Developing and mapping competencies for the Veterinary Technology degree at Tshwane University of Technology, South Africa

Catharina Isabella Boshoff

MBA (Poly), Econ., Adm., Mark: Education Management

19 April 2021

Author

Catharina Isabella Boshoff

Degree programme

MBA (Poly), Econ., Adm., Mark: Education Management

Report/thesis title	**Number of pages and appendix pages**
Developing and mapping competencies for the Veterinary Technology degree at Tshwane University of Technology, South Africa	74

Abstract

Introduction: The professional degree in Veterinary Technology was developed and implemented in 2020. This degree programme needs to comply with the guidelines of the professional registration body, the South African Veterinary Council (SAVC), for accreditation purposes. Curriculum review and compliance with the day one competencies as determined by the SAVC is a requirement for accreditation. New one day competencies need to be developed and mapped against the curriculum offered to ensure alignment.

Methods: One day competencies were developed in collaboration with industry to ensure graduate readiness to enter the workforce on completion of the qualification. A curriculum review framework was adopted to analyse the four-year programme on module level. Curriculum mapping was chosen as the method to obtain data and correlation of the module content and module outcomes with the expected day one competencies as set by the SAVC.

Results: Day one competencies criteria were developed consisting of three main areas: A) general laboratory knowledge; B) discipline knowledge and C) graduate attributes. Curriculum mapping was found to be a useful tool for evaluation of the compliance of the curriculum with all the day one competencies incorporated in the curriculum as part of the outcomes.

Keywords

Curriculum mapping, day one competencies, degree in veterinary technology

Table of content

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 Motivation for this study

In the veterinary field, all over the world, veterinary services are rendered under a legislative framework. It is therefore important that national veterinary services should meet specific standards adopted by each country and in line with recommendations made by the World Organisation of Animal Health (OIE) (OIE, 2012). In veterinary education, minimum competencies refer to the knowledge, skills, attitudes and aptitudes required from a newly graduated person to be licenced by a statutory body to be satisfactorily prepared to participate in veterinary services at the entry level. The most critical competencies relating to the profession are the skills that a new graduate is expected to perform; these are the so-called “day one competencies”. Day one competencies refer to competencies required from a person who has just graduated and needs to be able to meet the standards on the first day (day one) of entering the profession from the professional point of view. It is an essential outcome measure for universities offering training in the veterinary field.

Day one competencies were initiated and developed in the 1990 in the United Kingdom (UK) for medical professionals, realigning undergraduate medical training courses to more cohesive and outcome-oriented learning systems to target more practical and integrated skills learning (Newble et al., 2005). Although this was not requested for veterinary courses, the veterinary governing body in the UK compiled basic competencies for the veterinary profession (Royal College of Veterinary Surgeons, 2006). This was followed by recommendations made on the competencies of graduating veterinarians by an OIE ad hoc group on veterinary education. The OIE is the inter-governmental organisation responsible for improving animal health worldwide, with 182 member countries (OIE website). It was recommended that education establishments, together with veterinary statutory bodies, need to develop day one competencies appropriate to the needs of each country with the OIE recommendations in mind.

The South African Veterinary Council (SAVC) is the regulatory body for the veterinary and para-veterinary professions in South Africa and has a statutory duty to determine scientific and ethical standards of professional conduct and education. In South Africa there are currently four professions (veterinary nurse, animal health technologist, laboratory animal technologist and veterinary technologist) that are classified as para-veteri-

nary professions. Veterinary technologists are trained by Tshwane University of Technology (TUT), the only education establishment in Africa that offers this programme. All of these professions fall under the regulations of the SAVC and require registration to practise the various professions (Veterinary and Para-veterinary Professions Act no 19 of 1982). One of the objectives of the council is "to determine the minimum standards of tuition and training required for degrees, diplomas and certificates entitling the holders thereof to be registered to practise the veterinary professions and para-veterinary professions" (Act 19 of 1982). The council is thus responsible for ensuring standards of training and defining rules relating to the profession. As day one competencies were set for graduating veterinarians, it was also expected that day one competencies be set for para-veterinary graduates. The curriculum of any tertiary institution that offers a course of study for qualification as a veterinary technologist in terms of regulation has to consist of the exit level outcomes and day one competencies specified for veterinary technology graduates.

Veterinary technologists should be competent in the minimum competencies and skills required of a newly qualified graduate. To achieve this goal, it is vital that an agreement be reached between educators and training institutions training these professionals, as well as the profession or industry, on what skills should be required from a new graduate. Students should also understand these requirements and expectations. Competency is a standard combining knowledge, one or more skills and certain attitudes or personal qualities that are exercised in order to perform the duties of a job effectively. The most critical competencies are those that relate to the skills or abilities of a new graduate to perform without any supervision from qualified staff, the so-called 'day-one competencies'. There are significant advantages to incorporating accurately defined day one competency outcomes in a veterinary curriculum. Once the minimum competencies have been defined, these outcomes can be used to inform the design and management of the undergraduate curriculum. From an educational perspective the day one competencies are important because they constitute a set of learning outcomes.

In the South African curriculum framework undergraduate degree and diploma structures were identified as an immediate priority for change. A new curriculum is essential for the majority of the students to succeed in mastering their core curricula, and for enhancing the quality and relevance of South Africa's main undergraduate degrees and diplomas to ensure student success (A proposal for undergraduate curriculum reform in South

Africa: The case for a flexible curriculum structure (http://che.ac.za/sites/default/files/publications/Full_Report.pdf). Therefore the curriculum was redeveloped from a national diploma to a professional degree. With the implementation of a new degree in Veterinary Technology in 2020 at TUT, it is therefore of the utmost importance to establish day one competencies described by the SAVC and to map these against the curriculum developed for the Bachelor of Health Science: Veterinary Technology degree (BHSc Vet Tech) to ensure adherence to the required standards.

1.2 Research objective

The objective of this study was to determine whether the Veterinary Technology curriculum meets the specific standards set by the SAVC for accreditation. This will be achieved through three objectives:

1. To develop day one competencies required from the students in line with the standards set by the SAVC, indicating the knowledge and competencies required from the student on the first day after graduation.
2. To map the curriculum to determine if the curriculum for the veterinary technology programme offered by TUT is aligned with the day one competencies and expected learning outcomes.
3. To identify knowledge gaps in the curriculum that need to be addressed and corrected to ensure compliance. This is needed to ensure that TUT remains an accredited training institution with the SAVC.

1.3 Research questions

The research questions (RQ) to be answered for the outcomes are aligned and summarised:

Objective one: To develop day one competencies required form the students in line with the standards set by the SAVC, indicating the knowledge and competencies required from the student on the first day after graduation.

Research Question

- **RQ 1**: What are the minimum knowledge and competencies needed from a student on the first day after graduation, to ensure the standards of the SAVC?
- **RQ 2**: What knowledge does the industry require to ensure the employability of students?

Objective two: To map the curriculum to determine if the curriculum for the veterinary technology programme offered by TUT is aligned with the day one competencies and expected learning outcomes.

Research Question

- **RQ 1**: Does the curriculum developed for BHSc Vet Tech comply with and meet the requirements and expected learning outcomes of the SAVC?

Objective three: To identify knowledge gaps in the curriculum that need to be addressed and corrected to ensure compliance. This is needed to ensure that TUT remains an accredited training institution with the SAVC.

Research Question

- **RQ 1:** Are there any knowledge gaps in the curriculum, identified by the curriculum mapping tool, which need to be revised and addressed?

1.4 Chapter overview

Chapter 2 is a review of the relevant literature, focusing on curriculum design, module mapping and student graduate attributes.

Chapter 3 deals in more detail with the research objective and the methodology used through curriculum development and curriculum mapping.

Chapter 4 is the discussion chapter. In it, the data analysis, results and findings from the curriculum design and mapping are summarised.

Chapter 5 is the concluding chapter that deals with suggestions for further development or possible changes to implement. The reflection part focuses on personal development outcomes.

2 LITERATURE REVIEW

2.1 Veterinary technology

The veterinary technology qualification (BHSc Vet Tech) will provide graduates with skills to support the entire veterinary profession in diagnostic services, research and the production of biological products. The graduates produced by TUT serve an array of private and government corporations, which include among others: Deltamune; IDEXX; Department of Agriculture, Forestry and Fisheries; Department of Land Reform and Rural Development; the National Research Foundation' National Zoological Gardens of South Africa; the University of Pretoria; the University of KwaZulu-Natal and the Agricultural Research Council. Neighbouring countries in the Southern African Development Community region also need qualified veterinary technologists trained by TUT, as they do not have any formal training facilities for this qualification.

This BHSc Vet Tech is intended for prospective students who are interested in a laboratory-orientated career in veterinary science. Successful candidates will support veterinary services by conducting laboratory-based diagnostic tests and research investigations. Candidates will support veterinarians with diagnostic data and will thus be equipped with the necessary skills to conduct tests independently but to be involved in teamwork as well. They can be employed in private or government veterinary laboratories and as veterinary technologists in specific fields, such as research and diagnostics.

TUT regulations include the establishment of an advisory committee to guide every qualification on subject content. Annual discussions on the curriculum and industry demand for the BHSc Vet Tech programme are held with the programme advisory committee, comprising representatives of various stakeholders, such as government and private laboratories. The advisory committee justifies the need for this qualification to supply specialised skills in veterinary science. Veterinary problems on national and international scale, such as disease outbreaks, bioterrorism, zoonosis and public health among others, threaten the socio-economy, tourism and food safety and security. Outbreaks of diseases such as foot and mouth disease, bovine tuberculosis, avian flu and tick infestations, as well as tick-borne diseases, are common in South Africa, accompanied by massive losses in profits and livestock (Department of Agriculture, Forestry and Fisheries and Provincial Departments of Agriculture). The profession supports diagnostic and research ventures focusing on these and other diseases and promotes research through veterinary technology, leading to curbing losses in revenue and threats to food security.

Furthermore, the profession plays an advisory role with regard to treatment and prevention of diseases. This is vital for the health and productivity of livestock in Southern Africa.

2.2 Benchmarking other institutions offering Veterinary Technology

TUT is the only institution in South Africa that is accredited by the SAVC to train veterinary technologists. A registered veterinary technologist in possession of this qualification may perform his/her duties as stipulated in the Veterinary and Para-veterinary Professions Act, No. 19 of 1982. Because of the uniqueness of the qualification and the profession, it is of the utmost importance for the BHSc Vet Tech qualification to meet the standards of training.

Internationally, Massey University of New Zealand, the University of Queensland and the University of Adelaide in Australia offer three-year Bachelor of Veterinary Technology qualifications. However, the aim of these qualifications and profession differs from the qualification presented at TUT. In New Zealand and Australia veterinary technology student will gain skills in veterinary radiography and diagnostic practices, anaesthesia, surgery, clinical pathology and pharmacology, nutrition, veterinary therapeutics and animal reproduction. Thus students develop knowledge to be able to work in animal management and welfare in a clinical setting.

The veterinary technology programme offered by TUT is thus unique, as it addresses a need specific to South Africa, and TUT is the only institute offering this programme. Curriculum design is therefore of the utmost importance and relevance to the curriculum for the industry needs to be addressed. Since this is a unique kind of qualification, no guidelines or curricula from other national or international universities can be used, and correct curriculum design and mapping are of the essence.

2.3 Defining curriculum

The world curriculum originates from the Latin word *currere*, meaning "to run the course" (Jacobs, Vakalisa & Gawe, 2012). This is the same Latin word from which careers originated. Therefore a curriculum can be assumed to be a course of study allowing the student to follow it until he or she has finished the race.

Hass defined a curriculum in 1980 as: “The curriculum is all of the experiences that individual learners have in a programme of education whose purpose is to achieve broad goals and related specific objectives, which is planned in terms of a framework of theory and research or past and present professional practice.”

However, developing a curriculum is a time-consuming, challenging task. Ornstein and Hunkins (2009) explain that curriculum development involves how a “curriculum is planned, implemented and evaluated, as well as what people, processes and procedures are involved.” Curriculum models help designers to methodically plot out the use of particular teaching, learning and assessment approaches. Various models for curriculum developing are described. The models are based on learning theories, eg the information-processing model is supported by cognitivist theory and the situated learning model adopts constructivism theory. Overall, models can be placed into two broad categories, the product model and the process model (Sheehan, 1986). The product model is results-oriented, with stronger emphasis being placed on the complete product rather than on the learning process. The process model is focused on how learning develops over a period of time. Neither of these two models is a complete recipe for curriculum development, but some aspects of both can be taken into account when developing curriculum and professional knowledge. Background information will also guide and provide information on developing a good approach to enhance student learning.

2.4 Curriculum design

Various stakeholders are consulted when a curriculum is designed and the design includes learning objectives and aims, subject content, learning methods and experiences, as well as evaluation and assessment. This process is undertaken in consultation with various stakeholders to gather input from various sectors (Figure 1)

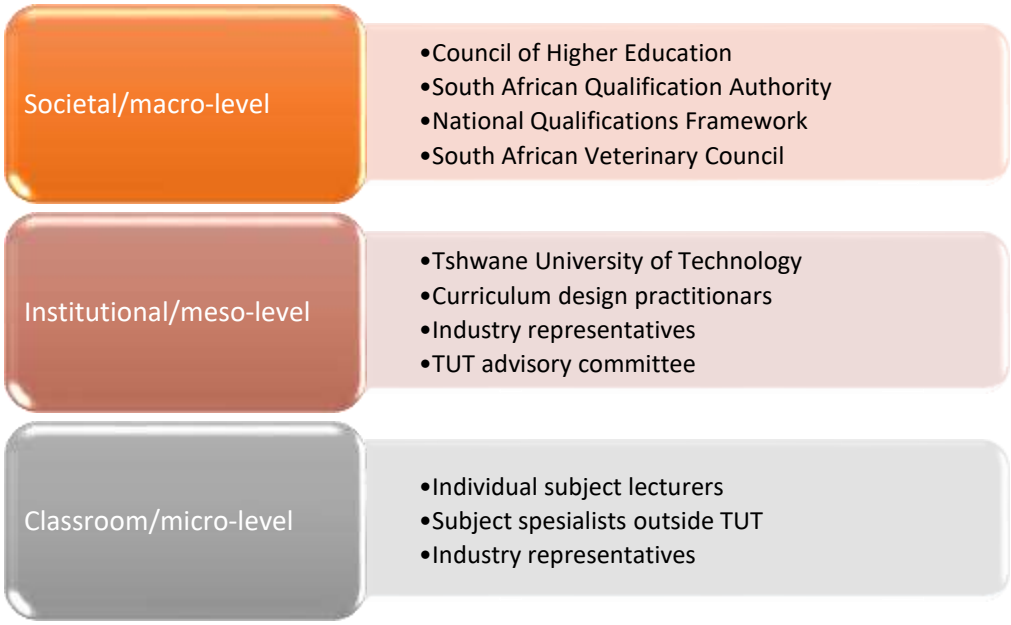


Figure 1: Stakeholders consulted in curriculum design

During curriculum design various aspects need to be taken into consideration, including the framework, employability, curriculum models, learning theories, assessment strategies and levels of achievement (Figure 2).

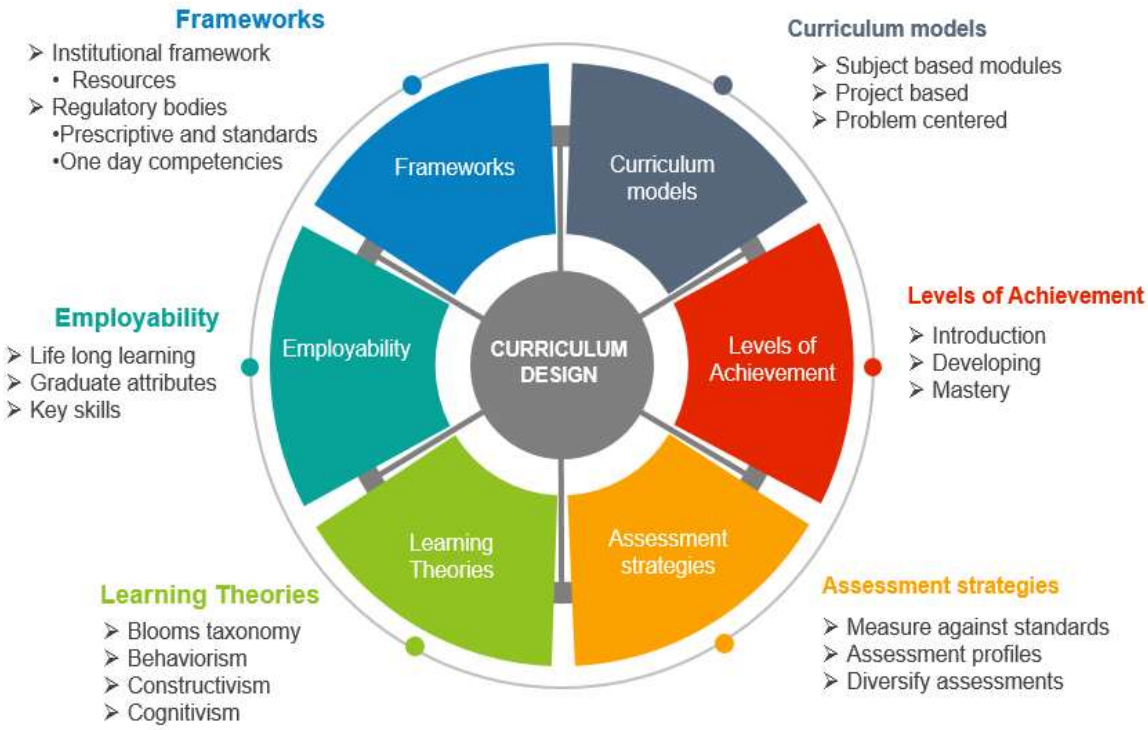


Figure 2: Aspects that from part of curriculum design

Frameworks guide the design and development of a macro-curriculum (Figure 1). The macro-curriculum refers to the content and structure at programme level. During the initial conceptualisation and design the institutional framework and resources need to be taken into account. During the initial planning phase it is crucial to consider the viability of offering the programme, taking into account supply and demand in industry, and to ensure that the programme fits into the qualification mix offered by the institution in line with the TUT strategy. If the programme is also registered at a professional council as a regulatory board, the requirements need to be taken into consideration as well.

