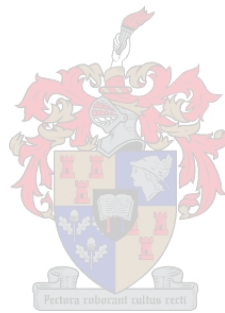


Title: The status of curriculum mapping of
undergraduate medical programmes in
South Africa

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Declaration

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Abstract

Introduction: Medical schools in South Africa have to provide evidence that the curriculum meets standards for accreditation and that graduates can address the health care needs in society. Curriculum review and renewal is an ongoing process to ensure curricula stay relevant. Curriculum mapping has become a widely used way in which curricula are being managed and reviewed. At Sefako Makgatho Health Sciences University (SMU) the Curriculum Development Committee (CDC) is in the process of developing a curriculum map. The aim of this study was to explore the status of curriculum mapping at medical schools in South Africa and to use the results to make recommendations to the CDC at SMU.

Methodology: The study made use of descriptive and interpretive (non-experimental) methods and an exploratory qualitative design. Semi-structured interviews were conducted with curriculum leaders from all eight medical schools in South Africa. Data were transcribed by the researcher and analysed by using the framework model. The analysis was done in a thematic non-linear process, with collection, transcription, and analysis being intertwined. Codes were used to facilitate comparison of data within and between categories. The analysed data were brought into context with knowledge on curriculum mapping processes and curriculum mapping tools elsewhere in the western world. Interpretation of data was done by aggregating patterns, searching for structure and synthesising findings, and explicitly focused on the South African context.

Results: All eight of the institutions who offered undergraduate medical training during 2015 participated in the study. In analysing the results it was clear that institutional representatives mainly described the current situation (2015) and the possible future vision. In the current situation, the four categories that emerged were curriculum design, curriculum documentation, strategies used at the institution for curriculum review, as well as challenges

experienced. The five emergent categories for the future vision were urgency for the preferred way of mapping, expectations of a mapping platform, elements to be reflected within the platform, stakeholders and stakeholder access, and institutional requirements for successful implementation. None of the medical schools in South Africa have completed a curriculum mapping exercise. All institutions have various and separate documents available to accreditation authorities and external examiners during review visits and have strategies in place for curriculum review and renewal. Institutions experience huge challenges intrinsic both to the curriculum and to the external realities impacting on the implementation of the curriculum. These challenges seem to warrant mapping as a possible strategy to analyse and manage the curriculum, and make improvements. There seems to be a growing awareness of sophisticated electronic mapping as a platform to share the vision of the curriculum and improve coherence, review and manage the curriculum, facilitate benchmarking and accreditation, and contribute to research and faculty development. A national mandate and full institutional support will be necessary for mapping to be successfully implemented at each institution.

Conclusion: The non-coherence of some curricula, the inability to formulate core content, and the lack of sufficient buy-in and involvement of clinical training educators are of concern. Curriculum leaders will need to ensure that the mapping platform will meet specific institutional requirements to address the challenges while portraying the unique structure of the curriculum. The expectation of benchmarking and collaboration amongst institutions and standardisation of undergraduate outcomes will require a national mandate. This study contributed to a baseline understanding of the status of curriculum mapping of undergraduate programmes at medical training institutions in South Africa. Additional research will be needed to establish if mapping could indeed address the expectations identified in this study.

Keywords: curriculum mapping, curriculum, curriculum challenges, curriculum review and renewal, expectations of a mapping platform.

Opsomming

Inleiding: Mediese skole in Suid Afrika is genoodsaak om bewys te lewer dat hulle aan akkreditiestandaarde voldoen wat verseker dat gegradueerdes gesondheidsorg-behoeftes kan aanspreek. Kurrikulum hersiening and vernuwing as 'n deurlopende proses kan verseker dat kurrikula relevant bly. Kurrikulum kartering is 'n algemene aanvaarbare praktyk om kurrikula te bestuur en te hersien. By Sefako Makgatho Gesondheidswetenskappe Universiteit (SMU) is die kurrikulumkomitee in die proses daarvan om 'n kaart van die kurrikulum te ontwikkel. Die doel van hierdie studie is om die status van kurrikulum kartering van die voorgraadse program by mediese skole te ondersoek, en om die resultate te gebruik vir aanbevelings na die kurrikulumkomitee.

Metode: Die studie maak gebruik van beskrywende and interpreterende (nie-eksperimentele) metodes in 'n kwalitatiewe benadering. Semi-gestruktureerde onderhoude is met kurrikulumleiers aan al agt die mediese skole in Suid Afrika gevoer. Die navorser het die data getranskribeer en analise is gedoen deur middel van die raamwerk-model. Nie-liniêre tematiese analise is gedoen deur data insameling, transkripsie and analise te kombineer. Toegekende kodes is gebruik om vergelykings te tref binne en tussen die kategorieë van alle datastelle. Die analise van data is beskryf binne die konteks van kennis rakende kurrikulum kartering, prosesse en instrumente soos beskryf in die literatuur. Interpretasie is gebaseer op sintesering van patrone wat gevind is binne die data, en fokus eksplisiet op die Suid-Afrikaanse konteks.

Resultate: Al agt die universiteite wat voorgraadse programme gedurende 2015 aangebied het, het aan die studie deelgeneem. Dit was duidelik dat die deelnemers hulle huidige (2015) situasie beskryf het en ook gefokus het op 'n moontlike visie vir die toekoms. As huidige situasie is vier kategorieë geïdentifiseer, naamlik kurrikulum ontwerp, kurrikulum

dokumentering, strategieë wat die universiteit gebruik vir kurrikulum hersiening, asook uitdagings wat hulle ervaar. Die vyf kategorieë wat na vore gekom het in die moontlike visie vir die toekoms sluit in: dringendheid vir die verkose manier van kartering, verwagtinge van 'n karteringsplatform, elemente wat reflekteer behoort te word, rolspelers en rolspeler-toegang, asook institusionele vereistes vir suksesvolle implementering. Geeneen van die mediese skole in Suid-Afrika het op hierdie stadium (2015) 'n volledige kurrikulum karterings proses voltooi nie. Al die skole beskik wel oor dokumentasie wat beskikbaar gestel word aan gesaghebbendes en akkreditasieliggamme gedurende akkreditasie besoeke. Mediese skole ondervind groot uitdagings beide ten opsigte van die kurrikulum en die eksterne realiteite om die kurrikulum te implementeer. Hierdie uitdagings blyk kartering voor te staan as moontlike strategie om die kurrikulum te analiseer en te bestuur, asook verbeterings aan te bring. Daar blyk 'n groeiende bewustheid te ontwikkel dat gesofistikeerde karteringsplatforms nodig gaan wees om die visie van 'n kurrikulum met rolspelers te deel, om die samevattende geheel te verbeter, om die kurrikulum te hersien en te bestuur, om maatstawwe te ontwikkel en akkreditasies te fasiliteer, en om by te dra tot ontwikkeling van personeel en navorsing. 'n Nasionale mandaat and volle institusionele ondersteuning sal egter nodig wees vir kartering om suksesvol by die mediese skole geïmplementeer te word.

Samevatting: Die oënskynlike gebrek aan samehang van sommige kurrikula, die onvermoë om 'n kern kurrikulum te formuleer en die gebrek aan voldoende betrokkenheid van sommige kliniese fasiliteerders is kommerwekkend. Kurrikulumleiers sal moet verseker dat 'n karteringsplatform aan die vereistes en behoeftes van die rolspelers in die mediese skool voldoen en die unieke struktuur van die program verteenwoordig terwyl dit die uitdagings aanspreek. Die verwagting dat kartering maatstawwe en norms kan aanspreek en samewerking tussen mediese skole fasiliteer om gestandaardiseerde voorgraadse uitkomst te verseker, sal 'n nasionale mandaat vereis. Hierdie studie lewer 'n bydrae deur die status van

kurrikulum kartering van voorgraadse programme in mediese skole in Suid Africa op hierdie stadium te beskryf. Addisionele navorsing sal nodig wees om vas te stel of kartering wel aan die verwagtinge, soos in die studie geïdentifiseer, te voldoen.

Chapter 1: Contextualisation of the topic for research

1.1 Background to the study

During 2013, the Health Professions Council of South Africa (HPCSA) recommended that the Medical School at the University of Limpopo, now Sefako Makgatho Health Sciences University (SMU), finalise decisions regarding core curriculum and provide evidence of course alignment. The HPCSA subcommittee for Undergraduate Education and Training furthermore requested during 2014 that institutions ensure a set of core competencies become entrenched within the medical school curricula in South Africa.

Curriculum review and renewal is understood as an on-going process that requires proper record keeping and reporting. The challenge of the Curriculum Development Committee (CDC) at SMU was to find a package or process in which to record the curriculum in such a way that it is accessible to ‘everybody’ and transparent. CDC also needed a ‘tool’ that could be managed as the process unfolds for quality assurance purposes. As will be discussed in chapter 2 Literature review, it will become clear that curriculum mapping for many medical schools in the western world became the standard in which to review and record curriculum. This prompted the CDC at SMU to explore curriculum mapping platforms which could be used. The immediate next question was whether other medical schools in the country are mapping curricula, and if so, what platforms do they use, what are the successes and challenges, what elements are being mapped etc.

The CDC at SMU prioritised the mapping of the MBChB curriculum. The mapping was to include more than one process, as follows:

- translating and adjusting the Charité University model of Learning Opportunities, Objectives and Outcome Platform (LOOOP) to the SMU context by 2016;

- exploring the status of curriculum mapping of undergraduate medical curricula at medical schools in South Africa by 2017;
- finalising the mapping of the MBChB programme onto the adjusted LOOOP by 2018; and
- using data and feedback from internal and external stakeholders to review and renew the curriculum as well as the mapping platform as the process unfolds.

This study therefore is done as a result of the need expressed by the CDC at SMU to explore the status of curriculum mapping of undergraduate medical programmes at other medical schools in South Africa. It is hoped that the results and lessons learnt will further inform the curriculum mapping process at SMU.

1.2 Problem statement

Curriculum mapping has been used in many universities in western countries to record and review the curriculum. Many different tools have been developed since the early nineties. Mapping of undergraduate medical curricula in South Africa needed to be explored in order to enhance understanding and application in the local context.

1.3 Research question:

This study explores the status of curriculum mapping at medical schools in South Africa (for example, do medical schools map their curricula, at what stage are they, what are the challenges experienced, which elements are being mapped, and would schools be interested in collaboration?). The research question was formulated as:

‘What is the status of curriculum mapping of undergraduate programmes at the medical schools in South Africa?’

1.4 Aim and objectives of the study:

The aim of the study was to explore the status of curriculum mapping of undergraduate medical programmes in South Africa. The exploration tried to establish whether curriculum managers have mapped the medical curriculum and how, for example what formats they use and which elements are included in a map, what strengths and successes have been achieved, and what challenges were experienced. This study therefore focused on the following five objectives:

- To explore the status of curriculum mapping for undergraduate medical programmes in South Africa.
- To identify the elements regarded as important to a map or mapping platform.
- To record successes and strengths of the mapping processes.
- To describe challenges (real or perceived) that are relevant to curriculum mapping.
- To explore opportunities for collaboration with regard to mapping of undergraduate curricula.

1.5. Methodology

The study was performed according to the principles and philosophy of a qualitative research approach. It made use of descriptive and interpretive (non-experimental) methods and an exploratory qualitative design. The data was expected to provide an in-depth understanding of the status of curriculum mapping in South Africa. Semi-structured interviews were held with curriculum ‘managers’ at all eight medical schools that had students during 2015. Data were analysed by using the framework model and to ensure rigour and trustworthiness.

1.6 Results of the study:

It transpired that all institutions have attempted to document the curriculum for accreditation purposes in some way or the other and has processes in place to ensure quality improvement; however, the majority regarded these as fragmented and not sufficiently comprehensive. More importantly, it seemed that curriculum mapping was seen as a possible strategy to drive curriculum review and renewal. Similar challenges for curriculum review, implementation and renewal as experienced by the various schools were reported. It was felt that a mapping platform should include elements such as structure, content and outcomes, learning opportunities, and assessment strategies. Various stakeholders should be involved in the developmental process and have access to the platform. A national mandate and full institutional support will be necessary for mapping to be successfully implemented.

1.7 Contribution of the study:

This study contributed to a broad understanding of the status of curriculum mapping at each of the eight medical schools in South Africa as was the case during 2015 and can be regarded as a baseline against which to measure progress of mapping in the future. Curriculum planners at some institutions have now started to see sophisticated electronic mapping as an opportunity to share the vision of the curriculum, as a tool to review and manage the curriculum, as a platform to facilitate benchmarking and accreditation and as a database to contribute to research and faculty development.

In this study the elements to be included in a curriculum map in the South African were clearly identified, as well as the stakeholders that should be involved. Strategies and process to be followed were described, as well as the importance of getting institutional support and buy-in from especially clinical academic staff.

This study furthermore contributed to a dialogue regarding the function and use of mapping platforms in the South African context, the possibility of reaching consensus on core clinical presentations, the outcomes frameworks to be used and third party taxonomies to cross reference against in order to enable benchmarking and make accreditation easier. The study also contributed to the dialogue regarding possible future mapping of subsequent phases of training. In chapter five a set of suggestions were offered to curriculum managers regarding the planning of platforms in order to improve usefulness of mapping platforms for the future.

Results from this study will further inform the CDC at SMU on continuous development and updating of the LOOOP, as the mapping platform of choice at SMU.

This study was conducted as partial requirement for the MPhil degree in Health Sciences Education at Stellenbosch University. Ethical clearance for the study was obtained from Stellenbosch University (S15/05/123). The SMU Research Ethics Committee gave additional permission for the study to be rolled out. None of the other universities required further ethical clearance. Stellenbosch University (Centre for Health Sciences Education) provided supervisory and academic support.

Chapter 2: Literature review

This chapter contributes a literature review in order to explain curriculum mapping within the context of this study.

In the first section of the chapter, issues investigated in the literature related to *curriculum* are presented. These include definition, description of challenges in implementing undergraduate medical curricula and motivation for ongoing review and renewal. Statements regarding curriculum mapping as strategy to review contemporary medical curricula conclude this section.

Thereafter, matters investigated in the literature related to *mapping* are introduced with a definition, followed by a discussion of the elements that should form part of a map. The discussion focuses on evolving trends regarding the nature of mapping over the past decade. The reasons for the increasing use of technology-based mapping platforms are investigated as current trends point to an increasing preference for this sophisticated mapping approach. The functions and purposes of mapping are discussed and then stakeholder involvement is explained with examples of how each stakeholder group can make use of curriculum mapping. The critical success factors necessary for curriculum mapping platforms conclude the literature review.

2.1 Curriculum

Medical schools have a mandate to produce health professionals capable of addressing the health needs in society (Boelen & Woollard, 2010; Frenk et al., 2010) and, when they fail in this task, it is postulated that the curriculum contributes to the problem ‘because fragmented, outdated, and static curricula produce ill-equipped graduates’ (Frenk et al., 2010:1923). On

the other hand, the curriculum can also be regarded as the solution if it is appropriately and rigorously planned (Harden, 2013:8).

2.1.1 Definition of the concept: curriculum

Curriculum seems to be a complex concept that is often found difficult to define. Genn (2001a:338) argues that:

Curriculum is the most over-used, under-interpreted, vague, ambiguous, misleading and misunderstood term in the whole of education discourse, [although it is also] the most holistic, inclusive and comprehensive entity and notion in education.

Harden (2013:8) suggests that ‘curriculum refers to what should happen in a teaching programme – about the intention of the teachers and about the way they make this happen’, but it could be argued that this definition is not sufficiently specific. An earlier, extended description of ‘curriculum’ by the same author is more useful as it specifies a greater number of elements (Harden, 2001:123):

The curriculum is a sophisticated blend of educational strategies, course content, learning outcomes, educational experiences, assessment, the educational environment and the individual students.

2.1.2 Challenges in implementing undergraduate medical curricula:

Curricula need to respond to circumstances and changes in society and in educational thinking. Medical schools face challenges as a result of changes in systems of health care delivery, advances in medicine and technology, and increasing expectations of the doctor by patients (Davis & Harden, 2003; Harden & Hart, 2002; Prideaux, 2007). At the same time,

outcomes- and competency-based education – currently two of the dominant approaches used in medical education – require careful and intensive coordination between all faculty members while they have to cope with an increased workload in terms of patient care and administration (Balzer, Bietenbeck et al., 2015; Balzer, Dittmar et al., 2015; Pugsley & McCrorie, 2007).

Matching outcomes which are significant, worthwhile, and enduring with specialised content is a particular challenge in this context (Harden, 2007). Not only is the scope large (basic and medical science disciplines, communication and clinical skills, social and community health, law, ethics, human rights, professionalism, and patient safety), but the connections between subsequent stages are not always clear and the potential for overload with common and major diseases is considerable (Dalley, Candela & Benzel-Lindley, 2008).

