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Perceptions of changes made to a clinical skills curriculum in a medical programme in South Africa: a mixed method study.

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

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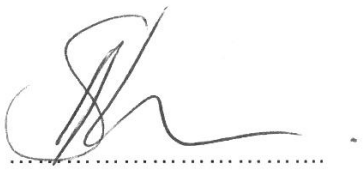
A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Health Science Education

Johannesburg, 31 October 2018

Declaration

I, Stuart Redvers Pattinson (Student Number: 0701312X), declare that this Research Report is my own, unaided work. It is being submitted for the Degree of Master of Health Science Education at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



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Abstract

In 2015 the University of the Witwatersrand's Medical Curriculum was reviewed. The reports identified that there was too large a gap between the Medical School based teaching in the second year of the programme and the hospital-based teaching in the third year when the students begin their clinical clerkships. A number of changes, based on current evidence, were made to the curriculum in order to try to remedy these important concerns for the accreditation of the programme and prepare the students better for the expectations of the clinical setting. An exploratory mixed methods approach was used to determine the perceptions of the students and the clinical teachers of the new curriculum, in respect to how well it prepares them for their clinical years, comparing the students taught under the new and old curricula respectively. Phase one was a narrative qualitative study; the narrative data were analysed using a qualitative approach and the categories that emerged informed the development of a questionnaire for phase two which was a cross-sectional, comparative, quantitative study. The results showed a statistically significant improvement of the perceptions of the third-year students of their preparedness for the clinical setting when compared to the fourth-year students who were taught under the old curriculum. The teachers' data showed no difference between the two groups. The new curriculum has resulted in a significant improvement (p value = 0) of the students' perceived preparation for their clinical clerkships.

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Abbreviations

GEMP: Graduate Entry Medical Programme

HPCSA: Health Professions Council of South Africa

HPD: Hospital Practice Days

MCQ: Multiple Choice Questions

OSCE: Objective Structured Clinical Examination

QQR: Quinquennial Review

CHAPTER ONE

1. Introduction

1.1 Background

In 2015 the Health Professions Council of South Africa (HPCSA) conducted an accreditation of the undergraduate medical programme in the Faculty of Health Sciences at the University of the Witwatersrand[1]. In the same year the University of the Witwatersrand itself conducted a Quinquennial Review (QQR) of the School of Clinical Medicine[2]. Both reports identified that there was too large a gap between the Medical School based teaching in the second year of the Graduate Entry Medical Programme (GEMP) and the hospital-based teaching in GEMP III when the students begin their clinical clerkships.[1,2] They found that there was a theory-practice gap; the students were ill equipped and under prepared for the application of clinical skills in a real clinical setting with patients.[1,2]

In an attempt to bridge this gap and remedy this concern for the accreditation of the course, a number of changes, based on the current evidence in medical education, were made to the GEMP II clinical skills curriculum for 2017. These changes are outlined in a summary document by Schoeman[3]. In the previous curriculum clinical skills were taught at three different sites (Helen Joseph Hospital, Chris Hani Baragwanath Hospital and Wits medical school) with little standardisation between sites and a largely didactic teaching approach as a high student to staff ratio meant that there was little or no opportunity for close supervision or small group teaching. There was only one formative assessment with minimal feedback.

Changes to the curriculum included centralising the teaching of clinical skills in the Clinical Skills Unit at the University of the Witwatersrand Medical School and standardising the content of the teaching, which was carefully aligned with the academic curriculum and integrates the knowledge and skills relevant to the students' concurrent academic module and applies this to real life scenarios and problems. More teachers were employed to allow for a change in the nature of the teaching from didactic instruction to small group learning with open discourse and interaction between the students and the tutors as well as increased monitoring.

Clear objectives for each session are set and communicated to the students. The sessions aim to develop the knowledge, skills and attitudes required for a holistic, competent and safe health care provider with a focus on communication and patient interaction, physical examination and the performance of medical procedures, using models and simulated patients. The sessions also aim to improve problem solving and critical thinking skills and develop professionalism and teamwork. The clinical skills sessions are designed to allow for deliberate practice[4] under supervision in small groups with feedback in and on practice, followed by interactive debriefing sessions. Formative assessment was introduced in the form of regular tutor-student assessments and formative Objective Structured Clinical Examinations (OSCEs). The students receive detailed feedback on their formative assessment, both immediately after performance and at a later stage for those students who need remediation and more support. Assessment of knowledge application is in the form of multiple choice questions (MCQs) included in each block test and the students have a final summative OSCE in order to demonstrate their competence. These assessments are aligned with the objectives communicated to the students. The weighting of the OSCE as a part of the final year mark has been increased to communicate its value to the students.

A clinical methods programme was also introduced to allow for early application of clinical skills in the real life clinical setting. This is in the form of structured bedside teaching tutorials facilitated by the clinical departments, where the students have to communicate with and examine patients (under supervision), followed by facilitated discussions with, and provision of feedback from, a specialist practitioner in the field. The students have a systems based curriculum where they are expected to integrate their basic science and clinical knowledge in the management of real patients. This has replaced the Hospital Practice Days (HPD) in which students were sent to a variety of clinical departments in teaching hospitals on the Wits circuit in Johannesburg for a less structured or planned clinical encounter where learning was far more opportunistic.[3] There was no specific curriculum and teaching was based on whatever interesting cases were found on the day. The structure was entirely dependent on whoever was assigned to teach the students on the day.

It is important to now evaluate whether these curriculum changes have had the influence on the student's preparation for their clinical years that was intended. The best time to investigate this is once they have started their clinical clerkships, to determine the students' perceptions of how well prepared they were for the experience that greeted them and to compare it to the perceptions of preparedness of students who were taught under the old curriculum. The perceptions of the teachers who work with the students in the clinical setting of the preparedness of the two groups, comparing those taught under the new curriculum with those taught under the old curriculum when they had just started their clerkships the year before, can also provide insight into the outcome of the changes. This comparison can act as a gauge of the success of the curriculum reforms.

1.2 Problem Statement

Determining both the students', as well as the teachers', perceptions of whether the students' preparation was adequate for the clinical setting is important in answering the question as to whether the changes made in the clinical teaching curriculum are addressing the issues identified in the HPCSA and QQR reports. Therefore the question asked is: Have these changes had the desired outcome and to what extent have the problems identified by the HPCSA[1] and the Wits QQR[2] been resolved?

1.3 Aim

To explore the changes made to the Wits medical school clinical skills curriculum based on the students' and teachers' perceptions of how well it prepares GEMP II students for their clinical clerkships in GEMP III.

1.4 Research Question

What are the perceptions of the students and clinical teachers of the changes made to the GEMP II clinical skills curriculum in relation to its preparation of students for their clinical clerkships in GEMP III?

1.5 Objectives

- To determine and compare the 2018 GEMP III and IV students' perceptions of the teaching of clinical skills in GEMP II.
- To determine and compare the 2018 GEMP III and IV student's perceptions of their level of preparedness for the application of skills (specifically physical examination, history taking and procedural skills) in their clinical clerkship in GEMP III.
- To determine and compare the perceptions of the GEMP III and IV students of how well the clinical methods bedside teaching and the HPD prepared them respectively for application of skills in their clinical clerkship.
- To determine and compare the perceptions of the clinical teachers of the preparedness of the 2017 and 2018 GEMP III students for their clinical clerkships

1.6 Conclusion

This chapter has outlined the background to this study and described its aims and objectives. The need to evaluate the changes made to the Clinical Skills Curriculum has been highlighted. In the next chapter the literature is explored.

CHAPTER TWO

2. Literature Review

2.1 Introduction

The literature was explored to see if there is existing evidence to suggest that the changes made to the curriculum would bring about an improvement in skills learning and its translation to the clinical setting. The search was conducted using PubMed and EBSCO (ERIC) as well as the search engine Google Scholar. Initial search terms were “clinical skills” AND “simulation” AND “theory-practice gap.” This search had very limited results so the term “theory-practice gap” was removed. This revised search yielded mostly literature related to high fidelity simulation training in emergency medicine so the search was rethought and modified. The second search used the terms; “undergraduate” AND “medical education” AND “clinical skills training” which yielded more positive results. Other key words included “small group learning”, “medical curriculum” and “bedside teaching”. This combined with some pearl growing techniques[5] resulted in a wide array of literature exploring the teaching and learning of clinical skills as well as the design of undergraduate medical curricula to prepare students for the practise of clinical medicine. This literature was explored for what the evidence suggests are the best strategies for preparing students for the clinical setting and bridging the theory-practice gap between medical school and hospital-based learning; to see whether these align with the changes made to the Wits clinical skills curriculum and if these changes are likely to bring about the results hoped for in rectifying the deficiencies identified by the HPCSA and Wits QQR.

2.2 Review of the Literature

In a paper called 'The Utility of Simulation in Medical Education: What is the Evidence?'[6] Okuda, *et al*, explore the literature on the use of simulation in undergraduate medical education.[6] They found that, in keeping with the findings of the Wits curriculum review, many students feel inadequately trained in "history taking, physical examination, diagnosis and management."[6] There is a "small but growing"[6 pg331] body of evidence showing that simulation can bridge the gap between pre-clinical knowledge and the care of real patients during the clinical clerkship and is an effective means for teaching physical examination and skills.[6] They found that simulations lead to improvements in medical knowledge, performance of procedures, was an effective tool for teaching teamwork and communication and was a reliable tool for assessing learners.[6] It also allowed the students to identify their own knowledge gaps and learn skills in a way that more accurately reflects the clinical experience. Simulation allows for deliberate practice without patients or students being put at risk, as it is "predictable, consistent, standardised, safe and reproducible,"[6 pg331] a variety of patient problems and critical events can be demonstrated and students can experiment, make mistakes and experience bad outcomes.[6] They can learn to solve problems, build on prior knowledge, and act as adult, active, self-directed learners.[6] The critical aspect of the success of simulation is specific, informative feedback and debriefing.[6] Simulation not only "increases the likelihood of a minimum competency level prior to clinical interaction and medical decision making"[6 pg339] but also makes patients more willing to have procedures performed on them by students.[6] The paper did identify that more studies are needed to determine whether simulation training improves outcomes.[6]

Supporting Difficult Transitions

The transition from the medical school based medical curriculum to the hospital based curriculum requires taking on new roles and responsibilities, adaptation to new cultures, changes in behaviour and the management of uncertainty, all of which pose a significant challenge to the student. These factors may result in student stress and unpreparedness and puts patient safety as risk.[7] Cleland *et al*[7] identify simulation based education as a pedagogic approach that can increase preparedness for practice and support difficult transitions within a medical career.

Deliberate, hands on practice in a safe environment that doesn't put patients at risk, with clear outcomes and timeous feedback allows for skills and behaviours to be learnt that make the transition to the clinical setting much easier and facilitates theoretical knowledge to be transferred to the clinical context.[7] Simulation based education can help improve confidence, clinical reasoning, technical and non-technical skills and patient outcomes.[7]

Integration of Learning Opportunities

The literature provides numerous strategies for optimising and improving both simulated clinical skills teaching and hospital based bedside clinical skills teaching. Importantly the literature recognises the importance of having both in an integrated curriculum.[8] Teaching through simulation has been shown to be an effective means for teaching clinical skills.[9,10] Remmen *et al* found that a longitudinal skills training programme that is an integral part of the curriculum and that starts early and runs through the pre-clinical period offers the students a superior preparation for clinical clerkship.[9] Junger *et al* also found that curriculum reform that promoted clinical skills within the curriculum leads to improved performance of history taking and physical examination.[11] It is important to recognise that simulated skills training is an adjunct to and cannot replace real patient interaction in the clinical setting.[12] Integrating both allows for standardisation and deliberate practice in a mistake forgiving environment in the clinical skills unit followed and augmented by application and experience of patient interaction in the clinical setting.

Teteris *et al* emphasise the importance of students being exposed to learning environments of increasing fidelity to allow for transfer of skills to a clinical setting.[10] Cognitive load theory recognises that students have a limited working memory and an unlimited long term memory.[13] Highly complex learning tasks can overload the students' working memory and inhibit learning.[13] Knowledge stored in long term memory, however, can be used to decrease the load of a particular task, allowing for more complicated concepts to be managed.[13] This is achieved by gradually increasing the fidelity and complexity of tasks while decreasing the amount of support.[13] Therefore, progressing from lower fidelity, supervised simulation before interacting with real patients in the clinical setting allows the student to use skills that have been stored in long term memory to manage the complex and emotionally

taxing load of the real life setting without becoming overwhelmed.[13] Cleland *et al*[7] identify simulation based education as having the potential to store knowledge and skills in long term memory that can be drawn on when required, freeing working memory to process new, unknown, unexpected challenges and situations presented by the transition to the new clinical context.[7]

Ramani also identified the need for a longitudinal and systematic curriculum in teaching physical examination skills.[8] Further, she suggests integrating simulation and bedside teaching to improve learning, increasing bedside teaching, systematically assessing clinical skills to drive learning and elevating the importance of clinical skills within the curriculum.[8]

Remmen *et al* showed, in two separate studies, that medical schools cannot rely on clinical clerkships alone to provide adequate clinical skills training, as due to the unstandardized and unpredictable nature of the clinical setting not all of the students got the opportunity to sufficiently practise the skills required.[14,15] A more systematic attention to clinical skills is required and this results in more skills being performed.[14,15] Lund *et al* showed that simulated clinical skills on models (IV cannulation) allowed for transfer of skills and professionalism into the clinical setting and found that they were actually faster, more accurate and professional than those taught at the bedside.[16] They attributed this to the opportunity for deliberate practice under safe, mistake-forgiving conditions, in structured and standardised sessions with feedback.[16]

Strategies to Improve Learning

De Boulay *et al*, in their review of clinical skills current practice, suggest that clinical skills need to be integral and relevant to the curriculum. The sessions must be structured, well supervised and safe.[12] There must be an emphasis on teamwork and clear objectives. Student competence must be evaluated on an ongoing basis with regular, structured feedback. Importantly there must be staff development in order to develop expert supervisors.[12]

Bugaj *et al*, in their review of practical clinical training in skills labs, identified similar key efficiency factors.[17] In addition they highlighted clearly defined outcomes and a controlled environment allowing for repeated practice, where mistakes can be made without fear of adverse outcomes. The simulation must reflect the real life working

environment as closely as possible and the sessions must be well planned and prepared. There needs to be direct feedback during the sessions and outcomes must be assessed in a standardised and clearly defined way, as assessment will drive the learning.[17] Herman-Werner *et al* identify feedback and reflection as the key to learning. This allows for superior immediate and long-term retention of skills.[18]

Motola *et al* report that determining outcomes and integrating into the curriculum, providing feedback guided by individual learning needs and providing a controlled environment with opportunities for deliberate practice and assessment are the key elements of simulation based clinical skills teaching with the results of improved skills and skill retention.[19] These are echoed in a review of simulation based medical education by McGaghie *et al*, where feedback and debriefing, deliberate practice with well-defined objectives, curriculum integration, reliable assessment of outcomes with high stakes testing, teamwork and authenticity of the simulation to the context of future practice were identified as the most important factors for learning clinical skills.[20] Brauer *et al* suggest that a curriculum that horizontally integrates the foundation or basic sciences as well as vertically integrating these with the clinical or applied sciences allows the student to organise the knowledge and skills in the way, and in the context, in which it will actually be used. This enables meaningful learning that enhances long-term retention of knowledge, deeper understanding and the development of skills.[21] Harden suggests that this integration of knowledge will encourage the learning of application of knowledge, rather than just recall.[22]