The employability of students after graduation needs to be looked at. This is very important to ensure that the curriculum matches the needs of the industry, to ensure that expectations from possible employers are met, not only discipline-specific knowledge, but also attributes and skills expected from a graduate (Figure 1). Industry needs to be involved with the design of the macro- as well as micro-curriculum, to ensure that the higher education training meets the requirements of the prospective employers. The micro-level refers to the content and structure of a single unit/subject/module.

The broad overview of modules needs to be planned carefully to ensure alignment, various levels of achievement and progression of knowledge. This can be achieved by considering various learning theories. During the design of the micro-curriculum specifically the content of each different subject, learning and assessment methods and strategies are of the utmost importance. These need to be designed by the relevant subject lecturer at university level, but subject experts from the field also need to be involved to give input on the relevance and standard of content. Curriculum alignment at the programme level, or constructive coherence between teaching, learning, and evaluation, is critical for teaching efficiency, according to Biggs and Tang (2007). It is critical to ensure that any activity aids in the realisation of learning goals in order for learning objectives to become actual learning outcomes and for students' learning to be optimised as a result.

To ensure that successful learning takes place, objectives need to be set on various levels of complexity and specificity by using Bloom’s Taxonomy. Bloom’s Taxonomy is a framework that was created by Benjamin Bloom in 1956, ordering learning outcomes and objectives. The original sequence of cognitive skills was knowledge, comprehension, application, analysis, synthesis, and evaluation. The framework was revised in 2001 and is now referred to as the revised Bloom’s Taxonomy (Anderson & Krathwohl,

2001). The most significant change was the removal of ‘synthesis’ and the addition of ‘creation’ as the highest level (Figure 3).

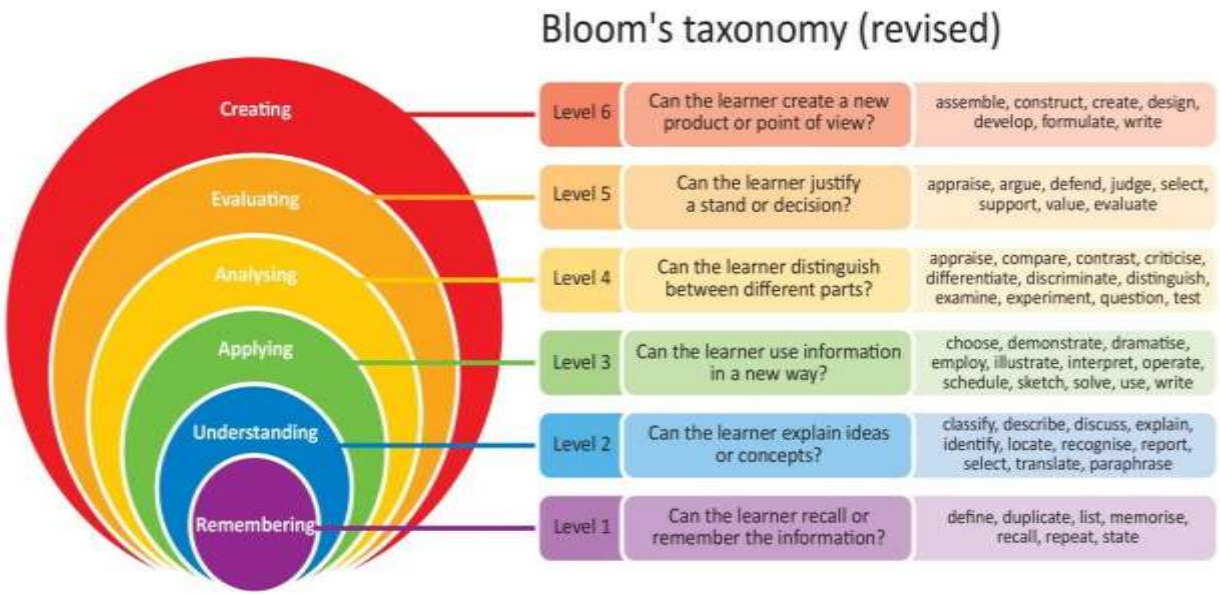


Figure 3: Revised Bloom’s taxonomy (https://www.niallmcnulty.com/2019/12/introduction-to-blooms-taxonomy accessed 12 December 2020)

The goal of using Bloom’s taxonomy is to encourage higher-order thought in students by building up from lower-level cognitive skills, linked to the level of achievement from the introductory, development and mastery levels (Figure 2). The Bloom’s Taxonomy framework can thus be used to construct individual modules and lesson plans and activities to help learning, as well as creating assessments to evaluate learning at various levels. This will ensure that the specific outcomes and objectives for the macro- as well as the micro-curriculum are achieved.

The final aspect that forms part of curriculum design is assessment (Figure 2). Assessment is a term that refers to a variety of activities that teachers use to gather knowledge about their students' success and achievement, therefore assessment strategies and practices should support student learning. When assessment forms part of curriculum development it is important to consider what types of assessments are better for learning, whether evaluation practices encourage lifelong learning and how feedback will help students enhance their performance (Carless, 2015). Developing assessments should therefore allow active participation of students in various authentic assessment methods

and feedback, as traditional pen and paper examinations to determine student knowledge (Carless et al., 2010) is a passive process, which influences learning unfavourably (Ertmer & Newby, 2013).

2.5 Graduate attributes

The purpose and nature of higher education are changing, altering the purpose and outcomes that need to align with the change in society and expectations from industry. Generic graduate attributes have been described as “the skills, knowledge and abilities of university graduates, beyond disciplinary content knowledge, which are applicable in a range of contexts and are required as a result of completing any undergraduate degree” (Barrie, 2006). Thus these attributes relate to being part of the students’ development during their time at the university. These attributes go further than the disciplinary knowledge gained in the modules previously presented by universities. This will assist in creating a well-rounded, highly employable graduate after completion of a degree to meet the demands and expectations from industry as well as the professional councils or bodies.

Graduate attributes are defined and described differently at various universities and different terminology is used, including terms such as key, generic or core skills, employability or soft skills or employability or professional skills (Treleavan & Voola, 2008). However, all of these are mere synonyms and in this project the term graduate attributes will be used. These attributes are composed of a variety of skills and capabilities that need to be acquired and developed. Therefore universities need to ensure that these are also embedded and mapped during curriculum design to form part of the modules and assessments. Desirable attributes depend on the profession and purpose of the graduates, but can vary from critical thinking, problem-solving or ability to work in a team, communication skills to an inquiring mind, to name a few.

2.6 Curriculum development

The curriculum development process includes the design and development (discussed under 2.5), implementation and evaluation of the curriculum (de Jager 2016).

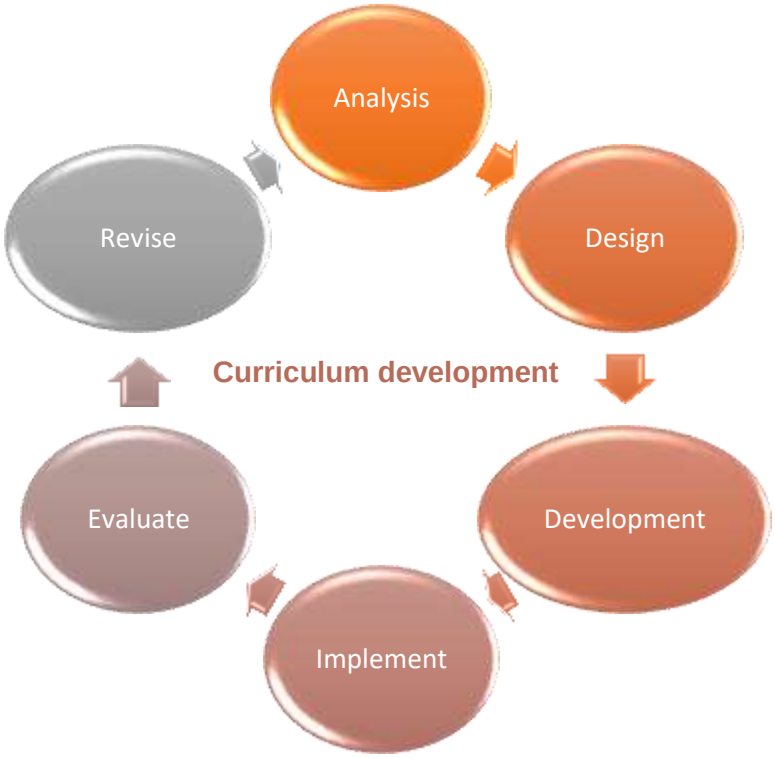


Figure 4: Curriculum development process

After the initial design and development, the lecturers and staff responsible for the qualification need to implement the curricula according to the education policies of the university. Student success rates are monitored, staff members are evaluated to be informed on good and bad practices, to identify possible changes or support needed to implement the curriculum successfully.

Evaluation of the curriculum is crucial to determine the effectiveness of the design, the implementation and learners' development and progression. Data analysis is needed to obtain information, to make changes to the curriculum if needed. A curriculum is never completed, and with changes in society and/or industry the process is never final, but is on a continuous developmental course of action between the different stages (Figure 4). Various curriculum assessment tools are available to use, of which curriculum mapping is a method that has been successfully used in health profession educational programmes (Komba et al., 2020).

2.7 Curriculum mapping

Curriculum mapping is a tool that can be used for collecting data about the curriculum, to determine the relationships between various aspects, such as day one competencies and learning outcomes (National Institute for Learning Outcomes Assessment, 2018). Curriculum mapping is an essential tool for the development and implementation of a curriculum to assist in aligning modules with learning outcomes to meet the overall programme outcomes. It can thus be used as a tool to determine the strengths and weaknesses of a programme and to identify and correct gaps experienced between curriculum designs and learning outcomes (Jankowski, 2017). When a curriculum is mapped, the end goal is to ensure that what students are actually taught matches the academic expectations and outcomes of a specific subject and/or year level. This process of curriculum mapping helps programme compilers to "identify and address academic gaps, redundancies, and misalignments for purposes of improving the overall coherence of a course of study and, by extension, its effectiveness" ("Curriculum Mapping," Glossary of Education Reform https://www.edglossary.org accessed 21 January 2021). This is needed as individual modules are planned and offered by individual lecturers, but a total overview of the programme still needs to be conducted to ensure that outcomes are met.

Curriculum mapping is the process of representing the various components of the curriculum spatially so that the overall picture, as well as the relationships and connections between the parts, can be seen easily. The goal of curriculum mapping can be multifaceted, including mapping of outcomes, aligning assessment, determining the depth of knowledge and levels, as well as evaluating skills and knowledge embedded in the curriculum (Figure 5)

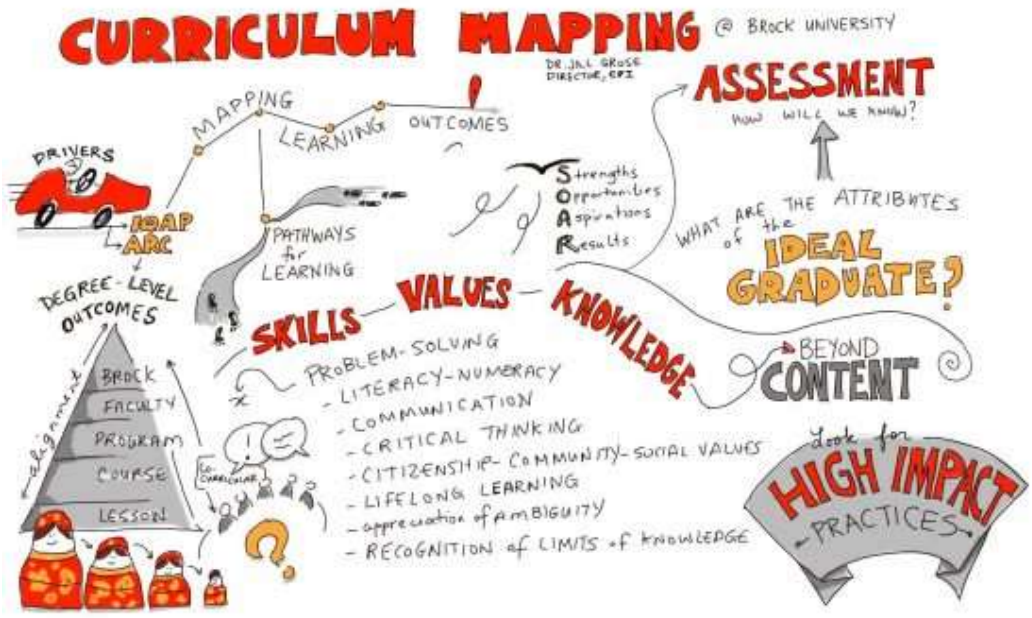


Figure 5: Curriculum mapping (Image from EDUCTECHALOGY)

Curriculum mapping can provide comprehension of curriculum coherence and assist across a programme in various years of study with level articulations to be able to achieve learning outcomes for each subject, but also overall learning outcomes of the programme. Module mapping has been used in higher education already for numerous years, and a variety of tools and approaches are used (Diamond, 1998; Knight 2000). Mapping is a well-known tool; most tools are still paper-based, with web-based tools that have been developed being university-specific (Shannon & Swift 2012).

3 METHODOLOGY

Veterinary technologists play an important role in the maintenance of animal health and productivity in South Africa. At TUT, under the Faculty of Science, in the Department of Biomedical Sciences, the department offers a four-year professional degree in Veterinary Technology (BHSc Vet Tech). Up to 2019, a three-year National diploma (N Dip) was offered. In 2020 the professional degree was implemented to replace the N Dip. The programme is accredited by the Council of Higher Education (CHE) and SAVC. The SAVC is the regulatory body for the veterinary and para-veterinary professions in South Africa and has a statutory duty to determine scientific and ethical standards of professional conduct and education (SAVC website). TUT is the only university in South Africa offering a professional degree in veterinary technology.

Graduates from the BHSc Vet Tech programme should be competent in minimum competencies, including essential skills necessary for graduates to render entry-level national veterinary services. It is important to determine the minimum competencies required but it is also important for these competencies to be addressed by the training institution and to form a critical part of the curriculum offered. The aim is thus for the profession and the educators to reach agreement on the competencies, skills and depth of knowledge required to be offered by the university. The objective of this study was thus to determine whether the Veterinary Technology curriculum meets the specific standards set by the SAVC for accreditation by addressing the RQ in three steps (Figure 6). The process of developing day one competencies is followed by curriculum mapping, by comparing the curriculum with the determined day one competencies, and concluded by a review and gap analysis.

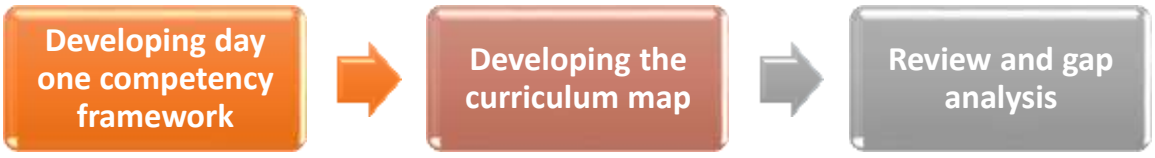


Figure 6: Three-step process

3.1 Developing day one competency framework

The first step was to develop a day one competencies framework that defines the capabilities required by graduates and reflects the needs of the employers of veterinary technology graduates. The competencies will assist researchers to make an analysis of the curriculum to determine whether an integrated approach was followed to ensure that all competencies are implanted across all levels and modules of the curriculum (Bok et al., 2011).

To define the day one competencies for the professional degree, the previous established and approved day one competencies (Appendix A, approved SAVC 2019) for the N Dip were examined and evaluated as a starting point. The existing standards defined by the SAVC were used as a baseline document. The document was uploaded onto Google Docs to facilitate the process of developing day one competencies that would align to the BHSc Vet Tech programme. Members of the development team worked collaboratively on a single master file. All lecturers (nine full-time and one part-time) involved with offering the various modules, theory and practical sessions were asked to provide input. Competencies were grouped into three major groups: A) general laboratory practices and knowledge applicable across all fields, B) discipline-specific competencies, including knowledge and skills and C) professional attributes. At the end of the process, a draft list of day one competencies was created. This draft document was distributed to the members of the South African Association of Veterinary Technologists (SAAVT) for input. They were asked to comment on the relevance of the competences, as they are the representatives from industry. Suggestions were collated, the document was revised and amended and a second round of editing took place, whereafter a discussion was held with a representative from the SAVC to finalise the document.

