiment that was performed at Senior Certificate (SC) level. Thus, revealing what students know is important multiple times throughout a unit (Kang, Thompson & Windschitl, 2014: 675). This is significant for both language and content lecturers in a collaborative science context.

Confirmative assessments are especially useful for underprepared students. These identify, explain and confirm the value of the students' performance improvement intervention over time. To this extent, the major element which distinguishes confirmative assessments from formative and summative assessments is the time factor. The heuristic, or rule of thumb is that confirmative evaluation should take place six months to a year after implementation (Online assessment tool from: https://flylib.com/books/en/3.398.1.36/1/). Thus, the BSc students were assessed at the beginning of the academic year.

Confirmative assessment expands traditional evaluation to measure long term effects and expanded performance improvement To this extent, data are collected and analysed in order to determine the continuing effectiveness and improvement of programmes or courses. Confirmative evaluation can therefore demonstrate the results of a programme or course as well as function as a tool to measure individual student performance improvement alongside the results of a change effort (Giberson, Tracey & Harris, 2006:43). Similarly, the continuing effectiveness of the written laboratory report is determined.

Confirmative evaluation is especially useful because it can determine policy in the field of education that will produce desirable long-term effects. It can also help resolve any gaps between the original stated goals and the actual outcomes (Online assessment tool from: https://flylib.com/books/en/3.398.1.36/1/; cf. 2.2.5).

To this effect, there should be wider efforts to inform and involve all educational stakeholders in the reforms of assessment practices in terms of international approaches and influence. Educators should align their assessment practices with current and proposed curricula and with best practice internationally. There should be the development of a repository of paper and digital resources related to assessment) (Murchan et al., 2012: 495; 2.2.1.7).

2.2.1.8 Learning-oriented assessment

The culmination of any assessment activity should be learning. Assessment could be deemed as one of the essential mechanisms for learning**.** What to assess in learning-oriented assessments, is an important point of departure. Amongst some of the assessment types discussed, Learning-Oriented Assessment (LOA) framework highlights methods, reasons and procedures that point out the benefits of doing this type of assessment in relation to the type of product being assessed namely, the laboratory report (Carroll, 2017: 27). This study underpins confirmative learning-oriented assessment (see 2.2.1.7).

Carroll (2017: 28) asserts that LOA is theorised as a development and validation framework for identifying the dynamic, interactive relationship between instruction, learning and assessment in the classroom. This is meant to enhance successful learning in order to guide the development of learning-oriented assessments.

Furthermore, LOA recognises the influences of educational standards and technology on the development of curriculum and materials used in both education and assessment (Purpura & Turner, 2015). Thus, lecturers should adapt instruction to meet students' immediate learning needs, as instructional processes include planning, implementation, assessment of outcomes and revisions in plans (Tomanek, Talanquer & Novodvorsky, 2008: 1115).

The Learning-Oriented Assessment Model (LOAM) represents a three-tier system with three distinct areas, namely, a focus on task design, the development of student evaluative expertise and student engagement with feedback. The design of this model is viewed through the lens of what could be referred to as 'Ways of Thinking and Practising' (WTP) (Carless, 2015: 3).

It is important for students to develop an evolving grasp of WTP. In this way, they could learn through engagement amongst each other regarding specific context, understanding particular disciplinary forms of discourse as well as observing values and ways of acting (Mc Cune & Hounsell, 2005). Importantly too, WTP can include an evolving familiarity with the conventions of scholarly communication within the discipline and relevant professional community (Anderson & Hounsell, 2007). In addition, Carless (2015: 4) refers to the development of WTP as authenticity in assessment. These arguments blend harmoniously with the social constructivism theory in the study (see 2.6).

The second tier in the model highlights a learning-oriented assessment task design which in inter-connected with the third tier in the student engagement with feedback model. The dynamics which take place between these two tiers involve students' abilities to engage with quality criteria, development of their self-evaluative capacities as well as making informed judgements about their own work and that of others. Evaluative expertise helps students to monitor and improve their learning. These are critical elements for student learning. To this extent, the role of the lecturer becomes critical in terms of assisting students to develop the capability to discern quality and make complex judgements (Carless, 2015: 4).

The last tier which relates to student engagement with feedback, is a core aspect of improvement. Carless (2015: 4) argues that for students to engage effectively with feedback, they should develop a conception of quality which begins to approach that of the lecturer; students and lecturers must operate in tandem (Sadler, 2010). Carless (2015: 4) refers to such development as an evolving capacity which will aid students to facilitate the decoding and uptake of feedback messages which tend to be cryptic or opaque.

Broadbent, Panadero & Boud (2018: 3) caution however, that university lecturers may face several constraints that will affect their choice of assessment practice. For example, teaching a large class can present real challenges in design, management, and standardisation of assessment practices (Broadbent, Panadero & Boud, 2018: 3). As a result, lecturers in HE find themselves pulled in different directions by assessment purposes other than facilitating student learning (James, 2003). Thus, academic communities have developed rhetorically effective and discipline-distinctive ways of constructing plausible accounts of research (Hyland & Salager-Meyer, 2008: 21).

Salvia and Ysseldyke (1995, 5) assert that when students are assessed, the way they perform a variety of tasks, in a variety of settings or contexts, the meanings of their performances in terms of the total functioning of the individual and the likely explanations for those performances are considered. Thus, good assessment procedures take into consideration the fact that a student's performance on any task is influenced by the demands of the task and by the factors inherent in the context in which the assessment is carried out.

Assessment procedures need to be designed or selected with a clear understanding of need and purpose (De Chazal 2014, 295). A key feature of all performance assessments is that they require students to be active participants; students are responsible for creating and constructing their responses. This type of assessment would provide lecturers with information about how a student understands and applies knowledge. Performance-based assessment requires students to demonstrate that they have mastered specific skills and competencies by performing or producing something (cf. Hibbard 1996, 5; Masters & Forster 1996, 25; see Appendix A).

Moreover, criterion-referenced tests are used to determine whether each student has achieved specific skills or concepts. Tests and test scores are reported and interpreted with reference to specific context used to assess a student's mastery of the curriculum (Dreyer, 2000: 270; Figure 1; Table 4).

2.2.2 Assessment criteria

Assessment criteria are statements specifying the standards that the students must meet and the evidence that will be gathered to demonstrate the achievement of learning outcomes (Brown, 2001: 10).

Frameworks for assessing students' learning are undergoing fundamental transformation, characterised by new thinking, new metrics and new technologies (Teachers' guide to assessment, 2016: 6).

Assessment criteria should reflect the level of the module. Higher level modules will generally require more complex analytical skills and greater depth of knowledge than the lower-level ones. Therefore, this must be reflected in the language used to write the criteria, with verbs that are more descriptive such as 'define' or 'describe', leading to increasingly sophisticated analytical and critical ones such as 'compare', 'evaluate' and 'critique' (Brown, 2001: 12).

The criteria must reflect the distinctive epistemological characteristics of the particular subject or discipline being assessed. Assessment criteria must be comparable to standards set in other institutions offering the same award. The meaningfulness of any qualification depends on it representing the same value wherever it has been obtained (Brown, 2001: 12). The criteria need to relate to the specific requirements of the task, that is, the criteria should describe the performance required for the task.

Learning outcomes may focus on knowledge acquisition, mastery of skills or development of attitude or ability. All the different expected outcomes will be specified in publicly shared statements and these will be linked in a clear way to explicit assessment criteria by which they will be measured (Brown, 2001: 2)

The outcomes-based approach has been developed in conjunction with credit-based modular frameworks in which each unit carries a specified number of credits, awarded on its successful completion. In order to achieve the desired qualification, the students must amass a stipulated number of credits, usually in stated proportions from different levels (Brown, 2001: 2). Thus, the outcomes-based approach to course design is meant to make the expectations of the educator more transparent to the students (Brown, 2001: 1). It starts with the specification of what the student will be expected to achieve by the end of the unit (Brown, 2001: 2).

2.2.3 The significance of English language support courses

If university tuition is offered to students in a non-native language such as English, these institutions inadvertently shoulder the responsibility of meeting the language needs of the students. As a response to the hegemony of English in HE, attempts made to meet the language needs of students in tertiary institutions are manifest in different approaches employed by universities, such as Integrating Content and Language (ICL) to support non-native speakers of English, in English media universities (Ngoepe, 2020: 230). This, therefore, puts a premium on English language support courses (ELSCs) (Ngoepe, 2017(b): 181) such as the SMHSU DLP one.

Furthermore, pedagogic practices for English language teaching evolved in response to the growth of English as a world language. Thus, content and language integration (CLI) are a practice that has emerged in response to such demographic changes. It also provides a means of teaching the English language through the study content. In a CLI approach, language learners are not expected to be proficient in English before working with subject content. Language support is provided alongside instruction for content area specialisations (Murray & Christison, 2014: 156). For instance, the value of English in the DLP context is located within an academic science community at the heart of knowledge construction (cf. Ngoepe 2019, 234; see 2.6).

In the United States (U.S.), content-based instruction (CBI) is most commonly used as a comprehensive term to refer to all types of programmes making dual commitment in content and language development (Murray & Chjristison, 2014: 157). However, post 1994, several institutions of higher learning in SA strategically attempted to redress educational imbalances of the past. Possible solutions include teaching courses such as EAP and ESP to support underprepared cohorts of students that they admit (Ngoepe, 2017(b): 186). These courses can serve as examples of English Language Support Courses (ELSCs) which can integrate content and language to the benefit of the underprepared DLP students.

The emergent DLP unit could forge productive interaction among SMHSU students, English language lecturers and content lecturers. This unit should be assessed by language and content lecturers who share the teaching of DLP students (cf. Ngoepe, 2017(a): 174). The rationale for this is that when language and content lecturers in a multidisciplinary setting assess what they teach in concert, they tend to benefit from that enriching experience, but students stand to benefit more. Although assessing science tasks remains a challenge to language lecturers, if language and content lecturers can assess in concert in a bid to hone their collective strengths and debilitate their weaknesses, students stand to benefit more from such interventions (Ngoepe, 2017(a): 172).

DLP teaching should reflect the underlying concepts such as 'Experimenting in a laboratory' and 'Report writing' related to science content, and it includes activities of the broad discipline such as projects on 'Absorption' and 'Transportation'. Content should be offered in thematic units subsuming a number of topics for lectures (cf. Ngoepe, 2007(a): 228).

2.2.4 The DLP sample unit

The DLP sample unit consists mainly of outcomes, credit value, assumption of prior learning, resources and teaching approach.

2.2.4.1 Outcomes

Assessment criteria are statements of achievement and need to be developed alongside the development of the curriculum and syllabus as they influence both the materials and the assessments (de Chazal, 2014: 302). The outcomes-based approach to teaching and learning is increasingly being used in HE as the model of best practice in constructing courses and evaluating students' work.

The DLP laboratory writing unit outcomes can be divided into critical cross-field outcomes and specific intended outcomes as follows:

2.2.4.2 Critical cross-field outcomes

Students should be able to identify and solve problems, work in pairs and/or teams, organize and manage themselves, collect, analyse and evaluate information, and communicate the findings of the experiment performed effectively, using science and technology, recognize problem solving contexts, reflect on and explore effective learning strategies, participate as responsible citizen as well as explore education and career opportunities (cf. Ngoepe, 2017(a): 180) on the basis of the laboratory report writing experience.

2.2.4.3 Specific intended outcomes

Specific intended outcomes imply that students should be able to investigate a problematic issue such as 'Absorption and transportation of water and salts by plants', use the international systems of units, refer to the periodic table, take notes, use tense appropriately and use the passive voice (cf. Ngoepe, 2017(a): 181).

2.2.4.4 Module units

The DLP module should consist of the following units: conducting an experiment (specimen and apparatus), taking measurements (SI Units), recording time at intervals, observing results (note-taking and note-making), using English language structures, integrating language and content, presenting results of an experiment (graphs and tables) and writing a report (cf. Ngoepe, 2017(a): 181).

2.2.4.5 Credit value

Learners' needs and characteristics ought to determine the purpose and the credit value of a module. Moreover, the module designer needs to consider the learning assumed to be in place.

DLP admits and teaches 350 students on average, in one big group. These groups could be divided into smaller groups comprising of approximately 60 students for each of the five core subjects. The classes are small but are also labour-intensive as the lecturers in DLP would on average spend 5 contact sessions per week with each of the 5 groups (cf. Ngoepe, 2017(a): 181).

The task unit should be taught during the first term and should be the first module to be taught. Groups start working on their task about 2 weeks after the beginning of the academic year. Despite the out-of-class time that the groups are expected to spend working on the task prior to report writing, the DLP spends one week teaching the experiment unit. The experimental report writing could be condensed into 1 week which translates into 35 hours (7hours x 5 days), excluding the out-of-class time spent on the task by students (cf. Ngoepe, 2017(a): 181).

2.2.4.6 Assumption of prior learning

It is assumed that DLP teaching staff members are part of the SMHSU staff. These staff members need to work in close collaboration with members of their mainstream subject departments they support and working groups should be established in all subject disciplines to carry out the process of curriculum development. There should be close involvement of mainstream content academics in the DLP (cf. Ngoepe, 2017(a): 181).

It is also assumed that students have studied English for General Purposes (EGP) up to NSC level. As a result, the DLP students should be taught how to use language structures and features in a science context during the first term of their academic year (cf. Ngoepe, 2017(a): 182).

2.2.5 Assessment tasks

The apex of assessment is represented by assessment tasks that students carry out as part of the courses for their degree programmes. Assessment tasks strongly influence how students direct their efforts and kinds of approaches that they prefer (Carless, 2015: 7).

Assessment tasks are part of a wider network of influences, including the nature of the curriculum and the discipline, the lecturers' beliefs and aims, educational and institutional contexts, relationships between classroom participants, students' attitudes and motivations towards the course being studied, and the extent to which students focus on grades and the mastery of relevant content and skills (Carless, 2015: 48). Assessments of a performed experiment will reveal the nature of first entering BSc students' tasks at SMHSU (cf. 2.2.1.7).

Tomanek, Talanquer and Novodvorsky (2008: 1113) highlight two categories of factors that influence lecturers' reasoning when selecting formative assessment tasks namely, characteristics of the task which relate to the qualities of the task and characteristics of students or the curriculum. Lecturers have to consider students' abilities to complete the task as qualities of the task include the level of student thinking demanded by the task. Lecturers should therefore be taught how to think about - and practice assessment of student understanding. For example, in terms of curriculum presentation, lecturers have to take into consideration lesson planning and selection of teaching strategies.

Kang, Thompson & Windschitl (2014: 675) argue that expectations for students to perform beyond basic competency levels will require new forms of teaching expertise in which lecturers come up with challenging tasks for students while creating a range of opportunities for them to demonstrate what they know (see 2.2.1.7). Additionally, Broadbent, Panadero and Boud, 2018: 307) aver that the role of lecturers in this regard would be to offer support to students pertaining to their intellectual engagement as well as their demonstration of deeper learning by producing well-designed assignments. Good assessment practices should cater for the implementation of design features such as use of exemplars, rubrics and audio feedback. Thus, Kang, Thompson & Wingschitl (2014: 675) assert that well-designed assessments give lecturers insights into students' current ideas, gaps in understanding and reasoning processes. Implicitly, lecturers can adapt instruction based on learners' needs and, in this way, encourage advanced thinking.

Moreover, scaffolding is identified as another dimension to assessment tasks. Five forms of scaffolding could be highlighted, namely, using contextualised phenomena, rubrics, checklists, sentence frames and drawing explanatory models in combination with written explanation. However, not much is known about the types of scaffolding lecturers use within assessments when designing written tasks. Qualities of assessments can impact the quality of produced responses. Strategic combinations of scaffolds can prompt students to more readily use what they know to produce evidence-based explanations, when scaffolding is of a high quality (Herman, 1992; Kang, Thompson & Windschitl, 2014: abstract).

2.2.6 Feedback

Assessments go hand-in-hand with feedback. Hence, the feedback provided by formative assessment is critical in a teaching-for-understanding practice (Tomanek, Talanquer & Novodvorsky, 2008: 1113). Formative feedback is an important factor in learning to meet students' needs (Hattie & Timperley, 2007). To be part of a formative process, the feedback needs to have clear goals (where am I going?), qualitative information about current performance (how am I doing?), and information about how to improve subsequent performance (where to next?) (Hattie & Timperley, 2007).

Feedback appears to work best if it is based on factual data and it is interpreted with reference to known and agreed criteria. For example, during a lecture, the lecturer may give feedback regarding common areas of mistakes in students' writing. This could be in the form of PowerPoint presentations, one-on-one feedback or written feedback (Ngoepe, 2015: 48; cf. 2.2.7**).**

Furthermore, assessment and feedback can be grouped into five broad areas, namely, diagnostics which focuses on students' strengths and weaknesses, achievement which illustrates the progress students have made, performance which highlights students' ability to perform target academic tasks, proficiency which assesses general competence for certification and accountability which provides evidence to funding authorities that intended outcomes have been met. Thus, feedback is salient to assessment (Hylands, 2006).