Rapid change and expansion of medical knowledge add to an already comprehensive curriculum (Dalley et al., 2008; Prideaux, 2007). This often leads to educators adding more information without removing any content, resulting in information overload. Careful discourse about the essential concepts and abilities must be facilitated with all stakeholders. Changes in faculty attitude and knowledge are often mandatory for processes to reduce information overload to succeed (Dalley et al., 2008).

It is evident, therefore, that there are multiple challenges that impact on curriculum implementation and that warrant curriculum review and renewal.

2.1.3 Motivation for on-going curriculum review and renewal

Theories from the broader educational literature contribute to the quest for dynamic models of curriculum development, review and renewal. Curriculum review and evaluation should form an integral and on-going part of medical education. The process of review and

evaluation is dynamic, cyclical and continuing (Bansal, Christensen & Leinster, 2009; Durning, Hemmer & Pangaro, 2007; Genn, 2001b; Kogan & Shea, 2007; Prideaux, 2007; Ramsden, 2010; Rotem, 1992; Woodward, 2002).

Amidst significant international reform in medical education, universities have become increasingly self-conscious, self-aware and critical in actively pursuing self-review (Genn, 2001b). Self-review is aimed at improving scholarship, curriculum, learning, teaching and assessment. The reasons for a self-review are formulated around improvement, to find solutions for a known problem or as part of the institution's managerial process (Bansal et al., 2009; Genn, 2001b).

Changing and renewing are key aspects of survival (Davis & Harden, 2003; Genn, 2001b) and there is a potential danger when a curriculum is perceived to be successful as this can lead to resistance to critical review and reduce the incentive to change it. Change comes about when academics notice 'difference, discrepancy, deficit, dissonance, discontinuity or disequilibrium' (Genn, 2001b:450) within the curriculum and decide to remediate it. The school should have the vision of how to improve and have a process in mind to get there (Davis & Harden, 2003; Genn, 2001b).

Continuous quality improvement fosters notions of cooperation, dialogue and ownership amongst stakeholders. The ongoing self-renewing aspect of the quality assurance process has an internal locus of control, driven by institutional stakeholders, curriculum planners, academic staff and students (Genn 2001a; Genn 2001b).

Medical curricula are traditionally subject to accreditation reviews by a national regulatory body. Accreditation inspections are usually aimed at evaluating good practice and performance standards according to a predefined set of criteria (Bansal et al., 2009; HPCSA, 2015; World Federation for Medical Education, 2012). In spite of this, little practical

guidance exists for the systematic evaluation of an entire medical curriculum (Bansal et al., 2009; Durning et al., 2007). Research pertaining to programme evaluation in medical education is largely descriptive and is still less developed than in other educational fields (Durning et al., 2007; Kogan & Shea, 2007; Pugsley & McCrorie, 2007).

According to Harden (2001:36), the curriculum map is an essential tool to operationalise contemporary medical curricula and aid at least in some aspects of curriculum review and evaluation:

In an age of quality assurance and academic standards, the curriculum map has a role in determining whether the curriculum meets specific standards and whether the school's curriculum is congruent with the expected learning outcomes.... No good curriculum can afford to be without one.

It is clear from the preceding discussion that the curriculum is a comprehensive entity that includes more or less all aspects of the educational enterprise in a specific field. Curricula experience challenges of implementation and further development. Medical education curricula seem to be additionally challenged by the demands put on lecturing staff in terms of service delivery and administration, as well as changes in disease profiles, health care systems and expectations society has of the doctor. Continuous quality improvement and innovation therefore become all the more important for undergraduate medical curricula. Research pertaining to whole programme review and evaluation in medical education is limited. Ongoing review and renewal of curricula could be facilitated by curriculum mapping.

2.2 Curriculum mapping

2.2.1 Definition of curriculum mapping

As early as 1981, Gjerde defined curriculum mapping as an approach to determine the degree of congruence amongst objectives, instruction and evaluation (Gjerde, 1981:316). Curriculum mapping is concerned with what is taught and assessed as well as when and how, and focuses on the patterns and relationships between elements (Harden, 2001:123):

Curriculum mapping is about representing spatially the different components of the curriculum so that the whole picture and the relationships and connections between the parts of the map are easily seen.

A map is much more than just a timetable or a list of contents; rather, it explains the components in relation to each other (Balzer et al., 2016; Harden, 2001; Steketee, 2015; Willett, 2008). Data include content and objectives (what), linked to learning, teaching and assessment strategies (how), linked to structure (by when), linked to the logistics such as timetables (when). In integrated curricula, the map becomes ‘the glue that holds the curriculum together’ (Harden, 2001).

A central repository which presents a course as a whole makes it possible for all staff responsible to develop the course collectively and to examine whether the course fulfils educational requirements (Steketee, 2015). In summary, curriculum mapping has increasingly become the tool used to communicate about the complex blend of elements within the curriculum (Davis & Harden, 2003).

2.2.2 Elements or windows

As explained earlier, the map enables a holistic approach by linking various elements of the curriculum, such as outcomes, with learning opportunities, content and assessments (Harden, 2001; Prideaux, 2007). Elements of the curriculum can be grouped into ten ‘windows’, namely, learning outcomes, curriculum content, assessments, learning opportunities, learning location, learning resources, timetable, staff, curriculum management and students (Harden, 2001). Students typically need information on various elements such as (Prideaux, 2003):

- context (background, abilities, experiences);
- intents (aims, goals, outcomes, objectives);
- content (scope, sequence, related to aims, related to practice);
- teaching and learning (various learner-centred methods, opportunities for self-direction, learning in real life settings);
- assessment (clear blueprint for formative and summative);
- organisation (blocks, units, timetables, venues); and
- evaluation or student feedback (surveys, questionnaires, focus groups).

It is important to strike a balance between the detail of elements and overall clarity of representation (Prideaux, 2003).

The complexities intrinsic to the integrated curriculum and the number of elements linked, resulted in curriculum mapping tools being further developed over the past decade.

2.2.3 Developments in curriculum mapping tools

2.2.3.1 Graphical / diagrammatic representations of the curriculum

Initially, curriculum mapping was likened to a road map where the curriculum was graphically represented with lines linking various elements. Harden (2001:21) provided a simple illustration:

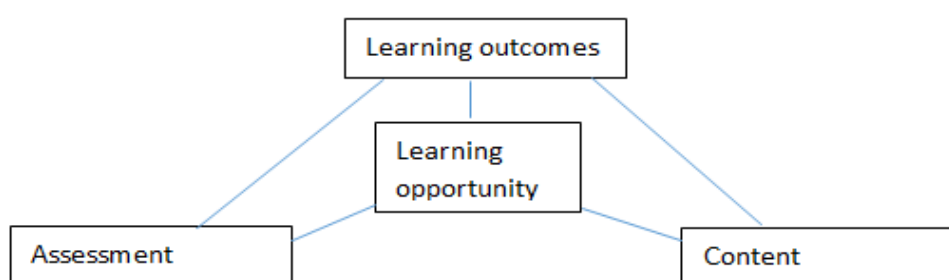


Figure 2.1: Harden's four key windows of a curriculum map (Harden, 2001:21)

These types of graphical and tabular maps were used in a few studies to review curricula. Wood, Meekin, Fins and Fleischman (2002) mapped themes related to palliative education amongst 13 medical schools using graphical formats. In a study by Plaza, Draugalis, Slack, Skrepnek and Sauer (2007), mapping was demonstrated in tabular format by linking outcome statements for the intended, delivered and received curriculum respectively. Tables provide a mechanism to visually show where competencies are covered. In a study by Sanchez-Reilly and Ross (2012), relevant competencies for a specific thematic area (inter-professional learning and teaching in Hospice and Palliative Medicine) were mapped in tabular format and linked with assessment methods. In another table, inter-professional-specific outcomes were linked with learning and teaching strategies.

As can be seen from the above, graphical and tabular representations of curricula are useful. However, at the completion of an iterative curriculum review process by Britton, Letassy, Medina and Er (2008), the authors concluded that static, essentially paper-based mapping systems have limitations. Harden, for example, indicated as early as 2001 that connections between windows made on computers are impossible to reproduce on graphical and tabular versions of a map. In addition, it seems that whole curricula cannot easily be displayed and represented in narrative form or in a single diagram. These limitations resulted in the exploration of computer-based alternatives.

2.2.3.2 Computer-based multi-dimensional curriculum maps

A sophisticated curriculum map is needed to allow staff and students to understand planned progression and complex relationships between various elements in a curriculum (Davis & Harden, 2003). Stakeholders have therefore identified the need for electronic mapping to facilitate and support a dynamic and sustainable curriculum mapping and peer review process. The use of a multi-dimensional curriculum map has become increasingly necessary to model, track and report on contemporary curricula (Ellaway, Albright, Smothers, Cameron & Willett, 2014).

A study by Willett (2008) argues that computer-based maps differ greatly, but could be analysed into hierarchical clusters (Table 2.1). Cluster 1 maps link details about teachers, date, time, students and location. Cluster 2 maps link aspects of assessments, assessment descriptors, and learning and teaching descriptors. Cluster 3 maps link outcomes, objectives and opportunities. Cluster 4 maps link freeform words, controlled vocabularies and ontologies in order to make benchmarking possible.

Table 2.1: Willett's hierarchical clustering of curriculum maps linking various elements

Cluster	Windows / elements linked
Cluster 1 maps	Teachers, date, time, students, location
Cluster 2 maps	Assessments, assessment-method descriptors, teaching or learning method descriptors
Cluster 3 maps	Learning outcomes, specific learning objectives, learning opportunities or events, courses, learning objectives of course
Cluster 4 maps	Freeform keywords, controlled vocabulary or ontology

(Willett, 2008:42)

Cluster 4 maps are seen as the most advanced in the cluster analysis framework and demonstrate the use of the semantic web as curriculum mapping tool.

a) The semantic web and curriculum mapping

Since 2005, the semantic web (Web 3.0) has provided many new possibilities for curriculum mapping and e-learning technologies (Blaum et al., 2013). Web 3.0 refers to a network data storage system which can automatically generate and discover contextual relations between data objects. The term mapping in this context reflects the process of connecting (cross-referencing) two or more sets of data.

The power of the map now lies in the multi-dimensionality with a series of matrices (Blaum et al., 2013). It enables the linking of complex, student-centred competencies with course-specific and well-defined objectives, as well as with teachers and suitable patients (Balzer, Bietenbeck et al., 2015; Balzer et al., 2016). It works by simplifying and abstracting curricular data to show important patterns and relationships for the purposes of curriculum management, analysis and reporting (Blaum et al., 2013; Britton et al., 2008; Ellaway et al., 2014).

A relational database allows browsing for information in different ways, including 'click on' links (Willett, 2008). Users can search curricular content by keywords, phrases, course names, learning objectives and/or programme outcomes.

Changes to the curriculum can be dated and tracked (Britton et al., 2008). This ability to record the past and project into the future enhances usefulness, but challenges related to version control should be managed carefully (Oliver, Jones, Ferns & Tucker, 2007).

b) The use of controlled taxonomies and outcomes frameworks

Controlled vocabularies facilitate searching of the curriculum for specific topics, themes or concepts in order to index content (Willett, Marshall, Broudo & Clarke, 2007; Willett, 2008). Commonly used content descriptors include Medical Subject Headings (MeSH) and International Classification of Disease (ICD-10). Using controlled vocabularies has many advantages, such as the ability to search for specific topics and to identify unwanted gaps and redundancies (the detection depends on a third-party content descriptor as opposed to the institution-specific heading). It also facilitates comparisons and the sharing of data amongst institutions (for example, a national repository of examination questions) (Willett et al., 2007).

Systematic mapping of one outcomes framework against another (for instance, cross-referencing learning outcome frameworks of The Scottish Doctor and Tomorrow's Doctors) became possible nearly a decade ago (Ellaway et al., 2007). Cross-referencing of frameworks is inherently subjective. Cross-referencing activities should be undertaken with care by a sufficiently expert representative group to ensure authority and validity and with the critical awareness of the tolerance of the results.

According to Willett (2008), the outcomes frameworks used by medical schools and countries varies and can include, for example, CanMeds 2005 (Canada), Tomorrow's Doctors (UK), The Scottish Doctor (UK), Brown University's Nine Abilities (USA), the World Health Organisation's Five-Star Doctor (international) and the Institute for International Medical Education's Global Minimum Essential Requirements (international). In general,

outcomes frameworks are not an attempt at rigid uniformity but allow for diversity in educational process and curriculum design.

c) Various mapping tools in use

As indicated earlier, curriculum mapping has become a common activity for medical schools in the USA, Canada, UK and Australia, yet little standardisation of function and purpose of these maps exists (Oliver et al., 2007; Watson et al., 2007; Willett, 2008; Willett et al., 2008). Implementation differences include technology platforms used as well as the data sets drawn upon (Ellaway et al., 2014; Willett, 2008).

According to Sallas et al. (2003), the Association of American Medical Colleges at an earlier stage promoted the use of the Curriculum Management and Information Tool (CurrMIT); however, by 2008 CurrMIT was seen as having an unwieldy taxonomy (Willett, 2008) and being too labour-intensive, while it also lacked flexibility (Ellaway et al., 2014). Other authors reported that universities were making use of relational databases such as Microsoft SQL Server (Britton et al., 2008; Ellaway et al., 2007; Willett, 2008), Oracle and Microsoft Access, Microsoft Excel spreadsheets (Willett, Marshall, Broudo & Clarke, 2008) and mind mapping software such as MindManager Pro 6 (Graham et al., 2007). Some commercial (Blackboard, ThinkingCap) and open-source (Moodle, Zope) products were also being used (Willett, 2008). In Australia, the University of New South Wales developed eMed as comprehensive curriculum management system consisting of six main tools (Watson et al., 2007) and University of Wollongong developed Prudentia (Steketee, 2015). Recently, Charité Medical University in Berlin developed the Learning Opportunities, Objectives and Outcomes Platform (LOOOP) and has published on its usefulness (Balzer, Bietenbeck et al., 2015; Balzer, Dittmar et al., 2015; Balzer et al., 2016).

As can be seen from technological developments over the past decade, the sophistication of curriculum mapping has dramatically expanded. It is now possible for stakeholders to use mapping in various ways to investigate complicated curriculum issues in a relatively short time. From the literature, it is clear that curriculum mapping has a variety of functions.

2.2.4 Functions and purposes of curriculum mapping

2.2.4.1 Developing familiarity with the curriculum

Traditionally, much of the information in a curriculum has been managed by academics in isolation from each other, while a map brings together the different elements in such a way that the broad picture as well as the connections between the elements can be examined (Steketee, 2015). According to Harden (2001), such mapping makes the curriculum more transparent. It develops a level of familiarity with the curriculum which is important for successful implementation of an integrated approach. Prideaux (2003:270) postulates that curriculum mapping displays the essential features of the curriculum in a ‘clear and succinct manner by providing a structure for the systematic organisation of the curriculum’.

2.2.4.2 Serving as analytical tool for curriculum review and renewal

Mapping serves as a blueprint for developing curricular goals and learning objectives and to manage, review and organise content (Harden, 2001; Prideaux, 2007). According to Harden (2001:123):

By diagramming relationships between the elements, a map provides a visual analytic tool and makes evident the need for strategy decisions which in turn can lead to improvements.

Mapping reduces discrepancy between the declared curriculum (what is assumed) and the learned curriculum (what the students actually learn) (Harden, 2001:123-137). It is used as a communication tool, but also for the planning and analysis of a curriculum. In this regard, mapping can be instrumental in the identification of the core curriculum, reducing unplanned duplications, identifying gaps or aligning outcomes across the curriculum (Steketee, 2015).

2.2.4.3 Facilitating collaboration between medical schools

Curricula remain unique to institutions, especially in terms of goals, values, priorities, design, description, time to complete, outcomes and structure (Ellaway et al., 2014). However, curriculum mapping makes it possible to improve collaboration between institutions. This becomes possible especially when institutions use the same outcomes framework (Ellaway et al., 2014). An advantage of shared outcomes frameworks is that they also provides a guide to best practice (Cumming & Ross, 2007). An example of this type of collaboration is the Bologna Process and European legislation that required mutual recognition of medical degrees and needed comparable examinations and standards of qualifications. This resulted in the Tuning Project for Medicine (Europe) as an outcomes framework for primary medical degree qualifications (Cumming & Ross, 2007). Institutions also need to use similar content vocabularies (e.g. MeSH or ICD-10) in order to search for thematically related objects, to enable automatic comparisons and to exchange data between multiple sets of information at multiple sites (Blaum et al., 2013; Willett, 2008; Willett et al., 2007; Willett et al., 2008).

2.2.4.4 Facilitating continuous professional development

In the past little collaborative planning by autonomous institutions for both undergraduate and postgraduate programmes existed. According to Harden (2006:799), a commission on medical education in the USA warned as early as 1932 that:

Artificial segregation of the basic medical course, the internship, the training of the specialist or the continuation of education of the general practitioner is likely to create serious gaps in the education of physicians.