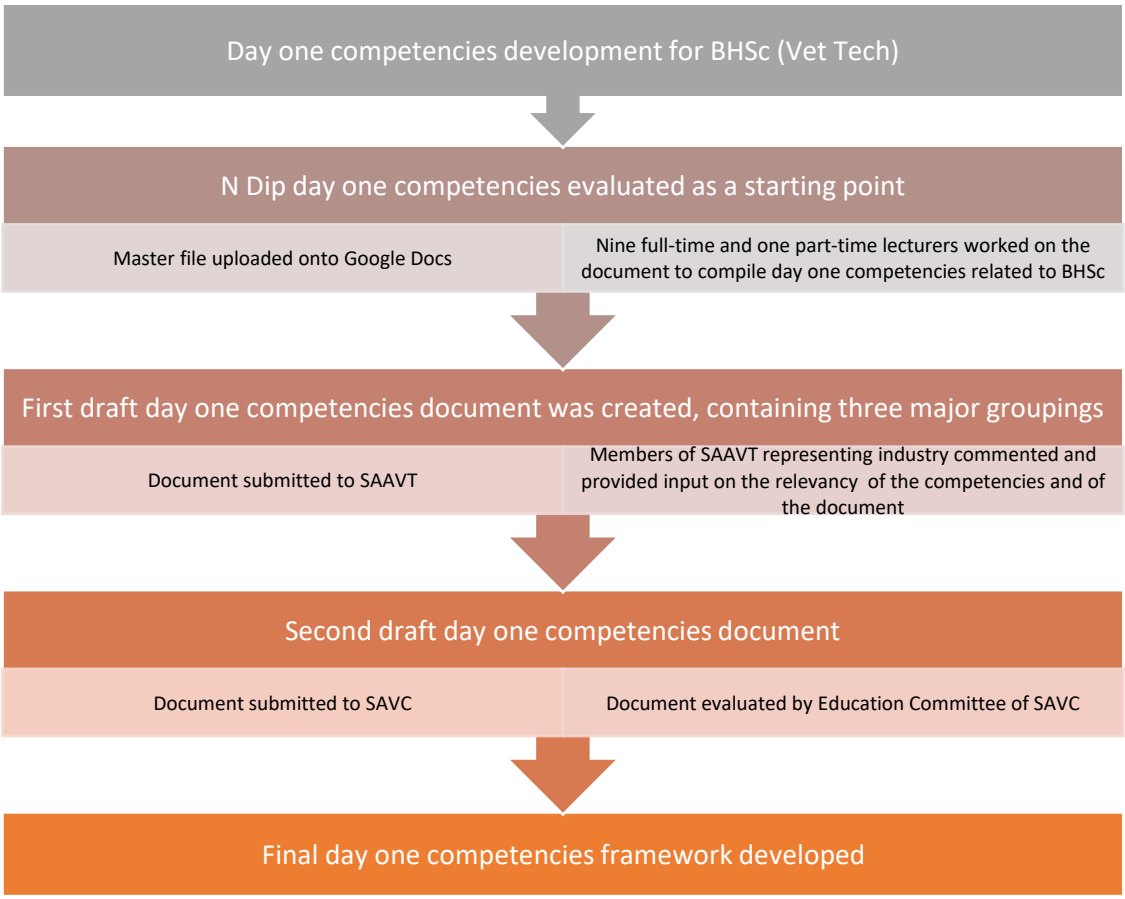


Figure 7: Flow diagram indicating the development process for the day one competencies for BHSc Veterinary Technology.

3.2 Developing the curriculum map

The next step was to analyse the teaching and learning activities of the curriculum and module content vs the day one competencies (Figure 6). This was done by using a curriculum map. To create a curriculum map, the content of each module in the curriculum (Appendix B) was compared with the day one competencies to check for alignment. Through the mapping process, the depth of learning and knowledge obtained could also be evaluated. Learning consists of three stages, namely introduction, development and mastery (Hale, 2008). During the introductory stage, the students are introduced and exposed to the study material for the first time and need comprehensive guidance from the instructor. In the development stage, the students start to comprehend the material but still need assistance with the application of the knowledge in the field. When mastery is achieved, the student fully understands the material, can apply the knowledge autonomously and demonstrate achievement of the competency. As students progress

through the curriculum, they are expected to move from the introductory level to the development level and depending on the programme outcome, to the mastery level across the various levels and years of study. On completion of the programme, students are expected to have high levels of competencies to meet the standards set out in the day one competencies. Therefore it is important to understand the link between the curriculum and competency levels to ensure that the course material is correctly aligned to meet the expected outcomes.

For the mapping exercise the day one competencies were mapped against all the modules' learning outcomes. To generate the curriculum map, all the module descriptors (Appendix C for example) for all the modules from year one to four were used (Figure 8). A map was drafted of the coverage of the competencies as well as the depth of coverage in each module. An analysis of the teaching and learning that took place, covering discipline knowledge as well as graduate attributes, was conducted.

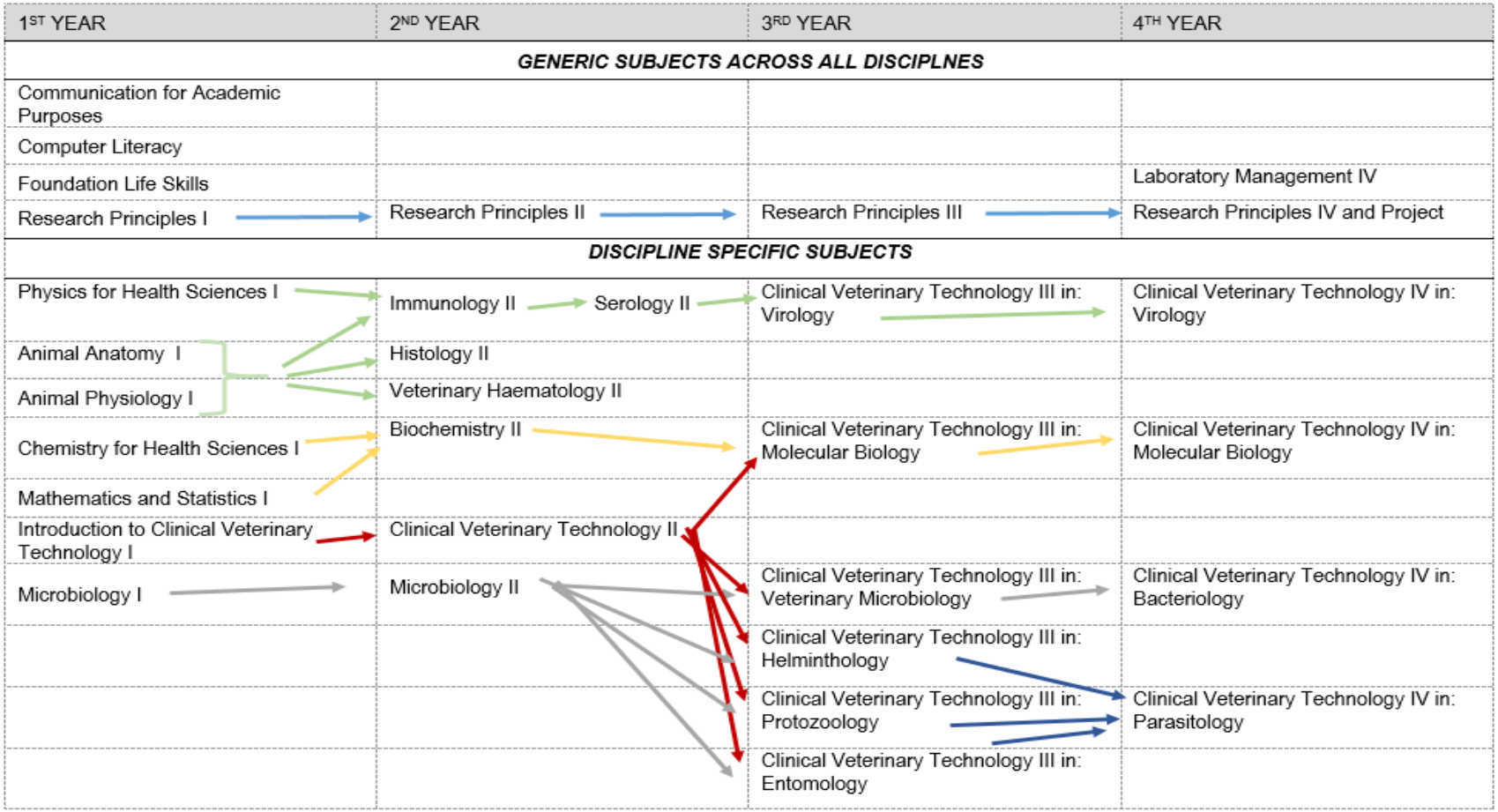


Figure 8: Programme modules and progression for BHSc Vet Tech: Learning programme outline

3.3 Review and gap analysis

The curriculum map data was analysed to identify any gaps in the day one competencies for BHSc (Vet Tech). The final step was to review the mapping process results and make recommendations for future implementation or possible curriculum interventions. All of the day one competencies were compared to the content of the curriculum's 32 modules. First, whether or not a given competency was covered in the curriculum was considered, and second, whether or not a specific competency was fulfilled when the description of the competency was taught and assessed at any level of the courses and modules. The review was used to determine whether all of the day one competencies were met and addressed in the modules, and it was also used to identify any gaps. Gaps were identified as competencies or parts of competencies that were not addressed anywhere in the curriculum, and this was used to make recommendations on curriculum revision.

4 RESULTS AND DATA ANALYSIS

4.1 Day one competency framework

A day one competency framework that defines individual competencies was developed. Competencies were categorised under three main areas, namely A) general laboratory practices; B) discipline knowledge and C) graduate attributes. Under general laboratory practices, a total of 11 competencies were set that relate to all the major disciplines and general knowledge needed across the curriculum. Under discipline knowledge, a total of 11 major disciplines were identified. Within each discipline, between two and 10 competencies were aligned for each discipline. Lastly, under graduate attributes, eight attributes were listed, for example communication, problem-solving, team work and ethical practice. Table 1 presents the final day one competencies determined and categorised in the three main areas.

Table 1: Day one competencies

A)	**GENERAL LABORATORY PRACTICE**
A1.	Understanding and knowledge of basic laboratory rules.
A2.	Understanding of basic principles of quality control and how to apply these.
A3.	Knowledge of correct and appropriate receiving, handling, labelling and storage of samples for each testing discipline.
A4.	Following instructions according to standard operating procedures.
A5.	Performing work in an ethical and professional manner and in accordance with relevant legislation, regulation and codes of practice.
A6.	Understanding of use, cleaning, maintenance and calibration of laboratory equipment and maintaining records thereof.
A7.	Understanding of laboratory safety requirements and biohazards.
A8.	Maintaining security, integrity, traceability and identity of samples, aliquot samples and work records (work sheets).
A9.	Setting up, using and maintaining basic laboratory equipment, such as microscope, centrifuge, pH meter and balances correctly.
A10.	Preparing buffers and laboratory reagents for use in laboratory, eg preparation of agar plates.
A11.	When working with zoonotic and infectious diseases, protecting oneself, colleagues and the public where applicable.
A12.	Having basic knowledge of the terms biosafety and biosecurity.

A13. Having knowledge of personal protective equipment and the importance of using it when working with infectious samples.

B) DISCIPLINE KNOWLEDGE

B1. ANIMAL ANATOMY AND PHYSIOLOGY

- Being able to identify and describe basic cellular, histological and anatomical (micro-anatomy and macro-anatomy) structures in the bodies of farm animals (equine, bovine, ovine, porcine and poultry) and companion animals (canine and feline).
- Being able to describe and explain basic physiological processes on all levels of complexity, applicable to the normal functioning of micro- and macro-anatomical structures, including organ systems, in the bodies of selected farm and companion animals.

B2. MICROBIOLOGY

- Understanding the process of media preparation and quality control thereof.
- Being able to apply aseptic techniques in the process of streaking microbiology plates.
- Having knowledge of incubation of microbiology plates under suitable atmospheric and temperature conditions.
- Isolating and identifying common disease-causing organisms (pathogens eg bacteria and fungi).
- Having the ability to perform Gram and acid-fast staining techniques and the microscopic examination and identification of bacterial isolates.
- Understanding and using the most applicable biochemical and physiological techniques for the identification of cultured bacteria and fungi.
- Understanding the principle of the anti-biogram test and being able to set up an anti-biogram according to the Kirby-Bauer method.
- Having knowledge of serial dilutions: principles, calculations and performing serial dilutions.

B3. HISTOLOGY

- Having knowledge of macroscopic evaluation of received specimens.
- Understanding the principles of tissue processing.

- Being able to prepare tissue sections from various organs for histological preparations.
- Being able to process tissue sections, including using a microtome for the sectioning of samples for the preparation of histology slides for the histopathologist to evaluate.
- Performing special staining techniques when requested.
- Having knowledge of embedding tissue samples in paraffin wax.
- Being able to cut 5-micron sections from tissue blocks with microtome.
- Staining the sections with the haematoxylin and eosin staining method.
- Performing special staining techniques to demonstrate:
    - Carbohydrate, mucin and glycogen using Periodic Acid Schiff staining.
    - Gram stain
    - TB using Ziehl-Neelson staining.
- Evaluating stained slides against control slides.

B4. HAEMATOLOGY

- Having knowledge of the correct use of Pasteur and other pipettes.
- Performing manual cell counts (Neubauer counting chamber).
- Preparing and staining blood smears (wedge and thick).
- Being able to evaluate blood smears (red cell morphology, white cell differential
- Counting and identifying blood parasites).
- Understanding the basic use of a haematology analyser (semi- and fully automated).
- Understanding the basic principles of a haematology analyser (semi- and fully automated).
- Performing a micro-haematocrit test.
- Setting up Winthrobe ESR (erythrocyte sedimentation rate).

B5. BIOCHEMISTRY

- Understanding the application of the sampling materials (tubes for specific tests).
- Performing aliquot of serum and plasma.
- Scoring sample condition.
- Performing pipetting of serum and plasma.
- Understanding the rationale of tests being performed.

- Understanding the method of testing used and the rules that apply (e.g. spectro-photometer and ion-selective electrodes, as well as colorimetric principles).
- Having basic knowledge of quality control and adjustments of calibration curves.
- Ensuring reliability and reproducibility of results.

B6. VIROLOGY

- Inoculating embryonated eggs via the allantoic sac route for viral enumeration.
- Candling of eggs to differentiate between dead and alive.
- Performing viral titrations in eggs.
- Calculating virus titres (EID50) using the Reed Muench method.
- Performing aseptic harvesting of egg allantoic fluids.
- Performing HI and HA under guidance.
- Retrieving or obtaining cell lines or tissue sample from fresh or preserved sources and preparing a culture.
- Passage and maintaining secondary cell cultures.
- Having knowledge of serial dilutions: principles, calculations and preforming serial dilutions.

B7. SEROLOGY

- Having knowledge of precise use of single and multi-channel pipettes, including calibration thereof.
- Making calculations: understanding and applying basic calculations.
- Being able to perform ELISA tests.
- Being able to perform serological plate agglutination tests.
- Being able to perform rapid point of care tests.
- Being able to perform direct and indirect fluorescent antibody tests.
- Having knowledge of serial dilutions: principles, calculations and preforming serial dilutions to determine antibody titres.

B8. ENTOMOLOGY

- Having knowledge of fixation and preservation of arthropod samples.
- Preparing mounts and pinning insects and acarines.
- Being able to identify ecto-parasites to genus level:
    - Ticks
    - Flies

- Mites
- Lice.

B9. PROTOZOOLOGY

- Evaluating samples for validation testing.
- Preserving and transporting parasitic material.
- Preparing solutions used for parasitological examinations.
- Performing blood smears for examination, identification and quantification.
- Performing coccidia flotation tests.
- Identifying the protozoa of importance to genus level.

B10. HELMINTHOLOGY

- Evaluating samples for testing.
- Performing McMaster faecal egg count.
- Performing Visser filter method for egg examination.
- Performing faecal flotation and sedimentation techniques for ova identification.
- Performing larval identification techniques, including Bearmann's technique and faecal culture.
- Being able to calculate FERT, EPG, reagent preparation and larval number estimation.
- Having knowledge of staining, dehydration and mounting of samples.
- Identifying common nematode, trematode and cestode parasites of selected farm and companion animals to genus level.

B11. MOLECULAR BIOLOGY

- Understanding the hazards and risks in the molecular biology laboratory.
- Being able to precisely pipette small quantities of reagents.
- Understanding the DNA molecule structure and function to:
  - Perform extraction of DNA and RNA from a variety of samples
  - Prevent/minimise DNA and RNA contamination.
- Performing calculations to dilute reagents (primers, nucleotides, enzymes, etc.) and preparing buffers and reaction mixtures to:
  - Set up a conventional polymerase chain reaction procedure on a thermocycler
  - Prepare agarose gel for electrophoresis

- Perform electrophoresis, read and record results.
- Setting up real-time PCR (qPCR) on light cycler with various chemistries such as SYBR green and probes.

C: GRADUATE ATTRIBUTES	
C1.	In-depth knowledge of each subject field and discipline
C2.	Ability to think critically and to solve problems
C3.	Good communication skills
C4.	Professionalism
C5.	Ethical practice
C6.	Adaptability
C7.	Enthusiasm
C8.	Ability to work in a team and independently

4.2 Curriculum map

The BHSc (Vet Tech) curriculum contains a total of 32 modules. All the modules from year one to year four were successfully mapped to the day one competencies. Two curriculum maps were produced, providing an overview of how each module aligns to the day one competencies. An Excel spreadsheet was developed where the modules were listed in the columns and the competencies defined in rows. The first map shows the basic coverage map (Table 2), indicating if the competency is covered as part of the module curriculum. The curriculum should cover all the day one competencies, at least to some degree, to ensure compliance with SAVC requirements to maintain accreditation.