Biggs' concept of Cognitive Alignment argues that the outcomes, content, teaching, learning and assessment of the curriculum need to align, so what is taught, how it is taught and how it is assessed matches the expressed outcomes and sends a message to the students about what is considered valuable.[23,24]

Townsend *et al* describe the OSCE as a valid and reliable instrument for assessing clinical skills in an integrated manner.[25] They also show that formative OSCEs are a powerful tool for encouraging learning and allow for deficiencies to be identified and corrected.[25]

The Role of the Tutor

In discussing the approach to clinical skills teaching at the University of Washington, Goldstein *et al* emphasise the need for a team of teachers fully invested in the

curriculum and dedicated to developing clinical skills.[26] The teachers need to act as facilitators, role-models and mentors to the students in a personalised experience with close monitoring and continuity of learning.[26] Harden *et al* further highlight the role of the teacher as a mentor and role model.[27] Clinical skills tutors need to act as facilitators encouraging student centred learning, not acting as an information provider but rather allowing the student to take responsibility for their own learning, giving them more freedom for self-directed learning. Importantly sufficient numbers of staff must be made available to implement the curriculum in this way.[27]

Small Group Learning

Tolsgaard highlights the benefit of student centred learning, showing that peer-teaching is effective for skill learning and that collaborative learning in pairs or groups allows students to perform better.[28] The value of collaborative learning is further emphasised by Tolsgaard in another study of dyad training, showing improved patient encounter skills.[29] Zeng et al found that team based learning, when guided by a facilitator, improved interest, self-directed learning, collaboration, teamwork skills and knowledge.[30]

Jacques suggests that small group learning has the potential to help students negotiate meanings, resolve misconceptions, learn from peers, allows them to express themselves in the language of the subject, apply knowledge, solve problems and to monitor their own learning.[31] In a study by Steinert, students identify "tutor characteristics, a non-threatening group atmosphere, clinical relevance and integration and pedagogical materials that encourage independent thinking and problem solving"[32 pg286] as the most important characteristics of effective small group facilitation.[32]

In his 'social learning theory', Bandura states that learning is dependent on relationships and interpersonal interaction. Learning takes place through modelling behaviours and attitudes on those who are part of the culture.[33] Vygotsky recognises that the student develops their identity within the discipline within the 'zone of proximal development', through discourse with, and support and guidance from, a more knowledgeable other.[34] Spouse identifies the nature of the support and guidance received from an approachable mentor, who embraces the desired culture of the discipline, encourages open discourse and develops respectful relationships,

as the most important factor influencing the development of professional knowledge.[34] All of the above highlight the importance of a knowledgeable group facilitator who is an exemplary role model who encourages open interaction between them and the students.

Barradell recognises the importance of making the tacit knowledge of the experts in the field explicit for the students, and the valuable role small group learning has in this regard.[35] The best way to achieve this goal of making knowledge explicit for the students is to identify what Middendorf and Pace term 'bottlenecks' that are preventing the students from reaching understanding.[36] The way to do this is to have open discourse in a small group that has a climate that encourages dialogue; allowing the student to make the expert aware of what, for them, is unclear or difficult to comprehend.[36] The facilitators must use what Bernstein calls 'elaborated language codes', which does not assume taken for granted knowledge and allows the student to enter the discourse and successfully develop their identity within the discipline in the small group setting.[37,38,39]

Student Perceptions

Looking into student's perceptions of clinical skills training Weller found that students valued simulation based learning highly, allowing them to apply theory in a safe and realistic setting and develop problem solving and teamwork skills.[40] Martens *et al* found that students value interpersonal and communication skills most highly in their teachers, especially their enthusiasm and ability to remediate students when they make mistakes.[41] Das *et al*, evaluating the views of senior clerks and interns on the use of simulation, models and mannequins to teach clinical skills, found this prior training to be very helpful.[42] Eyal and Cohen, in a study reviewing the medical students' and graduates' perceptions of their medical school curriculum, found that significant numbers of students reported not being equipped with the competencies they needed for the clinical setting and that they were not taught sufficient clinical skills, highlighting the need for a comprehensive and standardised clinical skills curriculum.[43] When Remmen *et al* used focus groups to evaluate clinical skills teaching, students identified the need for clear objectives that were well aligned with what would be required of them in their clerkships as well as regular constructive feedback.[44]

Bedside Teaching

With regards to bedside teaching Peters and ten Cate found that bedside teaching improved diagnostic skills, providing a holistic approach to the diagnostic process through history taking and physical examination skills.[45] The bedside provides an opportunity to integrate and improve skills. The bedside is also an opportunity to teach professionalism, decision making, clinical reasoning, problem solving, communication skills and ethics.[45] Ramani recommends good communication with clinical teachers about the curriculum, outcomes and the competency level of the students to make bedside teaching successful.[46] The sessions must be learner centred and well planned with clear objectives and expectations. The teacher must act as a role model, especially in teaching professionalism. They must learn to make use of teachable moments and provide gentle remediation of mistakes. They must also dispel the misconception that patients generally don't enjoy bedside teaching as this has been found not to be the case,[46] a finding supported by Peters and ten Cate who found that patients, students and teachers favour bedside teaching.[45]

Spouse describes how important it is that the students develop the culture, values, tacit knowledge and language of the discipline within the clinical context.[34] According to Bernstein, it is essential that students develop not only the "knowledge code"[47 pg46] being the "explicit principles, skills and procedures"[47 pg46] of the discipline but also the "knower code"[47 pg46] the "attitudes, aptitudes and dispositions."[47 pg46] The clinical setting allows the students to learn the specialised cultural practices of the medical discipline; the language (what Bernstein calls the "vertical discourse"[47 pg46]), values and system of meaning that allow them to become legitimate members of, and participate in, the discipline; to develop a sense of 'being' in the field.[48,49] It is more important who the students 'become' rather than what they know.[49] Lave and Wenger's situated learning theory suggests that time in an authentic clinical context under the guidance of an experienced practitioner allows for legitimate peripheral participation within the community of practise.[50] Students progress from the periphery to increasing participation as they negotiate their identity and practice the behaviours of the discipline, with regular constructive feedback and the encouragement of reflective practise.[50]

2.3 Conclusion

There is evidence in the literature to support all the changes that have been made to the clinical skills curriculum, in particular the teaching and learning strategies that have been employed in the new curriculum in the attempt to improve the student's challenging transition to clinical clerkships and decrease the theory-practice gap that has been identified. The use of simulation and deliberate practice to ease the transition to the clinical setting, small group teaching strategies that employ an understanding of socio-cultural theories of learning, encouraging discourse and feedback and integration of simulation and bedside teaching informed by cognitive load theory are all strategies used in the new curriculum that are supported by the literature. The literature not only identifies the strategies to improve clinical skills learning but also highlights that the execution of these strategies is critical. While the evidence suggests that the changes should help in addressing the issues identified by the HPCSA and Wits QQR none of the research used in this literature review, was conducted in the South African medical education context. The South African context provides unique challenges, including; financial constraints, limited resources, a need for generalist, primary care over specialist training and a demand for doctors who can provide care in rural areas and meet the burden of the HIV epidemic.[51] Limited human resources, particularly of academic staff who have to meet a high clinical burden and still find time for teaching, is a major constraint.[51] Our student group is diverse and comes from a wide range of educational backgrounds including many underprivileged and previously disadvantaged students.[51] It is imperative, therefore, to determine whether the changes made have actually had the desired outcome in the Wits Medical School context.

CHAPTER THREE

3. Methodology

3.1 Introduction

The aim of this research was to explore the changes made to the Wits medical school clinical skills curriculum based on the students' and teachers' perceptions of how well it prepares GEMP II students for their clinical clerkships in GEMP III.

In order to gather data on the perceptions of the large group of students and teachers in the curriculum, in relation to its preparation of students for the transition to the clinical setting, the dominantly quantitative paradigm of a mixed methods approach was used.[52] This was in order to allow numerical data to be ascertained that can be used to test the relationship between the two variables; the students taught under the old and new curricula. This comparison was made in order to see if there was statistical evidence to answer the question of whether the changes have resulted in a perception of better preparation of the students for their clinical rotations and whether the concerns of the HPCSA and Wits QQR have been addressed or not.

3.2 Theoretical Framework

The framework used as a guideline in developing the objectives is the Kirkpatrick Four-Level Model of Evaluation.[53] Kirkpatrick and Kirkpatrick, in the New World Kirkpatrick Model, advocate using only those levels which are important, useful and evaluable in the context for any curriculum evaluation.[54] As the aim of the study is to explore the changes made to the Wits medical school curriculum based on the students' and teachers' perceptions Kirkpatrick levels one and three were applied. Level one is Reactions; an assessment of the learner's reactions and attitudes towards the learning experience.[53] This will be assessed by evaluating the students' perceptions of the curriculum and how well it prepared them for the expectations of the clinical setting. Level three is Behaviour; determining whether skills have transferred to the setting for which they are being trained. This will be assessed by evaluating the teachers' perceptions of the behaviour of the students in the clinical setting, whether they perceive the students' skills have successfully transferred to real life practice with actual patients.[53] Level two (Learning) was not used as this

requires measurement of specific learning outcomes rather than exploring perceptions and this did not fall within the aim or scope of this research.[53] Level four (Results) was not used as this requires analysis of the final results of the teaching and the students were still engaged in their studies at the time of the research.[53]

3.3 Positionality of the Researcher

The researcher is an associate clinical lecturer at the University of the Witwatersrand Medical School, teaching clinical skills to the GEMP I and II students in the revised clinical skills curriculum.

The data were gathered in the GEMP III and IV years of study during which time he had no part in the facilitation, teaching or assessment of the students, nor will he have for the remainder of their studies.

3.4 Research Design

3.4.1 Study Design

The study is an exploratory sequential mixed methods study.[52]

A suitable, validated quantitative tool could not be found. Therefore, one was developed by the researcher for the purpose of gathering data about the students' and teachers' perceptions of the clinical skills curriculum's preparation of them for their clinical clerkships. This required an exploratory approach in order to use early phases of the mixed methods study to inform the research design and data collection tool to be used in the second phase.

The first phase of the exploratory mixed methods study was a narrative qualitative study. An open ended question was used to identify the themes, ideas, concerns and perceptions of the students. These were used to inform the development of a tool for the collection of the quantitative data in the second phase of the mixed methods study that accurately measure these constructs while exploring the research question.

The second phase of the exploratory mixed methods study then used this newly developed tool – a questionnaire based on the research question and the data from

the qualitative phase, to collect quantitative data that were used to compare the two variables (the two student cohorts taught under the different curricula) and in so doing explore the perceptions of the changes made to the clinical skills curriculum. This is represented based on Creswell's notation in mixed methods research as follows:

Qual → QUANT → Interpretation[52]

Phase One

Phase one was a narrative qualitative study. A single open ended question was used to determine the students' perceptions of the GEMP II Clinical Skills Curriculum's preparation of them for their clinical rotations in GEMP III. Phase One included only the students due to the limited numbers of teachers available to take part in both phases of the study. This open-ended question allowed narrative data to be collected; the student's personal stories and experiences of the clinical setting after having begun their clinical clerkships and experiencing the expectations and demands of learning in the clinical setting and how they felt the medical school based clinical skills curriculum prepared them for that experience.[55]

Phase Two

Phase two was a cross-sectional, comparative, quantitative study. Two preliminary questionnaires were developed for Phase Two (one for students and one for teachers), based on the objectives of the study, the literature review and the researcher's experiences of teaching in the programme. The qualitative analysis of the narrative data from the open-ended question in Phase One allowed for commonalities to be identified and grouped into dominant categories that informed the modification of the Phase Two questionnaires to best reflect the students' ideas, concerns and expectations. This process included assessing the relevance and value of the questions already included in the questionnaire and the inclusion of additional questions that measured the constructs identified as the dominant categories.

Observational, descriptive data were collected from the entire population at a specific point in time.[55] This quantitative, numerical data were collected through the use of Likert Scale type questions and were used, for both the students and teachers, to compare two variables; the students taught under the old and new clinical skills curricula.

3.4.2 Setting

The setting for the research was the Unit for Undergraduate Education (UUME) at the Wits University Medical School. UUME co-ordinates the undergraduate medical degree within the School of Clinical Medicine that falls under the Faculty of Health Sciences at the University of the Witwatersrand. The Bachelor of Medicine and Bachelor of Surgery (MBBCh) degree is a 6 year degree. The students either enter as school leavers into the first year of the degree or enter into the third year as part of a Graduate Entry Medical Programme (GEMP). The third to sixth years of the degree are then referred to as GEMP I – IV. GEMP I and II are medical school, lecture based years and GEMP III and IV are hospital based clinical years. The Clinical Skills Curriculum is implemented in the GEMP I and II years in preparation for the clinical GEMP III and IV years. In 2018 there were 379 GEMP I students, 325 GEMP II students, 319 GEMP III students and 311 GEMP IV students.

3.4.3 Variables

The two major cohorts being compared are those who were taught under the old clinical skills curriculum with HPD in 2016 (GEMP IV) and those taught under the new curriculum and the clinical methods programme in 2017 (GEMP III). The perceptions of the students themselves in each of the two cohorts, as well as the teachers' perceptions of the two cohorts were compared. Other variables are the perceptions of preparation for the three major skills outcomes; physical examination, history taking and clinical procedures.

3.5 Materials and Methods

3.5.1 Data collection tool

Phase One

The phase one data collection tool was a single question, free text response questionnaire. The question was: What is your perception of the GEMP II Clinical Skills Curriculum's preparation for your clinical rotations in GEMP III?
(Appendix - F)

Phase Two

The data collection tool for phase two of the explorative mixed methods study was a self-developed questionnaire using 5-point Likert scale type questions and one free text response question. Two separate questionnaires were developed in order to collect data from both students (GEMP III and IV) and teachers respectively.

Likert scale type questions were chosen as the research aims to explore the perceptions of the students and teachers and Likert scale type questions allow for the viewpoints of respondents to be explored.[55,56] A 5-point scale was chosen to allow for enough choice while keeping them manageable for the respondents.[55] The Likert scale questions had five options (strongly disagree, disagree, neutral/undecided, agree, strongly agree) which were assigned values of 1-5 to allow for numerical analysis of the data.