Curriculum mapping can integrate various stages in the educational programme in such a way that the exit-level outcomes of one phase become the entry requirements for the next.

The Australian curriculum framework for junior doctors is an example of a curriculum map of ‘capabilities’ to be developed after completion of primary-level training. Authors have indicated that positions, rosters and opportunities for teaching in clinical settings will need to be mapped, as well as valid and reliable assessment tools that can be used in the workplace. To enhance usefulness, mapping and cross-referencing are recommended in order to identify themes common in undergraduate curricula (before) and postgraduate curricula (after) (Graham et al., 2007).

2.2.4.5 Facilitating benchmarking, standard-setting and policy development

As described, the use of suitably constructed vocabularies for machine-readable descriptions of object content will enable accreditation bodies to measure curricula against a national standard (Blaum et al., 2013). A proposal for the Curriculum Inventory Standard for medical schools in the USA was approved in October 2010. This standard provides a means to compare and research medical curricula across multiple schools, focusing specifically on the content window as described by Harden. Data can support meta-educational activities such as national benchmarking, medical education research and policy development.

Authors warn that the implementation of rigid standards might cause disruptions such as ‘datafication’ (only those things expressed in the structure can be recorded, resulting in filtering out aspects that do not fit the model and only valuing the aspects that are

recordable). Another potential disruption is ‘homogenization of curriculum practice’. The impact of curriculum inventory standards still needs to be tested, although it is believed that a common model can underpin curriculum development, audit and quality improvement (Ellaway et al., 2014).

Ultimately, however, stakeholder needs will determine the purpose, type and functionality of the map, as well as the nature of access to it (Harden, 2001).

2.2.5 The use of curriculum maps by stakeholders

Harden (2001) points out that curriculum maps can be used by various stakeholders, including curriculum planners, educators, students, examiners, administrators, accreditation bodies, medical education researchers and the public. The use of the map will be determined by the needs of the user and the questions he/she wants to be answered. The focus on the map or the windows used might vary according to the user, but remains the same in showing the scope, complexity and cohesion of the curriculum (Prideaux, 2003).

2.2.5.1 Curriculum managers and planners

The map is often used to obtain a full picture of the curriculum, to plan for development and review, and to study the implications of changes made. An example of comprehensive course reviews in higher education is found in the mapping approach of Curtin University of Technology (Oliver et al., 2007). First, the existing courses were mapped (existing course outcomes linked to graduate attributes and to Bloom’s taxonomy of educational objectives). In a second step, this map was used to revise and align outcomes, learning experiences and assessment tasks and develop a new map. Thirdly, the new map was used to refine unit information. The new map was also used to ensure that higher order thinking skills are

appropriate and outcomes achievable. The maps were then used to assess the level of change and to prepare documentation for authorisation.

Two examples of mapping of health professions education are found in the United States and Australia. Curriculum mapping in pharmacy education at University of Arizona has been used to demonstrate and explore the links between content and learning outcomes, and aid in planning assessments (Plaza et al., 2007). Curriculum planners involved with the undergraduate medical programme at the University of New South Wales used mapping to monitor vertical and horizontal integration of content, plan sequencing and avoid duplication (Watson et al., 2007).

Curriculum mapping exercises are often used to investigate the so-called ‘soft’ sciences. Such sciences include social and behavioural sciences (Satterfield, Adler, Chen, Hauer, Saba & Salazar, 2010), disease prevention and health promotion (Litaker, Cebul, Masters, Nosek, Haynie & Smith, 2004; Wylie & Thompson, 2007), palliative care (Sanchez-Reilly & Ross, 2012; Wood et al., 2002), cultural sensitivity (Kai, Spencer, Wilkes & Gill, 1999), ethics and professionalism (DuBois & Burkemper, 2002), as well as inter-professional learning and teaching (Ross & Southgate, 2000).

2.2.5.2 Other educators, examiners and educational researchers

Learning outcomes are embedded in a curriculum map and show progression in terms of breadth, depth, utility and proficiency for each module at each level (Harden, 2007). Educators of specific units of learning (such as integrated themes or blocks) might use the map to determine student’s prior exposure to particular content and plan the level and breadth of new learning (Harden, 2001). This is especially useful in the case of a new lecturer (or an external examiner not familiar with the entire curriculum) being appointed to teach or examine on a specific topic or theme. Examiners might use the map to correct a mismatch

between the teaching and assessment process and construct valid examinations. The map might also be a rich resource for medical education researchers (Harden, 2001).

As the example of the Ludwig-Maximilian University demonstrates, curriculum mapping was used to develop and refine objectives for a specific module in the undergraduate medical programme. The results of the curriculum mapping suggested a need for restructuring the curricula in the occupational and environmental medicine modules. It furthermore identified inconsistencies between objectives, tutorials and examination content within the two modules (Hege, Nowak, Kolb, Fischer & Radon, 2010). In this example, curriculum mapping was used as analytical tool by educators who were interested in a specific discipline or field of expertise only.

2.2.5.3 Students

Potential students and the public could obtain an overview of the curriculum and the type of learning experiences on offer. A curriculum map can provide registered students with a clear statement of the learning outcomes at each stage and match learning outcomes to learning experiences and assessments (Blaum et al., 2013; Harden, 2001; Prideaux, 2007).

Curriculum maps can be used to log undergraduate and postgraduate student experiences and map feedback and ongoing needs assessment. Students can use mapping to book and log peer-assisted learning opportunities, check for available patients and book patient encounters (Balzer, Bietenbeck et al., 2015; Balzer, Dittmar et al., 2015). Wong and Roberts (2007) used a map in a study with Internal Medicine residents where they provided feedback about academic half day didactic and non-didactic teaching to develop medical and non-medical expertise.

Curriculum mapping differs from a learning management system (Steketee, 2015). Teachers are expected to guide students to relevant sites and learning resources (Harden, 2013) and this usually takes place via an e-learning system such as Blackboard (Steketee, 2015). Linkages to learning sources (such as text books and virtual patients) can be made by linking an e-learning system with the curriculum mapping platform (Blaum et al., 2013).

2.2.5.4 Administrators

Administrators and management might use the map as management aid, for example to plan logistics such as accommodation and transport, or to work out workload and contributions of a specific department (Harden, 2001). Balzer et al. describe mapping as a tool to optimise allocation of patients available for teaching by alignment of learning objectives, ICD10 codes and clinical routine data (Balzer, Bietenbeck et al., 2015; Balzer, Dittmar et al., 2015). Administrators use data from timetables to monitor teaching loads (Watson et al., 2007).

2.2.5.5 Authorities: Accreditation teams and external reviewers

A mapping platform could provide for easier access to required information before and during an external audit by accreditation bodies (Harden, 2001). In a case study described by Perlin (2011), the use of curriculum mapping for accreditation purposes was illustrated and resulted in a transformational experience for faculty. Cross-referencing explored 12 programme competency domains and 19 accreditation content areas.

Curriculum mapping has been an expected quality improvement process of programmes registered at the Accreditation Council for Pharmacy Education in the USA for some time now (Britton et al., 2008). During the mapping process for the University of Oklahoma's pharmaceutical degree, courses that needed content revision were identified. Renewed

alignment with programme outcomes lead to re-sequencing of courses and to re-assessments at higher levels of the course (Britton et al., 2008).

It is clear from the above discussion that stakeholders will have differing expectations of the map. Stakeholders such as curriculum planners and administrators will need to be involved with the mapping process right from the start. The map should be flexible enough for stakeholders to suggest new functions or changes as the need arises. From the literature, it is clear that mapping has become a useful tool in managing curricula; however, certain critical factors for success seem to be appropriate for discussion.

2.2.6 Processes and critical factors for curriculum mapping to be successful

2.2.6.1 Process

Harden (2001) suggests a nine-step process in developing curriculum maps (Table 2.2). The steps include needs assessment of users, scoping the task, establishing the links, populating the windows, deciding on the format of the map, deciding on access to the map, familiarising staff and students with the map, planning evaluation and updating the map, and allocating responsibility for the map.

Table 2.2: Harden's nine steps process for curriculum mapping

1	Needs assessment of users
2	Scoping the task
3	Establishing the links
4	Populating the windows
5	Deciding on the format
6	Deciding on access to the map
7	Familiarising staff and students
8	Planning evaluation and updating
9	Allocating responsibility

No additional literature could be found that reported on the steps as applied to medical school curricula; however, requirements for successful implementation are well documented.

Requirements include providing time for medical, educational and information technology experts and leaders to perform the tasks involved in creating and maintaining the map.

2.2.6.2 Information technology support

Overarching, the greatest concerns regarding curriculum mapping focus on the demand for time and human resources for the construction and maintenance of maps (Balzer et al., 2016; Davis & Harden, 2003; Ellaway et al., 2014; Harden & Hart, 2002; Willett, 2008). Mapping, as is the case with curricula, is an ongoing process that requires continual upgrading and maintenance of the platform being used (Britton et al., 2008; Oliver et al., 2007; Watson et al., 2007; Willett, 2008). It was found that the appearance and usability of the interface (what the users actually see on their computer screens) had a significant impact on the use and success of the system (Steketee, 2015; Willett, 2008). The map and mapping should focus on the needs of the users and must be user-friendly and non-threatening (Harden, 2001).

2.2.6.3 Academic buy-in

Curriculum mapping challenges include academic staff buy-in, participation and development (Watson et al., 2007; Willett, 2008). Some academic staff might resist mapping if they think mapping and maintaining curriculum documents represent a doubling of processes, instead of mapping *being* the curriculum (Steketee, 2015). A critical mass of staff needs to share the understanding of underpinning educational principles and concepts and the educational vocabulary to discuss educational developments and take part in decision-making (Davis & Harden, 2003; Oliver et al., 2007). Academic staff must also realise that evaluation and monitoring are cyclical (Steketee, 2015). Ongoing educational support and faculty development are needed to assist all stakeholders to move beyond personal self-interests and insecurities which are common when matters of curriculum are raised.

2.2.6.4 Leadership

Faculty leadership should be committed to continually communicating the spirit of mapping to meet the needs of the profession and to disperse the process into different teams of faculty members (Britton et al., 2008). Ideally, a staff member needs to be identified to provide academic leadership and be allowed protected time to coordinate the project.

An example of a successful mapping process is described by Watson et al. (2007) in the experience of the University of New South Wales. The development of tools for the curriculum map, timetable, student portfolio, peer feedback, assessment tracking and results tools were driven by educational needs and not by data-driven technology. The impetus for the mapping came from the office of the medical dean and included a group of medical educators and IT specialist support staff and was built on a business management perspective. Sustainability and a sense of ownership were developed by involving academic and clinical teaching staff, administrators, librarians and information technologists in the systems design process. A knowledge network culture that values capturing and sharing data, information and ideas transformed the decision-making process and drove improvements to learning and teaching practices (Watson et al., 2007).

Studies show that working with busy academic staff to review curriculum is complex, time-consuming and often unpredictable; however, schools that have completed parts of their maps reported sufficient benefits to justify the time and resources invested (Willett, 2008).

2.3 Conclusion

Medical schools cannot afford to stagnate as they need to produce professionals fit for the 21st century demands. Curricula, and all components thereof, need to be reviewed and renewed in an ongoing fashion. Curriculum mapping appears to be a well-developed practice

in western and developed countries in order to review and improve curricula in undergraduate medical programmes. This chapter drew from the literature published on mapping in these countries.

The literature review focused on the definition and purpose of curriculum mapping, the elements that form a part of mapping platforms and the stakeholders involved. It described the development of mapping during the past decade from basically paper-based graphical mapping to sophisticated web-based electronic mapping. The use of and motivation for third-party taxonomies and vocabularies in curriculum review, evaluation and comparison were discussed. Critical success factors in developing and maintaining curriculum mapping were identified.

It is unsure what the use and status of curriculum mapping are in developing countries. No publications could be found regarding the status of curriculum mapping of medical programmes in South Africa. This study aimed to establish the status of curriculum mapping of undergraduate medical programmes in South Africa. Results obtained with the necessary rigour should therefore contribute to the scholarship of medical education in this country.

Chapter 3: Methodology

The methodology chapter provides a discussion on the aim and purpose of the study and the objectives it attempted to achieve. It describes the research methodology in some detail, explaining sampling, data collection, recording, transcribing, analysis and interpretation. From these descriptions, the strategies to ensure quality and rigour, as well as enhance trustworthiness, are listed. Lastly, an explanation is provided on ethical considerations and application as well as some comments on assumptions and limitations.

3.1 Purpose/aim of the study and specific objectives

As indicated in Chapter 1, the CDC at SMU identified curriculum mapping of the MBChB programme as one of the priorities for curriculum review. It is expected that results of this study will contribute to the debate on mapping and subsequent quality improvement and innovation of the curriculum. At the beginning of the study, it was uncertain if any formal mapping of entire curricula had previously been undertaken at other medical schools in South Africa and what if any, formats or platforms have been used. It was hoped that this study could explore the potential of curriculum mapping and collaboration to support curriculum development.

The research question in the approved protocol for this study was formulated as follows:

‘What is the status of curriculum mapping of undergraduate programmes at the medical schools in South Africa?’

The aim was to explore whether curriculum managers have mapped the medical curriculum and how, for example what formats they use and which elements are included in a map, what strengths and successes have been achieved, and what challenges were experienced. This study therefore focused on the following five objectives:

- To explore the status of curriculum mapping for undergraduate medical programmes in South Africa.
- To identify the elements regarded as important to a map or mapping platform.
- To record successes and strengths of the mapping processes.
- To describe challenges (real or perceived) that are relevant to curriculum mapping.
- To explore opportunities for collaboration with regard to mapping of undergraduate curricula.

3.2 Methodology

The study was performed according to the principles and philosophy of a qualitative research approach. It made use of descriptive and interpretive (non-experimental) methods and an exploratory qualitative design (Nieuwenhuis, 2007a:47-117).

According to Bowling (2009:380), qualitative research promotes naturalistic enquiry, is less obtrusive than quantitative investigations and does not manipulate the research setting. Qualitative research seeks a deep understanding of a phenomenon rather than to predict an outcome. Boet, Sharma Goldman and Reeves (2012:165) point out that qualitative research focuses on answering the *why* and *how* and attempts to understand the phenomena in terms of the meaning people ascribe to it. Qualitative approaches attempt to collect rich descriptive data, where the emphasis is on the quality and depth of information and not on quantifiable scope (Nieuwenhuis, 2007a:51).

The phenomenon of curriculum mapping ('how' and 'why' – or 'why not' – as well as 'what now') was the focus of study for this research project. Reporting is done by providing the analysis and interpretation of the data, substantiated through the provision of quotes. Although tables summarise an institution's contributions to a specific opinion, the focus is

not on numbers or quantification of data. Where there are instances of a single response to a specific matter, it is still reported for the sake of understanding all viewpoints.

3.3 Sampling

Qualitative data collection techniques increase insight into social phenomena rather than assuming representativeness. Purposive sampling contributes to rich information for in-depth study. Participants are selected based on specific characteristics and representation, such as being an authority in terms of the data needed for the study. Sample sizes are small because of the complexity of the data and time it takes to analyse. The guiding principle is that a sufficient sample size has been reached when the same themes and topics are emerging from participants (Boet et al., 2012; Bowling, 2009; Nieuwenhuis, 2007b; Polit & Beck, 2012).

All eight institutions offering undergraduate medical programmes during 2015 were invited by e-mail to participate in this study. An e-mail was sent to the academic manager at the head of each medical school (Addendum 1). In the e-mail, the research question and aim of the study were explained. A copy of the participant information leaflet form (Addendum 2), the ethical clearance certificate from Stellenbosch University (Addendum 3) and the participant consent form (Addendum 4) were attached. The head (dean or director) was asked to consider the information and indicate:

- whether the institution would require the researcher to seek additional ethical clearance or permission to interview the appropriate curriculum leader; and
- who the researcher should approach as the most relevant person or persons to participate in the study.

In some cases the head of the medical indicated that he/she would participate, while in other cases the researcher was referred to either a curriculum manager, head of the programme,

head of the education office, chairperson of the curriculum committee, or curriculum guardian. These participants are collectively referred to as ‘curriculum leaders’. These curriculum leaders subsequently received a forwarded e-mail with the aforementioned documents attached. E-mails were followed up telephonically and appointments were confirmed by telephone or e-mail. All eight institutions offering undergraduate medical training in South Africa participated in the study. All participants interviewed indicated that they had experience with curriculum planning and review at their institution.

3.4 Data collection

Data collection was done by semi-structured interviews. Semi-structured interviews typically use a list of questions as a framework, but participants have the freedom to direct the conversation (Erlandson, Harris, Skipper & Allen, 1993; Nieuwenhuis, 2007b; Ramani & Mann, 2016). The advantages of semi-structured interviews are that more complex issues can be probed and answers can be clarified.