The veterinary technology four-year professional degree was designed to provide students with detailed comprehensive knowledge across all disciplines applicable to current veterinary technology knowledge. This give the graduates opportunities to apply knowledge and be ready for employment in the relevant field. Development of soft skills and attributes such as communication and team work will deliver a well-rounded graduate after completion of the degree. The second map indicates the depth of coverage (Table 3) by using mapping codes. This will assist with the level of knowledge used. The introduction, development and mastery were represented by different colours in the cor-

responding table cells. These maps provided an easy overview of the module alignments to the day one competencies. The frequency and level at which the modules address the competencies are also indicated by using the maps (Table 2 and 3).

Table 2: BHSc Veterinary Technology curriculum basic coverage map

DAY ONE COMPETENCIES / MODULES	1st year											2nd year								3rd year								4th year					
	Communication for academic purposes	Computer literacy	Foundation Life skills	Mathematics & Statistics I	Physics for Health Sciences I	Chemistry for Health Sciences I	Animal Anatomy I	Animal Physiology I	Microbiology I	Introduction to Clinical Veterinary Technology I	Research Principles I	Research Principles III	Biochemistry II	Microbiology II	Veterinary Haematology II	Immunology II	Histology II	Serology II	Clinical Veterinary Technology II	Research Principles III	Clinical Veterinary Technology III inHelminthology	Clinical Veterinary Technology III in:Protozoology	Clinical Veterinary Technology III in:Entomology	Clinical Veterinary Technology III in Virology	Clinical Veterinary Technology III in Veterinary Microbiology	Clinical Veterinary Technology III in Molecular Biology	Research Principles IV & Project	Laboratory Management IV	Clinical Veterinary Technology IV in Virology	Clinical Veterinary Technology IV in Bacteriology	Clinical Veterinary Technology IV in Parasitology	Clinical Veterinary Technology IV in Molecular Biology
A) GENERAL LABORATORY PRACTISE																																
A1: Understanding and knowledge of basic laboratory rules.					x	x			x	x									x		x	x	x	x	x	x		x	x	x	x	x
A2: Understanding of basic principles of quality control and how to apply it.																				x	x	x	x	x	x	x	x	x	x	x	x	x
A3: Knowledge of correct and appropriate receiving, handling, labelling and storage of samples for each testing discipline.									x	x											x	x	x	x	x	x	x	x	x	x	x	x
A4: Follow instructions according to Standard Operating Procedures.					x	x			x	x								x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
A5: Conduct work in an ethical and professional manner and in accordance with relevant legislation, regulation and codes of practice.																				x	x	x	x	x	x	x	x	x	x	x	x	x
· Understanding of use, cleaning, maintenance and calibration of laboratory equipment and maintaining records thereof.					x	x			x									x			x	x	x	x	x	x	x	x	x	x	x	x
A6: Understanding of laboratory safety requirements and biohazards.					x	x			x									x			x	x	x	x	x	x	x	x	x	x	x	x
A7: Maintain security, integrity, traceability and identity of samples, aliquot samples and work records (Work sheets).																					x	x	x	x	x	x	x	x	x	x	x	x
A8: Set up, use and maintenance of basic laboratory equipment, such as microscope, centrifuge, pH meter and balances correctly.					x	x	x		x									x			x	x	x	x	x	x	x	x	x	x	x	x
A9: Preparation of buffers and lab reagents for use in laboratory e.g. preparation of agar plates					x	x			x									x			x	x	x	x	x	x	x	x	x	x	x	x
A10: Working with zoonotic and infectious diseases protecting one self, colleagues and the public where applicable.																					x	x	x	x	x	x	x	x	x	x	x	x
A11: Have basic knowledge of the terms biosafety and biosecurity																		x			x	x	x	x	x	x						
A12: Have knowledge on personal protective equipment (PPE) and the importance of use when working with infectious samples.					x	x			x									x			x	x	x	x	x	x	x	x	x	x	x	x
B) DISCIPLINE KNOWLEDGE																																
B1: ANATOMY AND PHYSIOLOGY																																
• Be able to identify and describe basic cellular, histological and anatomical (micro-anatomy and macro-anatomy) structures in the bodies of farm animals (equine, bovine, ovine, porcine and poultry) and companion animals (canine & feline)							x								x	x	x	x														
• Be able to describe and explain basic physiological processes on all levels of complexity, applicable to the normal functioning of micro- and macro-anatomical structures, including organ systems, in the bodies of selected farm and companion animals								x							x	x	x	x														
B2: MICROBIOLOGY																																
• Understanding the process of media preparation and the quality control thereof.									x					x					x						x				x			
• Be able to apply aseptic techniques in the process of streaking microbiology plates.									x					x					x						x				x			
• Knowledge of incubation of microbiology plates under suitable atmospheric and temperature conditions.									x					x					x						x				x			
• Isolate and identify common disease causing organisms (pathogens e.g. Bacteria and Fungi)									x					x					x						x				x			
• Able to perform Gram and acid-fast staining techniques and the microscopic examination and identification of bacterial isolates.																										x				x			
• Understand and use the most applicable biochemical and physiological techniques for the identification of cultured bacteria and fungi.																										x				x			
• Understand the principle of the anti-biogram test and be able to set up an anti-biogram according to the Kirby-Bauer method.																										x				x			
• Knowledge of serial dilutions: principles, calculations and preforming serial dilutions									x				x		x	x			x						x					x			

Table 2 (continued)

B3: HISTOLOGY																																
• Knowledge of macroscopic evaluation of received specimens.							x										x		x													
• Understand the principles of tissue processing.																	x		x													
• Be able to prepare tissue sections from various organs for histological preparations.							x										x		x													
• Be able to process tissue sections including using a microtome for the sectioning of samples for the preparation of histology slides for the histopathologist to evaluate.																	x		x													
• Perform special staining techniques when requested.																	x		x													
• Knowledge of embedding tissue samples in paraffin wax.																	x		x													
• Able to cut 5-micron sections from tissue blocks with microtome.																	x		x													
• Stain the sections with the Haematoxylin and Eosin staining method.																	x		x													
• Perform special staining techniques to demonstrate:																	x		x													
○ Carbohydrate, mucin and glycogen using Periodic Acid Schiff's staining.																	x		x													
○ Gram stain																	x		x													
○ TB using Ziehl-Neelson staining.																	x		x													
• Evaluation of stained slides against control slides.																	x		x													
B4: HAEMATOLOGY																																
• Knowledge of the correct use of Pasteur and other pipettes.									x						x	x			x													
• Performing manual cell counts. (Neubauer counting chamber)															x	x			x													
• Prepare and stain blood smears. (Wedge and Thick)																x			x													
• Able to evaluate blood smears. (Red cell morphology, white cell differential																x			x													
• count and identification of blood parasites)																x			x			x										
• Understand the basic use of a Haematology analyser (semi and fully automated).																x			x													
• Understand the basic principles of a Haematology analyser (semi and fully automated).																x			x													
• Performing a microhaematocrit test.																x			x													
• Set-up of Winthrobe ESR (Erythrocyte Sedimentation Rate).																x			x													
B5: BIOCHEMISTRY																																
• Understanding the application of the sampling materials (tubes for specific tests).													x																			
• Aliquot of serum and plasma.													x			x		x	x													
• Perform pipetting of serum and plasma.													x		x	x		x	x		x			x	x	x						
• Understanding the rationale of tests being performed.													x		x	x		x			x	x	x	x	x	x						
• Understanding the method of testing used and the rules that apply (e.g. Spectrophotometer and ion selective electrodes as well as colorimetric principals).													x																			
• Basic knowledge of quality control and adjustments of calibration curves.													x					x											x			
• Ensure reliability and reproducibility of results.													x	x	x		x	x	x		x	x	x	x	x	x	x					
B6: VIROLOGY																																
• Inoculation of embryonated eggs via the allantoic sac route for viral enumeration.																								x						x		
• Candling of eggs to differentiate between dead and alive.																								x						x		
• Perform viral titrations in eggs																								x						x		
• Calculation of virus titres (EID50) with the Reed Muench method.																		x						x						x		
• Perform aseptic harvesting of egg allantoic fluids																								x						x		
• Perform HI and HA under guidance																		x						x						x		
• Retrieve or obtain cell lines or tissue sample from fresh or preserved sources and prepare a culture.																								x						x		
• Passage and maintain secondary cell cultures.																		x						x						x		
• Knowledge of serial dilutions: principles, calculations and preforming serial dilutions.																x		x						x						x		

Table 2 (continued)

B7: SEROLOGY																																
• Knowledge of precise use of single and multi-channel pipettes including calibration thereof.														x			x	x	x		x			x		x			x			x
• Calculations: understand and apply basic calculations							x						x					x	x		x	x	x	x	x	x	x	x	x	x	x	x
• Able to perform ELISA tests.																x		x	x						x							
• Able to perform serological plate agglutination tests.																x		x	x													
• Able to perform rapid point of care tests.																x		x	x													
• Able to perform direct and indirect fluorescent antibody tests.																x		x	x													
• Knowledge of serial dilutions: principles, calculations and preforming serial dilutions to determine antibody titres.													x			x		x	x					x								
B8: ENTOMOLOGY																																
• Knowledge of fixation and preservation of arthropod samples.																							x								x	
• Preparation of mounts and pinning of insects and acarines.																							x								x	
• Able to Identify ecto-parasites to genus level:																							x								x	
○ Ticks																							x								x	
○ Flies																							x								x	
○ Mites																							x								x	
○ Lice																							x								x	
B9: PROTOZOOLOGY																																
• Evaluation of samples for validation testing.																						x									x	
• Preservation and transportation of parasitic material.																						x									x	
• Preparation of solutions used for parasitological examinations.																						x									x	
• Perform blood smears for examination, identification and quantification.																						x									x	
• Perform coccidia flotation tests.																						x									x	
• Identify the protozoa of importance to genus level.																						x									x	
B10: HELMINTOLOGY																																
• Evaluation of samples for valid testing																					x										x	
• Perform McMaster faecal egg count																					x										x	
• Perform Visser filter method for egg examination																					x										x	
• Perform faecal flotation and sedimentation techniques for ova identification																					x										x	
• Larval identification techniques including Bearmann's technique and faecal culture																					x										x	
• Able to calculate: FERT, EPG, reagent preparation and larval number estimation.																					x										x	
• Knowledge of staining, dehydration and mounting of samples.																					x										x	
• Identification of common nematode, trematode and cestode parasites of selected farm and companion animals to genus level																					x										x	
B11: MOLECULAR BIOLOGY																																
• Understand the hazards and risks in the molecular biology laboratory.																										x						x
• Be able to precisely pipette small quantities of reagents.													x					x	x							x						x
• Understanding of the DNA molecule structure and function to:													x													x						x
• Extraction of DNA and RNA from variety of samples																										x						x
• Prevent/minimise DNA and RNA contamination																										x						x
• Perform calculations to dilute reagents (primers, nucleotides, enzymes, etc.) and prepare buffers and reaction mixtures to:																			x							x						x
• Set up a conventional Polymerase Chain Reaction procedure on a thermocycler																										x						x
• Prepare agarose gel for electrophoresis																										x						x
• Perform electrophoresis, read and record results																										x						x
• Set up real-time PCR (qPCR) on light cycler with various chemistries like SYBR green and probes.																										x						x
C) ATTRIBUTES																																
C1: In-depth knowledge of each subject field and discipline	x	x		x	x	x							x		x		x										x	x	x	x	x	x
C2: Able to think critically and able to solve problems																											x	x	x	x	x	x
C3: Good Communication skills										x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C4: Professionalism										x									x	x	x	x	x	x	x	x	x	x	x	x	x	x
C5: Ethical practice										x									x	x	x	x	x	x	x	x	x	x	x	x	x	x
C6: Adaptable										x									x	x	x	x	x	x	x	x	x	x	x	x	x	x
C7: Enthusiastic	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C8: Work in a team and independently	x	x	x	x	x	x	x	x	x	x	x	x							x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 3: BHSc Veterinary Technology curriculum depth of coverage map

	Day one competency	1st year Modules											2nd year Modules								3rd year Modules							4th year Modules					
		Communication for academic purposes	Computer literacy	Foundation Life skills	Mathematics & Statistics I	Physics for Health Sciences I	Chemistry for Health Sciences I	Animal Anatomy I	Animal Physiology I	Microbiology I	Introduction to Clinical Veterinary Technology I	Research Principles I	Research Principles II	Biochemistry II	Microbiology II	Veterinary Haematology II	Immunology II	Histology II	Serology II	Clinical Veterinary Technology II	Research Principles III	Clinical Veterinary Technology III in Helminthology	Clinical Veterinary Technology III in Protozoology	Clinical Veterinary Technology III in Entomology	Clinical Veterinary Technology III in Virology	Clinical Veterinary Technology III in Veterinary Microbiology	Clinical Veterinary Technology III in Molecular Biology	Research Principles IV & Project	Laboratory Management IV	Clinical Veterinary Technology IV in Virology	Clinical Veterinary Technology IV in Bacteriology	Clinical Veterinary Technology IV in Parasitology	Clinical Veterinary Technology IV in Molecular Biology
	A) GENERAL LABORATORY PRACTISE																																
	A1: Understanding and knowledge of basic laboratory rules.																																
	A2: Understanding of basic principles of quality control and how to apply it.																																
	A3: Knowledge of correct and appropriate receiving, handling, labelling and storage of samples for each testing discipline.																																
	A4: Follow instructions according to Standard Operating Procedures.																																
	A5: Conduct work in an ethical and professional manner and in accordance with relevant legislation, regulation and codes of practice.																																
	· Understanding of use, cleaning, maintenance and calibration of laboratory equipment and maintaining records thereof.																																
	A6: Understanding of laboratory safety requirements and biohazards.																																
	A7: Maintain security, integrity, traceability and identity of samples, aliquot samples and work records (Work sheets).																																
	A8: Set up, use and maintenance of basic laboratory equipment, such as microscope, centrifuge, pH meter and balances correctly.																																
	A9: Preparation of buffers and lab reagents for use in laboratory e.g. preparation of agar plates																																
	A10: Working with zoonotic and infectious diseases protecting one self, colleagues and the public where applicable.																																
	A11: Have basic knowledge of the terms biosafety and biosecurity																																
x	A12: Have knowledge on personal protective equipment (PPE) and the importance of use when working with infectious samples.																																
	B) DISCIPLINE KNOWLEDGE																																
	1. ANIMAL ANATOMY & PHYSIOLOGY																																
	• Be able to identify and describe basic cellular, histological and anatomical (micro-anatomy and macro-anatomy) structures in the bodies of farm animals (equine, bovine, ovine, porcine and poultry) and companion animals (canine & feline)																																
	• Be able to describe and explain basic physiological processes on all levels of complexity, applicable to the normal functioning of micro- and macro-anatomical structures, including organ systems, in the bodies of selected farm and companion animals																																
	2. MICROBIOLOGY																																
	• Understanding the process of media preparation and the quality control thereof.																																
	• Be able to apply aseptic techniques in the process of streaking microbiology plates.																																
	• Knowledge of incubation of microbiology plates under suitable atmospheric and temperature conditions.																																
	• Isolate and identify common disease causing organisms (pathogens e.g. Bacteria and Fungi)																																
	• Able to perform Gram and acid-fast staining techniques and the microscopic examination and identification of bacterial isolates.																																
	• Understand and use the most applicable biochemical and physiological techniques for the identification of cultured bacteria and fungi.																																
	• Understand the principle of the anti-biogram test and be able to set up an anti-biogram according to the Kirby-Bauer method.																																
	• Knowledge of serial dilutions: principles, calculations and preforming serial dilutions																																

Introduce

Developing

Mastery

Table 3 (continued)