Two preliminary questionnaires were developed, one for the students and one for the teachers. The student questionnaire had 13 Likert scale type questions and the teacher questionnaire had 15 Likert scale type questions. These questions were formulated based on the research question: What are the perceptions of the students and clinical teachers of the changes made to the GEMP II clinical skills curriculum in relation to its preparation of students for their clinical clerkships in GEMP III? The

development of the questions was further based on the study objectives outlined in Chapter One; determining and comparing the 2018 GEMP III and IV students' perceptions of the teaching of clinical skills in GEMP II, their preparedness for the application of skills (physical examination, history taking and procedural skills) in their clinical clerkship as well as how the clinical methods bedside teaching or the HPD prepared them for the real life clinical setting. The fourth objective was to determine and compare the perceptions of the clinical teachers of the preparedness of the 2017 and 2018 GEMP III students for their clinical clerkships. The questionnaires were further informed by the literature review and the researcher's experiences of teaching in the programme.

The questions in the student questionnaire asked the students' perceptions of; their preparation for application of clinical skills in the clinical setting, the difficulty of the transition to GEMP III, their ability to meet the expectations of GEMP III, their confidence in performing skills on real patients, their ability to transfer skills learnt on simulated patients and mannequins to real patients, their preparation to perform each of the three major skill categories (physical examination, history taking and clinical procedures) as well as their perceptions of how well the clinical methods or HPD respectively prepared them for their clinical rotations.

The teachers' questionnaire asked about each cohort separately, asking for perceptions of the 2018 GEMP III students and then of the 2017 GEMP III at the same point the year before. The questionnaire explored the teacher's perceptions of the students' preparation to apply clinical skills in the clinical setting, how difficult the transition from GEMP II to GEMP III was, if they were equipped with the skills needed to meet the expectations of their clinical rotations, their confidence in performing skills on real patients and their preparation for the performance of physical examination, history taking and procedural skills. A final question asked them to compare the preparedness of the two cohorts.

These two tools were then modified based on the qualitative data analysis from Phase One. (For the data analysis of phase one see Chapter 4, 4.1 Phase One).

The analysis of the qualitative Phase One data resulted in the retention of all 13 of the questions in the original student questionnaire and all 15 questions in the teacher questionnaire, as they all remained relevant to the students and teacher's perceptions. Three additional questions were added to the student questionnaires that were identified through the categories that emerged as described in Chapter Four. The questions explored the Clinical Skills curriculum's preparation of students to identify real clinical findings in patients with pathology, the adequacy of the resources available for learning clinical skills and the adequacy of the number of clinical lecturers available for teaching Clinical Skills.

In addition one open ended question was added to each questionnaire to allow for the expression of other comments, explanations or information about their perception of the GEMP II Clinical Skills Curriculum's preparation for their clinical rotations in GEMP III. This was in response to the rich data received in the qualitative Phase One of this research and the potential insights into the changes made to the clinical skills curriculum that qualitative data could provide.

The result of this exploratory approach was a student questionnaire with 16 Likert scale type questions and one open ended question.
(Appendix G)

The teacher questionnaire was finalised with 15 Likert scale type questions; 7 based on the 2018 GEMP III students and 7 on the 2017 GEMP III students (the GEMP IV students at the time of the study), one comparing the two groups and one open ended question.
(Appendix H)

3.6 Pilot Study

This questionnaire was piloted on the target population of the study. The student questionnaire was sent to 20 students from GEMP III and 20 from GEMP IV of varying gender and ethnicity using systematic sampling of every 15th student on an alphabetised class list. A research database with these 40 students was created using the REDCap (Version 8.4.5) tool and the questionnaire was made available

online. A link to the questionnaire was emailed to the students in the database with an introduction explaining the purpose of the study, ensuring confidentiality and requesting them to take part in the voluntary study. The data were then captured using the REDCap tool and exported for analysis - the data were first received by a neutral third party and then sent to the researcher to assure anonymity of the research participants. The pilot study was used to determine if there were any flaws with the data collection tool or any problems with the data collection process before sending the survey out to the whole target population. A total of 16 responses were received from both GEMP III and IV students (40% response rate). There were no problems or errors detected with the administration of the questionnaire or the collection of the data. No changes were made to the data collection tool.

3.7 Population

The study population was the undergraduate medical students at the University of the Witwatersrand and all the clinical staff on the Johannesburg academic medical circuit. The target population was the entire GEMP III and IV undergraduate medical student class and all the clinical staff (specialists, registrars and medical officers) who have been involved in teaching the GEMP III and IV medical students.

According to UUME in 2018 the GEMP III medical student class size was 319 students and the GEMP IV class size was 311 students at the time of data collection.

The number of clinical teachers involved in the GEMP III and IV clinical clerkships was estimated at 200. This number is not exact as the teaching role in the clinical setting is provided by joint appointed staff, including consultants and registrars, as well as medical officers whose involvement may vary and is dependent on their current clinical commitments, clinical rotation, availability and location. This number is an estimate provided by UUME.

3.8 Sampling

Phase One

For the qualitative Phase One of the exploratory mixed methods study a sample of 30 GEMP III and 30 GEMP IV students was selected to allow for a representative sample that could be analysed within the time limitations. Systematic sampling was used; every tenth GEMP III and every tenth GEMP IV student according to the

alphabetised class list was sent the open ended question resulting in a total of 62 students being included.

Phase Two

The questionnaire was distributed to a sample of the target population, subtracting only those used in the pilot study. The students sampled for the pilot study were removed from the class list prior to entry of the list into the Redcap database. This meant that 40 students were subtracted from the total of 630 resulting in 590 students being included in the study. Due to the heterogeneity of the diverse student group, as well as for accuracy of the statistical analysis a sample that was as large as possible was required[55]. For a confidence level of 95% and a confidence interval of 5, a minimum of 233 responses from the whole student group of 590 (response rate of 39%) was needed according to a sample size formula from Creative Research Systems[57]. According to the same formula 168 responses for GEMP III (response rate of 56%) and 166 from GEMP IV (response rate 57%) would be needed to meet the same criteria. A response of at least 132 from the teachers was needed based on the 200 staff number estimate.[57] While this study aimed for these sample sizes, Nulty[64] acknowledges that achieving high response rates for online surveys is very difficult.[64] In a study he found the average response rate for online surveys to be 33%[64], which is lower than all of the desired response rates suggested above. Keeping in mind the reality of the expected low response rates for online surveys he suggests a "best possible scenario"[64 p309] where more liberal conditions are set for an adequate response rate; a 10% sampling error and an 80% confidence level.[64] Table 3.1 below depicts the sample populations used in each phase of the study with a summary of the mixed methods methodology used.

Table 3.1 Methodology Summary Table

Phase	Methodology	Data Collection Tool	GEMP III Sample Population	GEMP IV Sample Population	Teachers Sample Population
One	Qualitative	Single question, free text response questionnaire	30	30	
Two	Quantitative	Self-developed questionnaire using 5-point Likert scale type questions and one free text response question	299	291	200

3.9 Ethical Considerations

This research was approved unconditionally by the Human Research Ethics Council (HREC) at the University of Witwatersrand. (Received on 27 October 2017.) Clearance Certificate Number: M171052 (Appendix B)

The study was approved by the Deputy Registrar of the university. (Received on 12 October 2017) (Appendix C)

The research proposal was approved by Faculty Registrar in the Graduate Studies Office of the Faculty of Health Sciences. (Approval of Title received on 26 October 2017) (Appendix E)

Permission to conduct the research was also attained from the Director of UUME, Professor S Schoeman, and the Assistant Dean of the Faculty of Health Sciences (Appendix D)

3.10 Data Collection

Phase One

A research database was created using the REDCap (Version 8.4.5) tool and the link to the free text question was made available online. The link to this was emailed to every 10th student on the alphabetised GEMP I and II class list with a reminder every 3 days. A two week time limit was allowed for the collection of data due to time constraints. The data were then captured using the REDCap tool and exported for analysis - the data were first received by a neutral third party and then sent to the researcher. This information was used to modify the questionnaire to be used in the quantitative phase (Phase Two). The purpose of the qualitative phase (Phase One) was to modify the questionnaire in order to best reflect and respond to the themes, ideas, concerns and perceptions of the students and accurately measure these constructs. The students from this phase of the exploratory mixed methods study were not excluded from Phase Two to maximise the sample for the quantitative Phase Two.

Phase Two

Two separate research databases (one for the student survey and one for the teacher survey) were created using the REDCap (Version 8.4.5) tool and the questionnaires were made available online. A link to the questionnaire was then emailed to all of the students (excluding those included in the pilot study) from the class list provided by UUME using the university email addresses with a weekly reminder. The link was emailed to the clinical teachers using the established UUME communication channels; the email was sent to the heads of the clinical departments for dissemination to all the staff involved in GEMP III and IV teaching and facilitation. The data were then captured using the REDCap tool and exported for analysis - the data were first received by a neutral third party and then sent to the researcher to assure the anonymity of the research participants. The data were collected during the first to the fourth clinical rotations for the GEMP III and GEMP IV students at the start of 2018. This was to allow time for the students and teachers to make an accurate assessment of their preparedness for the demands of the clinical setting. Data were collected for 80 days from the distribution of the questionnaire to allow for maximum opportunity for responses within the time constraints of the study.

3.11 Data Analysis

Phase One

A qualitative data analysis approach was used on the free text narrative data, using an inductive and iterative approach looking for patterns, similarities and differences in the texts.[58] This allowed the data to be coded into meaningful segments and then into frequent, dominant and significant categories for interpretation into findings and conclusions. The data were co-coded with a researcher with qualitative research experience. These categories were used to inform the modification of the questionnaire for Phase Two.

Phase Two

Statistica Version 13.3 was used in the statistical analysis of the quantitative data.

Descriptive statistics were used to analyse and present the data of the closed-ended questions. The response rates from each of the two student cohorts as a percentage as well as the total number of respondents from each cohort were described. Descriptive statistics were also used to describe the response rate and number of responses of the teachers and departments they were from. The Likert scale questions had five options (strongly disagree, disagree, neutral/undecided, agree, strongly agree) which were assigned values of 1-5 to allow for numerical analysis. Question 2 (The transition from GEMP II to GEMP III was very difficult) was negatively phrased so the scoring of the items was reversed. The data collected by the questionnaire were analysed using both ordinal and categorical methods. The data were considered ordinal rather than continuous as although the categories have rank order the distances between them cannot be presumed to be equal.[59]

The means and medians for each question were calculated. Comparisons were drawn between the perceptions of the two student cohorts (for both clinical skills curriculum and clinical methods/HPD) and between the teachers' perceptions of the two different student cohorts. The standard deviation of the data was calculated for each cohort for each question. p values were used to assess whether the ordinal data were normally distributed and parametric using the Shapiro-Wilk test. The data were presented using frequency tables.

The data from the student questionnaire were treated as ordinal with support from analysis of the categorical data. The data from the teacher questionnaire were analysed as categorical, looking for patterns and trends using frequency and contingency tables as each student cohort was asked about separately. Pearson Chi-square tests were used to compare the two variables.

Inferences were made from the ordinal student data using non-parametric statistical tests; Mann-Whitney U tests were used to compare the two cohorts.

The free text narrative data from the one open-ended question was analysed using a qualitative data analysis approach.[58] An inductive and iterative approach looking for patterns, similarities and differences in the texts. This allowed the data to be coded into meaningful segments and then categorised into frequent, dominant and significant categories for interpretation into findings and conclusions. The data were co-coded by a researcher with qualitative research experience.

3.12 Limitations

As they were in the second year of their clinical clerkships at the time of data collection the perception of the GEMP IV students of how well prepared they were at the start of their clerkships the year before may be affected by how much time had passed. Their perceptions may also have been affected by the experiences they had already had since then in the clinical setting, having completed more than half of their clerkships. This may limit the comparison between the two years.

The clinical teachers were asked to compare their perceptions of the GEMP III students with their perceptions of the GEMP IV students when they were at the same point the year before. The reliance on memory and the time that had passed may limit the comparison. Clarke *et al*[60] suggest that "it has been widely recognised that there is an inverse relationship between the length of time over which subjects are asked to recall prior use and the accuracy of the reported estimates"[60 pg1275] and "the longer the period of recall the greater the likelihood of error."[60 pg1275]

Due to the timing of the research the students in GEMP III had only completed two, three or four of their clinical rotations and had to evaluate their perceptions of their preparedness for their clinical clerkship based only on those rotations.

The response rate on the questionnaire was limited by the reliance on responses to email and the limited time available for data collection. The teacher questionnaire relied on a chain of communication from the department heads in order to be distributed, which may have limited the response.

3.13 Conclusion

This chapter has detailed the theoretical framework for the study methods as well as the study design, the variables being studied, the development of the data collection tools, the target population and sampling process. The data collection process data analysis methods have been described. The results of the study will be presented in Chapter Four.

CHAPTER FOUR

4. Results

4.1 Introduction

This chapter presents the results of Phase One and Phase Two of the study. The results are presented separately for each of the two phases. The Phase Two results are further separated, the quantitative results are presented for each sample separately (students and teachers) followed by the results from the open-ended questions. The results from the open ended questions are presented for the two samples separately followed by the results of the combined narrative data.

4.2 Phase One

4.2.1 Introduction

Phase One made use of a single open-ended question. The question asked was ‘What is your perception of the GEMP II Clinical Skills Curriculum’s preparation for your clinical rotations in GEMP III?’ The purpose of this open-ended question was to obtain narrative responses that contributed to the modification of the questionnaire used in Phase Two, in order to best reflect the concerns and perceptions of the students and accurately measure these constructs.

4.2.2 Findings

Forty students were invited to respond to the open-ended question and a total of 28 responded, giving a response rate of 45%.

An inductive and iterative approach was used to look for patterns, similarities and differences in the narrative texts. This allowed the data to be coded into meaningful segments and then into frequent, dominant and significant categories for interpretation into findings and conclusions

Detection of Pathology

Three categories emerged from the data. The first category to emerge was that the students felt under-prepared to detect actual pathology in real patients in the clinical setting in their clinical clerkships. They indicated that having learnt skills on healthy simulated patients and on models they struggled to confidently detect clinical signs and abnormalities, making the transfer to the clinical setting quite difficult. Once they had identified some clinical signs they also felt ill-equipped to interpret these findings, correlate the signs and symptoms and derive some sort of clinical meaning from those signs. The terms “pathology” and “meaning” were two of the most commonly identified, particularly amongst the GEMP IVs who felt under prepared to detect actual pathology with the skills they had been taught and to interpret its clinical meaning and significance. One student described lacking the “ability to pick up signs and connect them to a meaning” and another being able to “identify abnormalities and interpret them accordingly.” There was a theme of knowing how to perform the skills but not knowing enough of why it was being done, why it was important and what they were looking for, needing more knowledge around the skill to make it more meaningful.

Insufficient Exposure to Real Patients

The second category, which was closely related to the first, was that they felt that they had had insufficient exposure to real patients in their preparation for their clinical clerkships. They felt that it was a different challenge performing the skills on real patients; particularly psychologically when it comes to very “sick” patients and developing the “human element” of the patient interaction. Some students highlighted the difficulty in transferring skills they had learnt on simulated patients and models to real patients. They identified the importance of actually seeing clinical signs early in a setting where they could receive feedback on their findings in order to make what they had learnt more meaningful. They indicated that being able to interact with real patients would allow them to attach relevance to what they had been taught; they needed to be given the opportunity to apply their learning sooner in the real life clinical setting to become comfortable with examining real patients and to make the transfer to their clinical years easier.