In the case of a complex topic, such as the topic of this study, and numerous replies being expected, no pre-coding can take place. The function of probing was thus to motivate, without bias, for the participant to clarify and enlarge on what was said. A checklist of probing questions was developed and used flexibly as a guide to the topics to raise during the interview (Addendum 5). For this research, ideas for the probing questions were obtained from a study which made use of a 10-item survey questionnaire with multiple choice questions (Willett, 2008:786-793).

Once consent had been obtained from participants and the audio-recording device had been activated, the researcher started the interview by posing the following question:

‘Could you tell me about the status of curriculum mapping for your undergraduate programme in Medicine?’

In cases where participants asked for clarification (*‘I am not sure what you mean by curriculum map’* type responses), the following explanation was given:

‘In the literature a curriculum map is often referred to as a kind of roadmap for the curriculum. It is used to guide the users. Users can see different elements and connections between elements in such a map.’

In all cases, the participants were able to elaborate on their curriculum and the ways in which it was documented or ‘mapped’ after such an explanation was given.

The literature indicates that follow-up questions should focus on issues that are important to the research topic and in the case of participants talking about other issues not relevant to the questions, or stalling, the interviewer has to be skilled at redirecting the participant back to the point (Bowling, 2009; Erlandson et al., 1993; Nieuwenhuis, 2007b). The interviewer should avoid leading questions, biasing questions, double negatives and double-barrel questions. A relaxed interview atmosphere may obtain more in-depth and sensitive information if needed. It is assumed that, when a trusting atmosphere is created, the participants will reveal their ‘true’ feelings, opinions and experiences (Bowling, 2009:409-414). During this study, the interviewer took care to maintain a relaxed and non-threatening atmosphere by remaining friendly and unhurried, and by using verbal and non-verbal cues to encourage participants to talk. As far as possible, interviews were held in the offices of the participants.

Semi-structured interviews take time, as could clearly be seen from the length of the interviews conducted (Table 3.1).

Table 3.1: Number of participants and length of interview

	U1	U2	U3	U4	U5	U6	U7	U8
Number of participants	1	1	1	5	1	1	2	2
Time for interview	45 min	77 min	57 min	62 min	57 min	45 min	58 min	43min

Not only does it takes time to collect the data (setting up interviews and the interview itself), but it also takes time for transcription and analysis. Furthermore, semi-structured interviews can lead to interviewer bias or error. Interviewer bias is defined by Bowling (2009:172) as follows:

The interviewer can subconsciously, or even consciously, bias respondents to answer in a certain way: for example, by appearing to hold certain values which can lead to a social desirability bias, or by asking leading questions.

Social desirability bias is described to exert a small but pervasive effect in that participants may respond in a way they think the researcher wants them to (Bowling, 2009:311). Interviewer bias has to be measured against the benefits of being able to prompt for greater depth (Bowling, 2009:409-414). Interviewer and social desirability bias were minimised by the interviewer asking questions in a non-biasing and non-leading way. Great care was taken to appear neutral, although this in itself was difficult given the researcher's home institution's known interest in mapping. Interviews were recorded and transcription was done verbatim. A coding frame was developed by the researcher and an external coder was used to confirm coding. Even with these strategies in place, interviewer and social desirability bias have to be recognised as possible limitations.

All eight institutions offering undergraduate medical training in South Africa agreed to participate in the study. Telephonic interviews were arranged with two institutions due to challenges with arranging for flight tickets at short notice. One institution provided a team of

interviewees, which resulted in a group discussion with five participants. The advantage this group had over the individual interviews was the stimulation of discussion and the generation of ideas as a result of the group dynamics. A disadvantage could be that a dominant member could constrain contributions from others and that confidentiality within the group was waived. The same open-ended and probing questions as for the semi-structured interviews were used for the group interviews. In the case of the group, the interview was held in a venue of choice at the participants' institution.

3.5 Data recording, transcribing and storing

Bowling (2009) and Nieuwenhuis (2007b) indicate that it is common for research involving semi-structured interviews to be audio-taped with consent from the interviewees. In this study, data recording took place by means of auditory recordings of the interviews. At the start of the interview, the participant was asked for permission for the interview to be recorded before the recording device was activated. Some written notes were kept in case of the recording being damaged or compromised. All recordings were clearly audible and were duplicated and stored on more than one computer as well as on an external hard drive.

Transcribing was done by the researcher. According to Braun and Clarke (2006) and Vaismoradi, Turunen and Bondas (2013), the researcher, using thematic analysis, is expected to transcribe the interview to obtain a sense of the whole. Verbatim transcription started within a week after each interview. Different data sets were kept separate as individual 'cases' and secure in electronic folders with the necessary password protection. Transcriptions were marked with dates, times, participants' detail and where they were collected. The benefit of the researcher having done the transcriptions herself was that, by the time the last interview was transcribed, she already had a very good sense of what the emergent themes might be.

3.6 Coding and analysing the data

Qualitative studies provide large volumes of narrative data that need to be systematically transcribed, coded and interpreted through a process of thematic analysis (Bowling, 2009; Vaismoradi et al., 2013). In the literature, thematic analysis is described as a ‘method for identifying, analysing and reporting patterns within data’ (Braun & Clarke, 2006:79). It involves the identification of themes and patterns from which to draw meaning. Coding implies that sections of the data are being sorted into categories which develop as the data are being collected and analysed. It is important for the researcher to constantly note the potential categories in the margins of the raw material. Ultimately this ‘storage and retrieval system’ will allow sorting of data under a relevant category. Re-labelling can take place as required (Bowling, 2009; Maree & Van der Westhuizen, 2007; Polit & Beck, 2012; Ramani & Mann, 2016; Vaismoradi et al., 2013).

In this study, the process of coding and analysing the data started parallel with data collection but was spaced over a period of months in order to allow immersion in the data. The researcher conducted the thematic analysis through an inductive and multistep iterative approach. The process of inductive thematic analysis resulted in research findings emerging from the frequent, dominant and significant themes in the data. No pre-defined hypothesis was formulated. Data were ‘open-coded’ by generating categories as the process unfolded.

In literature, the framework approach is described as an increasingly popular approach to analyse qualitative data in health research (Gale, Heath, Cameron, Rashid & Redwood, 2013). It seeks to draw descriptive conclusions clustered around themes. It is valuable for managing large data sets where a holistic descriptive overview of the entire data set is desirable (Bowling, 2009). The defining feature of the framework model is the matrix output, namely, rows, columns and cells of summarised data (Gale et al., 2013). This matrix

developed in this study provided a structure into which the researcher could systematically reduce the data in order to analyse them. Comparing and contrasting data across cases as well as within individual cases was built into the structure and process.

According to Bowling (2009) the sorting, categorising and interpreting of qualitative data through the framework model involves five steps (Bowling, 2009:417):

- 1) familiarisation by reading the interview transcripts to obtain an overview of the material;
- 2) identification of the thematic framework emerging from the participants;
- 3) systematic application of the thematic framework by indexing each section of the transcript;
- 4) charting by rearranging the data according to the identified themes; and
- 5) interpretation by aggregating patterns, searching for structure and synthesising findings.

Gale et al. (2013) propose seven stages, namely:

- 1) transcribing;
- 2) familiarising with the interview;
- 3) coding;
- 4) developing a working analytical framework;
- 5) applying the analytical framework;
- 6) charting data into the framework matrix; and
- 7) interpreting the data.

For this research, the seven-stage approach as described by Gale et al. (2013) was found very useful, and is described below.

Stage 1: Transcribing

As described earlier, the process of transcription was a good opportunity to become immersed in the data. This is indeed a strategy to be encouraged for use by new researchers (Gale et al., 2013). Each data set was listened to repetitively and transcribed verbatim in order to obtain a full overview of the material.

Stage 2: Familiarising with the interview

The audio recordings and the transcripts were used repetitively in order to enhance understanding. Reading was done line by line, and a preliminary colour-coding system was used to highlight analytical notes and thoughts for each passage as shown in the example given in Figure 3.1.

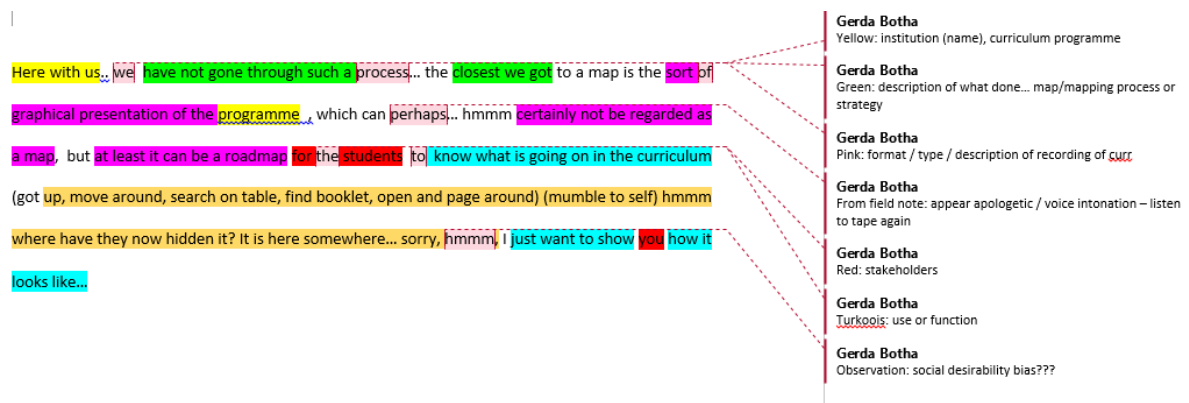


Figure 3.1: Example of line-by-line colour-coding

Stage 3: Coding

Assigning a code (word or short phrase) is aimed to classify all the data so that they can be compared systematically with other parts of the data set (Saldaña, 2015; Vaismoradi et al., 2013). Coding line by line alerts the researcher to consider that which may ordinarily remain invisible because it is not clearly expressed or does not ‘fit’ with the rest of the account.

Codes or labels can be grouped together into categories which are then clearly defined. This forms a working analytical framework (Gale et al., 2013).

A label to describe what was important was allocated to each colour. As the preliminary colour-coding process unfolded, a master list of codes with broad descriptive phrases or labels was developed and kept on the side, but added to as the analysis of each case progressed. The developing analytical framework was continually being challenged to explain and reconcile anomalies.

Stage 4: Developing a working analytical framework

An iterative process resulting in three drafts was required before no additional codes emerged. The third draft of codes was then summarised as the working analytical framework. This analytical framework was used as working framework, although it was not final seeing that all data were not yet collected. The analytical framework at this stage included the following categories:

- description of curriculum (design and time spent);
- description of types or formats in which information about the curriculum is available;
- description of consultative processes and strategies;
- description of success and strategies that worked well or that contributed to success;
- description of feelings, emotions and attitudes regarding mapping;
- description of concerns, challenges, threats and problems experienced or anticipated;
- description of the nature and type of preferred programme, template or mapping tool;
- motivation for institution or programme manager to engage in a mapping;

- description of elements or components that should be included in a mapping template;
- description of stakeholders;
- requirements, non-negotiable criteria or specifications regarding a programme tool;
- recommendations to enhance mapping success for the future; and
- opinion about collaboration and networking or sharing.

Stage 5: Applying the analytical framework

The analytical framework was re-applied to the first five data sets separately. An ‘other’ code was left open under each category to avoid ignoring data that did not fit. The researcher was careful to remain open to ideas and not look for confirmations of any predefined ideas from any of the data collected from earlier interviews. Data were thereafter summarised in a Microsoft Word document for each institution with possible quotes for all the coded categories. The colour-coded highlights were kept in the summarised text in order to ease tracking back to the original transcribed data. Transcribed data sets and summarised Word documents per data set were submitted to the supervisor of the study at this stage for comment.

Thereafter, the framework was applied to the remaining three data sets. Categories were changed and refined as the understanding increased and improved. The emergent (and confirmed) themes were grouped into meaningful analytical units and coded with more specific descriptive words (open coding). This information was then copied and pasted onto a Microsoft excel spreadsheet with each institution (1-8 in the table below) in a separate column and themes with categories coded in rows (Table 3.2). As can be seen from the example below, it was far from a finalised matrix, but by applying the analytical framework and populating the cells with institutional coded data, it made similarities and differences

between institutions more visible. Pasting the data into the cells implied an effective way of storing and organising data so that it became accessible for further analysis and interpretation.

Table 3.2: Visual presentation of draft 1 of analytical framework with descriptive wording

Themes	Categories	1	2	3	4	5	6	7	8
Description of current curriculum, process, challenges and experiences with mapping	Descriptions of curriculum (design and time spent)								
	Descriptions of types or formats in which information about the curriculum is available								
	Descriptions of consultative processes and strategies in order to get mapping done, or communicate about it								
	Descriptions of success and strategies that worked well/that contributed to success								
	Descriptions of feelings/emotions/attitude regarding mapping								
	Descriptions of concerns, challenges, threats, problems experienced or anticipated								
	Experience with existing electronic mapping software tools/maps/mapping processes								
Motivations for institution /programme manager to engage in a mapping, function of mapping, advantages, (why, what for, how will it help, what will it contribute, what might be achieved by mapping)	Provide for a common vision/share a vision								
	Enhance transparency								
	Obtain faculty member buy-in								
	Identify gaps and redundancies and define core								
	Review and articulate level and depth								
	Align assessments with outcomes								
	Formulate Outcomes								
	Address learning and teaching strategies								
	Align programme to social accountability brief								
	Align the programme to trends in HPE								
	Review platforms								
	Benchmarking and dialogue about national core								
	To identify faculty/staff development needs and priorities								
	Assist in accreditation								
Assist in management and planning for resources									
Provide an opportunity for possible collaboration									
Student placement and tracking of progress									
Description of ideal tool	Description of the nature and type of preferred programme/template/mapping tool								
	Description of elements/components that should be included in mapping template								
	Description of stakeholders: who will use it, who should develop it, who must have access to it, who will make decisions about what must be in it, who will be advantaged by it, whose job will be made easier because of it								
Recommendations to management at the institution	Requirements, non-negotiable criteria or specifications regarding a programme tool or template for mapping or the process and mandate involved in it								
	Recommendations to enhance mapping success for the future								
	Opinion about collaboration and networking or sharing (with external stakeholders/institutions/groups/communities of practice)								

Stage 6: Charting data into the framework matrix

Charting involves summarising the data into the matrix by categories. According to Gale et al. (2013), good charting implies a balance between reducing data and retaining the original meaning of the interviews. The chart should include illustrative quotations.

Once the data were copied and pasted into the framework, it became clear that the data were still very dense. Many direct quotes were included in the cells. At this stage, the framework spreadsheet was reviewed by a senior researcher for clarity. The comments of this colleague were taken into consideration in order to refine the spreadsheet further. No additional themes or categories were suggested but suggestions entailed combining some of the coding in order to reduce the themes and categories. Other comments mainly dealt with having many quotes as examples for each code that can and should be reduced in the final write-up of an article for submission to a journal, but could be kept for the sake of the research assignment. The colleague further pointed out that she had not immersed herself in the transcribed data, but only considered the spreadsheets. After having received this feedback, the data were rearranged where necessary in order to produce a more robust and meaningful chart.

Once all the data sets were plotted in separate columns on the Excel spreadsheet, the matrix allowed for in-depth analysis of the key themes across the data sets. The matrix proved an excellent tool for understanding the emergent patterns in the data and it became possible to improve arrangement of the data once more.

At this stage, the matrix of analysed data was confirmed with an external coder. The external coder (a senior academic with PhD in Nursing Education) received the transcribed, but uncoded, data sets of each of the institutions, as well as a copy of the protocol for the study. After coding the data independently, she met with the researcher and consensus was reached

on a final list of two sections with five and four categories per section respectively (Addendum 6).

The analysis was therefore done in a thematic non-linear process, with collection, transcription, and analysis being intertwined. Data were first open-coded by generating categories and related themes. Thereafter, the codes were used to facilitate comparison of data within and between categories. The framework method proved to be very valuable in providing clear steps to follow and in producing a highly structured matrix of summarised data.

3.7 Data interpretation

The analysed data were brought into context with knowledge on curriculum mapping processes and curriculum mapping tools elsewhere in the western world (USA, UK, Canada and Australia). Interpretation of the data explicitly focuses on the South African context, but the attempt has been made to state the larger meaning of the findings and to reflect on lessons learned elsewhere in the world.

Each institution's data set remained connected to aspects of their own account. Comparing and contrasting of data between institutions and within each case remained viable and assisted with data interpretation.

Interpretation of data was done by aggregating patterns, searching for structure and synthesising findings. Conclusions have been drawn on verifiable data and great effort has been made not to generalise findings outside of the context.