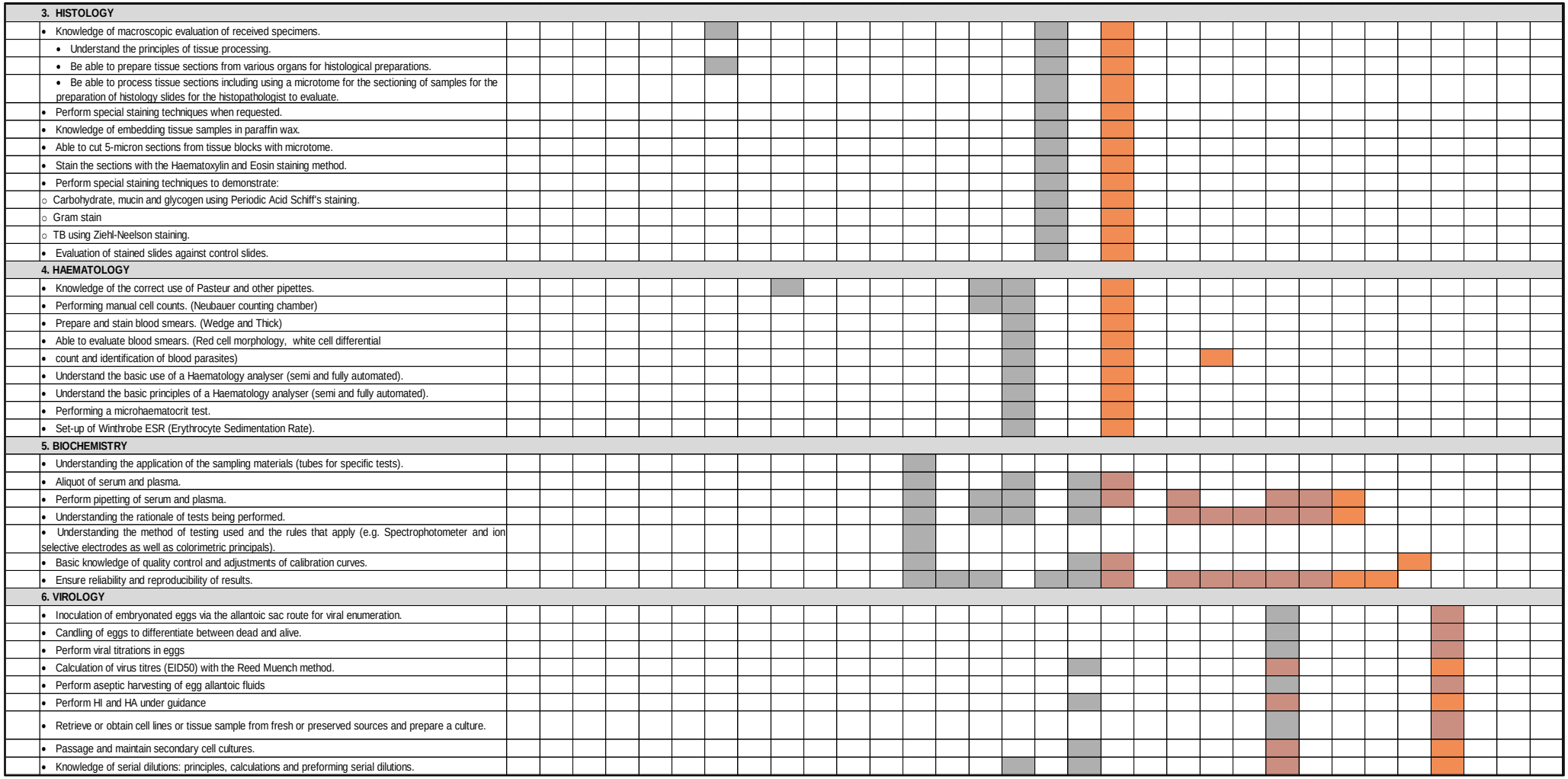
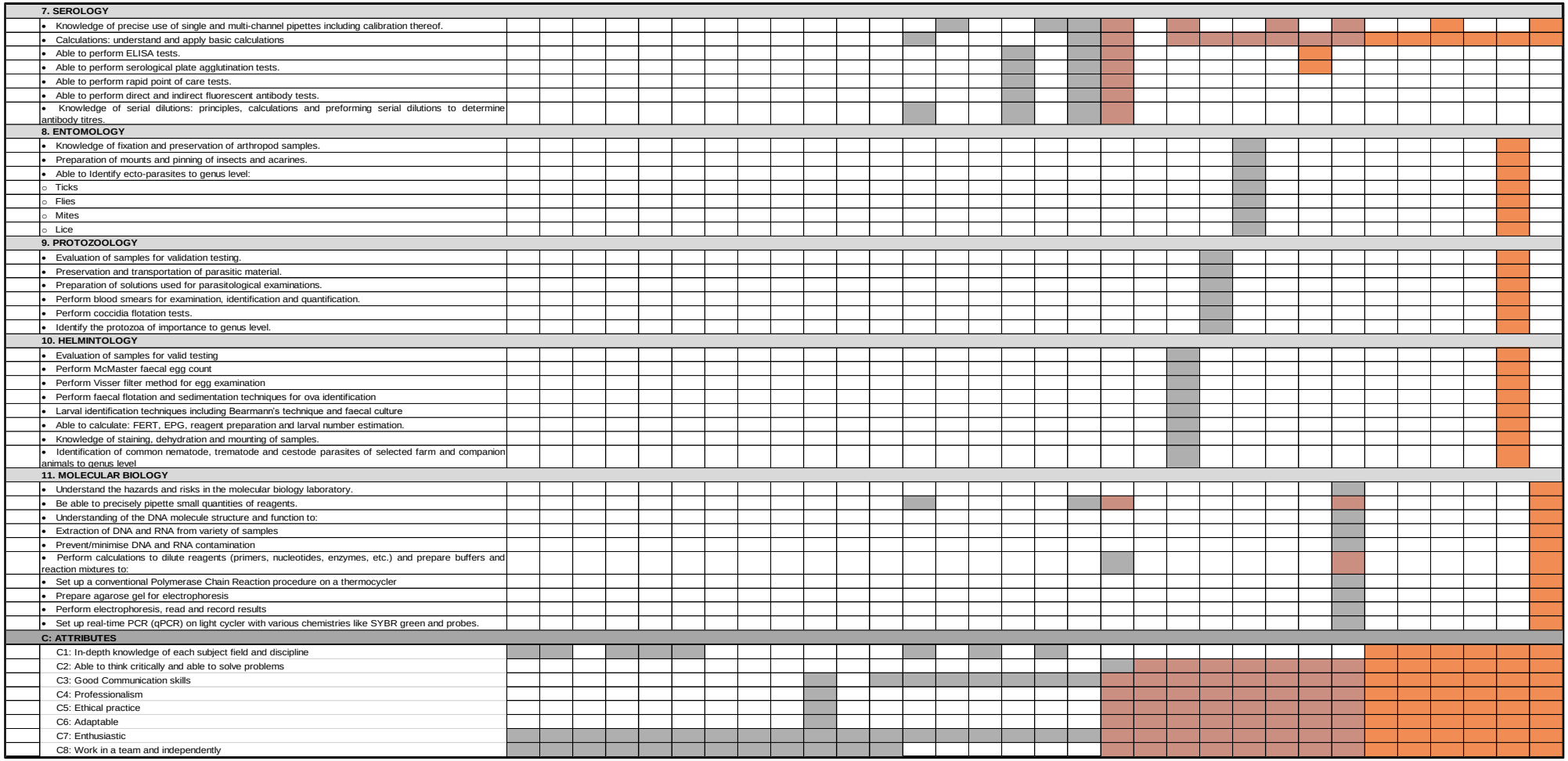


Table 3 (continued)



All the competencies required from a veterinary technologist are addressed in the BHSc Vet Tech curriculum across the four-year degree. The number of modules addressing the competencies varies between competencies, with the general laboratory and attributes ones included in a much higher number of modules than the subject-specific competencies (Figure 9). Figure 9 provides an overview of the number of modules addressing each individual competency. Most of the courses address general competencies, which are important for any graduate to be trained in.

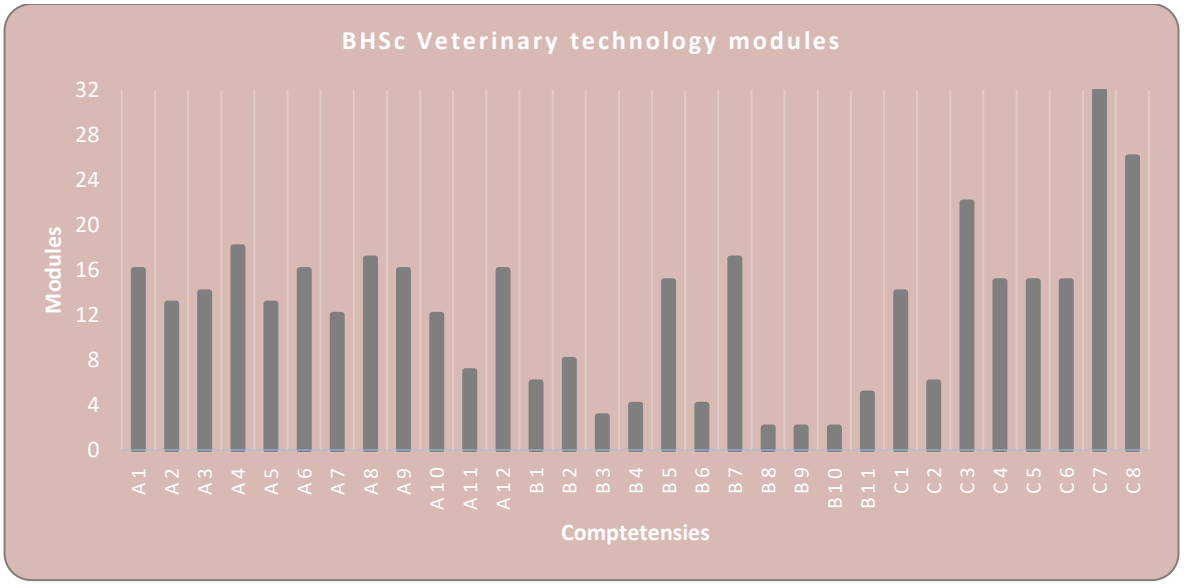


Figure 9: Various competencies of A) general laboratory practice; B) discipline knowledge and C) attributes included in modules of the BHSc Veterinary Technology programme

4.3 Gap analysis

During the gap analysis, all competencies were found to be addressed in the curriculum. Some of the discipline-specific competencies were found to be addressed only in the specific discipline modules, such as the histology and parasitology modules, with competencies for serology being covered more widely, as these aspects are covered in many discipline modules and are not discipline-specific. Overall, no significant gaps were identified.

5 DISCUSSION

All the modules' content was mapped against the day one competencies set by the SAVC. Upon examination of the map and cross-referencing the modules vs the competencies, it was shown that all competencies were covered across various modules. For general laboratory competencies and attributes, many modules covered the desired competencies. Individual modules were not expected to cover all the competencies, as the subject-specific disciplines are very detailed and specifically included in the curriculum to focus on the discipline content; for example, a module on Virology (Clinical Veterinary Technology III & IV in Virology) would be expected to cover the day one competencies set for Virology, and not necessarily for Molecular Biology, although some competencies can overlap. Rather, the curriculum in total should cover all the competencies set. The coverage map indicated that all competencies were covered in at least one module, indicating that no gaps were identified (Table 2).

General laboratory practices and attributes were covered intensively over many modules, as expected, as these are more general competencies relating to several modules in the degree. Substantial coverage of attributes such as communication skills and team work will benefit the students. Written assessments take place in many of the modules, as most modules end in examination, but various communication skills are practised, such as written assignments through reflections, report writing and creating posters. Oral presentations are also made, but the aim is subject knowledge rather than presentation skills and constructive criticism should be provided to students on the skill as well. Critical thinking and problem-solving form part of the final year, as progression through the levels of learning and hierarchy distinguish educational learning objectives into levels of complexity and specificity as progression take place.

Graduate attributes were covered across 100% of the modules, in various ways, with general laboratory knowledge being covered in 60% of the modules. Specific subject discipline modules were not covered to such a high extent; this was expected, as subject competencies were covered only in the relevant and related subject (Figure 10)

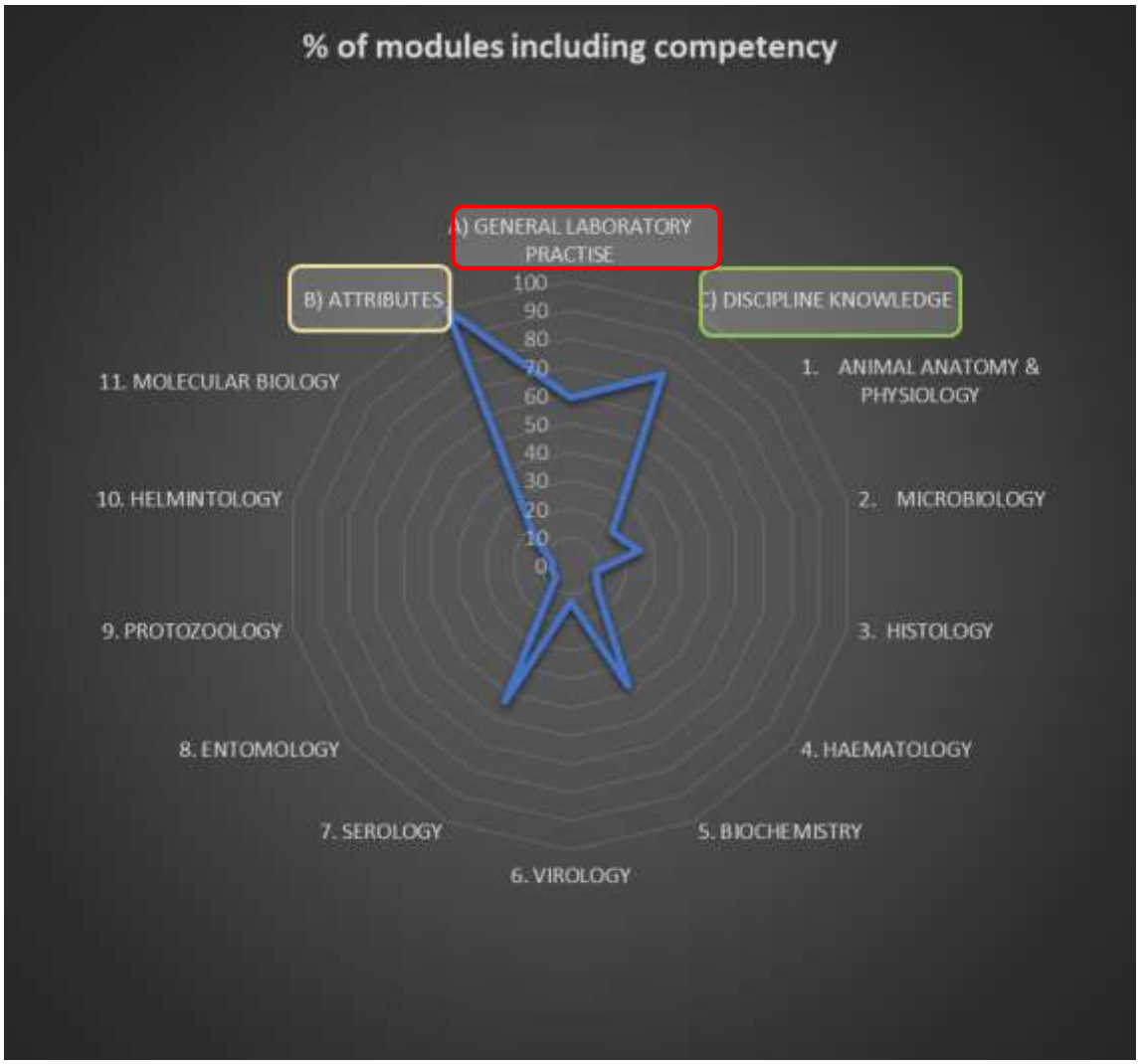


Figure 10: Percentage coverage of competencies in the three major categories: A) general laboratory practices; B) graduate attributes; C) subject knowledge

Discipline-specific competencies in general were covered intensively, but because of the variety of disciplines and broad field of study, specific subject discipline was only covered in the specific subject with limited cross-over between disciplines. For example, Protozoology content was only covered in this subject on third- and fourth-year level, with Serology being covered across multiple disciplines, but being more closely related to many disciplines. However, it needs to be noted that no competencies were left out and no gaps in the curriculum were identified.

The depth of coverage map for the degree indicates that as the students' progress through the study years, progression of competencies from introductory to mastery level

takes place as expected as students gain knowledge and competencies from the curriculum delivered. Overall, positive results are obtained, indicating that the curriculum and course levels and coverage are appropriate and comply with the standards set by the SAVC.

Curriculum mapping can be used as a tool to provide information to various stakeholders on an educational curriculum offered by a university (Harden, 2001). For curriculum planners it helps to understand the curriculum presented fully and it is valuable to evaluate an implemented curriculum. In this study, the curriculum mapping process was used to investigate whether the BHSc Vet Tech curriculum offered by TUT adequately address the day one competencies for a veterinary technologist graduate as required by the SAVC. The mapping was thus used as a resource to monitor the curriculum for compliance with the regulatory body, to ensure compliance for registration.

6 CONCLUSION

6.1 Conclusion

This chapter provides an overview of the study, a summary of the research findings in the form of answers to the research questions, which are defined at the beginning of this thesis, the outcomes of the implementation of the project and finally conclusions and recommendations for further development.

The main objective of this study was to investigate if the newly implemented professional degree qualification and curriculum comply with the standards set by the SAVC to ensure registration of the qualification. Four RQ needed to be answered to achieve this objective. The summary of findings per RQ are detailed below:

Objective 1: To develop day one competencies required for the students in line with the standards set by the SAVC, indicating the knowledge and competencies required from the student on the first day after graduation.
***RQ 1**: What are the minimum knowledge and competencies needed from a student on the first day after graduation, to ensure that the standards of the SAVC are met?*
Summary: A proses was followed to design day one competencies to align with the BHSc Vet Tech degree. These competencies need to be addressed as part of the curriculum to meet the standards set by the SAVC to ensure registration. Competencies were grouped into three major groups: A) general laboratory practices and knowledge applicable across all fields, B) discipline-specific competencies, including knowledge and skills, and C) professional attributes. Eleven competencies were established under general laboratory practices, which relate to all of the major disciplines and general knowledge required across the curriculum. In the section on discipline knowledge 11 major disciplines were identified, with from two to 10 competencies aligned with each discipline. Finally, eight attributes were listed under graduate attributes, including communication, problem-solving, teamwork and ethical practice.
***RQ 2**: What knowledge does the industry require to ensure the employability of students?*

Summary: The day one competencies were developed by lecturers involved in the delivery of the various modules, theoretical and practical. All lecturers were asked to contribute and comment on a baseline document. For feedback, the draft document was distributed to members of the SAAVT. They were asked to comment on the significance of the competencies because they are industry representatives. This was to ensure that the expectations from industry would also be addressed and the students would be ready to be employed in the industry directly after graduation.
Objective 2: To map the curriculum to determine if the curriculum for the veterinary technology programme offered by TUT is aligned with the day one competencies and expected learning outcomes
***RQ 1**: Does the developed curriculum for BHSc Vet Tech comply with and meet the requirements and expected learning outcomes of the SAVC?*
Summary: Curriculum mapping was used to determine whether TUT's BHSc Vet Tech curriculum adequately addressed the day one competencies of a veterinary technologist graduate. The degree consists of 32 modules spread out over four years, with each student taking all of them. The study found that all the day one competencies are addressed over the course of four years of study. This indicates that the curriculum adequately addresses the competencies and that students can demonstrate competencies through a variety of assessments.
Objective 3: To identify knowledge gaps in the curriculum that need to be addressed and corrected to ensure compliance. This is needed to ensure that TUT remains an accredited training institution with the SAVC.
***RQ 1:** Are there any knowledge gaps in the curriculum, identified by the curriculum mapping tool, that need to be revised and addressed?*
Summary: The gap analysis was performed by comparing the module content and learning outcomes to the required day one competencies. A gap analysis is required for a newly implemented curriculum in order to ensure compliance and provide direction for curriculum revision. Competency-based curriculum requirements established by the SAVC were used in this study to identify gaps in the newly offered BHSc Vet Tech curriculum. According to the findings, all competencies are addressed over the four years of study. General laboratory practices and attributes are addressed in more modules than subject-specific competencies, as expected, but overall the curriculum is in line with the professional council's expectations.