Boud and Molloy (2013) assert that the value of feedback lies in what the students can do with the feedback, rather than how the teacher provides it. For example, learning-oriented assessment can represent a possible way forward of focusing on assessment processes towards the advancement of student learning. There are three main functions of assessment, namely, to support student learning, to account for the assessment SMHSU lecturers administer to BSc students and to judge the quality of assessment (cf. Carless, 2015: 10). Similarly, laboratory report writing will be assessed in order to support BSc students' learning, judge the quality of assessment and justify the need for accountability among SMHSU lecturers.

Learning-oriented assessment seeks to circumvent some of the problems in the interplay between summative and formative assessment by focusing on stimulating productive student learning (Carless, 2015: 13). Writing a laboratory report about a performed experiment is meant to circumvent some of the challenges in the interplay between summative and formative assessment.

2.2.7 Assessments at SMHSU

English is a compulsory course for all first-year Health Education & Life Competencies (HELC) science students at SMHSU. In line with the requirements set by the South African Qualifications Authority (SAQA), the course has been designed in accordance with the National Qualifications Framework (NQF), level 5 (Sefako Makgatho Health Sciences University, 2013: 3).

A scoring rubric was developed by lecturers in the DLP to assess the different components that are being tested. Such a guide also serves as an aid to students, to remain focussed on essential areas in their writing, which are formally assessed and evaluated.

The contents of the question papers are discussed on an ad hoc basis by the lecturing staff either before or after student assessments shall have taken place. Aspects of grammar, comprehension skills, academic writing skills, referencing skills, visual and graphic literature in a General English (GE) context are some of the items that are normally included in both tests and examinations. The rubrics for each of the items assessed are also discussed and agreed upon by DLP lecturing staff. An external examiner is appointed to moderate the question paper as well as the students' scripts proportionally according to weakest, reasonable and excellent scores.

Three broad components of assessment that are included are CA, STs and the examination, all of which take place during the academic year. CA is conducted throughout the year. Coupled with this are STs with an overall weighting of 60%. Importantly also is the end-of-year examination 2 hour paper, with a weighting of 40% of the final year mark [University of Limpopo (MEDUNSA CAMPUS), 2013: 3]. Of importance too, is the fact that the written test, as assessment criteria, is regarded as some form of assessment channel between students and lecturers, especially in large classes.

HELC is a compulsory year course which carries 60 marks. BSc first entering students are afforded various opportunities to accumulate marks, for example in assignments, tests and examinations. As per SMHSU regulations, the primary distribution of marks is 60:40, that is 60% for continuous formative assessment and 40% for summative (end-of-semester) assessments. Four scheduled tests are written per annum: two in the first semester and two in the second semester. A student should score 40% in the continuous assessment, s/he will not be admitted to the final examination. It is further compulsory for a student to score a minimum of 40% in the final examination and a cumulative (that is continuous and final examination together) 50% to be promoted. This implies that a student will fail the course if firstly s/he fails to get 40% in the continuous assessment and secondly fails to get 40% in the final examination or lastly, fails to get a cumulative 50% to pass (Sefako Makgatho Health Sciences University, 2017:7).

For the successful completion of this course therefore, BSc first entering students are required to complete the following components (each with its own weightage): Test 1 (paragraph writing) which carries a weight of 18%, Test 2 (reading comprehension) with a weight of 10%. Next students must complete an assignment which carries a weight of 10%. This is followed by Test 3 (multiple choice questions) which carries a weight of 10%. Test 4 (oral presentation) carries a weight of 10% and lastly computer literacy which carries a weight of 2%. In total, the course carries 24 credits. The DLP may make the necessary changes from time to time (Sefako Makgatho Health Sciences University, 2017: 7).

A shortcoming in this context is that the DLP does not per se teach report writing. Also, to date, there are no diagnostic assessments imposed upon the first entering BSc students which would ideally pin-pointing specific shortcomings in terms of scientific genre writing. This remains a challenge. There is currently no scientific yard stick that can be either used as a point of reference or to determine the laboratory report writing needs of the BSc students upon entry into the DLP (cf. 5.3).

2.3 ACADEMIC GENRES

University students around the world, especially additional language students, face diverse challenges in acquiring adequate and necessary skills to participate in academic discourses of their chosen disciplines (Carstens, 2008: 82). Likewise, additional language first year BSc undergraduate students at SMHSU are expected to participate in the science academic discourse despite having a limited skills base in terms of participating in writing, in such specific discourses and genres.

Different types of academic writing that are known as genres; they have distinct purposes, forms and recognised structures. These could be essays, reports, projects, case studies and so on (Gillet *et al.,* 2009).

Three notable genre traditions have evolved since the 1980s. These traditions include the New Rhetoric School, the Australian Genre School, and English for Special Purposes ESP Genre School of which English for Academic Purposes (EAP) is a main branch. In line with EAP guidelines, there are new proposed models for teaching genre-focused disciplinary writing at tertiary institutions (Carstens, 2008: 93).

Genre writing is regarded as predominantly linguistic and varies with the social context in which it is produced (Ngoepe, 2007: 58). Similarly, a genre-based pedagogy would focus on making explicit a writing task's lexico-grammatical features (Parkinson et al, 2007).

Genres can be influenced by elements such as subject matter, the relationships between the writer and the audience as well as the pattern of organisation (Badger & White, 2000: 155). In all of these, it is important for students to learn to vary elements of their style according to the genre in which they are writing (Ngoepe, 2007: 58).

Marshall and Rowland (1998: 217) argue that report writing is a specific genre with specific designs. The various sections of a report should convey intelligible information to the reader. Marshall and Rowland (1998: 214) state that communicating findings and observations in a report is an integral part of science. According to Ngoepe (2012: 15) a student's care and observation, practical skills and expertise in experiential design using research techniques will therefore impact the standard of the overall scientific work and writing. Practical steps in scientific writing genres include good notes, investigative activity in research projects and writing reports which also include personal records. In addition, there is also a specific format to be used. Clarke (2015: 22) advises that the format for genre of a research article includes an introduction, methods, results and discussion. The laboratory report should run parallel in this regard.

Writing in a scientific genre has elements of art, and at the same time, stimulates thought processes. Importantly, there is a connection between science and writing. Notably the two are not separate but rather successive tasks (Barrass, 1978: 13). Thus, in performing a given task, first entering BSc students ought to demonstrate this connection between science and writing.

Furthermore, Boynton (2018: 13) argues that students can incorporate and successfully use genre features of popular science in their writing to varying extents. Motivation to do the research and read out-of-class work is crucial. These are the key factors which determine student incorporation and the use of genre features.

Moreover, Barrass (1978: 15) avers that within the context of science genre, observing species and processes need to be translated into descriptive formal style. Important elements in respect of observation and learning is the know-how of writing, how to use words in relation to numbers correctly and appropriate units of measurement which ensures precision and accurate description. In a description it is necessary to proceed from the general characteristics of an object to the finer details. Once this has been done the next item may be described. Therefore, precise and logical description is key.

Another reason why description plays a critical role in science genre is that it can provide opportunities for the rearrangements of observations to distinguish between the most conspicuous features and the detail. Alternatively, events can be described chronologically or in another fashion, for attention to be drawn to the observations that seem to be related (Barrass, 1978: 15).

Poor writing skills can impact negatively and have diverse effects and consequences in a genre-led context. For example, scientists and engineers must express their thoughts succinctly, clearly, simply and accurately in order not to be misunderstood. Therefore, accuracy is key in terms of computing and communicating results (Barrass, 1978: 15). In the same vein, there should be accuracy in communicating findings of an experiment performed by SMHSU first entering students.

There are certain attributes of scientific writing that must be observed. For example, all academic writers must display familiarity with the persuasive practices of their disciplines and genre practices such as encoding ideas, employing warrants, framing arguments and conveying an appropriate attitude to the readers and their ideas which audiences will find convincing (Hyland & Sagler-Meyer, 2008: 5).

Writing in science has specific features and purposes. Genres vary depending on the social context in which they are produced. The members share communicative purposes and events, and skills are honed in according to experiential design, practical skills and research techniques. In the science genre, stimulation of thought processes, communicating findings and observations, taking practical steps and the incorporation of genre features are key.

2.4 WRITING IN A SCIENCE COMMUNITY

First time entering university students are regarded as access seekers to a discourse community which would enable them to engage in the practices of such distinct communities (Jackson et al. 2006: 261; see Research Methodology).

Berkenkotter, Huchkin and Ackerman (1991: 191) point out that discourse communities come into existence; they emerge from the relevant discourse through which members of similar communities communicate (Jackson et al., 2006: 261).

Notably therefore, members of a science discourse community, for example, can include lecturing staff and students. Thus, SMHSU lecturers and students constitute an essential science discourse community.

The idea of academic community or discipline is central to an understanding of science and science writing. Further, the idea of academic community has provided a way of understanding the social practices of academics acting as group members. The distinctiveness of discourses cohering around the concept of community have become more sensitive to the ways genres are written, used and responded to by individuals participating as members of social groups.

Boynton (2018: 5) states that the two main forms of science writing for science undergraduates are essays and laboratory reports. This is why first entering BSc students will be tasked to write a laboratory report on an experiment they had previously performed (Boyton, 2018: 5; cf. 2.2.1,7).

Developing essential writing skills will stand to benefit first entering science students not only in their studies, but also in their workplaces where they will put the theoretical knowledge imparted into practice at Institutions of Higher Learning (IHL). According to Drury and Muir (2014: 79), the expectation of employers and government is that science graduates will have developed high levels of written communication within their degree programmes. Ideally, therefore, their style of writing should by the end of their degree programme, comply more neatly with the requirements of academic writing.

In light of the above, if academic writing and genres are that specific, the demands and expectations with regard to first entering BSc students can be hefty. Hence, it is important for lecturing staff to take into consideration, amongst other things, the educational foundation and background these students hail from regarding secondary preparatory work and background for tertiary education readiness. This is not an occurrence peculiar to SA, as Munro (2003: 327) clarifies that poor academic skills is a challenge which universities across the world have to contend with. Tertiary institutions worldwide move from the premise that the study of English is recognised as an international language of science, trade, media and conflict resolution (Chokwe & Lephalala, 2013). Notably, SMSHU is no exception in this regard.

Ideally, students should conform to the science genre's conventions which should be taught. This involves practical steps and structured approaches, guided by meticulous observation, planning and discipline (Clarke, 2015: 22; see Appendix A). A technical style of writing can be challenging, though. For example, translating units of measures into Standard English (SE) and writing a clear description are genre-specific skills that students must be taught (see 2.2.3). For English language first entering science students' at SMHSU context, this would involve acquiring a new set of skills and writing tools in order to be able to meet the demands within the particular discourse community they have become a part of.

Academically, these students need to build a knowledge base as well as perform different roles within the science discourse academia. Lebrun (2009) points out that the presenters of information such as first entering BSc students must be credible. The students must be knowledgeable on the subject and content, and be balanced with the language aspects drawn from believable and accurate conclusions. In order to determine how SMHSU science students observe, plan, remember and communicate, their laboratory report writing skills were assessed in this study.

2.4.1 A science discourse community

Writing has an uncontested place in the science discourse community. This is partly why scientists must write; they are not exempt from the process of writing. Scientists must write in order to produce appropriate forms of writing that falls within the realms of scientific writing which in turn prompts scientists to think, plan and organise. Similar yardsticks and expectations can also be formed with regard to the type of writing that science students at SMHSU are expected to engage in and then produce, thus, reflecting the styles and approaches of scientific experts. Students can only stand to benefit from good writing skills taught in relation to why and how scientists should write.

According to Paxton (2007), the idea of student purpose is used to describe first year student writing as a practice of taking discourses and texts from school in order to craft new texts as they make the transition to learning new academic literacy practices. First year students use writing styles with which they are familiar as they relate to their own prior experiences.

Grabe and Kaplan (1996: 3) state that students need to learn how to write well, because writing is the means by which they will construct disciplinary knowledge and it is the main means by which they will demonstrate their attainment of assessment purposes.

Barrass (1978: 9) also presents practical suggestions such as tracking, monitoring and guiding the student as a science writer. Customised kinds of concepts science students would write about are, for example, how to use an instrument and how to apply a technique.

Using a plan is the writing method frequently employed and expected in formal education; this is more likely to be used when writing a report (Marshall & Rowland, 1998: 187). For example, students can undertake research projects with peers and record their results in writing (cf. Ngoepe, 2017: 184).

In respect of the shortcomings in student writing, students often struggle to provide adequate links between sentences, a problem which the authors argue can be overcome quite easily (Gillet et al., 2009). Other tangible findings about mistakes in student writing include disjointed and unstructured writing and badly written texts. In terms of textual features, there is no concern for the reader and the style is too discursive, long winded and anecdotal (Naidoo & Tshivhase, 2003: 227). Students who use English as an additional language are therefore at risk of not taking such shortcomings seriously, and as a result the negative attitude they hold in respect of English as a subject taught outside of their discipline specific courses, intensifies. They do not seem to place any high premium on the value and quality of their writing, since writing in an L2 comes with its own history of many complex factors alluded to previously.

Furthermore, if a student is expected to design an experiment, the design should be written down. The written design can then be built onto as the student carries out the experiment, thus providing a detailed and organised basis for the final report. Specific steps should be followed by the student, namely, indicating the purpose of the report, the problem that must be solved and the predictions made by the student (Ngoepe, 2012: 52). These are pertinent areas that content subject lecturers and English lecturers need to familiarise and immerse themselves in. What should become apparent to lecturers involved in the development of students' academic writing skills within a science milieu is that there are bare essentials in writing which should be taught because of the specific academic genre involved.

Moreover, in order to gain insight into student writing, lecturers should consider the match between the purposes associated with science writing practices in a particular genre. The implicit purposes students could bring to a writing exercise, given the writing practices and the discourse conventions they are familiar with, should also be considered (Clarke, 2015: 38).

Writing is a compulsory condition in the academic environment, it is artistic in its nature, needs regular practice and is generated in the thought processes of the writer. These are important considerations to bear in mind when teaching writing as a skill to English language science students. Students must also adopt generic styles and approaches, must acquire appropriate discourse jargon, void of grammatical errors and adhering to required standards within their science discourse community.

In line with the above, conventions students should follow refer to the specific uses of scientific expressions and grammatical structures commonly followed by authors in most fields of research (Marshall & Rossman, 2014). To this effect, Weissberg and Bucker (1990: iv) reiterate the fact that the English of an experimental research report for example, is highly conventionalised. In other words, BSc ECP I students are expected to develop English writing skills which are technical in nature and which employ instructional language. However, many first year science students are not fully acquainted with the science discourse conventions.

Features of writing in scientific conventions can differ, depending on the purpose of writing and the level of professionalism. For example, students do not observe all the scientific conventions when writing, partly because of their restricted range of words and phrases as well as because of their initial unpreparedness. Professional scientific writers observe more of the conventions and as a result, they can produce research reports, that are highly conventionalised.

2.4.2 The scientific method of writing

Hyland and Salager-Meyer (2008: 4) argue that the label ‘scientific’ confers reliability on a method and prestige on its users. It refers to all that is most empirically verifiable about academic knowledge and is seen to provide a description of what the natural and human worlds are like. Scientific writing is a unique form of argument in which text is only the channel which allows scientists to communicate independently existing truths, relaying directly observable facts to the world (Hyland & Salager-Meyer, 2008: 4)

Haliday (1985) regards scientific writing as something that could be taught as impersonal and is restricted to describing facts. According to IATEFL (2013:14) it is the ideational stratum. The technical nature of scientific and clinical writing are skills that first year students in science lack. Detail to very specific and direct steps is essential. These are skills that are not acquired over a short period of time but in a continuous process as previously alluded to. Lebrun (2009) argues that such skills also result from confidence that lends itself from experience in the field by presenting detail that is very specific and has direct steps.

According to Barrass (1978: 8), important elements in digestible scientific content are knowledge of vocabulary, knowledge of acronyms, knowledge of visualisation techniques and knowledge of domain where the field of speciality is found. The readiness of first entering science students at SMHSU is resultantly placed under scrutiny within the arguments of written digestible scientific content, pertaining to laboratory report.

Furthermore, Barrass (1987: 7) asserts that the scientific method is structural, technical, clinical and factual, with a strong focus on results. In order for one to understand the basics of the scientific method of writing, one should understand that scientific research begins with a problem. Such a problem should be tackled by a specific method of investigation in order to obtain sufficient evidence to formulate a hypothesis. The scientific method ensures that science is a co-operative method, because no work can be regarded as complete until a written report has been produced. In this way students are afforded the opportunity to work in pairs or in groups as opposed to working on their own. So, the first entering SMHSU BSc students are expected to work in pairs when performing experiments.

2.4.3 Report writing

A key assessment genre across the undergraduate years is the laboratory report and this remains a critical genre for students to master (Drury & Muir, 2014: 79). Hence, laboratory report writing is a practical skill which first entering BSc students at SMSHU should be able to master in the milieu of a scientific culture. This is a process which involves dedication from students in respect of familiarising themselves with published textbooks in their fields as well as conducting research, and finally writing up their results (Weissberg and Bucker, 1990: iv). Sensitising students to the various registers of science writing as well as increasing their science literacy could be achieved by comparing academic scientific writing, that is, textbooks and research articles, with popular science writing (Parkinson & Adendorff 2004 in Boynton, 2018: 6).