3.8 Quality assurance and rigour

In the case of qualitative research, both the science (scientific excellence and rigour) and art (creativity and insightfulness) aspects of interpretation are important. Good qualitative research is descriptively sound and explicit, as well as interpretively rich and innovative. Various techniques and concepts related to validity and reliability are summarised in Table 3.3 (Maree & Van der Westhuizen, 2007; Nieuwenhuis, 2007b; Polit & Beck, 2012; Ramani & Mann, 2016).

Table 3.3: Description of key elements pertaining to quality assurance and rigour in qualitative research

Element	Description
Trustworthiness	Four criteria for trustworthiness are parallel to positivists' criteria and include credibility (internal validity), dependability (reliability), confirmability (objectivity) and transferability (external validity)
	<u>Credibility</u> : Confidence in the truth of the data and its interpretation enhances believability of findings. Credibility can be ensured by triangulation and skilful interviews.
	<u>Thoroughness</u> : Adequacy of the data as a result of sound sampling and data collection techniques (saturation) and full development of ideas.
	<u>Dependability</u> : Stability of data over time and conditions can be maximised by multiple observations, systematic data sampling, and analysis and respondent validation.
	<u>Resonance</u> : Confirming findings with participants in order to verify transcription, coding and interpretation.
Authenticity and vividness	<u>Confirmability</u> : The extent to which results can be confirmed by other researchers. Objectivity or congruence about the data's accuracy, to reflect the voices of participants, not the researcher's bias or perspective. This can be done by 'member checking' during data collection (probing to ensure that meaning is understood) as well as formally after data have been fully analysed (review and comment on drafts of the research report).
	<u>Transferability</u> : The extent to which findings are applicable to other settings and groups, to provide sufficiently rich data so that readers can evaluate the applicability to other contexts.
	<u>Representativeness</u> : The appropriate sampling technique to ensure adequate representation, for example homogenous sampling includes participants according to specified criteria – and findings should therefore be limited accordingly.
Authenticity and vividness	<u>Authenticity</u> : The extent to which researchers show a range of realities, the tone of the participants' lives or situations, enabling readers to develop a heightened sensitivity to the issues – some sense of the mood, feeling, experience.
	<u>Vividness</u> : Presentation of rich, vivid, faithful and artful descriptions that highlight salient themes in the data
Reflexivity, integrity and explicitness	<u>Reflexivity</u> : The process of reflecting upon the influences individuals bring to the study and the impact the researcher might have on the research design, data collection and analysis (e.g. gender, age, culture, training, assumptions).
	<u>Integrity, criticality</u> : Ongoing self-reflection to ensure interpretations are valid and grounded in the data. The researcher's critical appraisal of every decision made throughout the research process.
	<u>Explicitness</u> : The ability to follow the researcher's decisions and interpretive efforts. This is achieved by fully maintained records and explicitly presented results

In this study, the researcher attempted to ensure quality and rigour in various ways, as discussed below.

3.8.1 Credibility

Data collection techniques with open-ended and probing questions as well as an enabling atmosphere resulted in participants being able to explore and develop their ideas fully. In three cases where participants felt they were not able to provide adequate information as individuals, interviews were held with more people in order to obtain a full picture.

All raw data and transcripts were labelled and stored safely. Data reduction, analysis records and data reconstruction products (drafts of reports) were kept as an audit trail.

Data collected from each case were listened to and read through repeatedly in order to identify emerging patterns that are consistent with data collected for each case separately. Open coding through a process of inductive reasoning resulted in a master list of codes. The framework model with seven stages was used to develop a final matrix. Each case was plotted against this matrix of themes and categories. The matrix assisted in comparing the differences and similarities between cases or institutions. Charting data in this type of analytical framework ensured describing the data using participants' own subjective expressions before moving onto interpretation. A senior researcher assisted with confirming themes and categories in earlier drafts of the matrix. The final themes and categories were confirmed by an external coder.

3.8.2 Confirmability, dependability and resonance

During data collection, the researcher used clarifying probes and summaries to ensure meaning was understood. Thick descriptions provided detailed information for reviewers to

understand the context or the research setting. After the data analysis stage, the transcribed scripts and the draft report with themes and categories were submitted to participants for member checking and comments.

3.8.3 Transferability and representativeness

Representatives from all eight medical schools in South Africa during 2015 participated in the study. Academics involved with the curriculum in a leadership capacity were interviewed. Sufficiently rich quotes and descriptions were provided for reviewers to evaluate the applicability of findings. A broad range of quotes and descriptions was used to show the tone of participants' experiences with mapping and to enable reviewers to develop sensitivity to the issues raised. Interpretation of data was done by aggregating patterns, searching for structure and synthesising findings with those found in literature in the western world. In the final report, generalisations were avoided by contextualising findings and suggestions.

3.8.4 Integrity, criticality and reflexivity

Ongoing critical appraisal was necessary to ensure interpretations were valid and grounded in the data. The researcher, as educator in the context of undergraduate medical programmes in South Africa and actively involved with matters related to curriculum development and review, can be regarded as an 'insider'. As mentioned earlier, researcher bias could have an impact in this study given that curriculum mapping on an electronic platform is a priority at the researcher's home institution. Social desirability bias could also play a role. Ongoing self-reflection to ensure interpretations were grounded in the data took place by way of reflecting upon research notes and making use of external coders. It is hoped that the strategies to ensure resonance as explained earlier would further have successfully addressed social desirability as well as researcher bias.

It is assumed that any method of research is rigorous if well conducted. The researcher attempted to ensure trustworthiness by implementing all of the above.

3.9 Ethical considerations

Confidentiality: No identifying details of individuals who participated in the study were revealed. Great care was taken to protect the identity of individual institutions; however, some assumptions regarding identity might be possible to be deduced from the data presented.

Consent: Information regarding the research study was made available to participants by way of a participant information leaflet. Participants were required to sign a letter of consent to participate in the study and verbal permission was asked before the interviews were recorded.

Clearance: Ethical clearance was obtained from the Human Research Ethics Committee at the Faculty of Medicine and Health Sciences, Stellenbosch University. Permission to conduct the study was also obtained from the SMU Research Ethics Committee. The researcher asked in the original e-mail to institutions if the specific institution would need to be approached for further permission or clearance, but no other university responded with a request for further clearance.

3.10 Limitations

During this study, before the interviews started, some social exchange took place as the researcher was familiar with the majority of the participants. Although this might indicate a limitation, familiarity was restricted to professional relationships, for example having attended the same meetings and conferences in the past; therefore, social desirability bias should be limited. Another limitation relates to neutrality, given the researcher's home

institution's known interest in mapping. Great care was taken to appear neutral, although this in itself was difficult.

3.11 Conclusion

This chapter described the aim and purpose of the study, as well as the methodology. The sampling, data collection and data analysis techniques were detailed. Issues pertaining to data interpretation, quality assurance and rigour were discussed. Finally, issues pertaining to research ethics were clarified.

In the next chapter, the key research findings that emerged from the data are presented together with interpretations thereof. The logic behind interpretations is supported by participant quotes. Findings are compared and contrasted with literature. The discussion explains how this study expand on scholarship and how findings are applicable.

Chapter 4: Results and discussion

This chapter contributes results from the descriptive explorative study into the status of curriculum mapping of undergraduate medical programmes in South Africa. A qualitative research approach was followed and made use of semi-structured interviews. This resulted in data with rich descriptions which are reported on by sharing direct and translated quotations. The results are discussed against the background of relevant literature.

All eight of the institutions that offered undergraduate medical training in South Africa during 2015 participated in the study. In analysing the results, it was clear that institutional representatives mainly described the current situation (2015) and the possible future vision. In the current situation, the four categories that emerged were curriculum design, curriculum documentation, strategies used at the institution for curriculum review and challenges experienced. For the future vision, the five emergent categories were urgency for the preferred way of mapping, expectations of a mapping platform, elements to be reflected within the platform, stakeholders and stakeholder access, and institutional requirements for successful implementation. These categories are summarised in Table 4.1.

Table 4.1: Categories that emerged from the data

	Category	Table
Current 2015 situation	Curriculum design and structure	*
	Curriculum documentation	Table 4.2
	Strategies for curriculum review	Table 4.3
	Challenges experienced	Table 4.4
Future vision for mapping	Urgency for the preferred way of mapping	Table 4.5
	Expectations of a mapping platform	Table 4.6
	Elements to be included in the platform	Table 4.7
	Stakeholders and stakeholder access	Table 4.8
	Institutional requirements for successful implementation	Table 4.9

* Not presented in table format in order to attempt to protect identification of institutions

In discussing the results, each category is addressed separately. Issues raised for each of the categories are discussed in some depth and quotes are provided as evidence.

4.1 The current 2015 situation

4.1.1 Curriculum design and structure

Seven of the eight institutions which participated in the study offer a curriculum over six years, while one offers it over a period of five years. All eight institutions indicated that the curriculum follows some sort of integrative model, for example problem-based or case/themed-based, during the pre-clinical phase. Some indicated early clinical exposure which gradually increases over the full curriculum period. All curricula make use of clinical block rotations during senior years.

4.1.2 Curriculum documentation

All institutions participating in the study indicated that they have documented curriculum information in some format. All medical schools make use of learning guides, log books or case competencies lists for specific units of learning such as clinical blocks or integrated themes. The importance of keeping these documents in order was described. Often, one person takes responsibility for a specific unit of learning (a module/block/theme), but the details are not shared across the programme, although documents are available to students and accreditation authorities. There seemed to be a sense that more coherent or complete map of the entire curriculum could have value, as illustrated in the following quotes:

The best snapshot of any university is the documents they put forward for accreditation visits. That for me, if you want to have an idea of what is going on... that set of files will be the set of files that will give you the answer. The map is really what you are looking for, but in the end you are satisfied with getting a fairly fragmented picture across the programme, the universities are really good

at having a little file for each course, so now you get about 65 in a room... the whole picture exists in parts... (U2)

We don't have one big map, but we have lots of mini maps... it is not incorporated into a programme map right now... so there is lots of individual mind maps and varying degrees of it formally been recorded, scattered around, but they're not all drawn together... (U4)

However, some institutions (U1, U3, U7, U8) indicated that they make use of a graphical image in order to provide an overview of the curriculum specifically to orientate new students and academic staff, as indicated below:

We literally have a graphical representations of the curriculum presented on one page, it shows the different years and the phases, so you can see which modules forms part of each year – it is some sort of snapshot table showing the structure... (translated U3)

Here at our institution we have not gone through a process of mapping, the closest we get to it is a sort of graphical representation, it cannot really be regarded as a map, but it is at least a simplistic graphical picture of the curriculum for the students to see; at least in a person's brain it is some sort of roadmap, on the structure of the curriculum... (translated U1)

Some institutions have a curriculum document for the pre-clinical phase, but not for the clinical phase:

It is all written down week by week, so every week is mapped out for a specific function... and they speak to each other... like we are saying it is a spiral curriculum... the one lead to the other. As you see, we have the programme for

this, we have the map for each week and the cases on paper... In the more senior years then they break up into clinical clerkships where they go through their clinical rotations, then it is according to departments, disciplines... (U5)

Three medical schools (U1, U2, U6) have attempted to organise curriculum information into one central electronic document such as an expandable disc; however, they have not completed the process as the product was not regarded useful for curriculum management:

At a stage we tried to put together some sort of administrative map on a computer system, indicating the number of lectures, tutorials and seminars, but it is not a tool that is academically useful... (translated U1)

In an attempt to try and address the issue they put together a large map of everything that was being taught in the first three years in relation to the cases... and they made a CD of it and it went around the faculty and everybody got a copy and nobody ever looked at it and so it was a document that existing but it was actually not of much utility and the arguments continued... (U2)

Two medical schools (U2, U6) indicated that they previously have looked at examples of curriculum mapping software but have decided not to implement a web-based platform. Reasons for not implementing included the software not being perceived as appropriate for the setting and not investigating it with the intent to implement:

An electronic mapping tool will be useful. I have looked at ones they have internationally, but they are so patchy.... And they tend to be very specific, not one that will conceive about what we are doing. I can't say that I have found anything that I am beginning to understand fully. So what I did was trying to get

into this commercial websites, but I could never get very far, and it was very much just objectives and topics based. (U6)

Three medical schools (U1, U4, U7) indicated that they have made contact with an international partner to establish a business plan and costing for collaborating to develop a mapping platform. One of these (U7) had started during 2015 to load curriculum information onto the institutionally adapted platform. The process was described appreciatively and as work still in progress that had not been completed at the time that the interview was conducted.

We are privileged to have a web-based curriculum mapping platform from Charite, and we are at this stage uploading all the information... especially from all the pre-clinical departments, because they have been through a recent self-review and all their learning guides, and PQM documents and so forth are up to date... and to upload it onto LOOOP is a matter of packaging your information... and we are well on our way doing so... it is multi-disciplinary, and it also looks at the integration of the curriculum in all the levels, that is from first year to final year... I would say it is work that is continuing... so it is not really completed... (U7)

In summary, it seems that institutions offering undergraduate medical training in South Africa are documenting their curricula in more than one way (Table 4.2). Four institutions have a graphical display of the curriculum structure on one page. One institution has a document displaying the curriculum on a week-by-week basis. All institutions make use of detailed guides for specific units of learning. Some have attempted to produce electronic lists with descriptions of cases or competencies, but did not find this useful as curriculum management tool. Three institutions indicated mapping as a priority and have made contact

with an international partner to obtain, adjust and use an electronic mapping platform. One of the three institutions has recently started to upload information onto the web-based platform for the pre-clinical years, but have not yet completed the process for the clinical years.

Table 4.2: Current 2015 curriculum documentation

Current 2015 curriculum documentation	U1	U2	U3	U4	U5	U6	U7	U8
Document explaining integrated cases used in the curriculum /case competencies list					Yes	Yes		
One/two page graphical image of the structure of the curriculum	Yes		Yes				Yes	Yes
Various learning guides/handbooks/log books/files	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Attempted electronic package in the past	Yes	Yes			Yes	Yes		
Have looked at web-based platforms but not implemented		Yes				Yes		
Have made contact with international partner for costing and possible development of web-based platform	Yes			Yes			Yes	
Currently developing mapping platform and loading curriculum data							Yes	

It seems, therefore, that none of the eight medical schools who participated in this study have completed a curriculum mapping process or are using it as analytical tool to review and manage the curriculum, although some appear to have embarked on a process towards it.

Measured against the literature in the western world, not having a curriculum map will make curriculum management, analysis and reporting difficult. While mapping is not the only strategy to ensure continuous quality improvement and innovation, mapping has become a widely used way in which to plan, review and renew curricula (Britton et al., 2008; Oliver et al., 2007; Willett, 2008). It is therefore positive that some institutions in South Africa now realise the limitations to documenting an entire curriculum in various separate records and that these institutions now consider mapping the curriculum in a comprehensive manner which displays relationships between elements.

4.1.3 Strategies for curriculum review and renewal

All participants indicated that they have institutionally-based strategies and structures in place for academic planning and curriculum review. Each institution referred to these in different terms, although structures seem to include any type of programme, phase or module committee and task team as well as educational unit or specific directorate:

My suggestion is that we look at mapping by making use of a team approach. For instance here we have a programme committee in place, where we have representatives of all the phases. We also have for each phase a phase committee where all the module leaders are. We will definitely also have to manage curriculum mapping in this way... (translated U3)

We have the Curriculum Committee... first of all we have the Medical Education Committee as the committee of the faculty who is responsible for all undergraduate teaching and whatever changes we make must be approved by that committee. So that's where we deal with this issues... (U5)

When planning a new module for evidence-based practice, our Centre for Evidence Based Health Care Education had to go through a sort of mapping process and had to sit down to work through the various learning guides to see what happened where... (translated U1)

More recently, there'd been concerns that the clinical part of the curriculum is not actually primary health care orientated at all, so that set a process in motion of a curriculum revision task team focussing on years four, five and six with a specific mandate to make changes that would better be aligned with the primary

health care mandate... and that was driven by the Primary Health Care Directorate... (U2)

The majority of institutions indicated that the existing structures could be used to drive curriculum mapping, and only one indicated that a sub-committee would be needed to investigate mapping before the programme committee can make a decision:

The programme committee meets on a monthly basis... but there will need to be somebody that can spend more time than that hour long monthly meeting, I think a sub-committee will have to investigate, thereafter the current programme committee can take the final decision and drive the process... (translated U8)

Institutional structures seemed to frequently review curricula during some form of meeting or workshop which typically involved a variety of stakeholders:

When we started we talked with many stakeholders during big group indabas... we had several workshops... you know it is possible to agree on what the end product should be, so we called people from all over. (U5)

What we use often is the 'bosberaad' concept, where you for instance have one every year for the school of medicine, say for instance for the HODs, where we specifically look at some aspects e.g. teaching and learning. So, mapping would be something that we can look at by making use of a bosberaad... (translated U3)

These meetings usually include experts from all academic disciplines (basic and pre-clinical sciences, humanities and the clinical and pathology disciplines) as well as from the educational field and occasionally include members of the public. The teamwork approach seemed to have worked well for the majority of institutions, especially during the planning phases and for the pre-clinical years. Some institutions indicated that they achieved relative

success with processes for planning and reviewing the earlier years of the curriculum, but experienced challenges when it came to the clinical phase. Reasons given for challenges related to curriculum review and renewal in the clinical years mainly focused on change fatigue, lack of interdisciplinary teamwork or whole-school approach, lack of educational knowledge and experience in formulating an integrated curriculum, insufficient engagement, and the inability to define and differentiate core content for the undergraduate programme.