Insufficient Resources

Another category related to student numbers, with students outnumbering the teachers, which prevented the students from getting “hands on” experience with the skill and being able to perform the skill with guidance and feedback. They were taught the theory of the skill but did not have the time and opportunity to practise it, especially not while being observed and remediated. Linked to this was a lack of resources, not only of staff, but also models and materials that prevented students from having sufficient opportunity to practise their skills. One student also indicated a need for more time allocation to allow for everyone to get a chance to sufficiently practice the skills.

The interpretation of these findings resulted in the retention of the 13 questions in the original student questionnaire and all 15 questions in the teacher questionnaire, as they all remained relevant to the students’ perceptions. Three additional questions were included in the student questionnaire based on the categories that emerged as described above. The questions were:

‘The clinical skills teaching curriculum prepared me to identify real clinical findings in patients with pathology.’

‘The resources available for learning clinical skills were adequate.’

‘The number of clinical lecturers available for teaching clinical skills was adequate for the number of students.’

In addition one open ended question was added to both questionnaires to allow the students and teachers to express other comments, explanations or information about their perception of the GEMP II Clinical Skills Curriculum’s preparation for the clinical rotations in GEMP III. This was in response to the rich data received in the qualitative Phase One of this research and the potential insights into the changes made to the clinical skills curriculum further qualitative data could provide.

4.3 Phase Two

4.3.1 Introduction

The student and teacher questionnaires formed Phase Two of the exploratory mixed methods study. Phase Two was a cross-sectional, comparative, quantitative study. The questionnaire consisted of 16 closed ended questions for the students and 15 for the teachers using a 5-point Likert Scale and one open ended free text question. The data from the Likert Scale type questions were analysed as ordinal with support from a categorical analysis for the students and categorical for the teachers as each cohort was asked about separately. The narrative data from the open ended free text question were analysed using a qualitative approach.

4.3.2 Students Quantitative Data

Descriptive Statistics

A total of 247 students responded to the questionnaire out of a total of 590, giving a response rate of 42% which met the requirements for a confidence level of 95% and a confidence interval of 5.

Of the respondents 149 were from GEMP III, giving a response rate of 50% for the GEMP III class of 299 students (319 minus 20 from pilot study). From the GEMP IV class 98 students responded for a response rate of 34% from the class of 291 students (311 minus 20 from pilot study). The response rates for phase one and two are represented in Table 4.1 below. While neither of these met the requirements for a confidence level of 95% and a confidence interval of 5 they were still above the average online response rate of 33%[64] and did meet the liberal conditions set for an adequate response rate; a 10% sampling error and an 80% confidence level.[64] A total of 60% of the respondents were from GEMP III and 40% from GEMP IV. The voluntary open-ended question had 97 student responses, giving a completion rate of 39% out of all the students that responded.

Table 4.1 Summary of response rates for Phase Two.

	Sample Population	Number of Respondents	Response Rate (%)
GEMP III	299	149	50
GEMP IV	291	98	34
Total	590	247	42

As data were collected during the first to the fourth rotations of the year, the number of rotations completed by the GEMP III students varied depending on the time of completion. The number of completed rotations is represented in Table 4.2 below. All the GEMP IV students had completed all rotations during GEMP III the year before. One of the GEMP III students reported completing all rotations – this may have been a repeating student or an error. Responses were anonymous, so this cannot be confirmed. The majority of GEMP II students had completed two or three rotations, and all had completed at least one rotation. Due to the system of six-week rotations, and every clinical sub-group starting with a different rotation, each clinical department had had similar numbers of students and was equally represented in the data.

Table 4.2 Number of Completed Rotations from Both Student Groups (n=247)

Frequency Table Number of rotations completed		
Category	n	Percent
1 Rotation	51	20.65
2 Rotations	81	32.79
3 Rotations	13	5.26
4 Rotations	3	1.21
5 All Rotations	99	40.08

A Shapiro-Wilk test was performed for each of the closed-ended questions to assess whether the data were normally distributed. The test was performed on the data for the two groups combined as well as for each group independently for each question. Every question had a p value of less than 0.05 and therefore a confidence interval of 95%. This result indicated that the data were not-normally distributed and therefore non-parametric tests would need to be employed.

Ordinal Data

The means, medians and standard deviation were calculated for every closed-ended question in the questionnaire for the whole target population (Table 4.3) and each cohort individually (Tables 4.4 and 4.5).The means for GEMP III were higher than GEMP IV for every question. The Likert scale questions had five options (strongly disagree, disagree, neutral/undecided, agree, strongly agree) which were assigned values of 1-5 to allow for numerical data for quantitative analysis. For the GEMP III cohort the means for 13 of the 16 questions were above 3 (Table 4.4), indicating a generally more positive view (neutral, agreed or strongly agreed). The three questions that had means lower than 3 were; the difficult transition to GEMP III and the clinical skills curriculum and the clinical methods perceived preparation of students for the performance of procedures in the clinical setting. The students' perceived 'preparation for history taking' had the most positive response with a mean of 4. For the GEMP IV cohort 13 of the 16 responses had means of less than 3 indicating a more negative view of the curriculum (disagree, strongly disagree, neutral) (Table 4.5). Two of the medians were less than 2; indicating a strongly negative view; these were for two questions about the HPD – their preparation of students for the expectations of GEMP III and performing clinical procedures. The three questions that had a mean greater than 3 were the 'ability to transfer skills from simulated to real patients' and their 'preparation for clinical patient examination and history taking'.

Table 4.3 Combined Descriptive Statistics for Each Question Asked

Questions	n	Mean	Median	Standard Deviation
GEMP II preparation for GEMP III	247	3.3	4.0	1.1
Difficult transition	247	2.6	2.0	1.0
Equipped in GEMP II for GEMP III	247	3.2	3.0	1.0
Confidence performing skills on patients	247	3.2	4.0	1.2
Transfer of skills from simulated to real	247	3.6	4.0	1.0
Transfer of skills from mannequins	247	3.0	3.0	1.1
Ability to identify pathology	247	2.8	3.0	1.1
Preparation for history taking	247	3.9	4.0	1.1
Preparation for clinical examination	247	3.5	4.0	1.0
Preparation for performing procedures	247	2.6	2.0	1.1
Sufficient resources	247	3.3	4.0	1.0
Sufficient tutor numbers	247	3.0	3.0	1.2
Clin methods/HPD prep for GEMP III	247	2.7	3.0	1.3
Clin Methods/HPD prep for examination	247	3.1	3.0	1.3
Clin Methods/HPD prep for history	247	2.9	3.0	1.2
Clin Methods/HPD prep for procedures	247	2.3	2.0	1.1

Table 4.4 GEMP III Descriptive Statistics for Each Question Asked

Questions	n	Mean	Median	Standard deviation
GEMP II preparation for GEMP III	149	3.6	4.0	1.0
Difficult transition	149	2.7	3.0	1.0
Equipped in GEMP II for GEMP III	149	3.5	4.0	0.9
Confidence performing skills on patients	149	3.5	4.0	1.1
Transfer of skills from simulated to real	149	3.7	4.0	0.9
Transfer of skills from mannequins	149	3.1	3.0	1.0
Ability to identify pathology	149	3.0	3.0	1.0
Preparation for history taking	149	4.0	4.0	1.1
Preparation for clinical examination	149	3.8	4.0	0.9
Preparation for performing procedures	149	2.9	3.0	1.1
Sufficient resources	149	3.5	4.0	0.9
Sufficient tutor numbers	149	3.3	4.0	1.2
Clin methods/HPD prep for GEMP III	149	3.3	4.0	1.1
Clin Methods/HPD prep for examination	149	3.6	4.0	1.0
Clin Methods/HPD prep for history	149	3.5	4.0	0.9
Clin Methods/HPD prep for procedures	149	2.6	3.0	1.1

Table 4.5 GEMP IV Descriptive Statistics for Each Question Asked

Questions	n	Mean	Median	Standard Deviation
GEMP II preparation for GEMP III	98	2.8	3.0	1.0
Difficult transition	98	2.6	2.0	1.1
Equipped in GEMP II for GEMP III	98	2.7	2.0	1.0
Confidence performing skills on patients	98	2.7	2.0	1.1
Transfer of skills from simulated to real	98	3.3	4.0	1.1
Transfer of skills from mannequins	98	2.9	3.0	1.1
Ability to identify pathology	98	2.4	2.0	1.1
Preparation for history taking	98	3.7	4.0	1.1
Preparation for clinical examination	98	3.1	3.0	1.0
Preparation for performing procedures	98	2.3	2.0	1.1
Sufficient resources	98	2.9	3.0	1.1
Sufficient tutor numbers	98	2.5	2.0	1.2
Clin methods/HPD prep for GEMP III	98	1.9	2.0	1.1
Clin Methods/HPD prep for examination	98	2.4	2.0	1.3
Clin Methods/HPD prep for history	98	2.1	2.0	1.1
Clin Methods/HPD prep for procedures	98	1.9	2.0	1.1

Mann-Whitney U Tests

Due to the fact that the ordinal data were not normally distributed, the non-parametric Mann-Whitney U test was used to compare the responses of the two cohorts for each question to test for significance. The results of the Mann-Whitney U tests for each question appear in Table 4.6 below.

The p values for 14 of the 16 questions were less than 0,05 indicating a 95% confidence interval that the difference between the two cohorts was statistically significant. The only two questions with a p value greater than 0.05, and therefore not having a statistically significant difference between the groups, were the ‘difficulty in the transition to GEMP III from GEMP II’ and the ‘ability to transfer skills learnt on mannequins to real life patients’. The mean for both groups for these two questions was less than 3, showing that both groups had a more negative perception for both these questions.

Table 4.6 Mann-Whitney U Tests

Questions	Mean 1±SD	Mean 2±SD	p	Valid n 1	Valid n 2
GEMP II preparation for GEMP III	3.6±1.0	2.8±1.0	0.0	149	98
Difficult transition	2.7±1.0	2.6±1.1	0.3	149	98
Equipped in GEMP II for GEMP III	3.5±1.0	2.7±1.0	0.0	149	98
Confidence performing skills on patients	3.5±1.1	2.7±1.1	0.0	149	98
Transfer of skills from simulated to real	3.7±0.9	3.3±1.1	0.0	149	98
Transfer of skills from mannequins	3.1±1.0	2.9±1.1	0.1	149	98
Ability to identify pathology	3.0±1.0	2.4±1.1	0.0	149	98
Preparation for history taking	4.0±1.0	3.7±1.1	0.0	149	98
Preparation for clinical examination	3.8±0.9	3.1±1.0	0.0	149	98
Preparation for performing procedures	2.9±1.1	2.3±1.1	0.0	149	98
Sufficient resources	3.5±0.9	2.9±1.0	0.0	149	98
Sufficient tutor numbers	3.3±1.2	2.5±1.2	0.0	149	98
Clin methods/HPD prep for GEMP III	3.3±1.1	1.9±1.1	0.0	149	98
Clin Methods/HPD prep for examination	3.6±1.0	2.4±1.3	0.0	149	98
Clin Methods/HPD prep for history	3.5±0.9	2.1±1.1	0.0	149	98
Clin Methods/HPD prep for procedures	2.6±1.1	1.9±1.1	0.0	149	98

Categorical Data

A summary frequency table was created (Table 4.7) to display the percentages of responses for each of the possible scores (1-5) on the Likert scale for both cohorts for each question. This enabled analysis and comparison of patterns and trends of the two cohorts as well as the p values from the Pearson Chi-square tests.

The GEMP IIIs had consistently higher percentages of responses at the upper end of the scale (neutral, agree, strongly agree) than the GEMP IVs who had higher percentages towards the lower end of the scale (neutral, disagree, strongly disagree). For every question, the GEMP III's had more students scoring higher than the GEMP IIs. The Pearson Chi-square test had a p value of less than 0.05 for all but two of the questions. Only the questions about the 'difficulty of the transition to GEMP III' and the 'ability to transfer skills learnt on mannequins' had p values greater than 0.05; meaning that, for these two, the groups' perceptions were alike.

The GEMP IIIs responses showed that their perceptions of their preparation for; 'application of clinical skills in the clinical setting, their ability to meet the expectations of GEMP III, their confidence in performing skills on real patients, their ability to transfer skills learnt on simulated patients to real patients, preparation of students to identify real clinical findings in patients with pathology, their preparation to perform each of the three major skill categories (physical examination, history taking and clinical procedures), the adequacy of the resources available for learning clinical skills, the adequacy of the number of clinical lecturers available for teaching clinical skills as well as their perceptions of how well the clinical methods or HPD respectively prepared them for their clinical rotations', were all higher than the perceptions of the GEMP IVs with p values less than 0.05, showing that the results were unlikely to be due to chance and there was a significant difference between the responses.

The two questions with p values greater than 0.05 were about the difficulty of the transition to GEMP III and the ability to transfer skills learnt on mannequins. There was no clear difference between the groups for these two questions, both groups had the majority scoring on the lower end of the scale, indicating a disagreement or a strong disagreement with the questions.

Table 4.7 Combined Frequency Table for GEMP III and IV Categorical Data

	GEMP III Likert Scale Score (%) n = 149					GEMP IV Likert Scale Scores (%) n = 98					Chi-square and p	
Question	1	2	3	4	5	1	2	3	4	5	Chi Square	p
GEMP II preparation for GEMP III	5.4	8.7	16.1	59.1	10.7	7.1	38.8	21.4	32.7	0.0	46.1	0.0
Difficult transition	10.7	38.3	25.5	22.8	2.7	14.3	42.9	19.4	20.4	3.1	2.1	0.7
Equipped in GEMP II for GEMP III	10.7	38.3	25.5	22.8	2.7	14.3	42.9	19.4	20.4	3.1	40.6	0.0
Confidence performing skills on patients	6.7	12.8	12.8	55.0	12.8	11.2	41.8	17.4	28.6	0.0	46.2	0.0
Transfer of skills from simulated to real	2.0	9.4	16.1	57.7	14.8	8.2	17.4	15.3	54.1	4.1	16.1	0.0
Transfer of skills from mannequins	6.7	22.2	28.2	38.3	4.7	10.2	28.6	26.5	31.6	2.0	5.3	0.4
Ability to identify pathology	7.4	26.2	29.5	32.2	4.7	22.5	39.8	18.4	18.4	0.0	26.8	0.0
Preparation for history taking	1.3	12.8	8.1	35.6	42.3	6.1	12.2	10.2	50.0	20.4	17.4	0.0
Preparation for clinical examination	2.0	8.1	15.4	59.7	14.1	5.1	26.5	27.6	39.8	0.0	37.6	0.0
Preparation for performing procedures	10.7	30.9	24.8	29.5	4.0	24.5	42.9	15.3	16.3	0.0	21.5	0.0
Sufficient resources	1.3	17.5	17.5	54.4	9.40	5.1	36.7	27.6	27.6	2.0	30.7	0.0
Sufficient tutor numbers	8.7	24.2	10.7	45.6	10.7	19.4	40.8	14.3	22.5	2.0	27.5	0.0
Clin methods/HPD prep for GEMP III	6.0	18.8	24.2	42.3	8.7	46.9	33.7	9.2	8.2	1.0	88.6	0.0
Clin Methods/HPD prep for examination	0.7	14.1	26.2	49.7	8.7	37.8	36.7	11.2	12.2	1.0	102.6	0.0
Clin Methods/HPD prep for history	3.34	12.1	21.5	45.6	17.5	30.6	30.6	13.3	21.4	3.1	65.2	0.0
Clin Methods/HPD prep for procedures	17.5	31.5	27.5	21.5	2.0	44.9	30.6	13.3	9.2	1.0	28.5	0.0

4.3.3 Teacher Quantitative Data

Descriptive Data

A total of 71 clinical teachers responded to the questionnaire. Of the estimated size of the target population this was a response rate of 36%. This target population number is an estimate because the teaching role in the clinical setting is provided by joint appointed staff, including consultants and registrars, as well as medical officers whose involvement may vary and depends on their current clinical commitments, clinical rotation, availability and location. Based on this estimate the response rate is below that needed for a confidence interval of 5 and a confidence level of at least 95% but does meet the liberal conditions of a 10% sampling error and an 80% confidence. The Shapiro-Wilk test performed on the individual questions showed that each question had a p value of less than 0.05 showing that the results were not normally distributed.