Moreover, Barrass (1978: 5) argues that specific steps to the writing up of the report include starting off with a clear statement of the problem, deciding on the method and which materials to be used and focussing on the hypothesis to be tested in any given experiment. Notably, there is no elaborative and grandiose writing constructed with adjectival clauses or idiomatic expressions in scientific writing. Students should rather be guided by selective approaches as they are expected to find factual evidence in the quest for truth (see 2.6).

Science curricula are typically content rich with little time to address issues of students' writing alongside their increasing knowledge and understanding of content (Drury & Muir, 2014: 79). An effective curriculum involves all stakeholders in the process of design. This implies long-standing collaborations between discipline academics in science and engineering and language and literacy specialists in the integration of communication skills into curricula (Taylor & Drury, 2007; cf. 2.2). The effectiveness of team-based approaches lies in the different skills and knowledge that participants bring to their interactions in the design process. In this way, team members become engaged in 'a community of practice', learning collaboratively and sharing experience (Drury & Muir, 2014: 81). Report writing falls squarely within the realms of specific scientific conventions which must be observed. Such conventions have unmistakable writing features commonly followed by science writers.

Students should gain greater understanding of this specific genre's standards and adopt scientific literary practices. Report writing should be inclusive of a collaborative approach among all the stakeholders. Curriculum design should likewise be factored into this equation to ensure that first entering BSc students acquire a solid knowledge base, rich in content, new skills, discipline specific writing tools as well as understand the various roles they have to perform within the science discourse community (cf. Ngoepe, 2020: 240).

2.4.4 Note-taking during experiments

The development of arguments and hypotheses should be recorded during the investigation stages. Of importance too, is the safekeeping and back-ups of the recorded notes. The specific items that should feature in a record or notebook include the heading, the date, the written instructions, the numerical data recorded during the investigation, the steps in calculation, the results and any relevant drawing graphs, diagrams and so on (Glasman-Deal, 2011).

Moreover, it is advisable to start writing even before the investigation could commence. This could refer to what is observed; students should write down what is being recorded during an investigation. The data would then be subject to analysis in order to produce results later on. Conclusions are also dependent on data, assumptions and logic of reasoning because of its integral scientific nature (Lebrun, 2009).

Similarly, Barrass (1978: 15) indicates that specific instructions should be adhered to in record keeping of practical work. For example, keeping a notebook or keeping notes that are normally required to supplement drawings. As a result, making notes is regarded as students' first use of writing as an aid to remembering. Ngoepe (2015: 67) argues that note-taking could involve, amongst other things, listening to passages that are read out by the lecturer and writing down essential information. One might encounter challenges in respect of report writing if relevant detail has been omitted or not recorded. A report or any investigation must be based on record keeping prepared during the investigation.

Furthermore, the structure and content of the report should have 'Introduction' and 'Discussion' sections, whereas the 'Central Report' sections comprise the methodology, results and conclusion should also be included (Glasman-Deal, 2011).

Barrass (1978: 12) asserts that what scientists and engineers write about also include personal records that serve as aids to remember, observe, think, plan and communicate. Within this context, Marshall and Rossman (2014) deem it important to illustrate to students how to translate their research tasks into written reports that adhere to the standards of English-speaking scientific and academic community, inclusive of syntax and semantics. In line with this, SMHSU's first year BSc students should be instructed on how to write laboratory reports on the experiments they performed under the guidance of their lecturers.

2.4.5 The passive voice

First entering science students are challenged when it comes to writing in the passive voice within the specific science genre of writing they are sometimes subjected to. This in itself presents a need which should be addressed (cf. 5.3).

Ngoepe (2007: 23) asserts that institutional intervention regarding the specific language needs of the students in their curricula, should be enhanced with the intention to improve performance in science. Thus, SMHSU students need some pertinent intervention regarding scientific writing (see 2.2.5).

Writing in the passive voice is governed by specific conventions which includes procedural descriptions such as choosing the correct verb tense and verb voice. It is therefore more common to use the passive, instead of '*we*', more so in the central report section (Weissberg & Buke, 1990: 97). Importantly, Ding (2002: 138) stresses that of all the sections of the scientific report, the method section consistently displays the highest percentage of passive structures because in method 'the authorial role is that of a presenter of new data'. This is an area worth considering regarding analysis of data.

The passive voice offers two distinct advantages in scientific writing; it focusses the reader's attention on the method, result or principle being described and presents findings and ideas in a neutral, fact-based, objective way (Active vs Passive Voice in Scientific Writing, 2015). Report writing, where the passive voice is common, is generally less wordy than the active, more direct, and more efficient in conveying information (Baron, 1989). For example, 'tests were conducted (by me) with four different types of reactors' (Weissberg & Bucker, 1990: 102). One should refrain from using 'I' in the laboratory report. A more preferred way would be to write in the passive (Glasman-Deal, 2010: 12). In scientific writing, therefore, the emphasis is more on the content of the writing rather than on the writer of the experiment. In the majority of instances, in scientific writing, the passive voice properly puts the emphasis on the experiment or process being described, and not on the person carrying out the experiment. Hence such writing is void of expressive, emotive and elaborate styles (Hacker, 2003: 130).

Moreover, Glasman-Deal (2010) argues in a similar vein that in science writing, it is common to use the passive voice especially in the central report section. In other words, with the use of the passive voice, ‘agent’ refers to the person who performed the action of the verb. When referring to a dummy subject, the following example is used, ‘this article’ or ‘the present paper’. The passive voice describes procedure in order to depersonalise information. Emphasis is then placed on the procedure and how it was done.

The passive voice is a marked stylistic feature of science writing, especially within the context of procedural description which is often written in the simple past tense. The use of the passive voice involves technical expressions such as the use of expressions and grammatical structures (Weissberg & Bucker, 1990: iv). In the past decade many writers have studied passives in scientific writing, focusing on the rhetorical roles of the passive voice (Ding, 2002: 137).

Hacker (2003: 169) clarifies that with regard to the uses of the passive voice, active verbs illustrate meaning more emphatically and vigorously than their weaker counterpart verbs in the passive voice’, which lack strength because their subjects receive the action instead of doing it.

Scientific writing employs more passives than actives to focus on materials, methods, figures, processes, table, concepts and so on. Use of passives which focus on the physical world helps de-emphasise discreteness of scientific experiments. Uses of passives helps remove personal qualifications of observing experimental results. Passives enhance cooperation among working scientists by providing a common knowledge base of scientific work and objects (Ding, 2002: 137). These are important aspects that should be considered by English language lecturers teaching first entering BSc students (cf. Appendix B).

The passive voice in scientific writing also represents professional practices of science instead of personal stylistic choices of individual scientists. This highlights the technical and clinical features of scientific writing more emphatically. Scientists use the passive voice because it helps them focus on ‘organisms, materials, methods, findings, analyses, concepts and so on, and that this focus makes scientific writing thing-centered (Ding, 2002: 137).

Moreover, Beason and Lester (2000) indicate that using the passive voice is not an error because there is no universal rule against using it. Although most writing involves the use of active voice in L2 academic writing, when the doer of the action is unknown or perhaps unimportant, the passive voice is appropriate.

Furthermore, the passive voice also leans itself to social values in science. Ding (2002) states that the use of passive voice in scientific writing is socially conditioned. Scientific passives embody the professional practice and the rhetorical contexts of science. It also conforms to the thing-centered scientific work which establishes a common domain for scientists to work in and it meets expectations of researchers in the scientific communities (Ding, 2002: 138). The passive voice implies that scientists are willing to cooperate with each other in collectively advancing science, as they collect data through experimentation (Ding, 2002: 4). Thus, both lecturers and first entering science students tends to co-operate in a bid to advance science through experimentation (see 2.6).

Practically, all researchers of written academic corpora comment on the fact that passive constructions are far more prevalent in the academic genre than in any other (Quirk et al, 1985). Similarly, SMHSU first entering students will contribute to written academic corpora through this study (cf. Appendix A).

2.4.6 Use of tense

Passive voice should not be taught in isolation. It can narrowly be aligned with the use of tense in science texts. The past tense, for example, is necessary when describing or discussing events that were completed in the past. Some literary texts point out that little explanation can be found to guide the L2 writer about ‘when’ or ‘how’ particular tenses or voice can be used in academic writing. This poses a significant gap in the available literature. the verb tense signals when the action took place. The verb tense signals when the action took place. These technical aspects can create room for error and confusion among L2 speakers. Therefore, it remains an area for further investigation and research (Beason and Lester, 2000). According to

Reid (2000: 283) 'verb tense errors' can be serious as they often interfere with communication.

Furthermore, Beason and Lester (2000) specify that the present tense should be used to make statements of fact, generalisations and to describe habitual or repeated actions. Interestingly, Reid (2000: 283) points out that writing conventions require specific verb tenses to be used in different academic writing situations.

Notably, instruction in the meanings of tenses and voice takes place in the domain of grammar teaching and should make tenses relevant to academic writing contexts, or types of texts in which specific tenses and voice are more appropriate than others (Celce-Murcia, 1998; Celce-Murcia and Olshtain, 2000; Hinkel, 2002; Jordan, 1997). Thus, the use of tense is an important feature of scientific conventions that must be taught as a writing skill to first entering BSc students.

2.5 SEFAKO MAKGATHO HEALTH SCIENCES UNIVERSITY

Characteristic of the SMHSU's distinct features is the fact that it is a comprehensive health and allied sciences university which caters for a distinctive academic model and a varied set with a range of health professional programmes and training, at both under-graduate and post-graduate qualifications. These qualifications fall under a classified Programme Qualification Mix (PQM). Its nature and content cover the following categories: Medicine, Dentistry, Pharmacy, Physiotherapy, Radiography, Environmental Health Audiology, Nursing, Public Health, Dietetic, Occupational Therapy and Health and Basic Sciences. These programmes are presented in the various schools, namely, School of Medicine; School of Health Care Sciences; School of Oral Health Sciences; School of Pathology and Pre-Clinical Sciences; School of Pharmacy and School of Science and Technology (SA, Joint Technical Task Team, 2014; cf. 1.1). The various programmes offered augur well for discipline-specific language courses.

Furthermore, in 2010 there were 23 public Higher Education Institutions (HEIs) in SA. Of these HEIs, 11 are generally regarded as 'traditional' universities and six are Comprehensive Universities (CUs) which were established from the merger of traditional universities and former Technikons (SMU NEWS, 2015). Some SA HEIs enrolments are mainly patronised by students from a multilingual background, studying through the medium of English (see Ngoepe, 2020: 248). SMHSU falls within this category (cf. Ngoepe, 2007: 8).

Approximately 900 000 enrolments were recorded nationally at various SA institutions (SMU NEWS, 2015). However, despite these numbers, there is still a shortage as well as insufficient production of all kinds of suitably qualified health and science professionals in SA. For this reason, National Government in line with the National Health Insurance Policy (NHIP), deliberated upon strategic measures that could be taken to address these shortcomings and gaps in the health sector as a matter of urgency. As a result, there was a need for HEIs to offer a wide and varied range of health and science professional programmes for more HEIs. It is against such a background that a joint and calculated decision by the Ministry of the Department of Higher Education and Training (DoHET) led to an investigation into the possibility and feasibility of the establishment of a new Comprehensive Health and Allied Sciences University (CHASU) on the site of the Medical University of South Africa (MEDUNSA) campus of the University of Limpopo (UL) – as well as to incorporate that campus into the new university (SA, Joint Technical Task Team, 2014: vi).

The Minister of the DoHET, Dr Nzimande historically established a new institution named Sefako Makgatho Health Sciences University on the 6th May 2014 in terms of the Higher Education Act No 101 of 1997. The newly formed university is named after an influential African National Congress (ANC) stalwart Sefako Makgatho, who was a highly acclaimed politician, journalist, educationist and theologian during the Apartheid era. In order to honour the legacy of this great man, the new university is set to aspire to the strong symbolism associated with the causes which Sefako Makgatho stood for. It is hoped that the young university will strive to advance his lifelong struggle for an SA that is ‘legitimate, non-racial, non-exploitative, free, independent and democratic’ (Sefako Makgatho Health Sciences University, 2015). The values espoused through establishing this institution implies that non-native speakers of English will also be supported when studying at an English medium university.

Another historic milestone took place with effect from 01 January 2015, when the SMHSU incorporated the MEDUNSA campus of the UL (SMU NEWS, 2015: 3). In this regard, a legal framework for the separation of the MEDUNSA campus of the UL into the new university in terms of Section 24 of the Higher Education Act No 101 of

1997was developed. As a result, SMHSU now occupies the same site as it did previously when still part of the former MEDUNSA campus of the UL. Its geographical location is in Garankuwa, a township on the outskirts of the northern parts of Pretoria. Provincially, this township falls under Gauteng province in SA (Sefako Makgatho Health Sciences University, 2015).

The new university has set itself high ideals. Its Vision and Mission statements highlight its aspirations to achieve world class standards by being ranked amongst the first top 100 universities in the world. Further to this, its motto is 'Knowledge for Quality Health Services. To this effect, the alma mater student body of this university is also encouraged by its slogan, 'Unity in Partnerships' to remind post-graduate students to plough back their acquired knowledge. First entering students could strive for quality in the health sciences through discipline specific language.

The day-to-day activities and administrative priorities of SMHSU fall within a legal framework as stipulated in the Higher Education Act No 101 of 1997. This framework also made provision for an Interim Council (IC) and an Interim Management (IM) to perform the University's primary responsibilities (SA Joint Technical Task Team, 2014: xiii). By the time the IC had completed its work, a new University Council (UC) was appointed to take office along with the appointment of senior management. These authorities under the previous leadership of Professor De Beer as vice-chancellor were mandated to govern the new health and allied sciences university with full power and responsibilities (SMU NEWS, 2015).

Although English is the medium of instruction at this new university, SMHSU is also set to become an institution which can impact positively in terms of its output of health and science professionals suitably trained to improve the well-being of the many South Africans who are still shackled by poverty and lack of access to various areas of specialities and professions (SA, Joint Technical Task Team, 2014). In line with national priorities, SMHSU also plans to train and produce graduates who will create new models that will underpin new health and science systems through research evidence and innovation. Ultimately, after its expansion plans are realised, it would be well equipped and well-resourced to serve as a one-stop university which will attract ambitious young talent from across the country. SMHSU aims to become a university of choice where development of high-quality learning programmes and resources is a priority (SMU Newsletter, 2015). Aspirant first entering BSc students stand to benefit more from being taught scientific writing.

2.5.1 Student population

At SMHSU, as in most of the universities in SA, the student population is diverse in respect of race, language, background and educational orientations. Since English is not their mother tongue, the nature of the students' writing abilities will, as a result, necessarily be impacted. This also places high demands on lecturing staff who would have to, amongst other things, draw inferences about students' language and writing abilities very early on in the academic year (cf. Ngoepe, 2007: 7).

Patundi (2013: 2) argues that black students at HEIs use their mother tongue both in academic circles and in their social interactions outside the lecture halls. Mother tongue is also lauded for its ability to serve as a steppingstone for learning an L2. Further to this, Weigle (2007: 35) clarifies that L2 writers use many of the same writing processes similar to their First Language (L1), and that expertise in writing can transfer from the first to the L2, given at least a certain level of language proficiency.

Furthermore, while Weigle (2007: 35) highlights the differences between L1 and L2 writing, Silva (1993) points out that writing in an L2 is more constrained, more difficult and less effective. The challenge therefore lies in the fact that one cannot write in an L2 without knowing at least something about the grammar and vocabulary of that language. How much more challenging will it be for science students at SMHSU who have to master a specific genre in scientific writing. Writing in science requires additional skills since this is a more technical form of writing.

The first entering contact students to enrol at SMSHU historically engraved their names in the new university's books as they became the first cohort of under-graduate students to officially register at this new establishment (Sefako Makgatho Health Sciences University …, 2015: 11). However, some of the current students were also the same students who previously registered with the then MEDUNSA campus of the UL. In terms of numbers, the current student population is relatively small in comparison with other more established universities, such as the UL, which had a student headcount of 18 205 in 2010 (SMU NEWS, 2015).

Moreover, a total headcount of registered contact students at SMHSU in 2016 was 5 144. Approximately 360 students were registered in the School of Science and Technology in the 2019 academic year. The projected increases in student enrolments was aimed at 7000 by 2019, and by 2024 the university hopes to have increased its student numbers to 10 000 as per its phased in expansion plan (SA, Joint Technical Task Team, 2014). Therefore, the number of first entering science students who need to be taught scientific writing is also expected to increase exponentially.

2.5.2 Role of lecturers

One cannot only consider students' writing skills without also considering the role of science lecturers, vis-à-vis their science students. The lecturers must be competent too in order to teach their students effectively (Barrass, 1978: 14). They are required to understand and convey that scientific and technical writing is distinctly different from, for example, creative writing required in some GE language essay.