We started curriculum mapping right at the beginning, but one of the challenges was that the process was done in two phases, so there was the so-called pre-clinical phase and the clinical phase. For the pre-clinical phase we had a lot of participation from all the different science disciplines and because they mapped according to a set of cases it actually went quite well. When it got to the clinical disciplines the curriculum mapping process actually got stalled. I think people were already tired by then by 'change this change that' and the clinical disciplines were quite powerful in not implementing major changes; so they pretty much stayed with what they had, each department had their programme, and it kind of carried on... (U2)

... because in our system people tend to very much teach their own disciplines. We were not used to write an overarching integrated curriculum. Everybody only did their own bit in the old curriculum. They were used to it on their own. The challenges were to get everybody engaged, although it did not brought people sufficiently along, so now 10 years down the line we see the cracks developing... people now revert back to what they had before... (U6)

We tend to think of it in a very fragmented way, because of the arrangement of the programme across three schools. For the first three years the programme are

very much PBL based, it is broken up into themes and there are theme manuals... But the clinical years, I think it is still like the conventional blocks, it probably needs more defining for later years... for instance some details do not belong in the undergraduate curriculum programme, we got to take it out and instruct the specialist so that we do not waste time teaching it... (U4)

Furthermore, as can be seen from the following quote, although the majority of institutions have functional structures in place, it does not necessarily imply that all academic staff are engaged in and knowledgeable about curriculum matters:

I think mapping is important because we do not know what is going on in the curriculum, not even I know what is going on in the first, second and third year and I am the one person in the department that knows the most because I go to the undergraduate programme committee meetings... (translated U8)

From the above and as summarised in Table 4.3, it is clear that where there is not a functional structure which meets regularly, and with the mandate to authorise and drive changes, curriculum development stagnates or even regresses to earlier stages. At institutions where structures are in place and functional, with the mandate and buy-in of all stakeholders and with educational support, curriculum review and renewal is more successful. This has implications for curriculum mapping in the sense that functional structures will have a greater chance of success to engage a critical mass of academic and support staff.

Table 4.3: Strategies to involve stakeholders in curriculum planning, review and renewal

Strategy	U1	U2	U3	U4	U5	U6	U7	U8
Structures and processes in place for curriculum planning, review and renewal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Involved various stakeholders within the institution during the planning phases	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Tendency in senior years to limit review and planning to clinical discipline-specific process		Yes		Yes	Yes	Yes	Yes	Yes
Involved public and other stakeholders outside of the institution					Yes			
Curriculum 'big picture' often belongs to certain role players only	Yes	Yes	Yes	Yes		Yes	Yes	Yes

In order to avoid resistance and curriculum mapping being stalled, one institution warned against mapping the entire curriculum. It was advised that institutions should rather use a discipline-based mapping approach:

The way that I think that will probably be a better way to do it and there is actually now much more momentum for it is to actually look at mapping by department or by a discipline ... because people are in different places, depending on the change-readiness of the group you may get completely stalled because one or two disciplines are not interested in mapping anything... (U2)

One advantage of such a discipline-based approach to mapping is that all staff in the specific discipline could potentially participate and be empowered.

Another institution warned that the curriculum should 'belong' to all academics in all disciplines, and that mapping on an electronic platform will facilitate ownership, regardless of committees or the position of an individual. This institution also stressed the fact that all content should be mapped:

Whatever you do with regards to the curriculum and mapping... it should belong to the institution so there is always continuity and 10 years down the line people

will be able to work with it; because what was done in the past, curricula were owned by HODs or people who knew the curriculum, certain committees only, so if somebody left, when we wanted to review the curriculum it was like re-doing the whole... because we did not know the history... but when you have an electronic platform, it is all there, it is very visible, it is easy to change, and it is institutional, it belongs to us all... (U7)

Everybody should use it, unless all have uploaded their data, there will be a void... (U7)

It is important to note that mapping will be determined by the needs of the user (section 4.2.2). Transparency and analysis for duplications, redundancies and gaps only become possible once the curriculum and the various windows or elements are mapped (Blaum et al., 2013; Britton et al., 2008; Ellaway et al., 2014; Harden 2001; Oliver et al., 2007; Prideaux, 2003; Steketee, 2015; Watson et al., 2007; Willett, 2008). Finally, if parts of the curriculum belong to certain stakeholders in specific disciplines, it results in various challenges which are discussed later on in this chapter (sections 4.1.4.1, 4.2.2.1 and 4.4).

In summary, it seems that the majority of institutions have curriculum review committees and strategies in place. In general, institutions involved all academic stakeholders during the planning phases of curricula. There seems to be a recent tendency to work exclusively in clinical discipline-based teams for the final years. Not all medical schools in South Africa involve students or external stakeholders such as the public and community members. For the majority of medical schools, only certain role players have access to the ‘big picture’.

Literature indicates that curriculum mapping has to involve all internal as well as various external stakeholders (Davis & Harden, 2003; Harden, 2001; Oliver et al., 2007; Steketee, 2015; Watson et al., 2007; Willett, 2008). Mapping is an ongoing and iterative process that

needs commitment by everybody, regardless of level or seniority. The level and starting point of involvement depends on the use and function of the map. If mapping is to be used as tool for curriculum management and review, academic stakeholders from all disciplines and integrated themes need to be involved on an ongoing basis in mapping their particular modules (Steketee, 2015).

The current institutional structures and strategies are ideally placed to prioritise mapping and enable engagement. In some cases, however, extra effort and care are indicated in order to involve academics that are not usually members of the existing structures.

4.1.4 Curriculum challenges experienced in the local context

One aim of the study was to collect data regarding challenges related to mapping of the undergraduate curricula in South Africa, but participants spontaneously identified two sub-themes of challenges related to the curriculum itself. These sub-themes point to a need for a systematic approach to curriculum review and renewal and many of the institutions indicated that this need might be met by curriculum mapping. One sub-theme has to do with intrinsic complexities of modern-day curricula while the other has to do with external realities. The two sub-themes and the factors relevant to each are summarised in Table 4.4.

Table 4.4: Challenges that necessitate a systematic approach to curriculum review

	U1	U2	U3	U4	U5	U6	U7	U8
Intrinsic complexities								
Curriculum design, e.g. gaps/neglected topics, lack of coherence, duplications	Yes	Yes		Yes		Yes	Yes	Yes
Curriculum transparency, e.g. academics not knowing what happens where in the curriculum	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Teamwork, e.g. departments reviewing their curricula in isolation	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Academic staff attitude, e.g. resistance to reduce overload		Yes		Yes				Yes
Clinician as teacher, e.g. staff shortage, lack of experience to identify relevant content, lack of skills as educator, over-exposure of those who are willing to be involved in teaching and teaching administration	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Student preparedness, e.g. students studying to pass and not to learn all components of the work, level of preparedness and prior exposure				Yes	Yes			
Logistical challenges, e.g. cost and funding, transport, accommodation, venues on campus	Yes				Yes		Yes	
Uniformity in undergraduate training, e.g. lack of uniform standards for undergraduate training, the need to ensure the same outcomes are reached		Yes	Yes	Yes				Yes
External realities								
Disease, e.g. burden of disease, changing disease profile		Yes	Yes	Yes	Yes		Yes	
Human resources, e.g. shortage of staff, high service delivery demands		Yes	Yes	Yes	Yes			Yes
Training platforms, e.g. insufficient accredited sites, insufficient communication between sites		Yes						
Political pressures, e.g. increase in student numbers		Yes		Yes	Yes			
Supervision and standards, e.g. lack of supervision or mentorship of graduates during internship and community service, no clear differentiation between subsequent levels of training		Yes		Yes				Yes

4.1.4.1 Sub-theme 1: Intrinsic complexities

Specific issues were identified, as can be seen from a sample of six quotes representing sentiments of the majority of institutions. The first quote relates to disadvantages of integrated curricula, namely, a) facilitators from various backgrounds not working together

for coherence (unnecessary duplication, gaps/neglected concepts and topics, or disappearance of core baseline knowledge) and b) students not valuing all content, thus only studying to pass the overarching theme rather than all the components of the integrated theme.

One of the reasons why there is such a cry and a desperate need for a curriculum map, is because the MBChB programme has become so complex because of PBL and integrated learning and all the rest of it; so now because you have 20 people teaching different aspects of the same thing in one week it is a very real worry that some of them will do the same thing and none of them will actually teach something else that the students also need...

With integrated exams, one of the problems my colleagues over the years said, we had great integrated exams and the student can say, that's right I don't really need to know physiology, as long as I can pass the cluster and be able to get 50% I will be okay... And as soon as you say, no no no you need a sub-minimum for this and that... then they say it is not integrated anyway. (laugh) So there are many problems... (U4)

The second quote again explains concerns about non-coherence as a result of departments reviewing their curricula in isolation and adds the issue of transparency (academics not knowing what happens where in the curriculum):

It is possible to skip things or to let it fall on the ground for example palliative care, because you think it will be done somewhere else and need not be covered by you... when our Family Medicine department restructured their curriculum, they realised they do not have time for the visits to the hospice anymore, and so it was scrapped. So we only realised later it does not happen anywhere in the

curriculum. With a map we could have picked this up earlier... we could have done a gap analysis... (translated U1)

The third quotation in essence focuses on information overload or the inability to reach consensus on a 'core curriculum'. Unpacking the quote also reveals other underlying issues, such as resistance to strategies that should facilitate decision-making to reduce overload as well as underlying emotional responses and thinking processes.

I said the lists are far too long, what I want you to do now is to put just the core ones, the topics that are non-negotiable in a table on the left hand side and anything else that you really think is important can go on the right hand side... and the reason I did that is because people got incredibly angry about trying to make their list shorter... they said I'm (dumbing) down the curriculum and I'm throwing away the discipline and it is irresponsible and all sorts of interesting things were said so we are still very, very far from a practical, manageable, un-overloaded curriculum and it's kind of a work in progress... (U2)

There also seems to be a need for collaboration between medical schools in order to formulate a plan to standardise the outcome of the training and to organise subsequent levels of training with the academic intent indicated clearly.

I think in this country we have to work more towards a standardised doctor, after all we expect the same from everybody's (graduates)... so yes, if there can be transparency and all can be on the same level... At the moment, well you are fortunate if there is supervision for an intern... But for the community service doctors in rural areas, they have to cope with what they get, and if the training is not uniform, some of them (graduates) can and others can not at all, and that is a

big problem... so yes, if there can be transparency and all can be on the same level... (translated U8)

Another issue related to staff shortage and the overexposure of those who are willing to be involved in teaching and teaching administration.

When I took over we were involved with one of the blocks where interdisciplinary education was piloted, but then they started to abuse us heavily, because they also had too few staff and then we were pushed into all sorts of areas which are not actually our specialty, but you just get an e-mail that instructs you that you will present the next symposium. This should not be happening, and maybe a map will define what the collaboration should look like... (translated U8)

Other internal challenges around student preparedness and resources were also emphasised.

(Small group teaching) is labour intensive, but we find it useful, because (of) students whose educational background is poor... the small group tutorials have got a corrective aspect to it... we pick up students from underserved areas, and the problem that we now are confronted with, is that those students don't have the means to pay for their own fees... And the logistics; you need a lot of printing, and as the classes have become bigger, getting accommodation for tutorials have become a problem, and now that 25% of our teaching are in the community, there are instances where there are no transport for them... accommodating them in the community is a problem, and even getting preceptors in the community to help us with the teaching... and when it comes to academics, we find it difficult to recruit... (U5)

4.1.4.2 Sub-theme 2: External realities

This sub-theme focuses on external realities with the majority of the institutions indicated challenges as a result of disease burden and changes in diseases profile. There was a sense that curriculum planners were not necessarily informed as to the needs in communities and that opportunities to learn from decentralised sites were being lost (for instance lack of experience to formulate relevant content in the undergraduate programme due to specific types of practice, lack of accredited training platforms and communication problems between the health care system managers in the underserved areas and the academic hospitals). It was emphasised that curriculum renewal should be guided by an awareness of the context:

The disease profile of patients in hospital changed over the years so that students now mainly encounter patients presenting with HIV/TB, trauma and violence and/or diabetes, hypertension, ischaemic heart disease with limited opportunities to see anything else. The number of doctors declined and the number of students went up, resulting in students being withdrawn from clinics. Curriculum planners, based in tertiary hospital settings, perceptions about what is important to include in the curriculum is skewed by their clinical practice, while in the case of the rural campus an opportunity is lost because appointments are made without the university staff knowing the person and very little liaison with them...

(U2)

You have to attend to the disease profile of the population and needs in the environment for which you train, it will be different for Cuba and the USA and South Africa. The map should reflect the context and be linked to the burden of disease in South Africa... (translated U3)

Political pressure to increase student numbers and students entering the training and health care system from different educational backgrounds add to the need for contextualised teaching:

In this country we really are at a bit of a crossroads... I believe there is a major need for re-curriculation... due to changes... and what has changed is, one we are under pressure from minister of health to double our student intake...and two... now we've got over a 1000 students returning from Cuba per year shortly.... there are over a 1000 South African students who studied in China and elsewhere, coming back.... so in other words we have to start preparing our training programmes to also accommodate students returning from Cuba, students returning from China as well as our indigenous students and they have to be doubled anyway... (U4)

Added to these challenges, the shortage of clinical teaching staff and high service rendering demands by the employer put additional strain on the already limited resources. Once again, the feeling of being overwhelmed was expressed:

Especially for the clinical years, the fact that academic staff is employed by the province and the bulk of their responsibilities entails service delivery, and as with many other institutions, we have a shortage of staff and resources which impacts negatively on the ability to also teach... our main problem relates to human resources... you know there are departments with only one consultant, then he is also the head and might not even have a person providing administrative support... so it becomes very difficult under these type of circumstances to do your best... (translated U3)

In summary, institutions in South Africa offering undergraduate medical training experience challenges intrinsic to the complexities of the curriculum as well as challenges from the external reality. In medical education literature, this is reported as a worldwide trend, with institutions facing challenges as a result of changes in systems of health care delivery, change in educational approaches, advances in medicine and technology, and expanding roles of the doctor (Balzer, Dittmar et al., 2015; Boelen & Woollard, 2010; Frenk et al., 2010; Harden & Hart, 2002; Pugsley & McCrorie, 2007).

Advances in technology and information add to the already overloaded curriculum (Dalley et al., 2008; Harden, 2007; Prideaux, 2007). Academic staff that experience increased workload in terms of patient care, administration, teaching and research demands might have limited capacity to contribute to curriculum review and renewal. This situation can have a negative impact on the mapping process as busy academic staff might not make the commitment to mapping, not regard it as important, not attend meetings to plan a mapping platform (therefore missing out on the opportunity to include their needs) and not find time to upload data regarding their modules. These factors could also explain why participants reported relative success with curriculum documentation for the pre-clinical years, but not for the clinical years.

As can be seen from the literature, mapping in itself is labour- and time-intensive (Balzer et al., 2016; Davis & Harden, 2001; Ellaway et al., 2014; Harden & Hart, 2002; Oliver et al., 2007; Willett, 2008). On the other hand, some of the challenges can certainly be overcome by the review and renewal that will result from mapping. Mapping has been proven to assist in alignment of the curriculum, identifying redundancies and unnecessary duplications, thus opening time for neglected topics (Litaker et al., 2004; Plaza et al., 2007; Sanchez-Reilly & Ross, 2012; Satterfield et al., 2010; Steketee, 2015; Wood et al., 2002; Wylie & Thompson,

2007). Mapping makes the curriculum more transparent, addressing student anxieties and assisting new staff and curriculum managers, and it provides documented proof of the curriculum in action, which assists in preparation for accreditation.

Once clinical educators realise potential benefits, they might become more positive towards mapping, as could be seen from participant responses when they discussed expectations of mapping for the future (section 4.2.2). Mapping of exit level outcomes in an attempt to ‘produce a standardised doctor’ and mapping of subsequent phases of experiential or work-based training such as internship and community service might address some of the contextual issues and are discussed further in section 4.2.3. For mapping to be regarded worthwhile, it should address some of the challenges, at least those within the control of the academic institution.

4.2 The future vision for mapping

Data regarding a possible future for implementing curriculum mapping were categorised into five categories, namely, preferred method of mapping, expectations of a web-based mapping platform, elements to be included, stakeholders and stakeholder access, and institutional requirements to enable future implementation.