The representation of the clinical departments is shown in Table 4.8. The majority of respondents (73%) were from surgery, medicine or paediatrics. The highest percent being from medicine, followed by surgery and then paediatrics. The other six specialities accounted for 27% of the responses.

Table 4.8 Representation of Clinical Disciplines amongst Responders (n = 71)

Category	Count	Percent
1 (Surgery)	15	21.12676
2 (Medicine)	26	36.61972
3 (Paediatrics)	11	15.49296
4 (Other)	19	26.76056
Missing	0	0.00000

The questionnaire consisted of seven questions that were repeated, asking about each cohort separately. The first seven questions above asked about perceptions of the GEMP IVs when they started their clerkships and the next seven are the same questions asking about the GEMP IIIs. There is one question asking the respondents

to compare the two groups. The means and medians for each question are shown in Table 4.9. The means between each matching question were very similar between the cohorts and the medians were identical. Most of the means were close to 3, showing a largely neutral response. The one question that had a slightly higher mean and median for both groups was their ‘perceived ability to clinically examine patients’. The only mean below 3 was, for both groups, in their perceived preparedness for the application of clinical skills.

Frequency tables

Frequency tables were constructed for each question in the questionnaire. These were then further developed into a summary frequency table (Table 4.9) comparing the responses for the matching questions for each cohort. This allowed for the Pearson Chi-square test to be performed which all produced p values of less than 0.05 indicating that the results were unlikely to be due to chance.

There was no evidence of any significant difference of the teachers’ perceptions of the two cohorts, the medians for every question were identical between the two groups.

Table 4.9 Summary Frequency Table for the Teacher Categorical Data (n = 71)

	GEMP III				GEMP IV				Chi-Square and p	
Question	n	Mean	Median	Standard Deviation	n	Mean	Median	Standard Deviation	Chi-square	p
The 2017 GEMP III students were adequately prepared for application of clinical skills.	71	2.9	2	0.9	71	3.1	2	1.0	76.7	0.0
The transition from GEMP II to GEMP III was very difficult for the 2017 GEMP III students.	71	3.1	3	0.9	71	2.9	3	1.0	54.5	0.0
The 2017 GEMP III students were equipped with the skills needed to meet the expectations of their clinical rotations	71	2.8	3	1.0	71	3.0	3	1.1	71.3	0.0
The 2017 GEMP III students were confident in performing clinical skills learnt in GEMP II with real patients in GEMP III.	71	2.7	3	0.9	71	3.0	3	1.1	65.0	0.0
The 2017 GEMP III students were adequately prepared for history taking in their clinical rotations.	71	3.4	3	1.1	71	3.5	3	1.1	113.1	0.0
The 2017 GEMP III students were adequately prepared for physical examination of patients in their clinical rotations.	71	3.0	4	1.1	71	3.1	4	1.1	64.1	0.0
The 2017 GEMP III students were adequately prepared for application of procedural skills in their clinical rotations.	71	2.6	3	1.1	71	2.7	3	1.1	82.5	0.0

The final question asked the respondents to identify any perceived improvement from those taught under the old curriculum to those taught under the new curriculum. Of the respondents 48% indicated that they were neutral (Table 4.10), indicating that they could see no difference between the cohorts.

Table 4.10 Frequency Table of Teachers Comparison of the Two Cohorts (n = 71)

The 2018 GEMP III students are better prepared for GEMP III than the 2017 GEMP III students were		
Category	Count	Percent
1	3	4.2
2	14	19.7
3	34	47.9
4	19	26.8
5	1	1.4

The mean was 3.0 and median was 3 (Table 4.11), showing that the teachers perceived no difference between the groups.

Table 4.11 Summary Data for the Teacher final question (n = 71)

Question	n	Mean	Median	Standard Deviation
The 2018 GEMP III students are better prepared for GEMP III than the 2017 GEMP III students were.	71	3.0	3.0	0.9

4.3.4 Open Ended Questions

The last question of both the student (question 17) and teacher questionnaires (question 16) (Appendix G and H) was a single open-ended question. The questions for the students was: “Please provide any other comments, explanations or information about your perception of the GEMP II Clinical Skills Curriculum’s preparation for your clinical rotations in GEMP III” and the question for the teachers was: “Please make any additional comments about how you feel the Clinical Skills Curriculum in GEMP II prepares the students for performing clinical skills in GEMP III, in particular comparing the 2017 and 2018 GEMP III students at the same point.” This open-ended question was added to allow for the expression of other comments, explanations or information about their perception of the GEMP II Clinical Skills Curriculum’s preparation for their clinical rotations in GEMP III. This question was included in response to the qualitative data from Phase One of the exploratory mixed

methods study. The qualitative data received in the qualitative Phase One of this research proved to be very informative and inclusion of an open-ended question in Phase Two would hopefully be able to provide potential insights into the changes made to the clinical skills curriculum, what has worked and what can be improved. The purpose of this open-ended question was to obtain narrative responses that best reflect the concerns and perceptions of the students and teachers.

A total of 97 students completed the voluntary open-ended question from a total of 247 students who completed the questionnaire, giving a response rate for the question of 39%. Of the 149 respondents from GEMP III, 61 completed the open-ended question (41%) and 36 of the 98 respondents from GEMP IV completed the open-ended question (37%).

A total of 28 of the 71 respondents of the teacher questionnaire completed the voluntary open-ended question, giving a response rate of 39%.

An inductive and iterative approach was used to look for patterns, similarities and differences in the narrative texts. This allowed the data to be coded into meaningful segments and then into frequent, dominant and significant categories for interpretation into findings and conclusions.

Student Narrative Data

Difficult Transition to the Clinical Setting

The first category identified was the students' perception of being underprepared for the expectations in the clinical clerkships once they start GEMP III, especially in the transfer of skills to the clinical setting. This was a common category for both cohorts. One respondent commented that "the jump to GEMP III is huge and terrifying and seeing patients every day is overwhelming." The students indicated that there was a "massive jump from history taking we are taught in GEMP II to what is actually expected from us in reality in GEMP III" and that "it is difficult to apply what we learnt to patients." Many students commented on how "the transition is quite difficult for many" and "holds many challenges" and that the GEMP II teaching "does not prepare you for the expectations of GEMP III," not providing a sufficient foundation for the students. One of the most mentioned reasons was the difficulty in transferring

skills learnt on models and mannequins to real patients; “practising skills on a model is completely different to doing the skill on a real patient” and “mannequins don't really help.” Along with mannequins the students also struggled to transfer skills learnt on simulated patients, making integration very difficult, mentioning that “simulated skills were of very little value.” The most quoted demand of the clinical, real life setting where the students felt the least well equipped was the performance of procedural skills. Students indicated that “clinical procedures are really lacking,” their “procedure competencies quite poor” and that they need to “improve on practical clinical procedures.” The other areas where they felt ill-prepared to meet the expectations of the clinical setting was in making clinical assessments of patients and presenting their findings, suggesting that they were “never taught how to properly make an assessment or how to present a patient.” One of the students from GEMP IV, taught under the old curriculum was of the opinion that “the clinical teaching component of our degree is truly lacking, in every conceivable aspect” and “as a result, we are scared, don't know what to do, and have little to no support base to fall back upon.”

Student Perceived Improvement with the new Curriculum

As the GEMP III cohort had the old clinical skills curriculum in GEMP I in 2016 and the new curriculum in GEMP II in 2017 they were able to comment on their perceptions of the two different curricula. A category emerged of a perceived improvement with the new curriculum. Many students highlighted the enhancement with the term “improvement” being used regularly. Comments included: “Clinical skills improved greatly from 2016 to 2017” that the “program has improved significantly from what it was before,” that the “the GEMP II clinical skills curriculum has improved in leaps and bounds compared to clinical skills in GEMP I” and that it has “made a world of difference.” The changes that helped were that it was “more hands on, interactive and better with smaller groups forcing one to get involved every week and preparing as opposed to sinking into the background and not taking part as in GEMP 1.” “Getting more opportunities to examine the SPs and the mock OSCE (facilitating more frequent learning) personally helped me to practice more and become more comfortable.” The new clinical methods programme, that replaced HPD, was particularly singled out as much improved and helpful in the transition to GEMP III; “clinical methods sessions were valuable and definitely better than

hospital days that existed before." While the above category indicates a difficulty with the transition to GEMP III it was mentioned that "most of the things that I find difficult now are usually things that we were taught in 3rd year" (GEMP I). A few of the GEMP IVs indicated that they felt "disadvantaged" as they did not get to experience the new curriculum.

More Time Needed on Practical Skills

Another category was the belief that the time in GEMP I and II was disproportionally allocated, with more time needed on practical skills and less on theory. They felt "that more time in a week should be spent on practical learning" and that "theoretical aspect of clinical skills was decent, although practicality was severely missing." Students felt that they had spent too much time in lecture theatres and too little time practising the practical aspects of the medical curriculum; they had been in "lecture theatres a majority of the time" and needed more sessions to allow for deliberate practice. They even suggested that the GEMP I and II time should be decreased and GEMP III and IV increased.

More Time Needed in Clinical Setting

As well as the need for more time spent on practical elements of the curriculum a category to emerge was the need for more time to be spent in the clinical setting interacting with real patients earlier in the medical programme. The students indicated that they needed more time in the hospitals to become confident and the terms "real patients" and "actual patients" came up frequently. It was suggested that "exposure to real patients is highly needed in the earlier years of the GEMP programme" and that they need many more sessions in the clinical setting. The students need more bedside teaching and need to observe clinical procedures, such as phlebotomy, being done and have a chance to practise them themselves. Students also suggested that the time already spent in the hospital needs to be more productive and demanding as they find that they often haven't mastered basic skills very late in the programme; they "need more time in hospitals - not just clinical methods but actual full days where we clerk and fully examine more patients," as well as performing "basic ward work." The students recognised that the best time to learn clinical skills is with real patients as one respondent explained; "I learnt

everything I know from interacting with actual patients" as you "learn most when actually doing it."

Detection of Pathology

A category that follows on from the one discussed above is the perception of inadequate preparation for identifying actual pathology in real patients. They feel that they are not exposed sufficiently to actual pathology in preparation for GEMP III. The students are taught on simulated patients with normal findings but while told about pathology they have no "knowledge or understanding of what it meant," they need "patients with actual signs and symptoms," allowing them to apply their knowledge, interpret findings and get a feeling for and appreciate the meaning of real pathology. They haven't had a chance to see basic signs such as "jaundice on a patient, seen pitting oedema, lymphadenopathy and everything else in the general examination" and so struggle to pick up pathology and correlate their findings. They need to learn the examination "in the context of the patient and their pathology" to allow for transfer and application of skills, as one student explained; "I scored in the 90s for CVS stations in the OSCE, however, during internal medicine struggle to correctly identify the apex beat and heart sounds."

Simulation Reflecting Real Life

One of the categories highlighted a disconnect between the clinical skills taught and the real life demands of the clinical setting. The skills taught need to reflect real life expectations and clinical practice in the South African context. It was suggested that GEMP I and II are "poorly applicable to real world clinical medicine." One of the examples given a few times was the teaching of phlebotomy with vacutainers which are rarely available in South African state health facilities; blood is drawn much more commonly with a needle and syringe. Students learn skills to pass exams and go through the motions instead of really learning the skill. Students need to be taught skills in the way they will be used clinically, rather than to pass exams, and more clinical scenarios must be used in skills training. The skills and assessment need to be "realistic and reflective of the true process." The need to understand the theory and its application was emphasised; learning to examine isolated systems made "integration in GEMP3 very hard." It was suggested that better communication was needed between the clinical skills unit and the clinicians in the hospitals to reach

consensus on the clinical skills being taught; “clinical skills department should actually converse with the various departments on examinations.” There was also insufficient diversity amongst the simulated patients, who do not reflect the population of South Africa.

Insufficient Resources

This category demonstrated a perceived lack of sufficient resources for effective clinical skills teaching and learning. Several students mentioned an insufficient number of clinical staff, tutors and instructors. This applied to teaching of clinical skills in the clinical skills unit as well as the bedside teaching and supervision in the hospitals. One student said that the “amount of lecturers present for the clinical skills sessions was terrible.” There was also a complaint of too many student numbers for the resources available; “I think having 2 students clerking one patient rather than 8 students clerking 1 patient… would prepare us better,” and “clinical skills tutorials contained too many students for one simulated patient.” Often one doctor must accommodate a big group of students while still carrying out their clinical duties. There was also an issue with equipment in the clinical setting as “most of them are old and broken,” as well as insufficient mannequins in the skills unit.

Wider Scope

Students believed that the clinical skills curriculum needed a wider scope; that many more clinical skills could be included in the curriculum to better prepare the students. It was suggested that there was an “inadequate practical procedure scope.” The most common examples were doing full clinical assessments and the presentation of clinical findings. Variations of the terms “present a patient” and “make an assessment” were mentioned frequently. Students indicated a need to develop clinical reasoning, as well as a “need to teach how to do an assessment of a patient” and “formulate a management plan.” Other examples included suturing, having an approach to specific patient presentations, writing notes and lumbar punctures.

Clinical Methods and HPD

A category emerged from the discussion of HPD (which the GEMP IVs had in GEMP I and II) and the Clinical Methods programme (which was introduced in 2017 for the GEMP IIIs.)

The comments regarding the HPD were that they were poorly organised, poorly supervised and were of little benefit in preparing the students for GEMP III. Students showed a belief that very little teaching happened and that they were “largely useless.” The most common description of the HPD were that they were “poorly organised” and “a waste of time.”

Comments about the Clinical Methods programme were less frequent. Students suggested that the teaching in the hospitals did not coincide with the clinical skills curriculum, making it difficult to perform skills that they had not yet received training for. It was felt that they should be better organised and students be allowed to do more on their clinical visits; “clinical methods I personally felt did not have the desired effect as we were generally ignored in hospitals and were not allowed to examine real patients or to do any significant ward work, enough to sharpen our skills.”