Furthermore, the collaborative role of the lecturers can contribute towards ensuring that the subject contents and methodologies are made digestible for science students through adaptation. Such collaboration leans itself towards some scaffolding approach. Scaffolding refers to various forms of material, social, linguistic or conceptual assistance that can support students' reasoning, participation and learning. Providing effective scaffolding is a necessity, not an option – in the attempts to support students in meeting twenty-first century standards (Kang, Thompson & Windschitl (2014: 676; Ngoepe, 2020: 240).

Lecturers should gradually introduce information befitting the mixed educational make-up and backgrounds of the first entering science students. These students register for English as a compulsory subject in their first year with the Department of Language Proficiency (DLP) (see Ngoepe, 2007:15).

2.5.3 Department of Language Proficiency

Student under-preparedness and low literacy levels are strong factors that influence student writing. Students face many complex problems in their writing which will require a diagnostic analysis to highlight some of the common and critical areas that need intervention. Therefore, if the language proficiency abilities of under-graduate science students at SMHSU are not on par with tertiary level demands, it becomes crucial to identify and teach specific skills that are lacking and negatively impact on such students' abilities to perform well (Chokwe & Lephalala, 2013; Ngoepe, 2007: 20; see 5.3). The teaching of writing skills would enhance the edification of previously disadvantages students and increase the quantity and quality of students who study and pass the health sciences at the SMHSU.

According to Carstens (2008: 82), university students around the world, especially additional language students, face diverse challenges in acquiring the skills that are necessary to participate in the academic discourses of their chosen disciplines.

Structurally, the DLP falls under the School of Science and Technology in the Faculty of Health Sciences. The staff is located in the Basic Medical Sciences Building (BMSB) (Sefako Makgatho Health Sciences University, 2015: 3). This Department has been in existence for more than three decades. However, very limited recorded information could be found in terms of the exact number of years since inception more than thirty years ago. This could also be attributed to the fact that the DLP has not been governed by a specific language policy.

The role of the English Department is to help students to read, express their thoughts academically, and write effectively. English has a crucial role in both under-graduate and graduate levels of instruction. The various departments can have different levels of interaction with the Department ranging from very little to excellent (Jovanovic et al., 2017: np). Currently there is very little interaction between the DLP and the rest of the health science departments to whom it acts in the capacity of service provider (see 4.2).

Language proficiency refers to the level of competence at which an individual is able to use a language for both basic communication tasks and academic purposes (DoHET, 2013). There is an assumption that the students who attend this course have some basic knowledge in terms of having mastered English at high school level taught at SA public schools. Students should at this stage be taught to use English in an academic context because 'language demands become greater at university in terms of sophisticated texts and dense information' (Learning Guide, 2015). The DLP language course has therefore been pitched at NQF level 5, and is aimed at developing academic literacy skills as well as academic writing skills.

Another broad aim of the course is to illustrate how language is used to learn and communicate both in spoken and written forms. It further aims to create awareness amongst students of the process of academic writing as a combination of 'thinking' and 'language' (Learning Guide, 2015: 5).

The DLP recognises the fact that for the majority of its students, English is an additional, even third or fourth language, whose L1 could be one of the vernaculars spoken in SA. As such, the DLP further prioritises the development of academic reading and writing skills. This development is different from learning subjects like Biophysics or Psychology because an additional language cannot be taught or learned in a linear fashion (Sefako Makgatho Health Sciences University, 2015: 5).

On an annual basis, BSc students register for a compulsory course in Health Education and Life Competencies (HELC) with the DLP. Students are provided with a learning guide which gives an overview of what the course has on offer and class attendance is compulsory. There are five tutorial sessions of 40 minutes each offered per week. These sessions are used to generate communication skills such as reading, writing and oral discussions (Sefako Makgatho Health Sciences University, 2017). This study thus seeks to establish whether such offerings suffice for students' needs pertaining to laboratory report writing.

In the main, the course is aligned with the principles of outcomes-based learning, with emphasis on group-based and task-based learning. The HELC curriculum comprises the following components: reading comprehension, report writing, referencing and paragraphing, and argumentative writing (Sefako Makgatho Health Sciences University, 2017; cf Ngoepe, 2017).

The DLP is a relatively small unit in terms of the number of its teaching staff; a full-time Head of Department (HoD) and three permanently appointed lecturers. There are also two contract appointees and two part-timers. The DLP acts as a service provider to the following schools: School of Medicine, School of Oral Health Sciences and the School of Health Care Sciences and the School of Science and Technology. These Schools offer various diploma and degree programmes. However, there were approximately 900 registered students in the 2018 academic year who registered for a course in English in Health Sciences. These students are from the various schools in the university (cf. Ngoepe, 2020: 248).

The first entering BSc student cohort at SMHSU comprises approximately 360 full-time registered students. These students are then divided into four groups of approximately 70 students per lecturer. Therefore, classroom assessments for such large student-lecturer ratios should be done as accurately as possible in order to achieve the desired outcomes (cf. Ngoepe, 2017: 186). This should also impact on students' targeted writing of the laboratory report, in this instance. Thus, teaching large classes poses real challenges in respect of design, management and standardisation of assessment practices. Consideration should nonetheless be given to instructional strategies, communicative competence and communicative practices, as well as student learning and assessment measures of learning outcomes (Broadbent, Panadero & Boud, 2018: 3). Hence, this study explores how content lecturers assess laboratory report writing irrespective of the number of registered students (cf. 5.2).

First year students who enrolled for a formal qualification such as BSc are required to take English as a compulsory subject. Students' grasp of English has a lot to do with the kind of writing they produce. Students apply the various writing practices and conventions they were taught at school to their science writing in a university course (Clarke, 2015:38). For example, students can draw on their various school discourse conventions as they try to write in a genre of science discourse as inter-discursivity. This is when a writer incorporates two or more discourse conventions into the creation of one text (Ivanic, 1998: 4751). However, students' inter-discourse is not always successful. A mixture of discourse conventions would thus generally play a large part in determining the students' writing choices (Clarke, 2015: 37). Hence the significance of involving science content lecturers' in discourse.

There often is a tendency among first year students in the Health Sciences and Basic Sciences to view English as a first year subject that does not carry much weight in relation to the importance of their other content subjects (IATEFL, 2015). First year students at SMHSU are not an exception. The DLP offers English as a compulsory first-year subject that carries some credits in relation to the rest of the content subjects they have enrolled for. Motivation continues to lack and taking English seriously remains a challenge.

It should be borne in mind that these students are not English language students per se. They are however, enrolled within a science discourse community and as a result, are automatically initially exposed to science education literature which introduces them to genres of writing in a science context. Such genres include, but are limited to, textbooks, laboratory manuals produced by their respective departments, research articles and so on. At the same time, these students are above all subject to the pedagogies subscribed to by the DLP, not-withstanding the fact that science curricula at first year level should be guided by the needs and interests of students (cf. 2.6; 5.3).

The DLP does not necessarily focus on the content of the subjects of the students but rather presents General English (GE) and not English support courses such as English for Specific Purposes (ESP) or English for Academic Purposes (EAP). This can be regarded as a shortcoming or gap in the DLP curriculum given the discussion that ensued in this literature review. Given that ESP is an approach and not a product to be taught, curricular material will inevitably be pieced together, some borrowed and others designed specially (cf. Hutchinson & Waters, 1987; Ngoepe, 2012: 61). That should be the case in DLP.

First year BSc students fall within the realm of two distinctive discourse communities; they engage with content - and language lecturers which call for a different set of roles and interactions. If not properly managed, this in itself, can defeat the purpose of both these communities (see Research Methodology). The DLP students ought to be prepared to function effectively in a science discourse community.

The DLP currently structures its offerings within the framework of the four skills of language, namely, listening, speaking, reading and writing for academic purposes (SMU NEWS, 2015). These skills are macro skills which must be used as a foundation for the acquisition and development of identified skills to be dovetailed with the needs of students (Ngoepe, 2012: 72). The DLP is yet to customise the teaching of language in accordance with the needs of first entering BSc students. It has to create a bridge to narrow identified gaps and simultaneously prepare students for t scientific academic writing they are expected to produce in their content subjects. By doing so, the DLP would be responsive to the SMHSU's broader approach of adopting a student-centred strategy (cf. 1.1).

2.6 RATIONALE FOR THEORY IN THE STUDY

Theoretical frameworks provide points of reference to move from. They also give direction in respect of guiding role players into a process evolving into a culture and discipline specific practices, in a specific discourse community. This study is premised on Social Constructivism (SC).

Kang, Thompson and Windschitl (2014: 675) assert that SC is not intended to be a solitary approach. Instead, its ontologies and epistemologies are developed as a result of collaborative learning characterised by reading and interpreting, group work, creative thinking, and then production of a final product translated into appropriate scientific genre within a given context and culture.

Moreover, constructivist learning is a process in which people construct meaning and make sense of their experiences (Merriam & Caffarella, 1999). Learners' involvement in actively constructing knowledge in a learning environment which is culturally and socially supported, enables them to grow into deeper understanding, greater generalisable knowledge and growing confidence to apply that knowledge in different settings (Kang, Thompson & Windschitl, 2014: 676), such as a science laboratory one.

SC is based on reality, knowledge and learning. Firstly, SC highlights that reality is not something that can be discovered by individuals since reality is not made prior to social invention. Secondly, knowledge is created when individuals create meaning through interaction with each other and with their environment (Amineh & Asl, 2015: 13). Writing is a key element in the formation of social realities, institutions and personal identities in almost every domain of professional life and in the sciences, too. (Clarke, 2015: 1). Lastly, learning as a social process refers to meaningful learning that takes place when individuals engage in social activities such as interaction and collaboration (Amineh & Asl, 2015: 13). Writers seek to embed their writing in a particular social world which they reflect and conjure up through approved discourse (Hyland & Salger-Meyer, 2008:1) such as scientific discourse in the case of this study.

According to Hang, Bulte and Pilot (2017: 2), SC can be characterised by five key features namely, that learning is social, knowledge is experience-based, knowledge is constructed by learners, that all aspects of a person are connected and that learning communities should be inclusive and equitable. Texts are socially produced in particular communities and depend on them for their sense so that by studying the ways academics write, students learn more about disciplinary inquiry and how knowledge is constructed, negotiated and made persuasive (cf. Appendix A).

Mbati (2012: 99) argues that the social constructivist paradigm is associated with creative thinking and problem solving through collaborative thinking. This paves the way for diverse interests to be brought together and for collaboration to take place and in so doing, a finished product is created.

A sense of community which evolves from a social constructivist approach depends on common interests, assumptions and shared understanding which in turn create meaningful communication. The concept of community provides a means of analysing communication as a joint and socially situated accomplishment. When applied to academic domains, the expression of community in the notion of a discipline, offers researchers a framework for conceptualising the expectations, conventions and practices which influence academic communication (Hyland & Salager-Meyer, 2008: 22).

Disciplinary communities are described as ‘tribes’ (Becher, 1989) who practise their own norms, categorisations, bodies of knowledge, sets of conventions and modes of inquiry which consists of a recognisable culture (Becher, 1989). Within these communities, community members also subscribe to particular textual features which reveal writers’ assumptions about their readers. These assumptions result from repeated experience, participation in various groups and orientations to certain conventions (Hyland & Salager-Meyer, 2008: 22).

SC assumes that cognitive growth occurs firstly on a social level and then on an individual level. This is referred to as the Zone of Proximal Development (ZPD), a term coined by Vygotsky (1978). According to Jones and Araje (2002: 2). Vygotsky defines the ZPD as the distance between the actual developmental level as determined by independent problem solving and the level of potential development determined through problem solving under adult guidance in collaboration with more capable peers. In addition, ZPD reflects the idea of collective activity where those who know more or are more skilled, share that knowledge and skill to accomplish a task with those who know less. Guided participation is necessary when working in the ZPD and students bring their own understandings to social interactions and construct meanings by integrating those understandings with their previous experiences in the context.

The ZPD enables individuals to exhibit higher levels of skill through the assistance, encouragement, and coaching of other people. In such instances peer learning and engagement can become useful (Jones & Araje, 2002: 2).

According to Jones and Araje (2002: 1) Vygotsky is considered as the father of SC theory, and the one who identified the greater socio-cultural context. Key in this approach is the shift from individual processes to collaborative efforts when individuals are focussed on shared practices. Further, (Kang, Thompson & Windschitl, 2014: 675) assert that SC ontologies and epistemologies are developed as a result of collaborative learning characterized by reading and interpreting, group work, creative thinking, and then production of a final product translated into appropriate scientific genre within a given context and culture.

To this effect, peer collaboration is important. Jones and Araje (2002: 2) state that peer collaboration is the shared social interactions when peers work on tasks or activities in a cooperative manner, and that this serves as an instructional function. This approach is especially useful in mathematics, science and language and arts which bears evidence to the recognized impact of the social environment during learning. In tandem with this approach is reciprocal teaching which involves interactive dialogues between the lecturer and small groups of students. Both the lecturer and students are active agents in the process of students' development and as a result, the quality of the teacher-learner interaction becomes crucial in the learning process.

Mbati (2012: 99) argues that the SC paradigm is associated with creative thinking and problem solving through collaborative thinking. This paves the way for diverse interests to be brought together and for collaboration to take place and in so doing, create a finished product. SC is not intended to be a solitary approach, instead it emphasizes the idea that learning together with development is a social collaborative activity. Thus, learning becomes a process of 'enculturation' into a community of practices, social influences and interactions where shared meaning is generated. Those who surround the individual student, and the culture within which the student operates, greatly affect the way he or she makes sense of the world. Jones and Araje (2002: 3) maintain that a social constructivist lecturer, for example, creates a context for learning in which students can become engaged in interesting activities that encourages and facilitates learning by creatively applying teaching methods and tools. In this way lecturers can make cognitive growth and knowledge possible.

SC impacts the way humans view the world, that is, by means of the language they use and the personal reflection that is derived from that input (Jones & Araje, 2002: 2). Writers seek to embed their writing in a particular social world which they reflect and conjure up through approved discourses. It should be scientific discourse, in this case (Hyland and Salager-Meyer, 2008: 1). Writing is a key element in the formation of social realities, institutions, and personal identities in almost every domain of professional life and in the sciences, too. Scientific writing has evolved into socially constitutive of the disciplines of individual status and authority, and of knowledge itself (Clarke, 2015: 1). Every act of writing develops interpersonal relationships in an institution and a culture, however far apart the social actors may be Clarke (2015: 24).

Students' involvement in actively constructing knowledge in a learning environment which is culturally and socially supported, enables them to grow into deeper understanding, greater generalizable knowledge and growing confidence to apply that knowledge in different settings such as a science laboratory (Kang, Thompson & Windschitl, 2014: 676).

SC activities involve student-centered processes which allows them to take responsibility for what they study. It also involves anchored instruction; this approach helps students become more actively engaged in learning by anchoring education around an interesting topic (Eastwell, 2002: 82).

Domain-specific instructional knowledge has proven to be the key factor determining learning and problem solving in research in all science domains. Rather than being 'blank slates', students bring their own unique experiences and personal beliefs to the science classroom, and some of these intuitively held ideas differ from the ideas accepted by the scientific community. A student adopts one perspective in the classroom and yet a different way of understanding away from the classroom. Therefore, information not connected with a student's prior understanding may be easily forgotten and not easily transferred to similar, or novel situations (Eastwell, 2002: 82). Which is why instructors who are facilitators in SC should first provide support and help for learners, and then gradually decrease their support so that students can learn independently (Vygotsky, 1978).

According to Hang, Bulte and Pilot (2017: 2), SC can be characterised by five key features namely, that learning is social, knowledge is experience-based, knowledge is constructed by learners, all aspects of a person are connected, and that learning communities should be inclusive and equitable. Texts are socially produced in particular communities and are dependent on them for their sense so that by studying the ways academics write, students learn more about disciplinary inquiry and how knowledge is constructed, negotiated and made persuasive (cf. Appendix A).

Disciplinary communities are described as 'tribes' who practise their own norms, categorizations, bodies of knowledge, sets of conventions and modes of inquiry which consists of a recognizable culture. Within these communities, community members subscribe to textual features which reveal writers' assumptions about their readers (Becher, 1989). These assumptions result from repeated experience, participation in various groups and orientations to certain conventions (Hyland & Salager-Meyer, 2008: 22). The sense of community which evolves from a social constructivist approach depends on common interests, assumptions, shared understanding which in turn creates meaningful communication.

2.7 CONCLUSION

When lecturers plan to develop students' discipline-specific writing, they responsively address some of the students' essential skills needed to succeed in a given curriculum. These could be attained through carrying out specific tasks such as writing a laboratory report from an experiment performed and sharing the results with a science discourse community. The lecturers' assessment endeavours should be premised on assessment criteria and effective feedback.