The undergraduate curriculum for the BHSc Vet Tech is designed to provide students with comprehensive coverage of applicable knowledge, opportunities to apply the knowledge, and the development of graduate attributes such as communication skills and teamwork, all of which are part of the day one competencies. Curriculum assessment and curriculum mapping are essential components of curriculum development. The mapping is used to ensure that the learning objectives and competencies are met. The modules, when combined, form an interconnected network that achieves the degree's overall goal. However, the SAVC day one competencies are a living document that can change over time as technology and industry needs change, as seen previously with the introduction of new technology, such as molecular biology, a discipline that only became relevant in the late 1990s. Thus, course and module content can adapt and change over time, and the modules, as well as the map, should be updated and assessed as part of self-evaluation or programme reflection on a regular basis, preferably once a year, to ensure the modules' continued availability and alignment of day one competencies with the curriculum learning outcomes offered to students. Monitoring the curriculum versus the day one competencies will also help to gain better understanding of how students' knowledge and skills are met and developed as the course progresses to meet the levels and objectives of higher education.

The curriculum mapping's main purpose was to assess if the student learning is aligned with the set day one competencies as required by the SAVC. Mapping of the outcomes and alignment with day one competencies indicate overall curriculum coherence. Mapping was therefore considered a useful methodology to assist in analysing the newly designed curriculum. This will ensure that students gain the knowledge and skills needed to register as veterinary technologists with the SAVC and also comply with the needs from industry in the chosen career path.

In conclusion, the study was performed to identify day one competencies and followed by a curriculum mapping exercise to identify any possible gaps in the newly developed and implemented professional four-year BHSc Vet Tech degree. This assisted in identifying the gaps and strengths of the offering, to provide inputs for the next curriculum review as well as to ensure compliance for accreditation and registration with the SAVC, the professional body that ensures high standards of training.

6.2 Personal reflection

My journey with Haaga-Helia University of Applied Sciences started in 2018, when I started the vocational teacher training offered as part of collaboration with TUT. From the start the instructional format was different from my more traditional way of learning as a student, as well as my way of offering instruction as a lecturer. This journey continued after completion of the Master's degree in Education Management.

I was introduced and exposed to numerous varying teaching methods, styles and online platforms. One of the most important outcomes for my personal development was the importance of blended learning and changing from a teacher-centred to a student-centred approach. The COVID-19 pandemic was never anticipated, but the training came at just the right time to prepare and equip me to change to online teaching with the new teaching skills, different ways of thinking and approaches that I learned as part of the pedagogy training.

The importance of collaboration and networking was a critical outcome and insight. During both courses I worked and got to know colleagues with diverse background across various faculties. It was a pleasure and highlight to work with colleagues who were part of both the *Uranvaihtajat* and *Naisryhma* teams. Lifelong friendships were formed, and the importance of mentoring, coaching and knowledge sharing will form an integral part of my higher education career in the future.

This development project was identified as a critical part of work that needs to be conducted in the department. The SAVC will conduct a visitation in 2022, to monitor the standards of training of the new qualification to ensure compliance and the relevance of the qualification. Thus the outcomes of this project will be used in preparation for the visitation. The most important part was, however, time management to ensure completion of the study and project in time. With the demands from teaching amid a pandemic and managing staff and students, proper planning and time management were crucial. This emphasised the importance of effective time management skills for my professional life and career.

6.3 Acknowledgements

I want to thank TUT for granting me this opportunity to develop and learn. An important quotation from Suzy Kassem is: “My father taught me that learning is an endless process,

and that there is no limit to the amount of knowledge a person can contain. You are never too old to learn something new, or too young to learn too much."

Secondly, I want to thank all the guidance counsellors from Haaga Helia University of Applied Science who were part of this training and learning journey.

7 REFERENCES

Anderson, L.W., Krathwohl, D.R., & Bloom, B.S. 2001. A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. New York: Longman.

Biggs, J., & Tang, C. 2007. Teaching for quality learning at university. New York, NY: Society for Research into Higher Education & Open University Press. [Google Scholar]

Bloom, B.S. 1969. Taxonomy of educational objectives: The classification of educational goals: Handbook I, Cognitive domain. New York: McKay.

Bok, H.G., Jaarsma, D.A., Teunissen, P.W., van der Vleuten, C.P. & van Beukelen, P. 2011. Development and validation of a competency framework for veterinarians. *Journal of Veterinay Medical Education,* 38(3):262-9.

Carless, D.G., Joughin, G., & Lui, N-F. 2010. How assessment supports learning: Learningoriented assessment in action. Abington: Routledge.

Carless, D. 2015. Excellence in university assessment: Learning from award-winning teaching. Abington: Routledge

Diamond, R.M. 1998. Designing and assessing courses and curricula: A practical guide. *Academy of Management Learning & Education,* 9(2).

Ertmer, P.A., & Newby, T.J. 2013. Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly*, 26(2), 43-71. https://doi.org/10.1002/piq.21143

Glossary of Education Reform https://www.edglossary.org accessed 21 January 2021.

Hale, J.A. 2008. A guide to curriculum mapping. Thousand Oaks, California: Corwin Press.

Hass, G. 1980. Curriculum planning: A new approach.: Allyn and Bacon.

Jacobs, M., Vakalisa, N.C.G., & Gawe, N. 2012. Teaching-learning dynamics: A participative approach for OBE; Heineman.

Jankowski, N.A., Timmer, J.D., Kinzie, J., & Kuh, G.D. 2018. Assessment that matters: Trending toward practices that document authentic student learning. Urbana, IL: University of Illinois and Indiana University, National Institute for Learning Outcomes Assessment (NILOA).

Knight, P.T. 2000. The value of a programme-wide approach to assessment. *Assessment & Evaluation in Higher Education*, 25(3):237-5.

Komba, E.V.G., Kipanyula, M.J., Muhairwa, A.P., Kazwala, R.R., Nzalawahe, J., Makungu, M.J., Sebhatu, T.T., Mosier, D.A., Hamilton, K., Mur, L. & Schmidt, P.L. 2020 Evaluation of the Bachelor of Veterinary Medicine (BVM) curriculum at Sokoine University of Agriculture in Tanzania: Mapping to OIE veterinary graduate 'Day 1 Competencies'. *Journal of Veterinary Medical Education*, Sep;47(s1):20-29. doi: 10.3138/jvme-2019-0120. PMID: 33074078.

National Institute for Learning Outcomes Assessment. 2018. Mapping learning: A toolkit. Urbana, IL: University of Illinois and Indiana University.

Newble, D., Stark, P., Bax, N. & Lawson, M. 2005. Developing an outcome-focused core curriculum. *Medical Education,* Jul;39(7):680-7.

OIE https://www.oie.int/en/about-us/our-members/member-countries/ access 2/12/2020.

Ornstein, A.C. & Hunkins, F.P. 2009. Curriculum foundations, principles and issues. (5th ed). Boston: Allyn and Bacon.

Royal college of Veterinary Surgeons (RCVS). 2006. Essential competencies required of the veterinary Surgeon. www.rcvs.org.uk

Shannon, S.J & Swift, J.P., 2012. Employing computerised graduate attribute mapping to bridge the divide from education to employment. *Journal of Information Technology and Application in Education,* 1(4):184-194.

Sheehan, J. 1986. Curriculum models: Product versus process. *Journal of Advanced Nursing*, Nov;11(6):671-8. doi: 10.1111/j.1365-2648.1986.tb03384.x. PMID: 3641856.

Simon, C. & Barrie, S.C. 2006. Understanding what we mean by the generic attributes of graduates. *Higher Education,* 51(2).

Treleaven, L. & Voola, R. 2008. Integrating the development of graduate attributes through constructive alignment. *Journal of Marketing Education*, 30(2):160-173.

APPENDIX:

Appendix A: Day one competencies for National Diploma Veterinary Technology

SAVC DAY 1 SKILLS FOR THE VETERINARY TECHNOLOGIST

GENERAL LABORATORY PRACTISE

- Understanding and knowledge of basic laboratory rules
- Understanding of basic principles of quality control
- Correct and appropriate receipt, handling, labelling and storage of samples
- Follow instructions according to Standard Operating Procedures
- Conduct work practices in an ethical and professional manner and in accordance with relevant legislation, regulation and codes of practice
- Understanding of use, cleaning, maintenance and calibration of laboratory equipment
- Understanding of laboratory safety and biohazards
- Maintain security, integrity, traceability and identity of samples, sub-samples and work records
- Set up and use a microscope correctly (Inverted / stereo and light microscopes)
- Work with zoonotic and infectious diseases protecting yourself and the public
- Basic sample administration under supervision

MICROBIOLOGY

- Understand the process of media preparation and be able to follow the preparation instruction of basic media.
- Work with aseptic techniques
- Pour plates and use the correct methods to streak bacteria cultures
- Incubate plates under suitable atmospheric and temperature conditions
- Isolate and identify common causative agent (pathogen)
- Understand and use the most applicable biochemical and physiological techniques for the identification of reference bacteria
- Staining and microscopic examination of basic isolates
- Understand the principle of the anti-biogram test and be able to set up an anti-biogram plate

HISTOLOGY

- Receive and handle the histology specimen correctly.
- Know what the macroscopic evaluation of the specimen include.
- Understand the principles o Tissue processing.
- Know how to embed tissue samples in paraffin wax.
- Cut 5 micron sections from tissue blocks.
- Stain the sections with the Haematoxylin and Eosin staining method.
- Perform special staining techniques to demonstrate:
  - Carbohydrate, mucin and glycogen using Periodic Acid Schiff's staining.
  - Gram stain

- TB using Ziehl-Neelson staining.
- Set up and use a microscope correctly to evaluate stained slides against control slides.

HAEMATOLOGY
- Understand the basic use of a Haematology analyser(semi and fully automated)
- Correct use of a dilution pipette for manual cell counting methods (basic manual haematocrit)
- Correct use of Pasteur and other pipettes
- Preparation of wedge and thick blood smears
- Staining and evaluation (Red and white cell morphology) of blood smears
- Performing manual cell counts – Neubauer counting chamber
- Set-up of Winthrobe ESR (Erythrocyte Sedimentation Rate)
- Understand the principle of White blood cell differential count (Identification of Thrombocytes, Red and White blood cells as well as blood parasites)
- Basic principles an automated haematology cell counter / instruments
- Performing and obtaining micro-haematocrit values with micro-haematocrit centrifuge

BIOCHEMISTRY
- Understanding the application of the sampling materials (tubes for specific tests)
- Aliquot of serum and plasma
- Scoring of sample condition
- Pipetting of serum and plasma
- Understanding the rationale of tests being performed
- Understanding the method of testing used and the rules that apply (e.g. Spectrophotometer and ion selective electrodes as well as colorimetric principals)
- Quality control and adjustments of calibration curves
- Ensure reliability of results

VIROLOGY
- Inoculation of embryonated eggs via the Allantoic Sac route for viral enumeration
- Candling of eggs to differentiate between dead and alive
- Aseptic harvesting of egg allantoic fluids
- Slow speed centrifugation with bench top centrifuge
- Perform HI and HA under guidance

SEROLOGY
- Use of pipette, single channels and multi-channels
- Preparation of Buffers and test reagents:
- Calculations: understand and performing of basic calculations
- Adjusting of pH's of buffers
- Setting up of microscopes
- Using of bench top centrifuges
- Able to perform ELISA tests under guidance

ENTOMOLOGY
- Fixation and preservation of arthropod samples
- Preparation of mounts and pinning of insects and acarines
- Identification of ecto-parasites to genus level:
- Ticks
- Flies
- Mites
- Lice

PROTOZOOLOGY

- Evaluation of samples for valid testing
- Preservation and transportation of parasitic material
- Preparation of solutions used for parasitological examinations
- Blood smears for examination, identification and quantification
- Coccidia flotation tests
- Identify the most common protozoa to genus level

HELMINTOLOGY

- Evaluation of samples for valid testing
- Perform McMaster faecal egg count
- Visser filter method for eggs examination
- Faecal flotation
- Bearmann's technique and faecal culture
- Calculations: FERT, EPG, reagent preparation and larval number estimation
- Staining, dehydration and mounting of samples
- Identification of common nematode, trematode and cestode parasites of sheep and cattle to genus level

MOLECULAR BIOLOGY

- Understand the hazards and risks in the molecular biology laboratory
- Be able to accurately pipette small quantities of reagents
- Preparations and dilutions of reagents, primers and nucleotides
- Extraction of DNA and RNA from variety of samples
- Prevent/minimise DNA and RNA contamination
- Set up Polymerase Chain Reaction procedure on a thermocycler
- Prepare agarose gel for electrophoresis
- Perform electrophoresis, read and record results

CELL CULTURE

- Retrieve or obtain the cell lines or tissue sample from fresh or preserved sources and prepare a culture
- Select specified culture media and add any necessary growth agents or nutrients
- Incubate cells or tissue in specified conditions
- Inoculate the media with the specified amount of sample
- Culture of cell lines and tissue to specifications without contaminating the original sample and the environment
- Monitor growth of tissue and cell lines and products to ensure viability
- Be able to count cells and contaminants and recognising normal and abnormal cells
- Be able to detect contamination
- Passage samples by sub culturing to preserve or grow cell lines
- Harvest cells or cell products to optimise yields
- Storing of cells to ensure viability under supervision
- Maintain records of active and stored tissue and cell lines under supervision

[Council approved: 31 July 2019]
[VC/EDUC/DAT 1 SKILLS_version 2]

Appendix B: Learning Programme outline

YEAR1				
MOD-ULE CODE	**MODULE NAME**	**NQF LEVEL**	**CRED-ITS PER MODULE**	**OFFERED WHEN**
CAP105X	Communication for Academic Purposes	5	10	Year
CPL105X	Computer Literacy	5	10	Year
FLF125X	Foundation Life Skills	5	2	Block (3 Months)
RPL115P	Research Principles I	5	6	Semester 2
PHS115P	Physics for Health Sciences I	5	12	Semester 1
CHS115P	Chemistry for Health Sciences I	5	12	Semester 1
MAS105X	Mathematics and Statistics I	5	12	Year
ANM115P	Animal Anatomy I	5	12	Semester 1
ANP115P	Animal Physiology I	5	12	Semester 1
MBL115P	Microbiology I	5	12	Semester 2
CVT105P	Introduction to Clinical Veterinary Technology I	5	12	Year
TOTAL CREDITS YEAR 1:			**124**	

YEAR2				
MOD-ULE CODE	**MODULE NAME**	**NQF LEVEL**	**CREDITS PER MOD-ULE**	**OFFERED WHEN**
RPL216P	Research Principles II	6	6	Semester 1
BCH216P	Biochemistry II	6	12	Semester 1
MBL216P	Microbiology II	6	12	Semester 1
VHT216P	Veterinary Haematology II	6	12	Semester 1
IMM216P	Immunology II	6	12	Semester 1
HST216P	Histology II	6	12	Semester 2
SER216P	Serology II	6	12	Semester 2
CVT206P	Clinical Veterinary Technology II	6	42	Year
TOTAL CREDITS YEAR 2:			**120**	

YEAR3				
MODULE CODE	**MODULE NAME**	**NQF LEVEL**	**CREDITS PER MODULE**	**OFFERED WHEN**
RPL307P	Research Principles III (incl. Proposal writing)	7	6	Year
HMY307P	Clinical Veterinary Technology III in: Helminthology	7	18	Year
PZY307P	Clinical Veterinary Technology III in: Protozoology	7	18	Year
EMY307P	Clinical Veterinary Technology III in: Entomology	7	18	Year
VLY307P	Clinical Veterinary Technology III in: Virology	7	18	Year
VRM307P	Clinical Veterinary Technology III in: Veterinary Microbiology	7	18	Year
MCB307P	Clinical Veterinary Technology III in: Molecular Biology	7	24	Year
TOTAL CREDITS YEAR 3:			**120**	

YEAR4				
MODULE CODE	**MODULE NAME**	**NQF LEVEL**	**CREDITS PER MODULE**	**OFFERED WHEN**
RPP408P	Research Principles IV & Project	8	30	Year
LBT408P	Laboratory Management IV	8	12	Semester 1
VLY408P	Clinical Veterinary Technology IV in: Virology	8	24	Year
BTY408P	Clinical Veterinary Technology IV in: Bacteriology	8	24	Year
PAR408P	Clinical Veterinary Technology IV in: Parasitology	8	24	Year
MCB408P	Clinical Veterinary Technology IV in: Molecular Biology	8	24	Year
TOTAL CREDITS YEAR 4:			**138**	

Appendix C: Module descriptor example: Clinical Veterinary Technology III in: Virology

Faculty of Science

CURRICULUM MODULE DESCRIPTOR

Module name:

Clinical Veterinary Technology III in:

Virology

(NQF Level 7)

1. TECHNICAL DATA

All technical data related to this module is indicated in table 1:

Table 1: Technical data

MODULE DATA										
1.1	HEQSF PROGRAMME CODE:			1.2	MODULE CODE:					
1.3	LEARNING PROGRAMME:	BACHELOR OF HEALTH SCIENCE IN VETERINARY TECHNOLOGY								
1.4	MODULE NAME	CLINICAL VETERINARY TECHNOLOGY III IN: VIROLOGY								
1.5	CESM CODE:	091601	NQF LEVEL		7		CREDITS		18	
1.6	OFFERING TYPE:		CONTACT		☐		DISTANCE			
1. 7	MODULE TYPE:		COMPULSORY		☐		ELECTIVE			
1.8	OFFERED IN:		YEAR	☐	SEMESTER 1		SEMESTER 2		BLOCK	
1.9	OFFERING UNIT:		LEARNING PROGRAMME		☐		SERVICE DEPARTMENT			
1.10	NAME OF DEPARTMENT		DEPARTMENT BIOMEDICAL SCIENCES				CODE:		6102	
1.11	PATHWAY OF PROGRAMME		VOCATIONAL				GENERAL			
			PROFESSIONAL		☐		OTHER			
1.12	ADMISSION REQUIREMENTS OR PRE-REQUISITES	Immunology II (NQF 6) Serology II (NQF 6)								
1.13	INTERRELATIONSHIP WITH OTHER MODULES	Clinical Veterinary Technology III in: Molecular Biology (NQF 7)								
1.14	ASSESSMENT		EXAMINATION TERMINATING		☐					
			NON-EXAMINATION TERMINATING							

2. ARTICULATION OF THE ELO'S AND THE PURPOSE OF THE MODULE.

Exit level Outcomes (ELO's) are framed against the level descriptors from SAQA.
The level of cognitive progression is applied across year one to year four in the learning programme.