Adequate Preparation for the Clinical Setting

The final category was in contrast to the first; a number of students from both student cohorts who felt that they were well prepared to meet the expectations of their clinical clerkships. Many acknowledged that it had given them a foundation from which they could develop allowing them to “transition into the new hospital setting with ease” as it was “beneficial and helped in preparing for what to expect in 5th and 6th year.” One commented that the “skills that I learnt last year feel like second nature to me” and another suggested that “clinical skills in GEMP 2 helped me prepare in advance for the rotations.” As opposed to the procedural skills mentioned in the first category students felt generally well prepared for history taking and examining patients. The majority of these positive comments came from the GEMP III students, such as; the “clinical skills curriculum was very excellent and allowed me to enter into my clinical years as an extremely competent student.” Many students indicated that the clinical methods programme was the most beneficial in preparing them.

Teacher Narrative Data

More Time Needed in the Clinical Setting

The first category to emerge was that the teachers felt that there was insufficient time spent in in the clinical setting in GEMP I and II with inadequate exposure to real patients. They suggested that “exposure to real patients in GEMP II is insufficient” and students need “more individual patient contact time in GEMP 2” as their clinical exposure was not long enough to develop confidence. One respondent commented that the students spend too much time attending tutorials and that they would develop more “clinical maturity” if they were to “spend most of their clinical rotation time with patients.” Another suggested that they need “a lot more clinical application and maybe less tuts.” They argued that clinical skills are best learnt at the bedside and that “earlier exposure to real patients and more time spent in hospitals with clinicians is needed.”

Detecting Pathology

The next category was related to the first; the students struggling to detect actual pathology and clinical signs on real patients. Students struggled with “interpretation of actual clinical signs where there is pathology.” It was suggested that while the students are able to examine patients they “do it without insight and understanding into the underlying disease processes and the clinical signs they are seeking to illicit.” The students “struggle with being confronted with a 'real' patient” and “do not understand complexities of patients.”

Difficult Transfer

Another category was the perception that the students find the transfer to the clinical setting for their clinical clerkships very difficult and that there is a significant theory practice gap demonstrated by the students once they start in the clinical setting. The students are “really not well prepared” and struggle with “knowledge translation” struggling to apply their knowledge in the real life clinical setting. The students often have an approach but no “real understanding.” They don’t seem to “connect their GEMP 2 lectures to what they do in GEMP 3” and have “decent theoretical knowledge but clinical skills are dismal.” Some noted that the gap between learning

the skills and applying those skills in their clinical rotations is too large. The students have a problem with the transfer and application of skills.

Inadequate Competence

A related category was the perception that the students do not have sufficient competence with regards to their clinical skills performance. The term “poor” was used on multiple occasions to describe the students’ clinical skills. The students lack “confidence” and “procedural knowledge”. The student’s “practical hands-on skills still needs strengthening.” The students struggle with procedural skills and history taking.

No Perceived Difference between the Groups

A category emerged of the teachers being unable to perceive a difference between the two groups of students – those taught under the new and old curricula. The term “no difference” was frequently mentioned when comparing the two groups. Some comments included that the “new training program in GEMP 2 has made no difference whatsoever to the quality of GEMP 3” and that the “starting point is exactly the same in GEMP 3”. They indicated that in their opinion the two cohorts “perform equally” and that they struggled to identify a difference between the groups. One respondent did, however, comment that it was challenging to think back and compare the two groups as it was “difficult to remember 2017 vs 2018, with a constant 6 week cycle it is nearly impossible to differentiate them.” It was also noted that motivation and enthusiasm varies with every small group taught.

Adequate Preparation for Clinical Setting

In contrast to the above category some of the respondents did perceive an improvement with the students taught under the new curriculum. While the students may still need to increase their preparation and competence it was mentioned that “on the whole I think there has been some improvement” and that “they seem to have a good foundation.” One respondent had a perception that they “are becoming more confident with each passing year.”

Insufficient Resources

The last category was a perceived lack of resources to accommodate increased student numbers while maintaining teaching standards. One respondent commented that “the number of students are too large to give individual attention in clinical blocks and weaker students may be compromised.” The GEMP IIIs have larger groups which made clinical bedside teaching more difficult and cumbersome and it was difficult to give students individual attention.

Combined Narrative Data

The data from the open-ended question from the student questionnaire and the open-ended question from the teacher were combined to allow for analysis of the similarities and differences of the perceptions of the two cohorts.

There were similarities between the two cohorts; each highlighting comparable concerns about the curriculum. One of the categories in both sets of narrative data was the belief that the students need more time in the clinical setting, earlier on in the programme. Both groups felt that the students needed more exposure to real patients, more time spent on practical skills and less on theory in the lecture hall and in tutorials, and to have more expected of them in the clinical setting.

Another category shared by both cohorts was that students struggle to identify and make meaning of pathology in real patients. They suggested that the students have too little exposure to pathology in GEMP I and II in order to actually detect signs and symptoms and interpret them. While students are able to go through the motions of a clinical examination they struggle when in the real clinical context. They show little insight and lack confidence in their abilities.

Both groups recognised that the transition to the clinical setting in GEMP III is a very difficult one. Students are underprepared to meet the expectations and demands of their clinical clerkships. The students struggle with the theory-practice gap, struggling to apply their knowledge with real patients. Both groups identified a lack of proficiency with performing practical and procedural skills as well as having difficulty

making clinical assessments, showing critical thinking and problem solving and the presenting of patients.

The clinicians and students both raised a concern over a perceived lack of resources. The two most frequently identified were insufficient staff and increased student numbers. This results in less personal teaching, less personal feedback, difficulty providing small group learning, excessive demands on the teachers (who also have clinical demands in the hospitals), competition for and less opportunity for observed deliberate practice (especially with simulated patients) and overcrowding at the bedside – which disadvantages the patient and the students.

There were some noticeable differences between the perceptions of the two groups. While the difficulty of the transition to GEMP III was still recognised by many of the students, several still felt that they were well prepared for their clinical clerkships, especially the GEMP III students. This is in contrast to the teachers who felt that the students' skills were poor. They suggested that the students have poor confidence and procedural knowledge and that they are ill-prepared for the demands of the curriculum. While the GEMP III students frequently expressed a belief that the clinical skills curriculum is much improved and that they are better prepared for the expectations of their clerkships the opinion of the teachers was that they see no difference between those taught under the new and old curricula. They do, however recognise the difficulty in accurately differentiating between the two groups due to the high turnover and the time that has passed.

While the students and teachers seem to share many concerns and problems they have with the clinical skills curriculum and its preparation of students for the clinical years, they seem to strongly disagree on how much the new curriculum is improving the readiness of students for GEMP III and how well prepared the students actually are.

4.4 Conclusion

The student questionnaire had an adequate response rate and statistically significant data. The ordinal and categorical data showed a significant difference between the GEMP III and GEMP IV students, showing more positive perceptions among the GEMP III students of their preparation for their clinical clerkships. This significant difference was found for 14 of the 16 questions in the questionnaire. Only two questions had no significant difference between the two groups; the difficulty in the transfer to the clinical setting and the ability to transfer skills from mannequins to real patients in the clinical setting.

The categorical data from the teacher questionnaire showed no significant difference between their perceptions of the GEMP IIIs and the GEMP IV students.

The categories identified in the narrative data from the open ended questions identified several consistencies between the concerns of the students and teachers. In contrast to this the perceptions of whether the student's preparation is improving differed between the groups; with the students perceiving more improvement with the new curriculum. A number of categories emerged with suggestions of areas that need to be addressed that could contribute to better preparation of the students for the clinical setting.

CHAPTER FIVE

5. Discussion

5.1 Introduction

Phase Two of the exploratory mixed methods study was a cross-sectional, comparative, quantitative study made up of two questionnaires. One questionnaire was targeted at the GEMP III and GEMP IV students, taught under the new and old clinical skills curricula respectively, and the other at the teachers of the GEMP III and IV students in the clinical setting. The student questionnaire was made up of 16 closed ended questions and one open-ended question and the teacher questionnaire 15 closed-ended questions and one open-ended question. Each closed ended question was constructed using a 5-point Likert Scale. The data from the Likert Scale type questions were analysed as ordinal data with support from a categorical analysis for the students and categorical for the teachers as each cohort was asked about separately. The Likert scale questions had five options (strongly disagree, disagree, neutral/undecided, agree, strongly agree) which were assigned values of 1-5 to allow for numerical data for quantitative analysis. The narrative data open ended free text question was analysed using a qualitative approach. The results of this data analysis are discussed to interpret and describe the significance of the findings and to assess if it shows any new understanding or insights into the research question.

5.2 Student Closed Ended Questions

The response rate for the student questionnaire was 42% which met the requirements for a confidence level of 95% and a confidence interval of 5. The Shapiro-Wilk test showed that the quantitative data were not normally distributed, so non-parametric data analysis was carried out.

The means for each question were consistently higher for the GEMP IIIs than the GEMP IVs. A higher mean indicated a more positive response from the students. (1 = strongly disagree, 2 = disagree, 3 = neutral/undecided, 4 = agree, 5 = strongly

agree.) This suggested a perception of better preparation for their clinical clerkships amongst the GEMP IIIs when compared to the GEMP IVs. This indicated a possible improvement in the perception of the students resulting from the changes to the clinical skills curriculum, all of which were supported by the evidence in the literature.

The first question in the questionnaire was: “The clinical skills teaching curriculum in GEMP II adequately prepared me for application of clinical skills in the clinical setting in GEMP III.” The Mann-Whitney U test showed that there was a statistically significant difference between the two groups; showing that the GEMP IIIs felt that the clinical skills curriculum prepared them for the application of skills significantly more adequately than the GEMP IVs did. This was supported by the categorical data analysis using the frequency table. This was a valuable finding as the research question was: “What are the perceptions of the students and clinical teachers of the changes made to the GEMP II clinical skills curriculum in relation to its preparation of students for their clinical clerkships in GEMP III?” This statistically significant finding showed an improved perception of how well the curriculum prepares students amongst the students taught under the new curriculum. This is consistent with the literature which suggested that all the changes made should improve skills outcomes and decrease the theory practice gap. [8,9,10,11,19,20,21]

The second question asked the students whether: “The transition from GEMP II to GEMP III was very difficult.” The Mann-Whitney U for this question showed no statistically significant difference between the two groups. Both groups perceived the transition as equally difficult. While the previous question showed that the GEMP III students felt better prepared than the GEMP IVs they still found the transition challenging. This finding was supported by the categorical data analysis using the frequency table. While the new curriculum does make students better prepared there is a need for progress in making the transition less difficult. The transition from the medical school setting to the clinical setting will always be challenging; the academic, skill and emotional demands of performing on real patients are high. Okuda at al[6] as well as Eyal and Cohen[43] recognise that students often feel inadequately trained and ill-equipped for the clinical setting. Therefore, finding a way to reduce the difficulty is important. As discussed in the literature review, simulation-based education and integration and early implementation of clinical engagement should make the transition to the clinical setting easier.[7] Yet the Wits students, while

feeling better prepared, still find this transition very difficult. This means that there must be room for improvement in how these strategies are being implemented. Their execution needs to be revised and explored to determine where progress has been made and where it is deficient. The curriculum needs to continue to grow, change, adapt and develop based on a proper understanding of the evidence and, what appears to be, a positive foundation until the transfer from simulation to reality is found to be less difficult for the students.

The next two questions asked if: “I was equipped in GEMP II with the skills needed to meet the expectations of students in GEMP III” and “I had confidence in performing clinical skills learnt in GEMP II with real patients in GEMP III.” The mean for the GEMP IIIs was statistically higher than the GEMP IVs for both questions according to the Mann-Whitney U test. This finding was supported by the categorical data analysis using the frequency table. The GEMP IIIs, unlike the GEMP IVs, had a perception of being well equipped to meet the expectations of GEMP III and were confident in performing skills on real patients, both areas of concern in the HPCSA[1] accreditation and The Wits QQR[2]. This shows that, while the transition remains difficult, some of the objectives of the curriculum change are beginning to be realised.

The next two questions were: “I was able to transfer skills learnt and practised with simulated patients to real patients” and “I was able to transfer skills learnt with simulation on mannequins to real patients.” These two questions produced two markedly different results. For the first of these questions there was a statistically significant difference between the GEMP IIIs and the GEMP IVs, showing that the GEMP IIIs had a more positive perception of their ability to transfer skills on simulated patients to real patients. The second question had no significant difference between the two groups and both means were low, indicating a perception that transferring skills from mannequins to real patients was difficult. This finding was supported by the categorical data analysis using the frequency table. This is a stark contrast between simulated patients and mannequins. The literature suggests that both simulated patients[6,37] and low fidelity mannequins should be effective for teaching clinical skills[61]: this does depend on the execution of the teaching and the teaching environment[61]. Lund suggests that transfer of procedural skills learnt on mannequins should be effective but only if there is opportunity for deliberate practice

and feedback[16]. It may be that the learning done on the mannequins too distantly resembled the real-life experience of performing on a patient, and so the students struggled to transfer the skills[18]. This is an area that needs revision and improvement in the new curriculum.

The following question was: “the clinical skills teaching curriculum prepared me to identify real clinical findings in patients with pathology.” This question was added as a response to the concerns of the students that became evident in the narrative data of the qualitative Phase One of the exploratory mixed methods study. The p value showed a significant statistical difference between the GEMP IIIs and GEMP IVs. While the GEMP III result was neutral, the GEMP IV mean was significantly lower. This finding was supported by the categorical data analysis using the frequency table. Even though there was a notable improvement from the old curriculum the students were still neutral on their ability to pick up pathology. Remmen recommends that students need a longitudinal, integrated curriculum with increased clinical exposure[8]. De Boulay suggests that the best way to learn pathology is in an integrated, interactive curriculum, where students are asked to solve real clinical problems[62]. As the perceived lack of preparedness to detect pathology is a concern for the medical school, improvement in the integration of the curriculum and increased clinical experience earlier on in the curriculum need to be considered.