SC theory emphasizes the idea that learning, and development is a social, collaborative activity. Employing this approach in line with Vygotsky's ZPD, can serve as a guide for curricula and lesson planning (Jones & Araje, 2002: 4). This theory can also pose recommendations for practical recommendations that can be employed in the teaching environment such as connecting learning with everyday contexts, implementing activities which build upon students' existing ideas, alternative conceptions and current understandings; encouraging students to take responsibility for their own learning. This includes reflecting on their own thinking and learning processes, planning for both lecturer-student and student-student social interaction.

Practical work needs to be an integral part of the learning sequence; planning for the fact that students will have different preferred learning and working styles and learn at different rates. Formative assessment should be employed frequently, and a variety of assessment techniques should be used (Eastwell, 2002: 83).

The next chapter discusses the research methodology.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

An exploratory research design was used and a mixed research approach was followed.

3.2 RESEARCH DESIGN

According to Babbie and Mouton (2002: 70), social research is conducted to explore a topic. In this regard, exploration is typical if a researcher examines a new interest or when the subject of study itself is relatively new. Thus, the aim of exploratory studies, amongst other things, is to establish ‘facts’, to gather new data and to determine whether there are interesting patterns in the data (Mouton, 1996: 103). Social research is also done because there is an aspect of understanding of what goes on in society that is unresolved (Bryman, 2016: 3).

This exploratory research design was a two-phase sequential study involving a quantitative study designed to throw light on quantitative outcomes of this phase, as well as qualitative research (Richards, Ross & Seedhouse, 2012: 308). From this point of view, the study used a mixed method research approach. Quantitative research has a tendency to count occurrences across a large population and uses statistics and replicability to validate generalisations from survey samples and experiments. It also attempts to reduce contaminating social variables (see Appendix A). On the contrary, qualitative research looks deeper into the quality of social life. It locates the study within particular settings, which provide opportunities of exploring all possible social variables; it sets manageable boundaries (see Appendix B). An initial foray into the social setting leads to a more informed exploration as themes and focuses emerge (Holliday, 2016: 6; 3.5). The study aims to assess laboratory reports of first entering BSc students (cf. Research Objectives).

3.3 SAMPLING

Purposive sampling was employed in this study. Devers and Frankel (2000: 265) assert that purposive sampling strategies can be used in qualitative research and they can be revised throughout the research process as more knowledge of the setting and subject are obtained.

Purposive sampling allows decisions to be made about the selection of participants (Davis, 1995: 278). It also provides greater in-depth findings than other probability sampling methods (Gentles et al, 2015). Two hundred and fifteen (215) out of a population of 450 BSc first entering students and 4 content lecturers from the Departments of Biochemistry, Chemistry, Physics and Biology in the Faculty of Science and Technology as SMHSU were used as samples of the study after validation by the Statistician in the UL Research Office.

3.4 DATA COLLECTION

According to Mouton (1996: 110), during data collection, the researcher collects various kinds of empirical information or data such as historical, statistical or documentary data. Empirical information in this study was collected through a criterion-referenced test and an interview.

3.4.1 A criterion-referenced test

Criterion-referenced testing is used to determine whether each student has achieved specific skills or concepts. Test scores are reported and interpreted with reference to a specific context (Dreyer, 2000: 270). First entering BSc students sat for a criterion-referenced test in the form of a laboratory report writing task on an experiment. Data were collected in terms of the aim of the experiment, apparatus, method and findings from the students' written laboratory reports before teaching could start.

L2 researchers often use one or more measures of central tendency to provide precise quantitative information about the typical behaviour of students with respect to particular phenomena. There are three commonly used measures of central tendency namely, mode, median and mean. The mode is the most frequent score obtained by a particular group of students; the median is the score at the centre of the distribution, that is, the score that splits the group in half; and the mean or the arithmetic average is the most common measure of central tendency (Mackey & Gass, 2005: 254; McIntosh & Morse, 2015: 1; Appendix B).

3.4.2 An interview

SMHSU BSc content lecturers who teach BSc students were each interviewed for 1 hour 15 minutes on how they assess the students' written laboratory reports. Mackey and Gass (2005: 173) argue that semi-structured interviews are less rigid, and the researcher used a written list of questions as a guide, while still having the freedom to digress and probe for more information. Thus, the researcher designed semi-structured interview questions which were thematically arranged and recorded (see 4.3).

3.5 DATA ANALYSIS

Data were analysed quantitatively and qualitatively. A criterion-referenced test for BSc students in the form of written laboratory reports were marked and analysed in terms of aim, approaches, method and findings of the experiment (see Appendix A; cf. Table 5). The three commonly used measures of central tendency namely, mode, median and mean were used to analyse quantitative data collected from students' written laboratory reports (cf. Mackey & Gass, 2005: 254).

Qualitative data were obtained through the interviews with BSc lecturers and thematic analysis was used to analyse the data. Lecturers' responses to the structured interview questions were transcribed and analysed thematically in line with Braun and Clarke's (2000) six phases of thematic analysis; the six-step process consists of familiarising oneself with data collected, generating initial codes, searching for themes reviewing the themes defining and naming themes as well as producing the report (see Appendix B).

3.6 QUALITY CRITERIA

Quality criteria are made up of quantitative and qualitative approaches. In line with the research design, quality criteria that was observed in this study included validity, reliability, objectivity, credibility, transferability, dependability and confirmability. The present study lent itself to the criteria listed above.

3.6.1 Reliability

According to Bless, Higson-Smith and Kagee (2006: 150) reliability is concerned with the consistency of measures. The reliability of measurement is the degree to which that instrument produces equivalent results for repeated trials.

3.6.2 Validity

Validity refers to the extent to which a specific measurement provides data that relate to commonly accepted meanings of a particular concept (Babbie & Mouton, 2002: 125; Heale & Twyross, 2015: 66). To establish face validity, the research instruments were checked by the UL statistician, and content validity was established by piloting.

3.6.3 Objectivity

According to Creswell and Plane Clart (1991: 245), objectivity is the process by which analytical categories are developed and used. In addition, objectivity is a fundamental component of content analysis because it encompasses details that directly affect the overall quality of the judging process (Thomas, Nelson & Silverman, 2015: 213). Thus, the researcher strove for objectivity by employing developed analytical categories.

3.6.4 Credibility

Credibility refers to the confidence that can be placed in the truth of research findings, and establishes whether the research findings represent tenable information gathered from the participants' original data, and is an accurate interpretation of the participants' original views (Davis, 1995: 276; Anney, 2014: 272). Therefore, data collected from the participants were portrayed without any alterations.

3.6.5 Transferability

Anney (2014: 277) argues that transferability refers to the degree to which the results of qualitative research can be transferred to different contexts with different respondents. In other words, it is the interpretive equivalent of generalisability. Therefore, when the researcher provides a comprehensive description of the enquiry as well as select the participants purposively, it facilitates transferability of the inquiry. Thus, data collected and produced were transferable and applicable to other similar situations.

3.6.6 Dependability

Dependability refers to the stability of findings over time. It also involves the participants' evaluation of the findings, interpretations and recommendations of the study to make sure they are all supported by the data received from the informants of the study (Davis, 1995: 278). This study adhered to dependability in that the researcher ensured that the data were valid and dependable enough to be used as reference in other related studies.

3.6.7 Confirmability

Confirmability is the neutrality or the extent to which findings are consistent and could be repeated (Connelly, 2016: 435). It also refers to the repeated direct participatory and documented evidence obtained from primary informant sources (Morse, 1994: 107). In a similar vein, Davis (1995: 279) argues that confirmability refers to the degree to which the results of an inquiry could be confirmed or corroborated by other researchers. Watkins (2012: 156) further states that confirmability implies that an adequate amount of distance exists between the observer and the observed. Therefore, the researcher checked all the sources, recordings and transcripts to ensure that all the data collected were not misinterpreted.

3.7 ETHICAL CONSIDERATIONS

The researcher requested for permission to conduct the study among BSc students as well as content subject lecturers who teach these students from the Dean of Science and Technology at SMHSU. The participants were approached by means of request letters that helped the researcher prepare for this exploratory endeavour (see Appendix D & Appendix E). Anonymity and confidentiality of the participants were maintained throughout the study. The researcher also sought permission to conduct the research from the Turfloop Research Ethical Committee (TREC) at the UL (see Appendix F).

The next chapter presents, analyses and interprets results of the study.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF RESULTS

4.1 INTRODUCTION

In this section, results of the study are presented, analysed and interpreted. The students' quantitative laboratory report writing test scores and content subject lecturers' qualitative interview responses constitute the results of the study.

This study adopted SC teaching learning activities which would involve shared constructed meanings when students work collaboratively, cooperatively and participate reciprocally (Jones & Araje, 2002: 2). Communicating with others involves small group discussions, cooperative learning, and so on. This can enhance learning because it allows students to test their ideas and to consider the ideas of others (Eastwell, 2002: 83).

4.2 LABORATORY REPORT WRITING TEST

Laboratory report writing test results are made up of bio-data and written laboratory report information.

Chokwe and Lephalala (2013) assert that insight into students' background is critical and core to the teaching and development of academic writing at tertiary level.

4.2.1 Biodata

Table 1: Years students matriculated

Year	Total No. = 153	%
2013	2	1
2014	1	0.7
2015	7	5
2016	9	6
2017	49	32

2018	84	55
2019	1	0.7

Years in which students matriculated are presented in Table 1. Majority of the students (84%) matriculated in 2018, a considerable number (49%) in 2017, lower numbers (6%) in 2016 and 2015 (5%) and much lower numbers in 2014 (0.7) and 2019 (0.7%).

Furthermore, findings revealed that majority of students (71%) sat for an EFAL examination paper, and most of them (88%) went to government schools.

Table 2: English symbol obtained at senior certificate level

Symbol	**Total No. = 153**	**%**
A	14	9
B	67	44
C	52	34
D	19	12
E	1	0.7

Table 2 presents the number of students per symbol. The symbols obtained ranged between A and E. Most students (44%) attained a B symbol, which was followed by a C (34%). The lowest score was an E (0.7) which was attained by only 1 student.

Table 3: Other languages students passed at senior certificate level

Other languages	**Number**	**%**
Afrikaans	44	29
Tshivenda	6	4
IsiXhosa	6	4
IsiNdebele	1	0.7

Xitsonga	13	8
Isizulu	13	8
Sepedi	36	24
Sesotho	5	3
Setswana	27	18
Siswati	3	2
Irrelevant	2	1

Table 3 depicts languages other than English that a specific number of students passed at senior certificate level. The languages are as follows: Afrikaans (44%), Sepedi (24%), Setswana (18%), Xitsonga (8%), Tshivenda (4%), IsiXhosa (4%), Sesotho (3%), IsiSwati (2%) and IsiNdebele (0.7%). However, 1% of the students gave irrelevant responses.

Moreover, nearly all the students (150) passed Physical Science. Life Sciences and Mathematical Sciences were passed by 139 and 138 students, respectively. Geography was passed by 79 while 72 students passed Life Orientation. Agricultural Science was passed by 18 whereas 15 passed Accountancy. Business Studies (9) and Computer Applied Technology (8) was passed by nearly equal numbers. So did Biology (4), Economics (3) as well as Information Technology (3). Negligible numbers passed Civil Technology (1), Graphics and Design (1), History (1), Religious Studies (1), Tourism (1) and Visual Arts (1). However, another 1 did not respond to the question, 15 responses were not applicable and 42 were irrelevant.

This implies all the students passed the SC, their scores ranged from symbols A to E. This also indicates that the students have good foundation in GE which is essential for learning a specific language such as ESP.

None of the students has ever failed matric. Nearly all the students (97%) registered for other degrees while only 3% registered for B.Ed, Health Sciences, Electrical Engineering, Industrial Physics, collectively. The other degrees some of the students hold are Electrical Engineering and Health Sciences.

The multilingual student sample is representative of the SA population. The students have some science background and that made them qualify to be admitted at SMHSU. Although most of the students went to public schools, they belong to the top rung of the Senior Certificate passes. Additionally, the fact that the number of students registered for plain BSc is the lowest illustrates that Sefako Makgatho is a health science university.

Table 4: Degrees students registered for

Degree	Total No. = 153	%
BSc LS	41	27
BSc MS	36	24
BSc	8	5
BSc Ps	33	22
BSc Occupational/Environmental	35	23

Table 4 captures the degrees the students are registered for. A relatively high number of students (27%) registered for BSc LS and this is followed by BSc MS (24%), BSc Occupational/Environmental (23%), and BSc Ps (22%). The number registered for plain BSc (5%) was the lowest.

4.2.2 The written laboratory report

Institutions of learning should engage in collaborative analysis of achievement data to identify starting points, monitor progress and inform institution-based decision making (Teachers' guide to assessment, 2016: 5). SMHSU BSc students' content and language lecturers collaborated in assessing their laboratory reports.

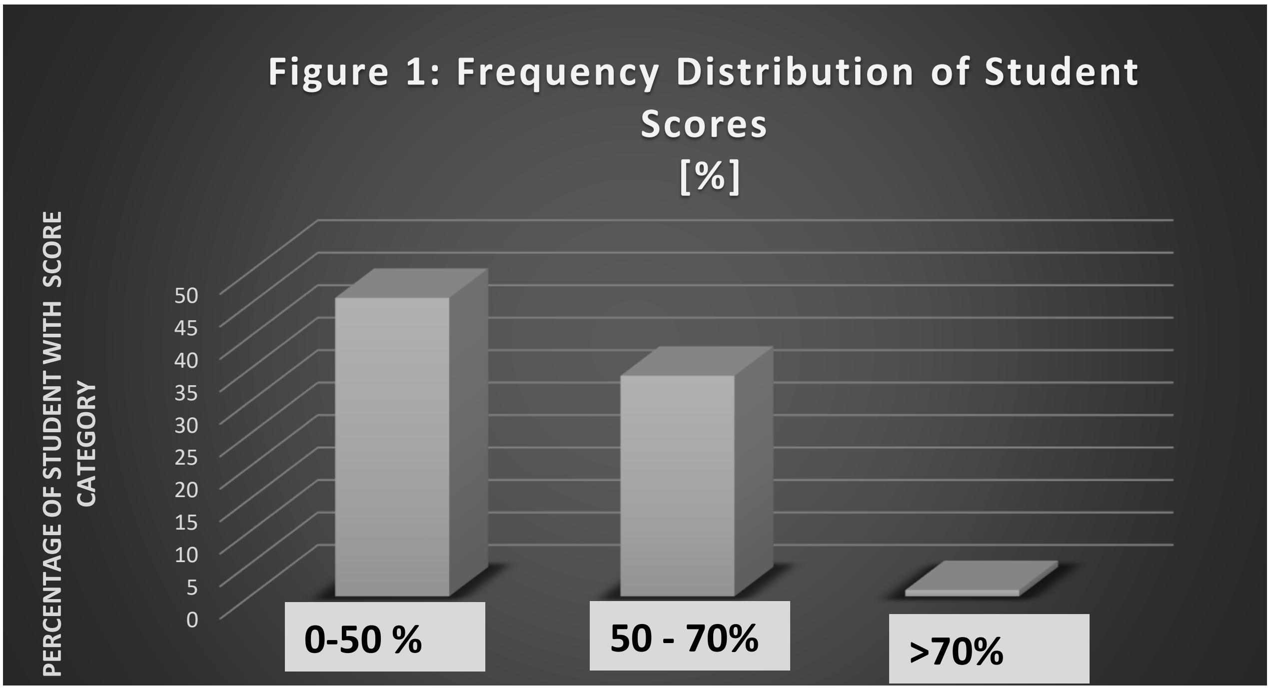

Figure 1: Laboratory report writing students' scores

Figure 1 depicts students' laboratory report writing scores in percentage categories as follows: 0-50%, 50-70% and >70%. Students' scores varied widely, ranging from 0 - 76%. The highest score was 76% whilst the mean and median scores were 30.5% and 28%, respectively. The scores were thus heavily weighted in the <50% range (>93% of the cohort), and only 7% scored 50% and above.

Jackson et al. (2006: 261) aver that it is characteristic of the science communities to share common cultures and common values. Thus, the SMHSU BSc students are by extension, access seekers to a science discourse community and need support in terms of laboratory report writing. Further, that the highest number of students scored between 0 and 50% suggests that there is a need to integrate laboratory report writing in DLP course.

Table 5: Students' average scores per item tested

Aim = 5	Apparatus = 10	Method = 5	Findings = 10	Total Score = 40
3.7	2.5	1.7	1	8.9

Average scores per item of report writing tested are depicted in Table 5 above. Students scored relatively high (3.7) in the aim section. Their averages were much lower in the apparatus section (2.5) and by far the lowest in the method (1.5) and findings (1) sections, respectively. The overall average score was 8.9.

The average students' scores presented in Table 5 suggest that the DLP intervention strategy should prioritise the main structure of a laboratory report when teaching BSc students.

In support of the above findings, Carstens (2008:82) assert that undergraduate students struggle with academic writing because of new demands that are placed on them, in the disciplinary cultures they find themselves in. The underlying assumption is that they should comply with the minimum writing requirements expected of them in the various disciplines.