Contextual Data

All data needed for the formulation of the purpose statement of the module is indicated in table 2:
Table 2: Purpose statement data

2.1.1	HOW DOES THE MODULE ARTICULATE WITH THE CLASSIFICATION OF SUBJECT MATTER? (CESM)	CESM CODE: 091601 - An integrated area of study in one or more of the veterinary medical or clinical sciences or a programme undifferentiated as to title. CESM CODE: 130503 - An area of study that focuses on the scientific study of subcellular pieces of genetic material, called viruses that inhabit living cells in parasitical relationships and their role in disease. Includes instruction in virus taxonomy and systematics, viral structures, viral genetics, prions, virus/host cell interaction, viral pathogenesis, and applications to specific topics such as cancer biology.
2.1.2	HOW DOES THE MODULE ARTICULATE WITH THE NQF LEVEL & LEVEL DESCRIPTORS?	The design of this module articulates with the level descriptors on NQF level 7 as indicated:
2.1.3	LEVEL DESCRIPTOR CATEGORY	

SCOPE OF KNOWLEDGE	☐	PRODUCING & COMMUNICATING INFORMATION	☐
KNOWLEDGE LITERACY	☐	CONTEXTS AND SYSTEMS	☐
METHOD AND PROCEDURE	☐	MANAGEMENT OF LEARNING	☐
PROBLEM SOLVING	☐	ACCOUNTABILITY	☐
ETHICS & PROFESSIONAL PRACTICE	☐	ACCESSING, PROCESSING & MANAGING INFORMATION	☐

2.1.4	HOW DOES THIS MODULE CONTRIBUTE TO THE ACHIEVEMENT OF THE PURPOSE OF THE QUALIFICATION AND THE EXIT LEVEL OUTCOMES? (INDIVIDUALLY AND / OR IN RELATION TO OTHER MODULES)	This module is part of the core modules in the knowledge mix of the related programme, contributing to the professional characteristics of the programme. It articulates with the purpose statement and exit-level outcomes of the learning programme.
2.1.5	WHAT IS THE RATIONALE FOR THIS MODULE IN THE CONTEXT OF THE PROGRAMME?	Graduates in this specialised field in Virology require a high amount of integrated and core knowledge of viruses. This module will further contribute to the integrated composition of the knowledge mix of the Veterinary Technology learning programme.
2.1.6	IN WHAT WAYS DOES THIS MODULE CONTRIBUTE TO THE INCREASING COMPLEXITY OF LEARNING AND ASSESSMENT ACROSS THE PROGRAMME?	This module will be offered on an NQF level 7, which is a progression module from Immunology II and Clinical Veterinary Technology II
2.1.7	HOW DOES THIS MODULE CONTRIBUTE TO THE DEVELOPMENT OF THE GRADUATE ATTRIBUTES IDENTIFIED BY THE UNIVERSITY?	TUT follows the philosophy of Scholarship of Teaching and Learning (SoTL), which is student-focused and requires in-depth understanding of literature, critical reflection, sharing through publication, and thus a research-based approach. SoTL contributes to the generic graduate attributes that aim to develop graduates' skills, personal attributes and values, which should be acquired by all graduates, with the outcome to both the world of work (employability) as well as other aspects of life.

Knowledge, Skills, Applied Competence, VAEB.

Knowledge, skills, competencies, and values represent graduate attributes that employers consider important and expect graduates to have when they enter the workplace. Graduates need to consolidate their intellectual ability and knowledge foundation in order to engage effectively with the workplace (SAQA, Graduate Attributes, January 2009).
The table below displays the attributes that students will gain through this module in order to reachthe applied competencies necessary to meet the pre-requisite standards of module progression and/or industry.

KNOWLEDGE (KEY WORDS)	SKILLS AND APPLIED COMPETENCIES	VALUES, ATTITUDES AND EXPECTED BEHAVIOUR
Viruses Properties and characteristics Replication and cultivation Classification Pathogenesis Diagnosis	Communication Skills Scientific presentation skills Management skills Analytical skills (diagnostic techniques; new trends) Evaluating skills Problem-solving skills Time management Reading skills Reasoning skills Listening skills Team working skills	Professionalism Ethical behaviour Inter-personal behaviour Independency Team work Curiosity Self-discipline Reliability Responsibility Empathy Life-long learning

Critical Cross-field Outcomes

SAQA adopted the following basic competencies commonly known as the Critical Cross-field Outcomes as an additional mechanism though which coherence is achieved in the HEQSF. These outcomes describe the qualities for development in students within the education system regardless of the specific area or learning content, and are embedded in the level descriptors.

The following table indicates the cross-field outcomes that are integrated in the ELOs, the Intended Learning Outcomes and associated Assessment Criteria as these pertain to this module.

BASIC COMPETENCIES (as applicable□)			
Identify and solve problems	□	Demonstrate an understanding of the world as a set of related systems	□
Work effectively with others	□	Utilise a variety of strategies to promote learning	□
Organise and manage themselves	□	Participate as a responsible citizen	□
Collect, analyse, organise and critically evaluate information	□	Demonstrate medical ethical, -jurisdiction and sensitivity to human rights	□
Communicate effectively	□	Develop entrepreneurial opportunities	
Use science and technology effectively and critically	□		

The Purpose Statement

PURPOSE STATEMENT OF THIS MODULE:
This module, Clinical Veterinary Technology III with specialisation in the field of Virology, is an 18-credit core learning module on cognitive NQF level 7 that prepares learners to integrate the acquired in-depth theoretical knowledge and understanding of the concepts and theories of virology with the clinical laboratory practice environment through a structured and managed work-integrated learning programme. Learners will gain the ability to select and apply a range of techniques, methods and procedures in order to perform clinical laboratory procedures/tests pertaining to the virology discipline. Students on this particular level will acquire the necessary knowledge and applied skills to address, analyse and evaluate clinical veterinary laboratory test results based on theory-driven arguments within the scope of veterinary technology practice. Competency will be measured through integrated formative assessment methods and instruments throughout the teaching and learning period and summative by means of written examination papers as well as an Objective Structured Practical Evaluation (OSPE) at the end of the learning cycle.

3. MODULE OVERVIEW

Module outcomes

The module outcomes are formulated and aligned with the ELO's, Purpose Statement of the Module and the Knowledge, Skills and Applied competencies.

MODULE OUTCOMES
Students should during and upon completion of this module be able to:
MODULE OUTCOME 1:
Demonstrate integrated knowledge and in-depth understanding of the nature of viruses and viral replication, as well as the pathogenesis of viral infections, and antiviral immunity related to the concepts and theories of the broader virology discipline.
MODULE OUTCOME 2:
Demonstrate the ability to identify, analyse and critically reflect on the epidemiology of diseases and further be able to apply a range of methods to resolve problems related to the control of viral diseases within veterinary technology practice.
MODULE OUTCOME 3:
Demonstrate competency and thorough understanding of the methods and techniques related to the diagnosis of viral infections within the scope of clinical veterinary laboratory practice.

Module Mapping and Design

The module units were identified in articulation with the purpose statement of the module, the module outcomes and the scope of practice as indicated in table 3.

Table 3.

DESCRIPTION	EMBEDDED DOCUMENT
Module mapping and design	 MOD MAPP DES_CVT III in_Virolo
MODULE DESIGN – THEORETICAL & PRACTICAL COMPONENT	

ODULE NAME	Clinical Veterinary Technology III in: Virology	NQF	7	CREDITS	9	NOTIONAL HOURS	90

CAMPUS-BASED THEORETICAL

NO	DESCRIPTION OF LEARNING UNIT	LEARNING ON CAMPUS UNDER SUPERVISION BY LECTURER											TOT
		INSTRUCTION BY LECTURER ON CAMPUS			PRACTICALS, APPLICATIONS & APPLIED COMPETENCIES UNDER SUPERVISION BY THE LECTURER					ASSESSMENT			
		NR OF WEEKS	HRS PER WEEK	TIME	STUDY SELF AND APPLICATIONS	ASSIGNMENTS	TRAINING IN SKILLS LABORATORY	DEBRIEFING AND REFLECTION	TIME	PREPARATION FOR ASSESSMENT	ASSESSMENT	TIME	TOTAL TIME LECTURER WITH
1	Nature of viruses	2.5	2	5.0	1.5		1.5	0.5	3.5			0.0	8.5
2	Viral replication	2.5	2	5.0	1.5		1.5	0.5	3.5			0.0	8.5
3	Pathogenesis of Viral infections	2.5	2	5.0	1.5		1.5	0.5	3.5			0.0	8.5
4	Antiviral Immunity	2.5	2	5.0	1.5		1.5	0.5	3.5			0.0	8.5
5	Laboratory Diagnosis of Viral Infections	2.5	2	5.0	1.5		1.5	0.5	3.5			0.0	8.5
6	Epidemiology and Control of viral diseases	2.5	2	5.0	1.5		1.5	0.5	3.5			0.0	8.5
	ASSESSMENT PLAN:												
1	Test 1			0.0				1.0	1.0	3.0	1.5	4.5	5.5
2	Test 2			0.0				1.0	1.0	3.0	1.5	4.5	5.5
3	Test 3			0.0				1.0	1.0	3.0	1.5	4.5	5.5
4	Test 4 (Practical)			0.0				1.0	1.0	3.0	1.5	4.5	5.5
5	Assignment 1 (Written)			0.0	5.0	4.0		1.0	10.0			0.0	10.0
6	Assignment 2 (Oral)			0.0	5.0	1.0		1.0	7.0			0.0	7.0
TOTAL		15		30	19	5	9	9.0	42.0	12.0	6.0	18.0	90.0
				33%	21%	6%	10%	10%	47%	13%	7%	20%	100%

WORKPLACE-BASED DESIGN – LEARNING IN PRACTICE

MODULE NAME	Clinical Veterinary Technology III in Virology	NQF	7	CREDITS	9	NOTIONAL HOURS	90

LEARNING IN PRACTICE / WORKPLACE-BASED LEARNING / LABORATORY WORK

NO	DESCRIPTION OF LEARNING UNIT	LEARNING IN PRACTICE UNDER SUPERVISION BY TUTOR (WPBL)											TOT
		INSTRUCTION BY CLINICAL TUTOR			PRACTICALS, APPLICATIONS & APPLIED COMPETENCIES UNDER SUPERVISION IN THE WORKPLACE					CLINICAL ASSESSMENTS			
		NR OF WEEKS	HRS PER WEEK	TIME	PRACTICALS AND APPLICATIONS and TUTO-	ASSIGNMENTS	CLINICAL WORK WITHIN 30 CURR WEEKS	DEBRIEFING AND REFLECTION	TIME	PREPARATION FOR ASSESSMENT	ASSESSMENT	TIME	TOTAL TIME WITH CLINICAL TUTOR
1	Nature of viruses	2.5	0.5	1.3	1.0		7.5	0.3	8.8			0.0	10.1
2	Viral replication	2.5	0.5	1.3	1.0		7.5	0.3	8.8			0.0	10.1
3	Pathogenesis of Viral infections	2.5	0.5	1.3	1.0		7.5	0.3	8.8			0.0	10.1
4	Antiviral Immunity	2.5	0.5	1.3	1.0		7.5	0.3	8.8			0.0	10.1
5	Laboratory Diagnosis of Viral Infections	2.5	0.5	1.3	1.0		7.5	0.3	8.8			0.0	10.1
6	Epidemiology and Control of viral diseases	2.5	0.5	1.3	1.0		7.5	0.3	8.8			0.0	10.1
	ASSESSMENT PLAN:												
1	Clinical Assessment 1							0.5	0.5	1.5	3.0	4.5	5.0
2	Clinical Assessment 2							0.5	0.5	1.5	3.0	4.5	5.0
3	Clinical Assessment 3							0.5	0.5	1.5	3.0	4.5	5.0
4	Clinical Assessment 4							0.5	0.5	1.5	3.0	4.5	5.0
5	Clinical Assessment 5							0.5	0.5	1.5	3.0	4.5	5.0
6	Clinical Assessment 6							0.5	0.5	1.2	3.0	4.2	4.7
TOTAL		15.0		7.5	6.0	0.0	45.0	4.8	55.8	8.7	18.0	26.7	90.0
				8%	7%	0%	50%	5%	62%	10%	20%	30%	100%

Alignment of the curriculum

All learning units are planned and structured within the context of curriculum alignment, the intended learning outcomes (ILOs) and associated assessment criteria (ACs) are formulated in line with words (action verbs) published as the *Taxonomy of Educational Objectives* namely, the Bloom's Taxonomy's list of action words, as per embedded file.

DESCRIPTION	EMBEDDED DOCUMENT
Bloom's Taxonomy's list of action verbs.	 ACT-VERB.doc

LEARNING UNIT 1	NATURE OF VIRUSES	NOTIONAL HOURS	40
INTENDED LEARNING OUTCOME (ILO) (Verb + Noun + Context)	ASSESSMENT CRITERIA (AC) (Noun + Verb + Context)		
Learners should be able to…	*This will be evident when/if…*		
ILO 1: Demonstrate integration of knowledge of the origin, nature and characteristics of viruses with the ability to apply knowledge of the morphology and classification during clinical veterinary laboratory practice.	AC 1: The nature of viruses is explored and analysed related to their genetic material and structure. AC 2: The characteristics of viruses are outlined to demonstrate further understanding of viruses and their host cell environment. AC 3: The viral morphology (structure or shape) of different viruses is identified and described in detail to assist in the evaluation and reflection of laboratory test results. AC 4: Viruses are named and categorised under a taxonomic system of virus classification with reference to their phenotypic characteristics (morphology, nucleic acid, host organisms, and types of diseases they cause).		
LEARNING UNIT 2	VIRAL REPLICATION	NOTIONAL HOURS	40
INTENDED LEARNING OUTCOME (ILO) (Verb + Noun + Context)	ASSESSMENT CRITERIA (AC) (Noun + Verb + Context)		
Learners should be able to…	*This will be evident when/if…*		

ILO 1: Demonstrate integrated knowledge and understanding of the viral life cycle related to typical viruses infecting animals. ILO 2: Apply knowledge of viral replication through identification and evaluation of procedures performed in a diagnostic veterinary laboratory.	AC 1: Growth of viruses and viral replication processes used by individual viruses are analysed and described in context of veterinary sciences. AC 2: Methods of viral replication used in virology laboratories are investigated and applied to the field of veterinary technology. AC 3: Selected traditional and/or modern virus quantification methods are accurately performed to obtain assay-based results related to various virus information.

LEARNING UNIT 3	PATHOGENESIS OF VIRAL INFECTIONS	NOTIONAL HOURS	40

INTENDED LEARNING OUTCOME (ILO) (Verb + Noun + Context)	ASSESSMENT CRITERIA (AC) (Noun + Verb + Context)
Learners should be able to…	*This will be evident when/if…*
ILO 1: Demonstrate specialised knowledge of Viral Pathogenesis and the factors that affect pathogenic mechanisms.	AC 1: Viral virulence genes (viral and host genes) are identified, compared and described in detail to demonstrate knowledge of the interaction between virus and host cell on cellular level. AC 2: Virologic and environmental factors are outlined and compared to demonstrate knowledge in mechanisms of viral infection. AC 3: Diagnostic test results are evaluated and classified in relation to mechanisms of viral infections.