Three questions were then asked about the three major components of the clinical skills curriculum: communication, physical examination and performance of clinical procedures. “The clinical skills teaching curriculum in GEMP II adequately prepared me for history taking in GEMP III with real patients in the clinical setting”, “the clinical skills teaching curriculum in GEMP II adequately prepared me for physical examination of real patients in the clinical setting in GEMP III” and “the clinical skills teaching curriculum in GEMP II adequately prepared me for performing clinical procedures in the clinical setting in GEMP III.” For all three questions the mean for the GEMP III students was statistically significantly higher than that the GEMP IVs. This finding was supported by the categorical data analysis using the frequency table. The perception of preparation for history taking was the highest mean for both groups showing effective learning that continues to improve. Reviewing the teaching strategy used for history taking skills may inform the improvement of other subjects. While the GEMP IIIs’ means were significantly higher than the GEMP IVs, both

groups had low means when it came to the perception of their preparation for the performance of clinical procedures on real patients. This is possibly related to the fact that students find it difficult to transfer skills from mannequins. While examination and history taking are taught with simulated patients in the medical school and on real patients at the bedside, clinical procedures are taught on mannequins. Moss suggests that doctors underestimate the anxiety the student experiences when having to perform what they consider “simple practical procedures”[63] meaning not only that they need better preparation to increase confidence but also more support and guidance when they first perform the procedures on real patients.[63]

The next two questions were related to the resources available for clinical skills teaching. These two questions were also added as a result of the qualitative data analysis from Phase One. These questions were: “the number of clinical lecturers available for teaching clinical skills was adequate for the number of students”, and “the resources available for learning clinical skills were adequate.” For both of these questions the GEMP III students’ means were significantly higher than the GEMP IVs. The GEMP IIIs had a more positive view while the GEMP IVs had a notably negative view that both the number of tutors for the number of students and the resources available for learning clinical skills were inadequate. This finding was supported by the categorical data analysis using the frequency table. This justifies the employment of new tutors to improve the ratio of tutors to students to allow for effective small group teaching. Harden[27] emphasises the need for sufficient staff to implement effective small group learning[27] which is a valuable means of teaching clinical skills.[28,29,30,31]

The last four closed ended questions explored the perceptions of the GEMP IV HPD with the GEMP III clinical methods. The questions were: The Clinical Methods/ HPD in GEMP II adequately prepared me for seeing real patients, adequately prepared me for history taking, adequately prepared me for physically examining patients and adequately prepared me for performing clinical procedures in the clinical setting in GEMP III. There was a statistically significant difference between the perceptions of the two cohorts, with the GEMP IIIs considerably higher. This finding was supported by the categorical data analysis using the frequency table. The GEMP IVs had consistently low means, showing dissatisfaction with how the HPD prepared them for

their GEMP III expectations. The GEMP III students had high scores except with regards to their perceived preparation for the performance of clinical procedures, in keeping with the earlier question regarding learning to perform clinical procedures on real patients. Neither clinical methods nor the clinical skills unit prepared them adequately to perform these skills. Apart from procedures the data showed a significant improvement in how clinical methods in the new curriculum had improved preparation when compared to the HPD. Ramani and Du Boulay recognise a need for integration of simulated and bedside learning and increased bedside learning earlier in the course[8,12]. The evidence supports the changes that have been made with clinical methods that have resulted in this improvement; especially the need for objectives to be communicated to the clinical teachers to ensure the teaching is aligned and that they act as effective role-models and provide good feedback and remediation[46].

5.3 Teacher Closed Ended Questions

The teacher survey had quite a low response rate; this may be due to an inaccuracy in the estimate of the number of clinical teachers. This number was estimated by UUME as the exact number is variable; the teaching role in the clinical setting is provided by joint appointed consultants and registrars, as well as medical officers whose involvement may vary depending on their current clinical commitments, clinical rotation, availability and hospital location. The low response rate may also be due to the communication channels used to send the questionnaire to the clinicians, relying on the heads of departments to distribute to the clinicians in their departments that they know are teaching rather than being able to email each individually. This limited the ability to send regular individual reminders which are essential for increasing response rates[64]. The literature also suggests that response rates improve if the survey has incentives[64] (which this did not have) and to provide more time to respond[64]; which was limited due to time constraints. For each individual question the Shapiro-Wilk test showed that the quantitative data were normally distributed.

Looking at individual clinical departments 73% of the respondents were from either surgery, medicine or paediatrics. The highest being from medicine, followed by

surgery and then paediatrics. The other six specialities accounted for 27% of the responses. This may be due to the larger departments' staff numbers compared to the other specialities or the fact that these are the only three specialities most involved in the clinical methods programme, having more of a vested interest in the outcome of the study.

The questionnaire consisted of 15 closed ended questions. The first seven questions asked about the perceptions of the GEMP IV students and the next seven asked the same questions about the GEMP IV students. The final question asked the teachers to compare the two groups.

The two cohorts had identical medians for all seven of the matching questions, showing that they perceived very little difference between the two cohorts. This was complimented by the data from the frequency tables that showed very similar distributions of responses. The final question asked if "The 2018 GEMP III students are better prepared for GEMP III than the 2017 GEMP III students were." The median was 3 with a mean of 3.03 with a low standard deviation of 0.88, indicating a neutral response to the question. This showed that they were unable to see an improvement in the students with the new clinical skills curriculum. This is in contrast to the perceptions of the students, who perceived a statistically significant difference between the groups in favour of the new curriculum. This may be, as suggested by the narrative data discussed below, due to the teachers' difficulty in the reliance on their memory of the preparedness of the GEMP IVs a year before in order to compare the two groups. Due to the regular turnover of small groups in the rotation system it may also be difficult to differentiate between which ones they remembered were GEMP IV and which were GEMP III. As every small group is different, they may be making their assessment based on whichever small group they had had most recently. The GEMP IIIs only had the new curriculum for clinical skills in their GEMP II year, having experienced the old curriculum in GEMP I. This may have affected the perceptions of the teachers if they were basing it on the performance of their GEMP I skills.

Only one question had a median above three and one below three. Five questions had neutral responses. The question that had the higher median displaying a more positive result for both the GEMP IV and III students was: "The students are

adequately prepared in GEMP II for physical examination of patients in their clinical rotations." This complements the finding from the student questionnaire that both cohorts felt confident in performing clinical examinations on patients, showing this is a consistently successful learning area. The question with a median of less than three for both groups was: the students were adequately prepared in GEMP II for application of clinical skills in their clinical rotations. The teachers perceived that both of the groups were equally underprepared for the application of the skills they were taught. This complements the finding from the student questionnaire that both groups find the transition from GEMP II to GEMP III very challenging. The GEMP III students, however, showed that they felt adequately prepared for the application of skills in their response to the questionnaire, displaying a difference in perceptions between them and the teachers. In a study by Barnsley et al, they compared self-reported competence with formally assessed performance and found that "There is no relationship between their self-reported level of confidence and their formally assessed performance."[65pg358] While the students felt more confident and prepared this may not have been reflected in their performance.

5.4 Combined Student and Teacher Narrative Data from Open Ended Questions

The open ended question provided rich and informative data from the teachers and students. In particular it informed possible changes and improvements that can be made to the curriculum that could remedy the concerns that became evident in both the open and closed ended questionnaire responses.

The students and teachers agreed that they needed more time in the real-life clinical setting earlier on in their studies to be better prepared and more confident for the application of skills, transfer to the clinical setting and identification of pathology, all of which were areas of concern for the teachers and students in the responses to the closed ended questions. The students also felt that the allocation of time to theory and that to practical skills was disproportionate, with much more time needing to be allocated to clinical skills. Two of the other categories in the narrative data from both questionnaires were the lack of preparation for the detection, clinical assessment and presentation of pathological findings and how difficult the transition from the

medical school to the clinical setting is for the students; who had a perception of being ill-equipped to meet the expectations of the clinical setting and having difficulty transferring their skills to real patients. More clinical exposure earlier came through as the prominent recommendation for the remediation for the problem. Okuda et al, recognise the difficulty in the transition[6] and du Boulay emphasises that simulated skills cannot replace real patient interaction in the clinical setting[12]. Ramani recommends increasing bedside teaching and integrating it with simulation longitudinally in the curriculum, starting in the clinical setting much earlier[8] and Remmen suggests that a clinical curriculum that starts early and runs through the pre-clinical period offers the students a superior preparation for clinical clerkship.[9] The evidence agrees that more, earlier experience in the real-life clinical setting should make the transition easier and decrease the theory-practice gap. The GEMP III students had a positive view of the existing clinical exposure (Clinical Methods) in contrast to the negative perception the GEMP IV students had of the HPD that they felt were of little benefit. While the learning in the clinical setting has improved in terms of quality it is suggested that there needs to be more quantity. The students also suggested that when skills are simulated they need to reflect the realities of the real-life setting better and the scope of the teaching needs to be widened to meet the demands of their clinical clerkships. The literature recognises how important it is that the skills are relevant to the curriculum[12] and that simulation must reflect the real-life working environment as closely as possible[17].

Both the teachers and students raised a concern about the lack of resources, which was also reflected in the quantitative data, particularly the insufficient number of tutors and clinicians to meet the demands of the increasing student numbers. This is a concern as while the target population for this study were 319 GEMP III students and 311 GEMP IV students the current GEMP II class has 325 students and the GEMP I class has 379, so this is a problem that may get worse. The concern is that there is then less individual teaching and feedback, difficulty providing adequate small group learning, competition for and less opportunity for observed deliberate practice and overcrowding at the bedside.[31,32] In order to maintain adequate small group teaching the structure of the teaching curriculum and number of tutors must be adapted as the number of students increase.

The teachers and students did have some contrasting findings from the narrative data. While many of the GEMP III students felt well prepared for the expectation of their clinical clerkships, the teachers had a perception of both cohorts having poor clinical skills. The GEMP III students, who experienced both the new and old clinical skills curricula, felt that the curriculum was much improved, which was reflected in the qualitative results. The teachers, however, saw no improvement between the two groups. These two contrasting findings indicate that while performance may not be noticeably improved by the outside observer, the perception of preparedness amongst the students for their clinical clerkships has been improved by the revised curriculum. It is important to keep in mind that, as suggested by the research by Barnsley et al, there is no identifiable relationship between the self-reported level of confidence among students and their formally assessed level of performance.[65] The contrast between the perceptions of the students and teachers may also be explained by the teachers' narrative data which suggested that comparing the two cohorts is very difficult. They had difficulty thinking back to the previous year when the GEMP IV students were at the same point in time as the GEMP IIIs were at the time of the data collection. Due to the variability in enthusiasm and motivation between each small rotation group and the constant six week cycle it becomes difficult to differentiate between the years and groups and make a judgement on the whole class which is not affected by whoever the most recent group was. The smaller teacher numbers and insufficient sample must be kept in mind when drawing conclusions from the teachers' results.

The narrative data from the open ended questions was in keeping with the quantitative data. It both supported the findings and provided additional insights. These results allow for conclusions to be drawn about the effect of the new clinical skills curriculum on the perceptions of preparation of the students for their clinical rotations.

CHAPTER SIX

6. Conclusion and Recommendations

6.1 Conclusion

The aim of this study was to explore the changes made to the Wits medical school clinical skills curriculum based on the students' and teachers' perceptions of how well it prepares GEMP II students for their clinical clerkships in GEMP III. This was in response to a finding by the HPCSA[1] and the Wits QQR[2] in 2015 that the medical students were ill-equipped for the transition from the theory based clinical years of the curriculum to the practice based years. The curriculum was revised and changed to try to remedy these concerns. The purpose of this research was to see to what extent these changes have made a difference to the perceptions of those concerned; the students themselves (comparing those taught under the new and old curricula) and the clinical teachers who have taught both of these groups.

This study had four objectives. To determine and compare the 2018 GEMP III and IV students' perceptions of; the teaching of clinical skills in GEMP II, their level of preparedness for the application of skills (specifically physical examination, history taking and procedural skills) in their clinical clerkship in GEMP III and how well the clinical methods bedside teaching and the HPD prepared them respectively for application of skills in their clinical clerkship. The fourth objective was to determine and compare the perceptions of the clinical teachers of the preparedness of the 2017 and 2018 GEMP III students for their clinical clerkships.

The results from the student quantitative data showed a statistically significant improvement in the perceptions of the group taught under the new curriculum (GEMP III). Their perception of; their preparation for the application of skills in the clinical setting, having the skills needed to meet expectations of their clerkships, their confidence in performing skills on real patients, their ability to transform skills learnt on simulated patients to real patients, the ability to pick up pathology and their preparation to perform history taking, examination and procedural skills was significantly better than the perceptions of the GEMP IVs. While the GEMP IIIs showed a significantly improved perception of their ability to detect pathology their narrative data did identify it as an area that needs improvement; in combination with

the skills of clinical assessment and presentation. Their perception of the sufficiency of resources and tutors was significantly improved compared to the GEMP IV perception. In comparison to the perceptions of the GEMP IV students of the HPD and the GEMP III students of the Clinical Methods programme there was a significant difference favouring the Clinical Methods programme.

Two of the questions did not have a significant difference between the two cohorts. The first was the perception of how difficult the transition from GEMP II to GEMP III is. Both student groups found this transition very difficult. Although the GEMP IIIs felt well prepared for their clerkships they still found the transition challenging. This was highlighted in the narrative data as well. While the new curriculum is improving the students' perceptions more needs to be done and solutions found for making the transition less difficult. The other question with no significant difference and a poor perception was the ability to transfer skills from mannequins to real life patients. This needs to be improved with more opportunity for feedback and deliberate practice and a closer resemblance to the expectations and demands of the real-life clinical setting.

The teacher quantitative data findings showed that they perceived no significant difference between the two cohorts. They shared a perception with the students that the students find the transition to the clinical setting very difficult. They recognise that both groups are well equipped to examine patients but had neutral findings for all other questions. They cannot separate the two groups and generally don't perceive them as either good or bad. It must be noted that the teachers' narrative data found that they had difficulty comparing the two groups and the sample was not sufficient for a 95% confidence level.

The narrative data findings provided some suggestions for further improvement of the curriculum. These were; to increase the proportion of time spent learning the practical aspects of medicine, to spend more time in the clinical setting earlier in the course, to have teaching that more closely resembles the real-life experience and to increase the scope of the clinical skills teaching.

The student data show a significant improvement under the new curriculum of their perception of the new clinical skills curriculum and its preparation of the students for application of skills, including history taking, physical examination and procedural performance. Their perception of the preparation provided by the Clinical Methods programme was significantly better than that of the GEMP IVs of the HPD. Overall the perceptions of the students taught under the new curriculum and how well it prepared them for GEMP III were significantly better than those taught under the old curriculum. The new clinical skills curriculum has improved the students' perceptions of their preparation and has had a positive effect on, and has begun to address, the concerns raised by the HPCSA[1] in their accreditation of the medical programme and Wits QQR[2] in their review.

Improvements need to be made in order to; further reduce the difficulty of the transition, advance the detection of pathology and to enhance students' learning to make clinical assessments and present patients. Improvement is also needed in the use of mannequins to learn clinical skills.

The results from the teacher data showed no statistical difference between the two groups but were limited in significance due to a low response rate.

While no significant improvement was found for the teachers the results found a statistically significant improvement in the perceptions of the students taught under the new curriculum, indicating a positive effect in this context of the changes made.

6.2 Recommendations for Practice

Several recommendations for practice can be identified from the results of the research. The changes made are improving the perception of preparation of the students being taught under the new curriculum. These changes need to be reinforced and strengthened, particularly through faculty development in learning about and applying these teaching and learning strategies. There needs to be an effort to find more ways to make the transition from the medical school setting to the clinical setting less difficult for the students.

The amount of time spent in the real-life clinical setting and the amount of time spent on the practical, clinical aspects of the curriculum needs to be increased and needs to start earlier in the curriculum. The students' learning opportunities need to more closely resemble the real life clinical setting to better prepare them for the expectations and demands thereof. This applies to the use of mannequins, which, in addition, needs more time for deliberate practice and feedback. An increased scope of practice needs to be considered to remedy some of the gaps in preparation that have been identified by the students. This includes preparation of the students for the assessment and presentation of patients.