4.3 INTERVIEWS WITH SUBJECT CONTENT LECTURERS

Interviews with the Mathematics, Chemistry, Physics and Biology content lecturers revealed pertinent main themes such as writing in a scientific context, laboratory report writing, content lecturers' expectations, challenges experienced by the lecturers, marking of the laboratory report, feedback giving, DLP liaison with other departments and suggested improvements.

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Science discipline staff at times feel ill-equipped to support students in developing their writing skills and that this is not their role. By extension, they also do not feel confident to assess the students' scientific writing (Drury & Muir, 2014:79).

Students should evolve into understanding discipline content alongside the report genre used to communicate a scientific sphere. This will enhance and explicate their awareness of writing reports in their discipline. Discipline content can also provide discipline staff with new opportunities for communicating with their students as well as supporting them in writing the laboratory report genre (Drury & Muir, 2014: 79). Additionally, the approaches they follow are team-based, where discipline staff, language and learning specialists work together to design and develop online learning resources as well as assess students together (Drury & Muir, 2014: 81).

According to the Mathematics lecturer, assessment criteria are used indirectly when students are tested in the course. However, in Chemistry, there are percentages per heading, that is, these are for the introduction, the data, the experimental and the conclusion. These have percentages but there was no exact clarity on what the percentages were. The Physics lecturer responded that lecturers use tests, tutorials, assignments and also encourage students to work in groups so that they can help each other. The Biology lecturer look at the introduction, the methodology, the results, consistencies in writing but students are not penalised for spelling. They also look out for neat work and those that have done good work. The criteria used for assessment vary form one department to the next.

Responses of the lecturers are subsumed under the following themes:

4.3.1 Writing in a science context

SMHSU first entering BSc students are expected to write in a scientific genre. de Chazal (2014: 59) states that a genre is made up of a class of communicative events and members thereof share a number of communicative purposes. An expert member of the parent discourse community would recognise the purposes, comprising the rationale for the genre (de Chazal, 2014:59; cf. 2.6).

The lecturers pointed out that first entering BSc students' language proficiency levels in Mathematics, Chemistry and Physics could be described as average. However, the lecturers found it is difficult to answer this question because these are students from various backgrounds such as students from former model C schools. On the whole, though, students' language proficiency levels in Biology were said to be good.

From the Mathematics lecturer's perspective, there must be a style which is scientifically universal. That is, if somebody reports something about laboratory findings at SMHSU, a person at the University of Pretoria or universities abroad should also be able to read and understand it. There should be a universally scientific procedure to do this. Although there was no response from the Chemistry lecturer, the Physics stated that there is a template which lecturers supply the students with and according to which students are expected to be able to write. The Biology lecturer indicated that students should be consistent in the way they write. For instance, if they students are using the past tense, they should stick to that tense. When they submit their reports, lecturers should check for consistency, referencing and they have to stick to the set method of referencing.

The Mathematics lecturer pointed out that students need some technique to do report writing. Such a technique should come with models or research skills. From a research point of view, when one conducts research one has to report; that reporting should be done in a certain format which anybody, anywhere can read. So, there must be a universally accepted procedure. Yet the Chemistry lecturer indicated that colleagues do not really focus on writing skills. What students write, though, should be in the past tense because the report is written after the practical had been performed. Similarly, the Physics lecturer stated that students are expected to write the laboratory report in a certain tense. After having performed an experiment they have to write what they have done Therefore, writing in a different tense is very important. However, the Biology lecturer responded that first year students should be trained because that would be their first time writing the Scientific Report (SR); lecturers should explain and train them on what is required of them. All they need to do is to know how to write this in good English. In many instances students are registering for English and this assists them to improve in whatever format they may want to write. Good English is important because it enables one to do the laboratory report given. If one is unable to write it down and fail to express oneself, one will get nowhere and nobody will want to read that work.

The Mathematics lecturer responded that passion is one of the factors which impacts on students' ability to write LRs. It could either impact negatively or positively because those who are passionate and can read well, will have positive feedback. Conversely, those who do not have the passion and cannot read will have negative impact. According to the Chemistry lecturer, the language used is the main problem. It cannot be time because students are given enough time to do the laboratory work two days after they shall have submitted their reports. The Physics one argues that students get enough explanation on how to write the laboratory report, if they get clarity on what the topic of the experiment is, then that will have a positive impact on them when writing the LR. However, the Biology lecturer stated that the main factor in Biology would be the lecturer himself or herself, whether or not he or she is willing to teach students or not. Other factors could be whether or not there is a conducive environment such as students who are willing to assist the weaker ones and their ability to access the internet.

Since writing in a science context is technical and practical, students will encounter conventions and broad discourse rules when they start writing in a science context (Clarke, 2015: 22). In particular, some writing conventions lean toward traditional forms of scientific genres such as the experiment and the laboratory report (Marshall & Rossman, 2014).

Only the Chemistry, Physics and Biology lecturers responded to the question posed. Chemistry students should be taught and understand the specific formats pertaining to scientific conventions. This would help them to build on more scientific experiments and findings. Lecturers do not receive any laboratory reports. Instead, the laboratory technician or laboratory practical co-ordinator marks the practicals using more or less the same format and adhering to the same way of writing the LR, and allocating marks under the different heading stipulated. Physics students must adhere to certain conventions when writing a LR. For example, when writing results in the form of a number, a number has to be written in a specific way, hence adhering to the scientific conventions. In Biology as well, students have to follow a certain format too because if they do not follow the format then they cannot use the appropriate method.

4.3.2 Laboratory report writing

The Mathematics lecturer interviewed stated that LRW skills are important for students because learning goes with writing; practicals enhance students' way of thinking. However, the Chemistry lecturer responded that writing is important because cutting-and-pasting is not encouraged. Additionally, the Physics lecturer stated that a student has to express himself or herself in his or her own words so that the laboratory technical aspect will make sense of it. However, the Biology lecturer indicated that by the time students apply for the Biology Honours Programme, they are expected to know how to write effectively since it would have been in their first year that they were introduced to writing skills by submitting reports without plagiarising and assistance from their lecturers.

The Mathematics lecturer indicated that it is very essential that the Laboratory Report (LR) act like a complement to learning while the Chemistry one indicated that students should really understand and relate the theory that they are doing in class to their practicals. The chemistry student should also handle all the data that they are given, translate and express the data as observed. The Physics lecturer stated that the role of the LR in Physics is to introduce the students to a hands-on approach, they should be able to report what they have observed and how they are going to conduct the experiment. The Biology lecturer, pointed out that the LR assists students to develop writing skills. Once they know how to write good LRs they can then transfer the skills as a goal before they do their Honours or Master's degrees. They would then know how to write papers correctly and submit good reports.

According to the Mathematics lecturer, the Mathematics department did not have anything directly to do with the laboratory except in the computer laboratory. However, the Chemistry lecturer stated that the organic Chemistry should be more specific, dealing with practicals because Chemistry is an experimental science. Therefore, without experiments, theory would not be not well expressed. The Physics lecturer responded that the modules which cover the laboratory report were first taught in the second terms of mainstream. However, in Biology, first year students in the Extended Curriculum Programme (ECP) did report writing.

The lecturers identified various laboratory writing needs. The Chemistry lecturer stated that in modern society, students need technological assistance in the form of computers or in the form of communication gadgets. Students need average writing skills that would enable them to express themselves in English and in so doing, write a LR that can be understood. Once the LR is not well understood, the report will not make sense. Further, students need to understand the language in Physics. The challenge that students mainly experience is that they do not often understand the questions and therefore do not understand what is required of them. Hence, it is important that the English which is used in the LR should be understood. Additionally, students need the internet and a place to print whatever they could have done in Biology.

4.3.2.1 The structure of the laboratory report

The Mathematics lecturer indicated that report writing should empower students with computational skills. However, the Chemistry lecturer responded that Laboratory Report Writing (LRW) in Chemistry comprises an introduction, objectives, an experimental part, data analysis. Similarly, the Physics lecturer stated that one should have the topic of the experiment, method, aim and procedure of the experiment. Further, the Biology lecturer indicated that whatever students did in terms of practicals, how they did that, the apparatus used, the chemicals and the results are important. A brief paragraph will introduce what they have done, followed by methods and how they did the experiment and then the response and conclusion.

The Mathematics lecturer responded that the introduction is a crucial aspect of writing the LR , whereas in Chemistry, the lecturer indicated that the most crucial part of a report is the data analysis which the lecturer and the lab technician should be looking at. This shows the kind of data the students got. The reason for its importance is that if concentrations are given, students do not know how to handle those concentrations therefore, they find it difficult to give the correct answers.

Moreover, the Physics lecturer stated that students are expected to understand how they are going to perform the experiment, how they are going to collect the results and how they are going to present the results. Additionally, the lecturer indicated that of importance is a way of introducing students to the outside world effectively. Therefore, when looking at the LR, the results and the concluding part are important because that is what people who are not in the laboratory will see. Students, therefore, write on what they have discovered and what they have done.

Students are expected to evolve into producing technical experimental report writing, which includes but is not limited to syntax and semantic features. Hyland (2006 and Veal (1992) point out that for Second Language (L2) speakers with little exposure to academic texts, access to the structural and linguistic requirements of the academic genres could be valuable and challenging, simultaneously. Thus, Barrass (1978: 17) highlights the importance of writing as an aid; writing should be used as an aid to observe, think, plan, remember and communicate results. This is especially relevant if one considers the steps students have to follow when they have to record their findings in the laboratory report, for example.

This question was not applicable to the Mathematics respondent's context. However, the Chemistry lecturer stated that he would talk about the structure of the laboratory report under several headings of which the most important ones are the data analysis and the discussion parts. How students translate or transform the data into their own words is of most importance. This also refers to how the students conclude the report. The Physics lecturer is not directly involved when it comes to dealing with aspects of the laboratory report whereas the Biology lecturer focuses on methodology, results and the conclusion.

The Mathematics lecturer pointed out that structure should entail understanding. If one looks at it from the point of view of doing a laboratory experiment, one is expected to come up with an outcome. That outcome should reveal one's understanding of whatever concept or whatever finding one should come up with. In his response, the Chemistry lecturer stipulated that there are sub-titles, the introduction and the experiment's data analysis and marks are allocated for each of these sub-titles. In Physics though, the lecturer indicated that, collectively, the topic of the experiment, the aim, the apparatus, the method in which the experiment is going to take place, the results and the conclusion, is what the common structure of laboratory report entails. Similarly, in Biology, the lectures responded that there is the introduction, the objectives, the methodology, results, discussion, conclusion and references. One should not plagiarise; one should rather use one's own words.

According to the lecturers interviewed, the departments in question emphasise different aspects of the laboratory report structure. In Mathematics, errors in structure tend to be subjective because this depends on what exercise the students are doing and which aspects they are working on. For example, the lecturer may give an exercise where structure may not be the focus, instead accuracy and non-structural aspects could be the focus. Hence, errors in structure are very subjective. Chemistry students are penalised for errors in structure, in Physics marks are deducted, more especially if students arrive late in the laboratory or if they did not submit reports on time, and in Biology students are not really penalised for errors in structure, but only if they completely ignore what is expected of them.

4.3.2.2 Laboratory report writing timelines

The time allotted to LRW practice differed from one lecturer to the next. In Mathematics, learning is continuous and students should practise writing every day. Practicals are written every week in Chemistry. For each practical, a LR must be submitted. This however, is not submitted on the same day of the practical. Students are given two to three days after practicals so that they can write and submit their reports. In the case of Physics, students attend practicals on Wednesdays in the afternoon. Before the end of that week, they are expected to have written the very LR and submit it for marking. The Biology lecturer stated that they do mini-projects with their honours students. When they submit, they are supposed to have written a report. Students will then review their work and write a mini-project. All in all, they are supposed to write 9 reports. Regarding first years, the lecturers involved in the ECP should be able to give more detail about that.

The Mathematics lecturer's response was vague regarding the frequency of submitting laboratory reports in that it was pointed out that first year students submit reports in order to build on basics. Nonetheless, there are about 7 to 10 laboratory reports per module which students have to submit in each module, per semester, according to the Chemistry lecturer. The Physics lecturer indicated that the number of times students are expected to write a LR in one academic year depends on the number of weeks in a semester. For example, if there are 20 weeks in a semester, students would be expected to write 20 laboratory reports. The Biology lecturer stated that Honours students write LRs as soon as they have completed a module. This implies that there is, however, no clarity about first years in this regard.

4.3.2.3 Laboratory report writing approach

The laboratory report is a core assessment task in undergraduate science curricula which challenges students to concisely report laboratory activities using appropriate, discipline-specific genre conventions as well as integrating reading into their writing. Report writing involves a specific science genre, style and structure (Barrass, 1978).

The Mathematics lecturer responded that they do not explicitly teach LRW to students but in Chemistry, lecturers only prepare students for a few minutes. Further, in Physics somebody else is assigned to teach LRW to students while Biology lecturer stated that they explicitly teach LRW to students. It is called scientific writing. Therefore, the Mathematics and Physics lecturers found the interview question was not applicable to their situations. However, lecturers only prepare students for a few minutes in Chemistry, while in Biology, for first year students, 3 weeks are set aside for teaching the LRW. The Physics lecturer stated that the question was not applicable.

The Mathematics lecturer did not respond to the interview question as it was not applicable to him. In response to the question, the Chemistry lecturer stated that the lecturer would give a short briefing of about 10-15 minutes to students in the presence of the practical co-ordinator and demonstrator. The lecturer would then introduce the practical to the students and explain what the report looks like, and how the technical aspects should be handled. Thereafter, the lecturer hands over to the practical coordinator. The Physics lecturer indicated that lecturers are not full time in the laboratory and do not teach laboratory writing. The lecturer only oversees whether the person assigned discusses the experiments with the students. However, the Biology lecturer responded that the lecturers first show students how to write a LR and then engage them one-on-one.

The Mathematics lecturer stated that he does not teach students LRW at all. The Chemistry lecturer, nonetheless, only gives students a short briefing of between 10 to 15 minutes and the Physics lecturer is not directly involved in the teaching of LRW. Further, the Biology lecturer indicated that the first thing that Biology lecturers do is to show students what is expected of them. For example, when an experiment has been carried out, it must be reported in a certain way. Thus, the Chemistry and the Biology departments prepare students for LRW.

4.3.2.4 Penalisation for errors committed

Parkinson et al. (2007) argue that it is important for students though to acquire the appropriate discourse needed for science and to learn to avoid grammatical errors that obscure the requirements of Standard English.

Advantages of teaching writing skills for young scientists are that they will use the necessary writing tools to shape their writing into well-written texts that are easy to read and understand (Barrass, 1978: 9).

The 4 lecturers interviewed responded that they approached penalisation for errors committed differently. In Mathematics, students are penalised for errors in grammar and spelling because lecturers would not understand what students have written and that impacts straight away on what they will be trying to write. Students are not often penalised for errors in grammar and spelling in Chemistry because the focus is not really on grammar. If mistakes are committed, lecturers underline them but do not penalise the students, students are thus only penalised from a Chemistry point of view. Physics students are penalised for errors in grammar and spelling. For example, they need to write in a certain tense and with the correct spelling and grammar. The use of correct sentences is also important because if one writes a report one writes it for somebody to understand. So, it should be written in such a way that the person who marks it, would understand what one has written. In Biology, however, students are not penalised for errors in grammar and spelling.

4.3.3 Content lecturers' expectations

With the exception of the Mathematics lecturer, the remaining 3 lecturers responded that first entering BSc students in Chemistry need to develop their laboratory writing skills in order to help them proceed in terms of scientific thinking. Laboratory writing skills should be developed from the first year because Chemistry is experimental. Students will all the time, either during or after the laboratory work, express their thoughts. Therefore, one should be able to start writing the report from one's first year. Otherwise, when one goes to third level or fourth level, one will not be able to write the report. That is why lecturers focus on that in the first year because it is very important. The Physics lecturer stated that, for BSc students, most of their disciplines involve laboratory activities from the first year to the last year including post-graduate level. It is therefore very important that when students reach university level, they should be introduced to the laboratory environment so that by the time they reach their final year, they are able, and have already developed skills to be able to do their work in a disciplined and proper way. The Biology lecturer stated that students go through all the stages , from the first year to the fourth year in terms of developing their laboratory writing skills. They get to acquire these skills when they get to university, they get used to them and will therefore be able to apply them correctly.

From responses of the Chemistry, Physics and Biology lecturers respectively, a variety of suggestions were made. Students should attend laboratory sessions and do all the exercises that pertain to report writing skills. The English Department (ED) must be involved when students in Chemistry start doing the LR. The role of the ED should be to 'unlock' the language part first and then Chemistry learning will flow. There are laboratory technicians and lecturers in Physics who are expected to help the students to understand the LR and how it is written. Post-graduate students are also used to help them in writing these reports. Students are expected to acquire laboratory report writing skills (LRWSs) from the lecturers who teach them in Biology. If lecturers do not teach them, students would not know. After being taught, there should be follow-ups as students gradually acquire the skills.