4.2.1 Preferred method of mapping

The preferred method of mapping differed amongst the institutions and was linked to five specific factors, namely, urgency, accreditation requirements (HPCSA), value or usefulness (the mapping tool must assist curriculum planners in curriculum review and renewal, and not merely be another exercise which requires a lot of time and energy) being user-friendly (easy to use) and cost (money, time and expertise to develop and maintain the map).

Four institutions (U1, U4, U5, U7) indicated that they are aware that the accreditation body (HPCSA) might require mapping of whole curricula in future because it can assist in evaluation.

I know the chair of the undergraduate committee of the HPCSA... who have been trying to push for these things... (laugh). It is for the accreditation team and for evaluation, you see we have our own internal evaluation, we have three levels of evaluation, that structure's function is to evaluate the curriculum in action, and the curriculum in action must be similar to the curriculum on paper as the literature in medical education says... (U5)

Three institutions (U1, U4, U7) indicated urgency for an electronic web-based platform while two other institutions (U5, U2) indicated that they preferred uncomplicated, paper-based mapping as the basic mapping process, because of the potential complexities involved in electronic mapping.

Curriculum mapping is a change management project and brilliant process, but poses many challenges. I like simple, non-complicated. If you could map on a piece of flipchart paper... just straight forward. My experience is been that there are all sort of maps around but those tools only work if the person putting the data in is very clear about the data... I don't think that you can map initially on an electronic tool, you have to map on paper. When your paper map is clear you can do it with a tool and then if you press it everything else will pop up. The problem with electronic tools is you are limited by the screen; you can't work on something that is not on the screen, and if you keep pressing the button in the end you have 17 screens open... and then you sit to work backwards and I really struggle with that... (sigh) (U2)

One institution did not specifically specify the nature or format of a mapping instrument, but was yet again specific about the tool being of value (for instance to replace existing evaluation questionnaires as template for quality assurance) and easy to use:

I think it will be valuable to develop such a tool. It depends on how user friendly it is. It should contribute to quality enhancement... so if you have a mechanism to do that, it will be very valuable. I don't know how involved you are with HPCSA accreditation, but that report of over a 100 pages is really not user-friendly, even the new template is not yet an optimal tool to use. So I think if a map is user-friendly it can even be used by HPCSA, to make their task easier. Although the content will be different, if the template is the same it entails all the components which all of us have to address. I am very much in favour for something like that.

(translated U3)

Five institutions (U1, U4, U6, U7, U8) indicated that they would prefer an electronic platform that has a track record of being useful (for quality assurance and accreditation) and user-friendly (easy and uncomplicated to use), and has the ability to reflect the unique organisational structure of the curriculum at the institution (allowing for uniqueness). One of these institutions was particularly adamant that a mapping platform must not be forced down on institutions if it is not going to be of any value:

It being an accreditation requirement after our last inspection makes it urgent although we are sceptic about it because one of the tendencies, and particularly when it is more or less forced on you by HPCSA, is just to come up with something that is pretty. That is of no value, particularly if it gives false security...

(U4)

One institution (U7) preferred to continue with the electronic platform they were in the process of developing because they felt it offered the potential for transparency, accessibility and ease with which to obtain curriculum data.

Integration becomes visible, now especially with all the modules that we so far mapped because you have a searchable database. You see the whole spiral. It is there within a few seconds and that was not apparent with the manual system we had before as all was separate in various documents. So the benefit is that it is on one database and it is searchable. It is accessible from anywhere, so it is not locked in a cupboard (laugh) it is not in various cupboards (laugh)... I would say it is alive, it is all together. When you have something like this electronic platform, it is all there, it is very visible, it is very easy to change, and it is institutional, it belongs to us all... (U7)

When prompted as to *why* specifically an electronic mapping platform, three of the five institutions who desired it (U1, U4, U7) expressed their motivation in emotional terms (to avoid embarrassment, to evoke enthusiasm for curriculum review) as well as in functional terms (for transparency, for alignment, for educational understanding, for curriculum review and reform):

I have a heartfelt desire for it, it's indispensable for the times we live in. I am embarrassed being the manager for 14 years and not knowing what is going on, having to sit down and scrutinise various guides... my basic need for a map is to know exactly what happens where. And for the students to show them what will happen over the next years ... and you need to show the curriculum to new registrars so they know what to teach; let's say students that arrive with them in

the third year for a clinical rotation, to show them what these students have done before, the levels also... (translated U1)

I see people becoming enthusiastic about curriculum matters. They started mapping because they know their curriculum so well, but now they are repackaging it in a better way and they are enthusiastic, they use different words of excitement (laugh) the younger ones will say 'this is cool' (laugh). People in the past when it came to the curriculum issues thought 'oohgg it is this mountain laying ahead' and now they are becoming enthusiastic as it is made easier even also for curriculum reform, they are also enthusiastic, because I had people here from other disciplines that had recently done their curriculum for a new course and they sat here and made changes to their PQM, because they said 'did I actually write this, because it just doesn't make sense...?' so they changed their plans. So this platform is excellent to review the curriculum... (U7)

Institutions indicated caution regarding the costs involved, especially financial implications, as this seemed to be a determining factor in obtaining a sophisticated mapping platform.

I think the biggest challenge for the map will be the data input, the people needed to create the map, the technical expertise and then of course the cost. I have seen it is not a simple task to build the map and it also is not cheap... (translated U1)

It has financial implications... so we know that it takes time... you don't decide I want to use it now and in a few months you have it... because you must take it back to your university and... to tell people about it and get their buy-in before you can get money to buy the platform. So that will be the main challenge for others to get started... (U7)

One medical school did not regard mapping as a priority, mainly because of it being seen as labour-intensive work without the potential for being appreciated, while other participants were uncertain whether the institution might provide a mandate for mapping.

Mapping is a huge amount of work; that kind of thing is really very labour intensive... and if someone is going to win a medal for it, you know, they will do it... but we are not. And so, no mapping... (U2)

I don't know if they (management) will think mapping is important if they have to spend money, they might think it is unnecessary because one can get the information currently if you really want it... you can ask a head of a department or look in a book... (translated U8)

In summary, as can be seen from Table 4.5, it seems the institutions prefer a specific type of mapping tool based on five perceptions, namely, urgency, accreditation requirements, value, ease and cost of the platform.

Table 4.5: Preferred method of mapping linked to reasons for it

Preferred method and reasons	U1	U2	U3	U4	U5	U6	U7	U8
Awareness of mapping possibly being an accreditation requirement	Yes			Yes	Yes		Yes	
Prefer non complicated paper-based map (ease: clarity of data)		Yes			Yes			
Prefer electronic mapping platform (value: searchable database, transparency, all in one place)	Yes			Yes		Yes	Yes	Yes
Not specific in preference on method of mapping (value, ease)			Yes					
Cautious to find the right type mapping platforms (value)				Yes		Yes		
Cautious of the cost involved (finance, time, expertise)	Yes						Yes	Yes
Mapping might not be regarded as a priority currently (non-urgency, cost)		Yes	Yes		Yes	Yes		Yes
Urgency, wanting to implement a mapping platform within the foreseeable future	Yes			Yes			Yes	

As reported in literature, paper-based maps have been used successfully to display relationships between curriculum elements in tabular format, while the motivation for electronic platforms is formulated around sophistication (Davis & Harden, 2003; Ellaway et al., 2014; Willett, 2008). Five institutions indicated a preference for a sophisticated electronic platform because it allows for a searchable database in one place which, once developed, they believe would allow quick access to all information and will assist in curriculum review and management (value). Sophisticated mapping platforms, however, come at a cost and institutions will need finance and the expertise to develop a platform and maintain it. In the current financial climate, this might be a challenge for some institutions in South Africa. It seems that the final decision with regards to a mapping platform will be determined by weighing up the value added to curriculum management against the financial investment institutions will have to make to develop and maintain the platform.

4.2.2 Expectations of institutions for a mapping platform:

Institutions had very specific expectations of a mapping platform. These expectations could be divided into four main functions for a map, namely:

- transparency and sharing of a vision for the curriculum;
- curriculum review and renewal;
- collaboration, benchmarking and accreditation; and
- providing data for administration, research, student progress tracking and faculty development purposes.

4.2.2.1 Transparency and sharing of a vision for the curriculum

Mapping should provide for transparency and for a shared vision amongst different stakeholders within the institution, especially those from different disciplines. Mapping is

therefore seen as having the potential to overcome the current challenges experienced by medical schools regarding integrated curricula (section 4.1.4.1), as illustrated in the following quotes:

It has the potential to bring together people, to build the bridges between silos and provide for clear articulation backwards and forwards for different parts of the programme... (U2)

Providing all stakeholders with the full picture will enable them to work with the end in mind; and this result in a more holistic and efficient work approach... (translated U3)

4.2.2.2 Curriculum review and renewal

Mapping should facilitate curriculum review and renewal as part of an ongoing curriculum management process, and therefore result in continuous quality improvement and innovation:

To use it as a curriculum management and review tool in constant reflection on a curriculum, this should very much be a living document; something that is continuously effected on and evolve in continuously reviewing the curriculum... (U6)

It gives you the opportunity to make the review at the time when you are not required to do it as part of a formal review; it gives you an on-going review process... (U7)

Participants shared detailed responses regarding what the review should reveal. It was particularly emphasised that mapping should make it easier to find ‘gaps’ (especially related to the so-called soft sciences) and detect duplications or redundant content. It should assist in

defining core content and reduce information overload. It should assist with aligning appropriate level and depth of learning with outcomes at each level or phase and competencies across the programme. The quotes below illustrate these three aspects.

a) Identify gaps and duplications

To use it for gap analysis and blue-printing exercises to see where things were skipped or has fallen off, or where unnecessary duplication is taking place, to see where things are going well and where more work is needed... (translated U1)

... for instance if it shows this topic is covered a 100 times, is it planned to do it a 100 times or is it pure repetition? (U4)

... it would be nice to go into the system and say to what extend are we teaching for instance leadership and advocacy... (U6)

b) Reduce information overload and reduce student anxieties by defining core content

The biggest plus of having a curriculum map is that the students' anxieties about what they have to learn will go away, because we drive students to insanity by producing 700 conditions for seven weeks... (U2)

Somebody could be teaching that sort of stuff and we won't worry about it until one day the students come and complain that they are given inappropriate stuff... (U4)

c) Align level of learning, outcomes and assessments across the programme (within and between modules)

Address level and depth issues and sort out with everybody in the mapping process to what depth students must know about this condition... (U2)

Align learning and assessments for each module with module specific objectives and programme exit level outcomes... (translated U3)

It actually assist you to realise that you are not achieving what you said, there is either something wrong with the curriculum or there is something wrong with the assessment... and you look at the assessment and say, okay but assessment is fine, so you go back to the curriculum and say 'I see, I think here is the problem, the delivery of the learning or the lecture or presentation is not actually linked to the outcome... and that is why students are not understanding' and now you have to improve on that... so that is just a little; it is just a small part, but it change things, and you can fix it; so it does help... (U7)

The alignment and integration is the main issue I would like to see addressed, there is lots of things that gets repeated, the students say there is duplication and contradictions, they say we teach them one thing and another discipline teach them different, so it will help to see we are in line, that the content is in line... (translated U8)

4.2.2.3 Collaboration, benchmarking and accreditation

Mapping should facilitate accreditation, benchmarking and collaboration for standardisation, especially when it is linked to an existing national framework.

a) Accreditation

It will really benefit the institution and the curriculum. It will make curriculum review and accreditation reports so much easier... (U7)

I think one of the advantages at professional board level if everybody maps, is simplifying the task of accreditation, you know, I think the map can be used to complete the self-assessment questionnaire... (translated U1)

b) Benchmarking

I think one should be guided by the HPCSA document on competencies, one maybe should consider how you can incorporate these competencies applicable to your curriculum as I would like to link the frameworks with each other... (translated U3)

c) Collaboration

It takes a huge amount of time to set a MCQ... so why do we have seven bunches of people around the country... all doing what others do... most of the questions should be free to share amongst each other and a map can assist with that. (U4)

Participants saw collaboration with other medical schools in the country as potentially beneficial as far as it is providing guidelines for quality and standardise outcomes, and as it can assist in reaching a national decision regarding the core content at undergraduate level.

Currently we have a variety of programmes but the burden of disease seems to be the same throughout and the quality of what a doctor should be like, is national. So in that way I think institutions need to sit together and look at curricula in terms of standardisation of national outcomes... (U6)

I think one can learn from each other, none of us are really experts in education and when in our department we have to sit and formulate outcomes it comes out completely dissimilar, some say they MUST have this, others say, NO, it is highly specialised; so I think it will help to have a look at what other institutions have,

you have a bigger pool to look at... if you can click on a map... currently it is very difficult to obtain... (translated U8)

I think it can contribute to increased uniformity amongst institutions although everybody wants to do their own thing, I think the map has the potential to assist us look closer at how we train and assess... (translated U1)

It could be argued, based on the responses, that in South Africa, there seems to be a need for a national approach to mapping with a parallel programme mapping system, implying that programme outcomes for interns, community service doctors and postgraduate registrars should also be mapped:

I have a few more points to make... it is an increasing concern now amongst the committee of medical deans about poor quality training in internship and in community service... and one very good way to focus on this is to have a national curriculum map for internship... not in great detail... but a much clearer definition of what sort of things will be covered during internship and what sort of things in community service, to be a very broad outline... at the moment there is nothing... students just goes to obstetrics of 4 months... and they present themselves for a signature... so it's absolutely not conducive.... So a broad / national curriculum map for internship should be the ideal... (U4)

Stakeholders groups to be involved, such as the College of Medicine, were suggested:

We have now established a platform – through the colleges of medicine- where people are equally represented and invested in doing something, so it goes back to curriculum mapping... (U2)

Other stakeholder groups included the undergraduate committee for accreditation of the HPCSA, The Committee of Medical Deans, the Department of Health and communities of practice under the auspices of the South African Association for Health Educationists.

However, although institutions expected a mapping platform to assist with benchmarking, accreditation, and possible future collaboration, institutions were cautious about sharing the same platform given the fact that curricula are unique:

We have a difference in focus at different universities; the problem we have here, we seem to have different spectacles looking at medical training in South Africa and when you have different outlooks it becomes difficult for you to have a common ground for a meeting... (U5)

Universities have different histories and different designs, and where they are coming from is different. LOOOP was adjusted for our specific context, it will be problematic to share it just as it is; remember the platform is also linked to organisational components such as the timetables and specific lecturers. In Germany they even have patients. The sharing of the academic information is possible when comparing the content part but not the organisation. (U7)

... as long as there is a basic national framework upon which institutions can bring creativity to individualise it... (U6)

4.2.2.4 Providing data for various administrative and research purposes

Mapping should provide data for administration, research, student progress tracking and faculty development purposes.

a) Data facilitating administration decisions

The map will help the manager to know which departments teach in integrated modules and make decisions regarding subsidy allocations... (translated U1)

It might help to plan and manage the resources, money and budgets including the number of patients, consultants, nursing staff, equipment, transport requirements. Everybody said it is really a good idea for the third years to go to the rehab site until there was no money for the bus, actually realising you can't afford what you want to do – so again the map might be a reality check. Even to plan for administrative staff you almost need to map administration requirements, each year level need an administrator... we had to re-grade the jobs recognising these people were doing jobs way above the complexity they were paid for, carrying service loads much higher than anticipated... (U2)

b) Data facilitating educational research

One should drive this type of education innovation project with a PhD candidate and some master degree projects. Curriculum mapping can provide statistics regarding the core curriculum. We are having this debate about teaching the core curriculum, statistical analysis will assist to pull that numbers out of a map, or out of a database. A map can assist education innovation converted to a research project with a very specific question, you actually can get the information that you need. Clinical disciplines are really deeply invested in objective data. Show them p-values and they pay attention. Data that is properly presented will create credibility. In the end if you got your data properly you could present it properly, it is credible and credibility is a huge part of change management... (U2)

c) Data facilitating placement and progression of students in various tracks with different educational backgrounds and experiences

The map should show for instance, would it be possible to take students directly into second year; or show if the curriculum change substantially, will it still be appropriate for students returning from Cuba to come into our five and a half year? The map should be able to track students in different tracks (fast or high level track, research track, dual track, parallel curriculum) The map should assist us to analyse student progress, especially through formative assessments, picking up on struggling students and providing support... (U4)

d) Data facilitating faculty development programmes

The map can help in identifying learning, teaching and assessment strategies and methods; and where it still is terribly traditional, to feed information forward to faculty development courses... (translated U1)

From the data collected and as summarised in Table 4.6, it is clear that participants had a variety of expectations of curriculum mapping. It could be argued that these expectations point to the type of sophistication only electronic mapping platforms, linked with third party vocabularies and outcomes taxonomies, can provide.