6.3 Recommendations for Further Research

This research can be continued into 2019 to compare the students who spent one year learning under the new clinical skills curriculum (the 2018 GEMP III students included in this study) with those who spent two years under the new curriculum (the 2019 GEMP III students) to see if there is a greater improvement in their perceptions.

One of the categories from the open ended questions identified by the students and teachers was the difficulty they have in the identification of pathology in patients. Further research needs to be done in how to best prepare students for the identification of pathology, and the formulation of meaning from these findings, prior to their entry into the clinical setting, in particular in the interest of the patients; their safety and prevention of undue discomfort or harm.

While the changes as a whole have improved the perceptions of preparation for the students, further research should be done to identify which of the changes had the greatest effect in order to inform the priority of changes that can to be made in other settings.

The research focused on the perceptions of the students of their preparation once they started their clerkships and had experienced the demands of the clinical setting. Further research could be done at the end of the academic year to determine whether there has been an effect on the performance of the students, by analysing the outcomes of their assessments and comparing those to previous years.

CHAPTER SEVEN

7. References

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CHAPTER EIGHT

8. Appendices

8.1 Appendix A

Plagiarism Declaration

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I Stuart Redvers Pattinson (Student number: 0701312X) am a student registered for the degree of Master of Health Science Education in the academic year 2018.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: _____ Date: 31 OCTOBER 2018

8.2 Appendix B

Ethics Certificate

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R14/49 Dr SR Pattinson

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M171052

NAME: (Principal Investigator)	Dr SR Pattinson
DEPARTMENT:	Faculty of Health Sciences Undergraduate Unit for Medical Education Medical School
PROJECT TITLE:	Perceptions of changes made to a clinical skills curriculum in a medical programme in South Africa: a mixed method study
DATE CONSIDERED:	27/10/2017
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Professor P McInerney
APPROVED BY:	Professor PE Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	06/12/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on 3rd floor, Phillip V Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/We fully understand the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to resubmit to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. in this case, the study was initially reviewed in **October** and will therefore be due in the month of **October** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

07/12/2017
Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

8.3 Appendix C

Permission from the Deputy Registrar of Wits University

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

OFFICE OF THE DEPUTY REGISTRAR

12 October 2017

Mr Stuart Pattinson
Student number 0701312X
Master of Health Sciences Education Candidate
Centre for Health Science Education
Faculty of Health Sciences

TO WHOM IT MAY CONCERN

"Perceptions of changes made to a clinical skills curriculum in a medical programme in South Africa: a mixed method study"

This letter serves to confirm that the above project has received permission to be conducted on University premises, and/or involving staff and/or students of the University as research participants. In undertaking this research, you agree to abide by all University regulations for conducting research on campus and to respect participants' rights to withdraw from participation at any time.

If you are conducting research on certain student cohorts, year groups or courses within specific Schools and within the teaching term, permission must be sought from Heads of School or individual academics.

No research can commence before ethical clearance has been obtained. Kindly forward a copy of the clearance certificate to this office.

Nicoleen Potgieter
Deputy Registrar

8.4 Appendix D

Permission from Assistant Dean and Director of UUME

WHO WILL SUPERVISE THE PROJECT? (Where applicable)

Name P.A. McINERNEY Department: CHSE

Telephone No: 0117172073 Email: PATRICIA.McINERNEY@wits.ac.za

Signature: P. McInerney Date: 5.10.2017

HEAD / RESEARCH COORDINATOR OF DEPARTMENT / ENTITY IN WHICH STUDY WILL BE CONDUCTED (Where applicable) (Wits Students Academic HOD must sign)

Name: L. Green-Thompson Department / Entity Office of Teaching & Learning

Tel No: 7172764 Email: lionel.green-thompson@wits.ac.za

Signature: Date: 5/10/2017

Dear Stuart,
I am happy with the protocol and give my permission for the study.

Best wishes
Scarpa Schoeman

Prof. Scarpa Schoeman
Director: Undergraduate Medical Education
Wits Medical School
Faculty of Health Sciences
Wits University

Adj Prof Scarpa Schoeman
Director: UUME

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WITS UNIVERSITY

UUME
Unit for Undergraduate Medical Education

8.5 Appendix E

Approval of Title

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

26 October 2017
Person No: 0701312X
PAG

Dr SR Pattinson
201 Bolton Hall
8 4th Avenue
Killarney
2193
South Africa

Dear Dr Pattinson

Master of Health Sciences in Education: Approval of Title

We have pleasure in advising that your proposal entitled *Perceptions of changes made to a clinical skills curriculum in a medical programme in South Africa: a mixed method study* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

8.6 Appendix F

Questionnaire - Part one

Dear Student

My name is Stuart Pattinson and I am conducting a research study, under the supervision of Assoc Prof P McInerney, looking into how well the GEMP II (Graduate Entry Medical Programme) clinical skills curriculum at the University of the Witwatersrand medical school is preparing students to perform skills in their clinical rotations in GEMP III.

I am inviting you to please answer the question below. The question is about your experience in GEMP III and your perceptions of how well your GEMP II clinical skills curriculum prepared you for performing clinical skills in the hospital setting, particularly history taking, physical examination and procedures. It should take no longer than 5-10min of your time to complete.

Participation is entirely voluntary and your response will remain strictly confidential. You may withdraw from participation at any time during completion of the questionnaires without any penalty. There are no risks involved in taking part in this study and no personal information or IP addresses will be recorded. To further protect the participants' identities the responses with be retrieved by a neutral third party who will then send them on to the researcher. The data will be stored on a password protected computer and only my supervisor and I will have access to the data. Data may be made available to the Human Research Ethics Committee as required and cohorts may be identified on publication.

The study has been approved by the Deputy Registrar of Wits University - Nicoleen Potgieter.

If you have any queries or complaints related to the research process please direct these to the Human Research Ethics Committee using the contact details below:

- Chairperson: peter.cleaton-jones1@wits.ac.za
- Administrators - Ms Zanele Ndlovu/ Mr Rhulani Mkansi/ Mr Lebo Moeng
  Tel 011 717 2700/2656/1234/1252
- Email: HREC-Medical.ResearchOffice@wits.ac.za

Your completion of this questionnaire will be taken as consent to participate in the study.

For further information you can contact me at pattinsonstuart@yahoo.com or at 0117172786

Thank you very much; your participation in this study is greatly appreciated and will contribute to the improvement of the clinical skills curriculum.

Stuart Pattinson
Research for the degree: Master of Health Sciences Education
Supervisor: Associate Professor P McInerney

Question

What is your perception of the GEMP II Clinical Skills Curriculum's preparation for your clinical rotations in GEMP III?

8.7 Appendix G

Questionnaire - Part Two: Students

Dear Student

My name is Stuart Pattinson and I am conducting a research study, under the supervision of Assoc Prof P McInerney, looking into how well the GEMP II (Graduate Entry Medical Programme) clinical skills curriculum at the University of the Witwatersrand medical school is preparing students to perform skills in their clinical rotations in GEMP III.

I am inviting you to please complete the short questionnaire below. The questions are about your experience in GEMP III and your perceptions of how well your GEMP II clinical skills curriculum prepared you for performing clinical skills in the hospital setting, particularly history taking, physical examination and procedures. It should take no longer than 5-10min of your time to complete.

Participation is entirely voluntary and your response will remain strictly confidential. You may withdraw from participation at any time during completion of the questionnaires without any penalty. There are no risks involved in taking part in this study and no personal information or IP addresses will be recorded. To further protect the participants' identities the responses with be retrieved by a neutral third party who will then send them on to the researcher. The data will be stored on a password protected computer and only my supervisor and I will have access to the data. Data may be made available to the Human Research Ethics Committee as required and cohorts may be identified on publication.

The study has been approved by the Deputy Registrar of Wits University - Nicoleen Potgieter.

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  Tel 011 717 2700/2656/1234/1252
- Email: HREC-Medical.ResearchOffice@wits.ac.za

Your completion of this questionnaire will be taken as consent to participate in the study.For further information you can contact me at pattinsonstuart@yahoo.com or at 0117172786

Thank you very much; your participation in this study is greatly appreciated and will contribute to the improvement of the clinical skills curriculum.

Stuart Pattinson

Research for the degree: Master of Health Sciences Education

Supervisor: Associate Professor P McInerney

Phase 2 Research Questionnaire – Students

What is your current year of study?

GEMP III	
GEMP IV	

If you are in GEMP III, which clinical skills rotations have you completed?

Surgery	
Medicine	
Paediatrics	
Obstetrics and Gynaecology	
Family Medicine	
Psychiatry	
ENT	
Urology	
Ophthalmology	

Question 1

The clinical skills teaching curriculum in GEMP II adequately prepared me for application of clinical skills in the clinical setting in GEMP III

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 2

The transition to from GEMP II to GEMP III was very difficult.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 3

I was equipped in GEMP II with the skills needed to meet the expectations of students in GEMP III

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 4

I had confidence in performing clinical skills learnt in GEMP II with real patients in GEMP III.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 5

I was able to transfer skills learnt and practised with simulated patients to real patients.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 6

I was able to transfer skills learnt with simulation on mannequins to real patients.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 7

The clinical skills teaching curriculum prepared me to identify real clinical findings in patients with pathology.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 8

The clinical skills teaching curriculum in GEMP II adequately prepared me for history taking in GEMP III with real patients in the clinical setting.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 9

The clinical skills teaching curriculum in GEMP II adequately prepared me for physical examination of real patients in the clinical setting in GEMP III

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 10

The clinical skills teaching curriculum in GEMP II adequately prepared me for performing clinical procedures in the clinical setting in GEMP III

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 11

The resources available for learning clinical skills were adequate.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 12

The number of clinical lecturers available for teaching clinical skills was adequate for the number of students.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 13

The Clinical Methods bedside teaching/ Hospital Practice Day in GEMP II adequately prepared me for seeing real patients in the clinical setting in GEMP III

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 14

The Clinical Methods bedside teaching/ Hospital Practice day in GEMP II adequately prepared me for history taking in the clinical setting in GEMP III

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 15

The Clinical Methods bedside teaching/ Hospital Practice day in GEMP II adequately prepared me for physically examining patients in the clinical setting in GEMP III

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 16

The Clinical Methods bedside teaching/ Hospital Practice day in GEMP II adequately prepared me for performing clinical procedures in the clinical setting in GEMP III

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 17

Please provide any other comments, explanations or information about your perception of the GEMP II Clinical Skills Curriculum's preparation for your clinical rotations in GEMP III.

8.8 Appendix H

Questionnaire - Part Two: Teachers

Dear GEMP III teachers

My name is Stuart Pattinson and I am conducting a research study, under the supervision of Assoc Prof P McInerney, looking into how well the GEMP II (Graduate Entry Medical Programme) clinical skills curriculum at the University of the Witwatersrand medical school is preparing students to perform skills in their clinical rotations in GEMP III.

I am inviting you to please complete the short questionnaire below. The questions are about your perceptions of the clinical skills of the 2017 and 2018 GEMP III students and how well you think the GEMP II clinical skills curriculum prepares them for performing clinical skills in the hospital setting, particularly history taking, physical examination and procedures. It should take no longer than 5-10min of your time to complete. At the end there is a free text comments section for any additional comments you may have.

Participation is entirely voluntary and your response will remain strictly confidential. You may withdraw from participation at any time during completion of the questionnaires without any penalty. There are no risks involved in taking part in this study and no personal information or IP addresses will be recorded. To further protect the participants' identities the responses with be retrieved by a neutral third party who will then send them on to the researcher. The data will be stored on a password protected computer and only my supervisor and I will have access to the data. Data may be made available to the Human Research Ethics Committee as required and cohorts may be identified on publication.

The study has been approved by the Deputy Registrar of Wits University - Nicoleen Potgieter.

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  Tel 011 717 2700/2656/1234/1252
- Email: HREC-Medical.ResearchOffice@wits.ac.za

Your completion of this questionnaire will be taken as consent to participate in the study.
For further information you can contact me at pattinsonstuart@yahoo.com or at 0117172786
Thank you very much; your participation in this study is greatly appreciated and will contribute to the improvement of the clinical skills curriculum.

Stuart Pattinson
Research for the degree: Master of Health Sciences Education
Supervisor: Associate Professor P McInerney

Perceptions of changes made to a clinical skills curriculum in a medical programme in South Africa: a mixed methods study.

Phase 2 - Research Questionnaire – Teachers

In which clinical rotation are you involved in teaching/facilitating the GEMP III students?

Surgery	
Medicine	
Paediatrics	
Obstetrics and Gynaecology	
Family Medicine	
Psychiatry	
ENT	
Urology	
Ophthalmology	

Perceptions of 2017 GEMP III students

Question 1
The **2017** GEMP III students were adequately prepared in GEMP II for application of clinical skills in their clinical rotations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 2
The transition from GEMP II to GEMP III was very difficult for the 2017 GEMP III students.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 3
The 2017 GEMP III students were equipped in GEMP II with the skills needed to meet the expectations of students in their clinical rotations

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 4
The 2017 GEMP III students were confident in performing clinical skills learnt in GEMP II with real patients in GEMP III.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 5
The 2017 GEMP III students were adequately prepared in GEMP II for history taking in their clinical rotations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 6
The 2017 GEMP III students were adequately prepared in GEMP II for physical examination of patients in their clinical rotations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 7
The 2017 GEMP III students were adequately prepared in GEMP II for application of procedural skills in their clinical rotations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Perceptions of the 2018 GEMP III students.

Question 8
The 2018 GEMP III students are adequately prepared in GEMP II for application of clinical skills in their clinical rotations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 9
The transition from GEMP II to GEMP III was very difficult for the 2018 GEMP III students.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 10
The 2018 GEMP III students are equipped in GEMP II with the skills needed to meet the expectations of students in their clinical rotations

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 11
The 2018 GEMP III students are confident in performing clinical skills learnt in GEMP II with real patients in GEMP III.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 12
The 2018 GEMP III students are adequately prepared in GEMP II for history taking in their clinical rotations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 13
The 2018 GEMP III students are adequately prepared in GEMP II for physical examination of patients in their clinical rotations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 14
The 2018 GEMP III students are adequately prepared in GEMP II for application of procedural skills in their clinical rotations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 15
The 2018 GEMP III students are better prepared for GEMP III than the 2017 GEMP III students were.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Question 16

Please make any additional comments about how you feel the Clinical Skills Curriculum in GEMP II prepares the students for performing clinical skills in GEMP III, in particular comparing the 2017 and 2018 GEMP III students at the same point.

8.9 Appendix I

Turnitin Report

0701312x:Research_Report_Stuart_Pattinson_0701312X.docx

ORIGINALITY REPORT

10%	8%	3%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to University of Witwatersrand Student Paper	2%
2	opus.lib.uts.edu.au Internet Source	<1%
3	scholar.sun.ac.za Internet Source	<1%
4	www.esua.org Internet Source	<1%
5	www.asme.org.uk Internet Source	<1%
6	Fallatah, Hind I, Ara Tekian, Yoon Park, and Lana Al Shawa. "The validity and reliability of the sixth-year internal medical examination administered at the King Abdulaziz University Medical College", BMC Medical Education, 2015. Publication	<1%
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