In support of the above, Kang, Thompson and Wingschitl (2014: 675) assert that well designed assessments give lecturers insights into students' current ideas, gaps in understanding and reasoning processes. Implicitly, lecturers can adapt instruction based on learners' needs and, in this way, encourage advanced thinking.

The first respondent stated that the initial expectation in Mathematics is that students should do better. In Chemistry students are expected to express themselves in writing to procedurally do the laboratory practicals. That means all the steps that they undertook in the laboratory should be expressed from start up to the end. However, students are expected to write simple sentences in Physics. They are also expected to be able to understand the questions that are asked. In Biology, the initial expectation is to see if students can read and what they can do initially, one cannot expect too much. Therefore, once lecturers know what they can do, they can build on that. They must know students' abilities and their strengths.

The Biology lecturer was the only one who indicated that initial expectations were met. The Mathematics said that initial expectations are not met because the numbers are big. There are many more students who are being mentored by lecturers despite the fact that the lecturers are fewer in number. In writing, expectations are not met but in Chemistry, the expectations are met. A memorandum has to be followed. Students may not get the same data in a practical, but if that number is similar to the number of the practical co-ordinator, one will know that the student really handled the practical well. In Physics, expectations are not necessarily met because students do not normally prepare. They struggle to understand what is expected of them before they can come to the laboratory. In Biology, thus far expectations are met when students write because some of them have done some of the practicals at their high schools where they did submit reports. When they come to university, senior students help them with what they need to do.

Three out of 4 lecturers responded to the question posed. The Chemistry lecturer said that students do not read and the laboratories are not enough for the large numbers of students. The concern is also whether the university can hire enough language lecturers to match the number of students admitted and improve proficiency. Practical co-ordinators, tutors and demonstrators should not only focus on Chemistry, but also on English, so that they can collectively help the students move forward. In Physics, the concern is that students just write for the sake of getting marks, they do not really learn much from the experiments. Additionally, the issues of time and workload are cause for concern in Biology. Some of the students complain about the workload, time and access to the internet. Other students do not have laptops of their own.

4.3.4 Challenges experienced by the lecturers

According to the 4 content lecturers, students experienced different contextual challenges. In Mathematics students struggle to interpret the procedure for LRW. With a laboratory exercise, they will not be provided with a laboratory manual when they have to read and initiate a laboratory exercise. This is the initial point of struggle, where students struggle to interpret procedure. The area which students struggle most with, in Chemistry, is data analysis. These are numbers that have to be analysed in a narrative way. With the introduction, they can get that in a book or even in their laboratory practical manual. Lecturers also expect students to reformulate and to restructure information gathered, but what is really most important is that the data should be analysed. The areas that students struggle with in Physics are the conclusion of the experiment because they have to relate that to the experimental results. In Biology, however, they struggle to bring everything together, to make sense of it together with the results.

The Chemistry, Physics and Biology lecturers respectively, suggested that students are not very passionate about reading, hence, their reading skills are poor. This, negatively affects their LWS. They need time to focus on laboratory exercises. For example, they will have to read procedures which can positively impact LWS, especially those that are weaker. In Chemistry, writing skills impact on the LR. Since English is the language of tuition and SMHSU, students have to write in English. Therefore, if students have a problem with writing in English, it will impact negatively on the LR. This tends to create problems for the reader because the ideas will not flow. The language barrier is the main challenge that affects students negatively in Physics. Students are not able to understand what the question asks. Some of them have never been exposed to the laboratory at high school. To this effect, some of them will for the first time see apparatuses and will resultantly need time to understand the use of these apparatuses. Additionally, the use of English, time and the availability of resources are some of the factors that negatively affect students' laboratory writing skills in Biology.

Moreover, the lecturers argued that students struggle with spelling and grammar in Mathematics. In Chemistry they struggle with grammar whilst students struggle with understanding the language in Physics. This has more to do with the Physics terms that are used, how to interpret them and the meaning of some of the terms. However, in Biology, students struggle with nearly everything, that is, spelling, grammar and tenses. Students should understand that they can do the practical and then write something about the practical part of whatever it is that they have done. They have problems with interpretation.

Furthermore, the 4 lecturers interviewed suggested that their departments have different strengths. In Chemistry the strongest areas are the introduction and the objectives because both are given in the students' practical manual. In Physics the strongest areas are the materials as well as the methods while in Biology the strongest area is the introduction. In the Mathematics department students' performance in LRW is average. In Chemistry there is a problem at departmental level because the laboratory practicals have not been updated. For example, students who studied in 2014 will give their scripts to first year students or to their friends. When those students submit the reports, one might think that they are performing well because they get the material from others. If one considers that the LR or the practical in general counts for 25% of students' year mark, that 25% helps to push their marks higher, so that they can qualify for good marks. Students' performance in Physics is average while students perform reasonably well in Biology and are doing their best.

The 4 lecturers stated that the DLP is short-staffed which is why the lecturers struggle to render good services to the large numbers on campus. The library should be well stocked with material for students to read and improve their proficiency skills. Incoming students are not well groomed in their language before they come to university. The interview should also have included Laboratory Technicians (LT) in the Chemistry department since they are the ones who work with the students in the laboratories. There is also a lack of awareness in certain departments regarding the DLP. There should be some interlink between departments and the DLP. Students struggle with content; understanding the content has to do with understanding the language that one is using. If a student does not understand the language, it becomes difficult for them to understand the content itself. Although language proficiency is important for the first years, students unfortunately do not take English seriously. Lecturers must be able to refer their students to the DLP. Thus, there should be greater recognition of the DLP. Language Proficiency (LP) should not only be taught in the first year but in the second - and third year levels as well since learning is a continuum. In this way students will be able to express themselves very well. The teaching of English could also be done in the form of an elective with other courses.

The Mathematics lecturer responded that the question on lecturer-student ration is difficult to answer because in essence, it should not be more than 5 students to one lecturer or one assistant in Mathematics. No new infrastructure has been put in place at SMHSU. Hence, there are not enough laboratories. In Chemistry, there is approximately 250 students. This big group is split in two. One group uses the laboratory on Mondays and the other group, on Tuesdays. Therefore, in the laboratory there can be approximately 100 students doing laboratory work while the rest of the students will be doing tutorials. For the one half of the group there is one practical co-ordinator and several practical student assistants, tutors and demonstrators. The practical co-ordinator is a staff member and the demonstrators are senior students, and together they attend to the students. In Physics the lecturer-student ratio in the laboratory is 1 to 100. There are about 250 students. There are 2 laboratory sessions. In one session, approximately 100 students are expected, 50 in one laboratory and 50 in another laboratory since there are only 2 laboratories. In Biology the ratio is 1 to 15. At times it could be one-to-twenty, at honours level. All the students will be in the laboratory with one demonstrator assigned to a group of 15 students.

The first respondent stated that the initial expectation in Mathematics is that students should do better. In Chemistry students are expected to express themselves in writing to procedurally do the laboratory practicals. That means all the steps that they undertook in the laboratory should be expressed from start up to the end. However, students are expected to write simple sentences in Physics. They are also expected to be able to understand the questions that are asked. In Biology, the initial expectation is to see if students can read and what they can do initially, one cannot expect too much. Therefore, once lecturers know what they can do, they can build on that. They must know students' abilities and their strengths.

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4.3.5 Marking of laboratory reports

The Mathematics lecturer did not respond to the question. The Chemistry lecturer explained that the LR would be marked and the marks would be added to students' final marks, at the end of the year. The Physics lecturer stated that in the Physics Department, in the first year of students' entry, they are assisted in the laboratory. Explanations are given and they get a trial paper to write to make sure that they understand how to write the report before marks are allocated for the proper LR. In

Biology, lecturers give marks. They mark each section in the report to see how well it is written, where students can improve, then allocate marks.

The 4 lecturers explained how the 4 departments approached the marking of the LR. In Mathematics students are assessed when they have to apply laboratory report writing skills whereas Chemistry LRs are marked by laboratory technicians and the marks allocated also count towards the students' final year marks. The Physics Department first gives students a trial paper and assists them with it. Thereafter, they write the laboratory report and marks are allocated once the laboratory report is understood. However, Biology lecturers mark the laboratory report and then allocate marks.

Biology lecturers do mark students' written laboratory reports, whereas the Mathematics, Chemistry and Physics lecturers do not; the marking is done by their assistants in the departments. Although the Mathematics and Biology Departments do not use a rubric key when assessing students' laboratory report writing skills, the Chemistry lecturer is not aware of anyone using it while in Physics a rubric key is used at post-graduate level. The Mathematics lecturer thought of sharing the marking of students' work with the DLP but never got to doing it. However, the Chemistry, Physics and Biology lecturers stated that do not share the marking of students' work with the DLP.

4.3.6 Feedback giving

The Mathematics lecturer gives feedback by commenting on grammatical errors. Further, the Chemistry lecturer responded that feedback is given only after the laboratory technicians I have marked the LR. Marks are then entered into the system and practical work is returned to the students. According to the Physics lecturer, once assessments are done, scripts are returned to the students and feedback is given in class, but the Biology lecturer stated that students are told where they have gone wrong and what they can do to improve.

Moreover, the Mathematics lecturer argued that feedback should improve students' laboratory writing skills and enable them to improve. Further, the Chemistry lecturer responded that feedback should be effective if the Chemistry Department can cooperate with the DLP so that the focus is not only on Chemistry but also on language. The Physics lecturer stated that feedback will enable Physics students to understand where they have gone wrong and they will be able to correct their mistakes. The Biology lecturer argued that feedback is very, very effective in the department. When one gives feedback, one will know where students made mistakes and one will know where they need to improve.

If all the assessments together with tasks and valuable feedback are well administered and communicated, students should be able to demonstrate a core disciplinary proficiency, constructing evidence-based explanations within their given discourse community (Kang, Thompson & Windschitl, 2014: 675). If assessments are effective, they should illustrate to lecturers what students have learned.

4.3.7 The DLP liaison with other departments

The Mathematics lecturer asserted that the DLP teaches first year students in Foundation and English Proficiency (EP). Although the Chemistry lecturer was not clear on which services the DLP renders, the Physics lecturer indicated that when students do not perform well, they are referred to some of the divisions, but not the DLP. However, the Biology lecturer stated that they only made use of the DLP's computer laboratory for their tests and they were not sure if the DLP deals with evaluations. Therefore, only one lecture, that is the Mathematics lecturer, had an idea of what the DLP teaches.

Furthermore, regarding the Mathematics lecturer, the DLP should offer an effective service. From a Chemistry perspective, the service is not sufficient. However, it is starting to be. The Physics lecturer could not recall asking anything from the DLP, and the Biology lecturer did not answer this question.

The Mathematics and Physics Departments did not liaise with the DLP. Although the Chemistry Department has never met with the DLP, the Biology Department staff may have sometimes met the DLP staff in the corridors. Additionally, none of the Departments under review ran students' projects with the DLP. Only the Mathematics lecturer once had a meeting with the DLP in 2013 but never again since then. Thus, Chemistry, Physics and Biology Departments have never met with the DLP.

4.3.8 Suggested improvements

The Mathematics lecturer suggested that students should improve their language skills through reading novels. The Chemistry lecturer was of the view that different departments should come together to discuss how LWS can be enhanced. The Physics lecturer stated that students' laboratory writing skills can be enhanced by reducing the student intake at the beginning of the year. Alternatively, more space should be made available for students so that they can work in smaller numbers. Further, the Biology lecturer stated that getting assistance from lecturers and senior students can enhance students' I LRW. The Mathematics respondent maintained that staffing the library with Mathematics material, as reading skills can be acquired through the library. There are, however, no interventions in place, in Chemistry, according to the Chemistry lecturer. Perhaps the people working with the Physics students in the laboratory have some interventions; the Physics lecturer however, did not know of any. The Biology lecturer reported that lecturers assist students and talk to their colleagues about challenges they experienced. They also listen to presentations in class.

The Mathematics lecturer stated that support is given to students through advice and encouragement. Additionally, the Chemistry lecturer pointed out only certain things to students in respect of writing in English. For example, lecturers ask students to redo the laboratory report if it is not good. Regarding English, it is difficult for the subject content lecturer to do this. The Physics lecturer did not respond to this question while the Biology lecturer responded that students are divided in smaller groups and are called per group to explain what is expected of them.

SC assumes that cognitive growth occurs firstly on a social level and secondly on an individual level. This is referred to as the Zone of Proximal Development (ZPD). Therefore, instructors who are facilitators in SC should first provide support and help for learners, and then gradually decrease their support so that students can learn independently (Vygotsky, 1978).

The Mathematics and Chemistry lecturers responded that students' RWSs are not discussed in relevant platforms. The Physics lecturer stated that they only discussed students RWSs when they visited her office, individually. Alternatively, when the lecturer visits the laboratory during the experiment, she would explain certain parts of the experiment that students will be performing. If there are challenges with the laboratory technicians, this would be discussed in the School Board Meeting. The Biology lecturer stated that the lecturers always discussed students' RWSs in departmental and School Board meetings or even at Senate level. This, however, happens only at honours level.

The Mathematics lecturer does not teach LRW while the Chemistry lecturer did not respond to the question. The Physics lecturer stated that students should read about the experiment they are doing before conducting the experiment. They should also be able to write a pre-laboratory report, as there are certain aspects of the LR to be written before the experiment can be conducted. This includes the topic of the experiment, the aim, the apparatus they are going to use as well as familiarising themselves with those apparatuses. The Biology lecturer stated that If students write more and more, they can improve their LRWS. The Mathematics lecturer argued that from a Mathematical perspective the DLP should work on providing and improving ways to aid students. The Chemistry lecturer was of the view that the DLP should assign a lecturer dedicated to LRW prior to the start of laboratory practicals. This person should arrange for a few sessions with the students in preparation for writing the laboratory report. Additionally, the Physics lecturer stated that the DLP should help students develop their writing skills in Physics. They should also attend to the narrative aspects of report writing even though Physics students do not take English seriously. According to the Biology lecturer, the DLP should focus on the use of English and how to write.

The Mathematics lecturer argued that library studies should be made compulsory for Mathematics students in order for them to understand the language better as well as use it in the laboratory. According to the Chemistry lecturer, currently, in Chemistry, there are no remedial mechanisms in place to improve students' LRWS. Before students could start with laboratory work, lecturers remind them again what they should do, what is expected in the LR and what is not expected in there. In Physics, there are no mechanisms or measures in place to improve students' LRWS, except that students are shown a LR that has been marked, indicating where mistakes were made. They use a template and go to the library to read about the experiment before coming to the laboratory. However, the lecturers give feedback in Biology. Students do assignments and give presentations. Whenever students do anything in the laboratory, they present it to the lecturers and to their colleagues to help them improve.

Although the lectures advanced a range of contextual barriers to enhancing writing skills, the Mathematics lecturer suggested that lecturers should expose students to relevant technological assistance. This might be a problem because of the numbers and scarcity of language laboratories and their language proficiency levels. The Chemistry Department and the DLP should come together to enhance students' laboratory writing skills. The challenge experienced in Physics is that there are too many students expected to perform one experiment. Therefore, the problem of space is also a challenge. Students are not able to work in small groups. If the university can build more laboratories or alternatively not admit so many students, it could be helpful. In Biology students frequently submit LRs and lecturers give feedback as soon as it is ready.

4.4 CONCLUSION

Quantitative data revealed the generally low scientific writing proficiency levels of the BSc students which is then supported by the qualitative responses of content lectures who mainly teach the students in question. These lecturers are in cognate departments indicated how report writing practice was structured, the time allotted for practice, the marking, liaison with the DLP, and so on.

SMHSU language and subject content lecturers need closer collaboration in supporting first entering BSc students. Discipline-specific students' needs can be satisfied if the lecturers plan, implement and review curricula perennially together. Thus, the students stand to benefit more from synergies of the DLP and the cognate departments, and as a result, the attrition rate of underprepared non-native students studying science in an English medium university such as SMHSU will increase.

The next chapter concludes the study and makes recommendations for future research.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This chapter aims to recall the objectives of the study and summarise the key findings. It also seeks to conclude the findings of assessing laboratory report writing skills of first entering BSc students. The last section will present recommendations of the study.

5.1 OBJECTIVES OF THE STUDY

The objectives of the study were meant to guide the exploration of laboratory report writing skills of first entering BSc students. The following objectives below guided the study:

- to assess written laboratory reports of first entering BSc students at SMHSU.
- to establish how SMHSU content subject lecturers assess first entering students' laboratory report writing skills.
- to suggest how first entering students' laboratory report writing skills could be assessed.

5.2 SUMMARY OF THE FINDINGS

This study aimed to assess laboratory writing skills of BSc first entering students at SMHSU. It adopted a quanti-qualitative exploratory approach which employed a criterion-referenced test and an interview as instruments for data collection. The general findings of the study were that although first entering BSc students' GE proficiency levels were above average (see Table 2), their scientific English proficiency levels are average and their lecturers' approached laboratory report writing in the 4 sampled modules, differently. The data collected were aligned with the set objectives of the study.