LEARNING UNIT 4	ANTIVIRAL IMMUNITY	NOTIONAL HOURS	20

INTENDED LEARNING OUTCOME (ILO) (Verb + Noun + Context)	ASSESSMENT CRITERIA (AC) (Noun + Verb + Context)
Learners should be able to…	*This will be evident when/if…*
ILO 1: Demonstrate detailed knowledge and in-depth understanding of term antiviral immunity and how it relates to the immune response mechanisms in veterinary sciences.	AC 1: Host immune responses are investigated with specific reference to viral infection. Strategies to protect against and combat viral infection are discussed. AC 2: Mechanisms of non-specific and specific immune responses, specific cell mediate immunity to combat viral infections are compared.

	AC3: Types of vaccines and their characteristics are discussed related to different types of viruses and protection.

LEARNING UNIT 5	EPIDEMIOLOGY AND CONTROL OF VIRAL DISEASES	NOTIONAL HOURS	20

INTENDED LEARNING OUTCOME (ILO) (Verb + Noun + Context)	ASSESSMENT CRITERIA (AC) (Noun + Verb + Context)
Learners should be able to…	*This will be evident when/if…*
ILO 1: Demonstrate comprehensive knowledge and understanding of epidemiology and control of viral diseases related to the environment of veterinary science.	AC 1: The epidemiology of viral diseases diagnosed in animals is examined and scientifically described. AC 2: Strategies for the control of viral diseases and disease surveillance are developed to demonstrate knowledge of the monitoring methods and ongoing plans to assess the health and disease status of a given population in South Africa.

LEARNING UNIT 6	LABORATORY DIAGNOSIS OF VIRAL INFECTIONS	NOTIONAL HOURS	20

INTENDED LEARNING OUTCOME (ILO) (Verb + Noun + Context)	ASSESSMENT CRITERIA (AC) (Noun + Verb + Context)
Learners should be able to…	*This will be evident when/if…*
ILO 1: Demonstrate competency in the application of knowledge and the standard operating procedures followed during diagnostic veterinary laboratory tests.	AC 1: The accurate collecting, packaging and transport of specimens are well described and observed during clinical veterinary technology practice. AC 2: Learners demonstrate the ability to select and apply the optimal methods for the detection of viruses during clinical veterinary technology practice. AC 3: Serologic diagnostic test results are accurately evaluated, communicated and critically reflect on to address evidence-based solutions to veterinary-related inquiries

Instruction, Independent study, Debriefing and Reflection

INSTRUCTION AND METHODOLOGY (Teaching strategies)	LEARNER ACTIVITY AND/OR INDEPENDENT STUDY	DEBRIEFING AND REFLECTION
The lecturer…	The student…..	Lecturer and Student
PowerPoint presentation to introduce the learning unit, as well as the expected outcomes and assessment tasks Academic articles discussions during instruction time. Case study discussions during instruction time Group discussion as part of the instruction time.	Reading of academic sources and articles Prepare questions for discussion Design Mind Maps to outline main concepts Unpacking of content for contextualisation purposes	Feedback to lecturer on learning experiences Suggestions and acknowledgement Challenges experienced Writing a reflective report

3.6 Information Sources and Resources

The library and other resources are adequately suited to the Bachelor of Health Science in Veterinary Technology learning programme, as staff and students will make use of the library to conduct especially information searches to gain access to relevant articles and information and will use resources for skills development. It is the policy of Tshwane University of Technology that the Library and Information Services acquires all information resources in support of Teaching and Learning, as well as research-based performance. Through the library website students and staff are offered access to e-books and databases through which they are able to access online journals.

SOURCES OF INFORMATION	RESOURCES	
Academic Textbooks Hand-outs Worksheets Scholarly online articles	Library for Books/Articles myTUTor (E-learning platform) Clinical facility	

4. TEACHING AND LEARNING (T&L) STRATEGY

Teaching and Learning Analysis

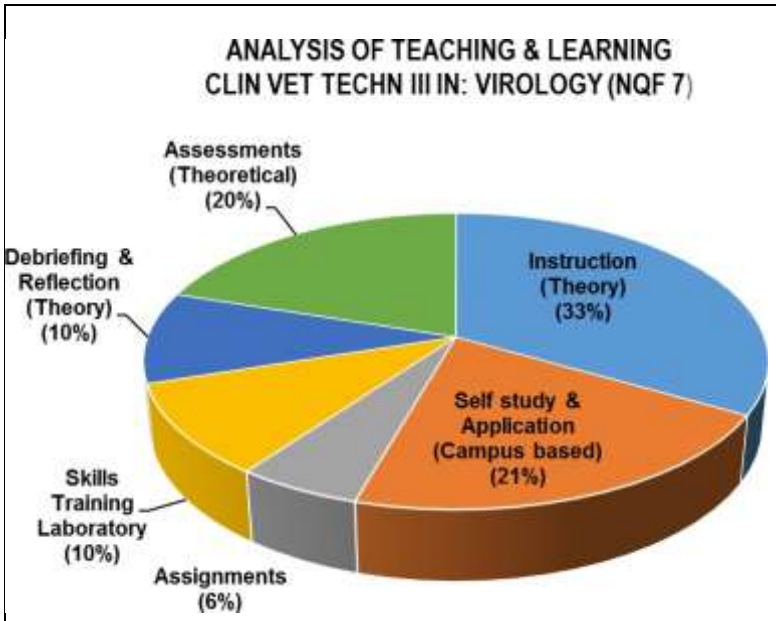


Figure 1:
TEACHING & LEARNING COMPONENTS

Campus-based Theoretical Components

Figure 1 shows a layout of the different teaching and learning components, based on the design as indicated in table 3.

33%	INSTRUCTION	The notional time is provided for instruction by the lecturer by means of, but not limited to, PowerPoint presentations and facilitation of discussion sessions.
21%	SELF-STUDY AND APPLICATION	Provided to the student for self-study, and the application of their independent learning skills and responsibility for own learning,
0%	TUTORIALS	This section includes tutorial sessions as part of collaborative learning, and will be facilitated by the lecturer.
10%	SKILLS TRAINING CENTRE/PRACTICAL LAB	Assist students in acquiring the necessary techniques that will lead to gaining in procedural knowledge and clinical competence.
6%	ASSIGNMENTS (WRITTEN AND/OR ORAL)	Compilation of assignments based on various topics, either in written or oral format.
	WORK INTEGRATED LEARNING (WIL)	See figure 2 below to describe this part
20%	THEORETICAL AND/OR PRACTICAL ASSESSMENTS	Assessments will include preparation for assessment and the assessment itself
10%	DEBRIEFING AND REFLECTION	This section will include reflection-in and reflection-on learning by learners to provide support on the learning needs. It will further assist with teaching and learning practices with possible improvement on lecturer instruction and facilitation.

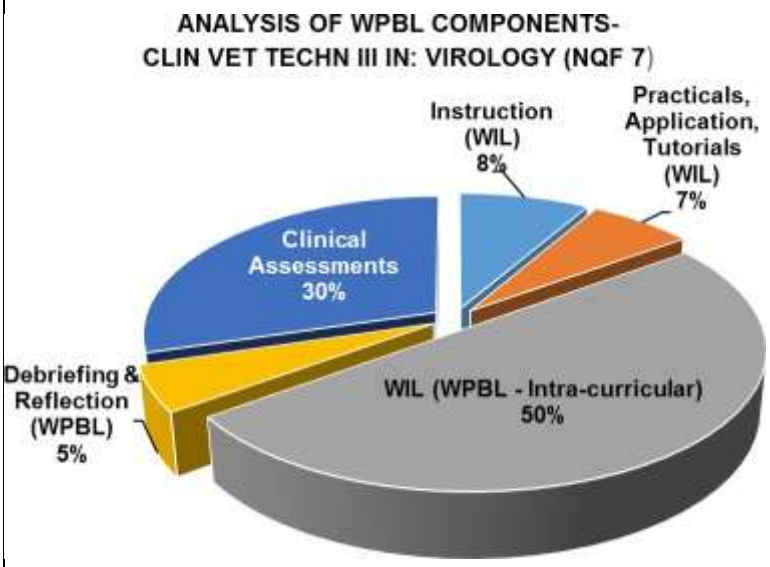


Figure 2: TEACHING & LEARNING COMPONENTS

Workplace-based learning components (WPBL) as part of WIL.

Figure 2 shows a layout of the different teaching and learning components, based on the design as indicated in table 3.

8%	INSTRUCTION	Clinical tutor/supervisor, and a small percentage of the total notional time of the module. This allows time for the clinical tutor to instruct students w.r.t the clinical environment, routines, procedures etc.
7%	SELF STUDY & APPLICATION, PRACTICALS, TUTORIALS	Provided to the student for self-study, and the application of their independent learning skills and responsibility for own learning,
	ASSIGNMENTS	N/A
50%	WORK INTEGRATED LEARNING (WIL)	Work Integrated Learning (WIL) activities, such as Workplace-based Learning (WPBL) and/or Project-based Learning (PJBL) activities. Exposure to real life experience under supervision
30%	CLINICAL ASSESSMENTS	To determine progress of learners' competence in communication, knowledge, technical skills, clinical reasoning, emotions, values etc.
5%	DEBRIEFING AND REFLECTION	This section will include reflection-in and reflection-on learning by learners to provide support on the learning needs. It will further assist with teaching and learning practices with the possible improvement on lecturer instruction and facilitation.

Teaching and Learning Approach

A blended teaching and learning approach will be followed using a variety of teaching strategies e.g. direct instruction, small group work, co-operative learning, problem-solving, case studies, writing, as well as project-based learning and exposure to industry.

Contact sessions in the form of face-to-face lecturer-facilitated teaching and learning will take place for 2.5 hours per week over a 30 academic week period. During this time facilitation will include core lectures, group and class discussions, case study analysis and application, viewing of relevant audio-visual materials and simulated activities with lecturer demonstrations and feedback on student simulations, peer group feedback and personal reflection on learning activities. Electronic media for teaching and learning will be used, referred to as myTutor, an e-learning platform that enables student-student interaction and student-lecturer interaction. This teaching method will be used in order to allow access of all students to teaching and learning materials such as lecture notes, class discussions and for diagnostic and formal assessments.

Additional notional time for teaching and learning and competency-based assessment will be supported through practical laboratory training in a fully equipped skills training laboratory on campus, as well as a South African Veterinary Council (SAVC) accredited training facility off campus. Specific intended learning outcomes are to be achieved in a practical/clinical setting to integrate theoretical concepts within a practical/clinical environment under the supervision of dedicated clinical tutors/supervisors registered with the SAVC as a qualified Veterinary Technologist.

These teaching strategies and educational methods of learning will enable thorough understanding of knowledge components, as well as the ability of learners to apply such knowledge and required clinical skills to promotion of employability and well-rounded graduates.

4.3 Work Integrated Learning (WIL)

ACADEMIC AND WORKPLACE-BASED ROTATION

Being a skilled veterinary technologist requires a certain amount of training hours. Therefore, students will be placed in a SAVC accredited clinical setting for gaining real-life

practical experience in the workplace as part of an integrated academic and workplace-based rotation system.

Preparation entails a great deal of responsibility and requires continual thought and effort in order for the student to eventually act effectively in a dynamic work situation.

The table below indicates an integrated model of rotation between academic classes consisting of lectures on theoretical knowledge, application, to include anything from practical skills laboratory training, research-based activities, and Workplace-based Learning (WPBL) in a clinical facility under the guidance and supervision of the academic lecturer and/or a dedicated qualified clinical tutor/supervisor. The academic programme is designed to run over 30 academic weeks, which will include a theoretical and WPBL component (intra-curricular). Additional extra-curricular WPBL component (hours) are furthermore indicated, and reflects time that students will spend in the workplace additional to the formal academic programme and the prescribed WBPL hours.

DESCRIPTION	EMBEDDED DOCUMENT
Academic and Workplace-based Learning (WPBL) rotation model	INTEGRT ACADEMIC WPBL MODEL_BHSc

5. ASSESSMENT STRATEGY

Assessment of module outcomes

Assessment tasks in table(s) 4.1 and 4.2 below reflect an integrated assessment approach to evaluate learners on their knowledge, skills, and attitudes required for the demonstration of applied competence in either a particular area, or time frame, or end of the module outcome(s). The approaches and methods of assessment are ultimately designed to support learning. Assessment methods and instruments are selected and designed to adhere to the principles of assessment, namely fairness, validity, reliability, and practicability.

The preparation and assessment of the theoretical assessment tasks require 20% of the total 90 theoretical notional hours out of the total of 180 notional hours of the module. Preparation and assessment of the clinical assessment tasks require 30% of the remaining 90 notional hours pertaining to the WIL component. Time for assessment will be for the accounts of the academics in collaboration with practical and clinical laboratory staff. All tasks are directly aligned with the ILOs and ACs as indicated in the module outline and module outcomes.

However the majority of the assessment methods will be assessed by the academic lecture staff, laboratory technicians and qualified clinical staff. Other assessment methods will also include peer evaluation, and self-assessments via demonstrations and/or presentations with the purpose to promote management of and learner-directed learning abilities.

Assessment tasks, as well as feedback on assessments, are planned in accordance with the TUT Policy on Teaching, Learning, and Assessment as set guidelines for a minimum number of assessment tasks per semester/year module.

The assessment tasks as set out in this module are further planned and designed with the purpose to support learning directly and to provide the students with the required applied competencies in a particular field of study on a particular cognitive level (SAQA NQF level).

All collected assessment tasks are to be placed in a prepared portfolio of evidence (PoE) for peer review and/or academic audits when required.

Assessment Plan

The assessment plan as projected in tables 4.1 and 4.2 provides a clear layout of all integrated assessment tasks in line with the requirements of SAQA. The purpose of each task is clearly indicated and is in line with the needs of the promotion regulations of the module.

Table 4.1: Assessment plan – Theoretical component

ASSESSMENT TASK	INSTRUMENT	DESCRIPTION	METHOD	TOOL	ASSESSMENT TYPE				
					DIAGNOSTIC (D)	FORMAL (M) INFORMAL (I)	FORMATIVE (F) SUMMATIVE (S)	PROMOTION (Yes/No)	WEIGHT (%)
1	Written Test 1	Required learners to respond to a range of question within a certain time.	Questioning	Question Paper and Memorandum		M	F	Y	20
2	Written Test 2								20
3	Written Test 3								20
4	Practical Test 4	Direct observation of procedural skills measuring progress in acquiring of	Questioning & Observation	Question Paper and Memorandum		M	F	Y	10

		core knowledge and competencies.		Observation sheet					
5	Assignment 1 (written)	Assignments will be conducted around relevant topics and/or to clarify a difficult concept.	Product	Rubric		M	F	Y	15
6	Assignment 2 (oral)								15
TOTAL								100	

Table 3.2: Assessment plan – Workplace-based Learning (WPBL) component

ASSESSMENT TASK	INSTRUMENT	DESCRIPTION	METHOD	TOOL	ASSESSMENT TYPE				
					DIAGNOSTIC (D)	FORMAL (M) INFORMAL (I)	FORMATIVE (F) SUMMATIVE (S)	PROMOTION (Yes/No)	WEIGHT (%)
1	Clinical Assessment 1	Assessment of clinical competence and standard performance in a clinical environment.	Questioning & Observation	Question Paper & Memorandum Observation sheet		M	F	Y	10
2	Clinical Assessment 2								10
3	Clinical Assessment 3								15
4	Clinical Assessment 4								15
5	Clinical Assessment 5								20
6	Clinical Assessment 6								20
TOTAL								100	

EXAMINATION TERMINATING (SUMMATIVE ASSESSMENT)

ASSESSMENT TASK	INSTRUMENT	DESCRIPTION	METHOD	TOOL	PROMOTION (Y/N)	WEIGHT (%)
1	Written Paper	Required learners to respond to a range of question within a certain time.	Questioning	Question Paper & Memorandum	Y	50%
2	OSPE	A comprehensive and integrated, simulated clinical & theoretical assessment based on different stations reflecting evidence-based practice for real-world responsibilities.	Questioning & Observation	Question Paper & Memorandum Observation sheet	Y	50%
EXAMINATION TOTAL:						100%

Promotion

PREDICATE MARK	EXAMINATION MARK	PROMOTION MARK
Minimum 40% calculated on all formative assessment tasks	Minimum of 50% (summative assessment)	A final calculated % mark of predicate and examination that equals or exceeds 50%

6. MODERATION

This is a Non-Exit Level Module module that requires internal moderation.	☐	This is an Exit Level Module that requires external moderation.	

The TUT Senate committee for Teaching and Learning appoints the internal and/or external examiner/moderator. The examiner/moderator is responsible for moderation of the draft question papers and memoranda, moderates samples of scripts on the particular module and re-marks scripts on the module in cases of student appeals.

At least 50 % of assessments are moderated. The examination paper and the scripts are moderated as part of the 50%. The number of scripts to be moderated will be a sample of 10% of the scripts with a minimum of 20 and a maximum of 40. If there are fewer than 20 scripts, all scripts must be moderated.

LIST OF PRESCRIBED AND/OR RECOMMENDED READING

VIROLOGY			
PRESCRIBED/ RECOMMENDED 1:		PRESCRIBED/ RECOMMENDED 2:	
Title:	Virology	Title:	
Author:	J. A. Levy., H. Fraenkel-Conrat., R. A. Owens	Author:	
Publisher:		Publisher:	
Edition:		Edition:	
ISBN:		ISBN:	
PRESCRIBED/ RECOMMENDED 3:		PRESCRIBED/ RECOMMENDED 4:	
Title:		Title:	
Author:		Author:	
Publisher:		Publisher:	
Edition:		Edition:	
ISBN:		ISBN:	