5.3 CONCLUSIONS OF THE STUDY

This study adopted the SC theory (cf. 2.6). However, the dearth of laboratory report writing practice in the DLP manual which is evidenced by the poor performance of BSc students (cf. Table 5), spawned 'The DLP sample unit' (see Table 5). This is further corroborated by the qualitative and quantitative research findings discussed in Chapter 4.

Moreover, findings revealed that the majority of students (71%) sat for an EFAL examination paper, and most of them (88%) went to government schools. Nearly half the number of the students (44%) attained a B symbol, which was followed by a C (35%) symbol. The lowest score was an E (0.7%) and this was attained by only 1 student.

Students also passed other languages at SC level. Nearly all the students (98%) passed Physical Science. Life Sciences and Mathematical Sciences were passed by 91% and 90% students, respectively. However, the overall average score in laboratory report writing was 22%.

None of the students had ever failed matric. Nearly all the students (97%) registered for degrees for the first time. Only 3% registered for B.ed., Health Sciences, Electrical Engineering, Industrial Physics, collectively. Additional degrees a few students already hold are Electrical Engineering and Health Sciences.

The Chemistry, Physics and Biology modules covered LRW; the report writing structure entails a topic, an introduction, objectives, apparatus, experiment and results. Crucial aspects tend to be contextual. For example, it was introduction in Mathematics, data analysis in Chemistry, understanding how to perform an experiment is key in Physics as it is a way of introducing students to the outside world. Practicals should enhance students' way of thinking. Students were expected to express themselves in their own words and they are expected to know how to write effectively.

The lecturers stated that there must be a style which is scientifically universal; there must be a universally accepted procedure. What students write, though, should be in the past tense because the report is written after the practical. Therefore, it should be in the past tense, because that would be their first time writing the Scientific Report (SR). Thus, lecturers should explain and train them on what is required of them. English assists them to improve in whatever format they may want to write.

Furthermore, the lecturers indicated that it is very important that when students reach university level, they should be introduced into the laboratory environment so that by the time they reach their final year, they are able, and have already developed skills to be able to do their work in a disciplined and proper way.

In the same vein, students should be taught and understand the specific format pertaining to scientific conventions. For example, when writing results in the form of a number, that number has to be written in a specific way, hence adhering to the scientific conventions (cf. 2.4.2; 2.2.5.4). The lecturers further stated that first entering BSc students' language proficiency levels in Mathematics, Chemistry and Physics were average. However, their level in Biology was good. In addition, in modern society, students need technological assistance in the form of computers or in the form of communication gadgets.

Moreover, the lecturers argued that students were expected to attend laboratory sessions and do all the exercises that pertain to report writing skills. The role of the ED should be to 'unlock' the language part first and then Chemistry will flow. If lecturers do not teach them, students would not know. For each practical, a LR must be submitted. This, however, is not submitted on the same day of the practical. Thus, before the end of that specific week, they are expected to have written the LR and submit it for marking. The number of times students are expected to write a LR in one academic year depends on the number of weeks in a semester.

According to the lecturers, negative aspects were that students were not very passionate about reading, hence their reading skills were poor. They would be expected to read procedures which can positively impact LWS especially those who are weaker. Additionally, since English is the language of tuition at SMHSU, students have to write in English. Therefore, if students have a problem with writing in English, that should be addressed. The language barrier is the main challenge that affects students negatively. Students are not able to understand what the question asks.

Lecturers are not full time in the laboratory and do not teach laboratory writing. The lecturers only oversee whether the person assigned discusses the experiments with the students. In Biology students are shown how to write a LR and are engaged one-on-one. The lecturer would talk about the structures of the laboratory report under several headings of which the most important ones are the data analysis and the discussion part.

The lecturers argued that passion is one of the factors which impacts on students' ability to write LRs. It could either impact negatively or positively because those who are passionate and can read well, will have positive feedback. Other factors could be whether or not there is a conducive environment, whether some students are willing to assist the weaker ones and the ability of students to access the internet.

Moreover, students struggle to interpret procedure while lecturers expect students to reformulate and to restructure the LR. Students should understand that they can do the practical and then write something about the practical part of whatever it is that they have done. The use of correct sentences is also important because if one writes a report, one writes it for somebody to understand it.

The lecturers suggested a number of remedial mechanisms. Departments should expose students to relevant technological assistance. The DLP should come together to enhance students' laboratory writing skills. However, space is a challenge. The university should build more laboratories or alternatively not admit as many students. There are no mechanisms or measures in place to improve students' LRWS and the student numbers in laboratories range from 5 to 250. Procedurally, all the steps that students should undertake in the laboratory should be expressed from start up to the end. Most departments do not meet expectations, only one does.

Since only 1 department explicitly teaches LRW, students do not read and the laboratories are not enough for the large numbers of students. The university should hire enough language lecturers to match the number of students admitted and improve proficiency.

Practical co-ordinators together with English lecturers should work collectively to help students move forward. The issues of time and workload are cause for concern in Biology and some students do not have laptops of their own. The lecturer gives a short briefing of about 10-15 minutes to students in the presence of the practical co-ordinator and demonstrator. The lecturer then hands over to the practical co-ordinator.

Students should be able to write the topic of the experiment, the aim and the apparatus they are going to use. More lecture space should be made available for students so that they can work in smaller numbers.

Getting assistance from lecturers and senior students would enhance students' laboratory writing skills in Biology. Support given to students is in the form of advice and encouragement. For example, the service rendered by the DLP is not effective; only 1 department met once with the DLP and the rest did not liaise with the DLP. Examples of effective services are that LRs were marked and allocated scores. Although students did not take the English language seriously, departments should work on providing and improving ways to aid students.

Although marked LRs scores were used for students' final year marks, the marking was not shared with the DLP. Marks were entered into the system and practical work was returned to the students. Students were told where they went wrong and what they could do to improve. When one gives feedback, one will know where students made mistakes and where they need to improve.

The lecturers stated that the DLP was short-staffed that is why the staff struggle to render good services to the large numbers on campus, there was lack of awareness in certain departments regarding the DLP and that lecturers ought to be able to refer their students to the DLP for support.

5.4 RECOMMENDATIONS FOR FUTURE RESEARCH

- Some Needs Analysis (NA) of SMHSU first entering BSc students could be conducted.
- Needs of DLP lecturers could be determined.
- Means analysis (MA) of the DLP environment could be conducted.
- A review of the DLP course could be carried out to determine how discipline-specific the content is.
- SMHSU first entering BSc students' LPs could be assessed to investigate whether or not the passive voice is used effectively.
- A study investigating whether or not there is collaboration between DLP lecturers and that of subject content lecturers at SMHSU should be carried out.
- The current DLP could be evaluated to determine whether or not it is fit for purpose.
- DLP lecturers and content lecturers at SMHSU could collaborate to review existing assessment methods in order to address the shortcomings in this regard.

- Guidelines for collaborative curriculum development between SMHSU content subject lecturers and language lecturers in respect of laboratory report writing skills, could be determined.

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APPENDICES

APPENDIX: A Laboratory Report Writing Test

Laboratory Report Writing Test

Duration: 1 hour 45 minutes

Venue:

Section A

1.1 Give the symbol that you obtained in English in your Matriculation/Senior Certificate:

____

1.2 What was the type of English language examination that you sat for (EFAL or EHL)?

____

1.3 Was the school you attended a government or private one?

____

1.4 In which year did you pass matric?

____

1.5 What are the other language(s) that you passed in matric?

____

1.6 List the content subjects that you passed:

____

____

____

____

1.7 Have you ever failed matric?

____

1.8 If you answered ‘yes’ in 1.7, in which year?

1.9 What is the university degree that you are currently registered for?

1.10 Is this your first degree?

1.11 If not, what was your first degree?

1.12 Mention other degree(s) that you hold.

SECTION B

Write a report on an experiment that you performed in Grade 12 investigating the absorption and transportation of water and mineral salts by plants. Your report should have the following four subheadings:

1.13 Aim of experiment (5)
1.14 Apparatus (10)
1.15 Method (15)
1.16 Findings (10)

APPENDIX B: Interviews with First Entering BSc Students' Subject Content Lecturers

Interview questions will be divided into Sections A and B. Kindly respond to all the questions asked.

Section A. Personal Details

1.1 When did you join SMHSU?
1.2 Please give the name of your department.
1.3 What is/are your highest academic qualification(s)?
1.4 What is your academic rank?
1.5 What is your academic discipline?
1.6 Give your teaching experience in years and months.
1.7 List the modules/courses that you have been assigned to teach.
1.8 What is your gender?

Section B: Laboratory Report Writing Skills

2.1 What is the role of laboratory report in scientific writing?

2.2 Which modules/courses cover the laboratory report?

2.3 What does laboratory report writing entail?

2.4 Which aspects of writing the laboratory report are crucial for first entering BSc students?

2.5 Are laboratory report writing skills important for the students? Why?

2.6 Is there a specific writing style required when writing a laboratory report?

2.7 Does writing a laboratory report require specific writing skills? If yes, what are these skills?

2.8 What does the most common structure of laboratory report entail?

2. What is Expected of Students

2.1 Why do first entering BSc students need to develop their laboratory writing skills?

2.2 Are first entering BSc students expected to adhere to a specific format pertaining to scientific conventions for writing laboratory reports?

2.3 Would you rate first entering BSc's students' language proficiency levels as poor average, good or exceptional? Please choose one.

2.4 What are the students' dire needs in respect of laboratory report writing?

2.5 How are the students expected to acquire laboratory report writing skills?

2.6 During which time of the academic year are students expected to write laboratory reports?

2.7 How many times are they expected to write a laboratory report in one academic year?

2.8 Mention some of the factors that negatively influence students' laboratory writing skills?

2.9 Which factors do you think impact on students' ability to write laboratory reports?

2.10 Which areas of laboratory report writing do students generally struggle with?

2.11 Which are the stronger areas in students' laboratory report writing abilities?

2.12 Describe the performance of students in laboratory report writing?

2.13 Which aspects of writing (e.g. spelling/grammar/tense and so on) do students mostly struggle with?

2.14 Are students penalised for errors in structure?

2.15 Are students penalised for errors in grammar and spelling?

2.16 How do you think first entering BSc's students' laboratory writing skills can be enhanced?

2.17 What remedial mechanisms/measures do you have in place to improve students' laboratory report writing skills?

3. Role of Lecturer

3.1 What is the lecturer-student ratio in the laboratory?

3.2 What are your initial expectations in respect of the students' laboratory report writing skills?

3.3 Are the expectations met? Please explain.

3.4 What are your concerns regarding students' laboratory writing skills?

3.5 Do you explicitly teach laboratory report writing to students?

3.6 If you do, how much time do you set aside for teaching laboratory report writing?

3.7 How is the teaching of laboratory report writing approached?

3.8 How do you prepare students to write a laboratory report?

3.9 Which aspects of the laboratory report do you focus on?

3.10 How do you think students can improve their laboratory report writing skills?

3.11 In which ways do you think students' laboratory writing skills can be enhanced?

3.12 Which interventions do you have in place to improve students' laboratory writing skills?

3.13 How do you support students who face challenges in laboratory report writing?

3.14 Do you ever discuss the students' report writing skills in relevant platforms?

4. Role of the Department of Language Proficiency (DLP)

4.1 What services does the DLP render to your Department?

4.2 Is this an effective service especially in respect of students' laboratory report writing skills?

4.3 Do you sometimes liaise with the DLP regarding students' writing needs?

4.4 Do you sometimes run students' projects with DLP? Please explain.

4.5 Do you sometimes assess students with DLP? Please explain.

4.6 Do you sometimes meet with DLP to strategise on how to enhance the performance of students in the sciences?

4.7 How can the DLP aid in the students' laboratory report writing skills?

5. Assessment

5.1 How do you assess first entering BSc students' laboratory report writing skills?

5.2 Do you mark their written laboratory reports?

5.3 Do you use a rubric key when you assess students' laboratory report writing?

5.4 List the assessment criteria that you use, if any.

5.5 Do you sometimes share the marking of the students' work with DLP? Please explain.

5.6 How do you give feedback?

Do you think feedback is effective in terms of improving students' laboratory writing skills?

APPENDIX: D

STUDENT CONSENT TO PARTICIPATE IN RESEARCH

Introduction

My name is Helga Veldtman, and I am a staff member in the Department of Language Proficiency (DLP). I am also currently enrolled as a part-time Master student in English with the School of Languages and Communication, University of Limpopo (UL).

I am conducting research on issues pertaining to laboratory report writing skill of first entering students at SMU and I would like to ask you some questions in respect of these issues.

Purpose of study

The purpose of the study is to assess report writing skills of first entering BSc students at SMU. Also, the research design I subscribe to is exploratory in nature, therefore a quanti-qualitative approach will be employed. To this extent I will have to assess SMU first entering BSc students as well as engage in semi-structured interviews with the students' BSc subject content lecturers.

Interview

This interview will take approximately one hour fifteen minutes. Responses will be recorded.

Confidentiality

All the information gathered during this interview is confidential and will be solely used for the intended purposes of this study. I will not reveal to anyone your name or any form of your identity without your permission.

Voluntary participation

I will conduct this interview with the understanding you have freely accepted to take part in this study, and that you are not under any obligation to answer the questions that I will be asking. You are free to discontinue the interview at any time.

Benefits

There are no direct personal benefits that you will get by participating in this study. However, the study will enhance our collective knowledge on the subject and the findings may be used by both the Faculty of Science and Technology and the Department of Language Proficiency at SMU to enhance the relevant programmes.

Information about study

Feel free at any time to ask questions to clarify anything related to this interview or study.

Consent

I freely consent to take part in this study. I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop participating at any point should I not wish to continue. I also confirm that the purpose of the study has been fully explained to me. I understand that this research project's purpose is not necessarily to benefit me personally in the immediate or short term. I also understand that my participation will remain confidential.

Signature of Interviewee: ………………… Date: ……………………………………

Thank you for your participation.

APPENDIX E:

Department of Language Proficiency

Basic Medical Sciences Building

Room 211C

SMU

01 April 2019

Prof Obi

Dean: School of Science & Technology

Natural Sciences Building

SMU

Dear Prof Obi

REQUEST FOR PERMISSION FROM THE SMHSU DEAN TO COLLECT DATA

I would hereby like to conduct interviews with four staff members in the Faculty of Science and Technology from the following departments: Biochemistry, Chemistry, Physics and Biology. These interviews will serve as samples of the study.

The detail of my research is indicated below for your information.

1.

Title of project: **Assessing laboratory report writing skills of first entering Sefako Makgatho Health Sciences University Bachelor of Science Students: An exploratory study**

2. **Principal Investigator**

Title, Initials and Surname	**Qualification:**
Ms H D Veldtman	Master of Arts in English (MA)

3. **Name of supervisor:**

Name:	**Department: Language Studies, UL**
Dr L. J. Ngoepe	MA – English Studies

4.	**E-mail address:** hveldtman@gmail.com & helga.veldtman@smu.ac.za

The research design I subscribe to is exploratory in nature and a quanti-qualitative approach will be employed. To this extent, I will have to assess SMU first entering BSc students, as well as engage in semi-structured interviews with the students' content lecturers.

Within the context of the background information provided, I would therefore like to

request for permission to conduct the research in line with SMU policy guidelines.

I trust that you will consider this request favourably.

Yours sincerely

____

H D VELDTMAN (MS)

APPENDIX F: Marking guide on the experiment investigating absorption and transportation of water by plants

Examining water absorption by the stem

Aim

To examine/investigate water absorption and transportation by the stem. **(5)**

Apparatus

- water
- food colouring dye (available at supermarket)
- white flower on a stem, e.g. Impatiens, carnation or chrysanthemum
- scissors
- two jars, cups or measuring cylinders
- plastic tray
- sticky tape **(10)**

Method

1. Fill one jar with plain water, and one with water containing several drops of food colouring dye.
2. Take the flower and carefully cut the stem lengthwise, either part way up the stem or right up to the base of the flower (try both, the results will be different!)
3. Put one half of the stem into the jar containing plain water and one half of the stem into the jar containing food colouring dye. To make it easier to insert the stalks without breaking them, it helps to wedge paper underneath the jars so that you can tilt them towards each other. Tape the jars or cylinders down onto a tray so that they do not fall over.
4. Observe the flowers after a few hours and the next day, and note where the dye ends up in the flower head. You can leave the flowers up to a week but make sure that they have enough water. **(15)**

Results/Findings

Most volume of **water** entering plants is by means of passive **absorption**. The **water** will enter the plant through the root cells that can be found in the roots where mainly passive **absorption** occurs. With the **absorption** of **water**, minerals and **nutrients** are also **absorbed**. **(10)**

APPENDIX G: TREC Ethics Clearance Certificate

UNIVERSITY OF LIMPOPO

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING:	6 March 2019
PROJECT NUMBER:	TREC/66/2019: PG
<u>PROJECT:</u>	
Title:	Assessing laboratory report writing skills of first entering Bachelor of Science students.
Researcher:	HD Veldtman
Supervisor:	Dr LJ Ngoepe
Co-Supervisor/s:	N/A
School:	Languages and Communication Studies
Degree:	Master of Arts in English Studies

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:
i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Finding solutions for Africa