Table 4.6: Expectations of a mapping platform

Expectation	U1	U2	U3	U4	U5*	U6	U7	U8
Provide for transparency and a shared vision, overcome 'silo' thinking	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facilitate curriculum review and renewal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facilitate accreditation, benchmarking and collaboration for standardisation of undergraduate national outcomes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provide data for various administrative and research purposes	Yes	Yes		Yes	Yes		Yes	Yes

*U5 did not indicate an interest in electronic mapping platforms, but referred to their paper-based map and what the curriculum office uses it for

In the literature, some studies indicate that these expectations can be met if the platform is planned and developed according to the needs of the stakeholders (Harden 2001), if the stakeholders are involved in the planning, and if the platform allows for some flexibility and ongoing development as the needs change (Balzer, Bietenbeck et al., 2015; Balzer, Dittmar et al., 2015; Balzer et al., 2016; Britton et al., 2008; Ellaway et al., 2007; Oliver et al., 2007; Steketee, 2015; Watson et al., 2007; Willett, 2008).

Using mapping for benchmarking and accreditation purposes implies stakeholders from the eight institutions need to collaborate to define the features and functions of such a map and decide as a group on the specific outcomes framework and vocabularies. If these are not available they would need to be created for the South African context and this might best be undertaken now before too many institutions have developed their unique platforms in order to synchronise some of the functions (for example, decide if mapping will be done against MeSH terms or against ICD-10).

One participant indicated the need for student progression tracking. Mapping platforms are able to provide this function, but another institution warned against this because of the sensitivities around student marks. In South Africa, institutions might also already use specific systems to track student progress. Stakeholders will have to indicate clearly if this is a real need or if they would rather have the two systems ‘talk’ to each other.

In developing platforms that can address the needs, it is essential to identify the elements that should be part of such a platform.

4.2.3 Elements or windows to be reflected in an electronic mapping platform

It seems that institutions agreed on most of the elements that should be part of a curriculum mapping platform. The elements on which everybody agreed include structure, content and

outcomes, learning and teaching strategies, assessment strategies and methods, as well as teaching platforms and venues. Some institutions did not indicate linkages to third-party taxonomies, but this could be because they were not aware of the possibilities, and some did not indicate e-learning systems, possibly because the system is fully operational at their institution and they did not regard the link important. This however, will need to be confirmed by further research.

Structure: All institutions indicated the importance of reflecting the structure of the curriculum. Some indicated it explicitly while others referred to the different year levels, phases or semesters in a spiral, and progression between these years, phases or semesters.

Content linked with outcomes and competencies: All institutions emphasised content explicitly by wanting the map to show themes and topic as they spiral through the curriculum, for instance metabolism of carbohydrates, diabetes mellitus and renal failure. All institutions wanted objectives, outcomes or competencies to be specified in the map, such as exit level outcomes for the programme as a whole as well as module outcomes and objectives for topics within the modules or units of learning such as blocks. The participants were particular about the ability of the map to show breadth and depth of outcomes:

Because one of the biggest challenges of mapping is not actually the clinical presentations or the list of conditions... it's the depth to which their knowledge needs to be taken... (U2)

Learning opportunities, strategies and teaching platforms: All institutions wanted learning and teaching strategies to be displayed, for instance lectures, tutorials, seminars, practicals and ward rounds. All institutions indicated the importance of including the platform and/or venue where teaching and learning is to take place, for example ambulatory setting, clinic, ward, outreach facility, rural hospital, tertiary hospital, rehab site, hospice,

laboratories and dissection rooms. Some institutions preferred a link to the e-learning management system and resources. One institution would prefer to link policies such as the policy on needle-prick injuries. One institution indicated the possibility for the mapping platform to in the future map patients as resource.

You can check the availability of patients, to map the number of beds so students can book... (U7)

The same institution also indicated a link to a peer-education system where students map peer learning sessions for booking.

Logistical details (dates, times, lecturer details): The majority of institutions indicated that they preferred logistical details, such as calendar dates and times, specific educators and contact details, to be included. One institution was, however, adamant about not needing this detail.

It is NOT important to put the date and time and lecturer detail, but rather exactly what the content was and to what depth it was taught and how we have addressed it at first year, at what level, what contents and so progressively up the years for all the years... (U4)

Assessments: All institutions wanted the map to be able to show alignment of assessments with the specified outcomes as well as competencies:

This is much more difficult than to map theoretical knowledge, competencies is very important, everything, from the most practical skill... it is different from when and where they are teaching it and where it was assessed, we need to show it can be checked that students actually learnt it... (U4)

All institutions wanted assessment criteria, strategies and methods and details about tasks to be included. One institution indicated the inclusion of assessment rubrics and another indicated a link to a database with previous assessment papers. There was, however, a counter-suggestion that assessment results should not form part of a curriculum map, as confidential information about student progress should not be displayed for everybody to see.

Outcomes frameworks, taxonomies and vocabularies: Nearly all institutions mentioned the HPCSA-adopted version of the CanMeds model, while one institution mentioned SAQA NQF level descriptors, Bloom's taxonomy for knowledge outcomes and Miller's pyramid for skills. The vocabularies described by one institution included MESH terms. Other institutions indicated utilising the HPCSA logbook for interns.

The elements or windows identified by institutions are summarised in Table 4.7, and seem to be in line with what is suggested by Harden and others in the literature (Harden, 2001; Prideaux, 2007; Willett, 2008). These elements need to be mapped and then linked with each other in order to review alignment.

Table 4.7: Elements to be reflected in a map

Element	U1	U2	U3	U4	U5*	U6	U7	U8
Structure of the curriculum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Content (themes, topics)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Outcomes and competencies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Learning opportunities and strategies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Timetables and schedules (dates and times)	Yes	Yes	Yes	Yes **	Yes	Yes	Yes	Yes
Teaching platforms and venues	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department and lecturer/facilitator details	Yes	Yes	Yes	Yes **	Yes	Yes	Yes	Yes
Assessment strategies, methods and tasks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Links to outcomes frameworks such as HPCSA's CanMeds, Miller's pyramid, Blooms levels, NQF level descriptors.	Yes	Yes	Yes		Yes		Yes	
Linkages to controlled vocabularies such as MESH terms							Yes	
Links to e-learning system, e.g. Blackboard, or references, case studies or previous exam papers		Yes	Yes	Yes			Yes	
Learning opportunities booking system (patients, peers)							P	

* U5 did not indicate an interest in electronic mapping platforms, but indicated what they considered in developing their paper-based map

** Timetables and lecturer details less important

P Possible

The results of this study show that there is consensus amongst four institutions about using the HPCSA-adopted CanMeds competencies as a framework to enable benchmarking. However, for the expectation of national collaboration to be met, it will be important for all institutions in South Africa to also reach consensus on the third-party vocabularies they would like to use, for example MESH terms or ICD-10. Curriculum mapping platforms might include all the mentioned elements, but the structure and the design of the curriculum might differ (e.g. five-year vs. six-year, integrated vs. traditional), and therefore institutional maps will be different. The benefit if all institutions map the same basic elements is that it will be easy to see where institutions can collaborate more (e.g. share clinical training platforms) or to perform benchmarking exercises (e.g. cross-reference outcomes for anaesthesiology amongst participating institutions). As some institutions expressed the need for a single exit

level standard and possibly MCQ examination (U2, U3), assessment questions might in the future need to be mapped specifically. While taxonomies such as Bloom's can determine alignment and progression (Harden, 2007; Prideaux, 2007), this expectation immediately raises issues pertaining to institutions having access to each other's databank of MCQs while limiting student access.

In this study, participants identified students, academic staff and curriculum planners as important stakeholders in the mapping process and as users of a mapping platform and not as an element to be mapped.

4.2.4 Stakeholders and stakeholder access

All institutions indicated that a variety of stakeholders should have access with or without specified limitations to the curriculum mapping platform. As can be seen in Table 4.8, These stakeholders include curriculum planners, all academics regardless of level and representation in committees, support staff, students, authorities, and even visitors and the public. The need for managing access was also acknowledged:

It is a matter of giving access to someone, we can create a password to make certain information available, it is just a matter of getting the permission or whether to authorise... perhaps you could have a limited view for the outsiders...

(U7)

Table 4.8: Stakeholder groups and access to mapping platforms

Stakeholder group	U1	U2	U3	U4	U5*	U6	U7	U8
Curriculum planners & academic planning committees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Academic staff & educators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Administrative and support staff	Yes	yes	Yes	Yes	Yes	Yes	Yes	
Students	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Authorities (such as accreditation teams and external examiners)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Others ('outsiders', public, visitors)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Educational researchers		Yes						Yes

* U5 did not indicate an interest in electronic mapping platforms, but indicated stakeholders for their paper-based map

Participants in this study identified stakeholders and users similar to those described in literature (Harden, 2001). The frequency and use of the map will be determined by the needs of the user and the questions he/she wants to be answered. As has been indicated before, stakeholders have varying needs of the map. In the case of assessment questions and results, password protected access is indicated. Students will need to understand that curriculum mapping is not to be confused with an e-learning system. Although only two institutions indicated educational researchers as a stakeholder group, it is important to note that stakeholder access was prompted by an open-ended question only. It might be that participants did not at the time consider potential research opportunities, or that they might have considered ethical issues. This point will need to be explored by further research.

4.2.5 Institutional requirements for successful implementation

Institutions identified requirements that will be necessary for a mapping process to be successfully implemented. These requirements resort around two main issues, namely, mandate/buy-in and resources. It seems that, without these requirement being met, mapping will not be regarded as a priority to engage in for the medical school, regardless of urgency, value and ease as reported on in section 4.2.1.

4.2.5.1 Providing a mandate and lobbying for buy-in from all stakeholders

As has been pointed out already, management will need to provide a mandate and drive for curriculum mapping to be successful (even providing incentives), and all stakeholders (academic and administrative) will need to buy into this as a priority, be empowered to make decisions and become engaged in the process as it unfolds.

You need a mandate that this is actually something that you have to have because people are in different places, depending on the change-readiness of the group, you may get completely stalled because some disciplines are not interested ... It is very difficult to get people to look at something if they don't understand what they are meant to do with it. It is not valued in the university, nobody cares if there is a map or no map. You don't get a promotion for it, you don't win a prize and you don't get a medal... (U2)

It would take quite a lot of commitment in the beginning from the admin as well as from the academic process... which I don't think are often enough chosen with freedom, I don't think we get the opportunity to choose, we are often given a system... and we don't often have the freedom. The people building it would need access to essential decision-making processes, would need to be part of it, even if it is a midlevel admin person, they would have to be able to speak to somebody that matters... that should have the understanding or knowledge that this is a powerful tool... (U6)

University policy and procedure regarding copy right and intellectual property rights must be observed. It must be user-friendly, once all academics understand the programme and how to use it, everybody should have access to it. A team

approach should be used to enter information and the final programme should be signed off by the programme director... (U3)

4.2.5.2 Making resources available

Resources include time, funding, human resources and the relevant mapping platform, as shown in the following quotes:

The institution is to appoint a champion and driver with good negotiation skills and the ability to bring people together and to establish a small team with an IT expert and academics at the appropriate levels... (U2)

We need a person with clinical as well as educational background as coordinator because if you have a purely education expert, they will struggle to link it with MESH because they don't have the MESH knowledge and if you have a clinician, we all know medical people usually don't have educational background... and you will not easily found someone having both, doing this kind of work... (U7)

The requirements for successful mapping mentioned by the participants in this study and summarised in Table 4.9 corresponds with what is found in literature (Balzer et al., 2016; Britton et al., 2008; Davis & Harden, 2003; Ellaway et al., 2014; Harden, 2001; Harden & Hart, 2002; Watson et al., 2007; Willett, 2008).

Table 4.9: Institutional requirements for successful implementation

Institutional requirements	U1	U2	U3	U4	U5*	U6	U7	U8
Mandate, buy-in and commitment from all stakeholders	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Resources (time, mapping platform, funding and specific expertise/human resources)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*U5 did not prefer an electronic platform, but indicated nonetheless that they need to above in continuing building and responding to their paper-based map

Full institutional support (management, finance, human resources, IT, faculty development etc.) will be needed for institutions offering medical training in South Africa to successfully implement curriculum mapping. One institution indicated that support is often forthcoming when curriculum planners can show it is a priority within the national context, or when it can be driven as a research project which contribute to a scholarship footprint. If mapping is to be taken seriously at all institutions in South Africa, it will need to be put on the national agenda, either by the HPCSA undergraduate committee or through the Committee of Medical Deans.

4.3 Conclusion

Curriculum planners from all eight institutions offering undergraduate medical training in South Africa during 2015 participated in this study. Curriculum mapping does not seem to have been a priority over the past decade. As far as could be established, none of the institutions have completed a relational database which guide users through its various elements and their interconnections. Nevertheless, all institutions participating in this study have documents in place describing the curriculum. These documents are made available to accreditation authorities and external examiners during review visits.

Institutions also have strategies in place to regularly discuss curriculum review and renewal. Institutions experience huge challenges intrinsic to both the curriculum and the external realities impacting on the implementation of the curriculum. These challenges seem to warrant mapping as a possible strategy to analyse and manage the curriculum and make improvements.

Curriculum planners at some institutions have now started to see sophisticated electronic mapping as an opportunity to share the vision of the curriculum, as a tool to review and manage the curriculum, as a platform to facilitate benchmarking and accreditation and as a

database to contribute to research and faculty development. It was felt that a mapping platform should include elements such as structure, content and outcomes, learning opportunities, and assessment strategies. Various stakeholders should be involved in the developmental process and have access to the platform. A national mandate and full institutional support will be necessary for mapping to be successfully implemented.

In the next chapter, final conclusions and suggestions based on the results are presented.

Chapter 5: Summary and conclusions

In order to reach conclusions and formulate suggestions for the implementation of curriculum mapping at medical schools in South Africa, this chapter draws on the results and discussions as reported on in Chapter 4. The motivation for and context of the study, the literature review and the methodology are also reflected on.

5.1 Reflections on the background of and motivation for the study

The study was performed in response to needs expressed by the CDC at SMU. Results of the study were shared with the project leader of the LOOOP project and informed the CDC at SMU regarding the ongoing development of the mapping platform. The results re-assured members of the committee that SMU is not the only institution that faces certain challenges and that SMU is on the right track with the mapping platform and the elements included. It served as an early warning system in terms of stakeholder buy-in and also instilled a sense of urgency in continuing to develop the LOOOP platform. It contributed to a feeling that SMU can share lessons learnt regarding mapping with colleagues from other medical schools, and resulted in the project leader being invited to share expertise with at least three other medical schools.

5.2 Reflections regarding the aim and objectives of the study

This study resulted in an improved understanding of curriculum mapping in the South African context. It explored the status of mapping to the extent that conclusions could be drawn regarding the lack of a comprehensive record of the curriculum across all years in all medical schools. It also seemingly contributed to an understanding that curriculum mapping might provide the necessary structure and process in which to not only map the curriculum, but also facilitate on-going review and renewal of curricula. It contributed to a clear

description of the elements needed in a curriculum map such as structure, content and outcomes, learning opportunities, assessment strategies, and logistical details. Participants indicated that mapping platforms should provide links to the HPCSA-adopted CanMeds competency model. The study described stakeholder involvement and access and identified the essential requirements for institutional mapping to be successful. It was emphasised that full institutional support (among others, funding, human resources and information technology) will be necessary for mapping to be successfully implemented and that care should be taken to ensure mandate and stakeholder buy-in, especially from academics in the clinical disciplines. However, the most important contribution was the sometimes surprisingly detail in which participants elaborated on the expectations of a curriculum map and mapping platform. It became clear that curriculum planners prefer a tool that is useful and can contribute to review and management of the curriculum – not only a record of the curriculum and the elements in it. Various expectations for mapping were described which suggests that a sophisticated mapping platform will be needed. Mapping is expected to facilitate quality assurance and coherence, curriculum review and renewal, collaboration and benchmarking in the national context, evaluation and accreditation, as well as to contribute data for various purposes. This in-depth understanding of what a mapping platform should be able “to do” can be used in a future survey to explore expectations of stakeholders at individual institutions, and in doing so, base the development of the platform firmly on the perceived needs of stakeholders.

5.3 Reflections regarding methodology used

The researcher made use of descriptive and interpretive (non-experimental) methods and used an exploratory qualitative design. All eight institutions offering undergraduate medical training in South Africa participated in the study. Data collection was done by semi-

structured interviews, which were recorded and transcribed verbatim by the researcher. Coding and analysing the data ran parallel with data collection. A process of inductive thematic analysis was followed. Results emerged from the frequent, dominant and significant themes in the transcribed data. Analysed data were confirmed with an external coder. Results were summarised into four categories describing the current situation (design, documentation, challenges and strategies for curriculum review and renewal) and five categories describing the future vision for mapping (preferred mapping tool, expectations, elements, stakeholders and institutional requirements). Tables were used to emphasise quality and transferability. The research was conducted with the necessary rigour and great care was taken not for the researcher's voice to become dominant or biasing. The qualitative method contributed to a deeper understanding of the challenges experienced by medical schools both internally and externally, and to 'discover' the expectations of a mapping platform. This would not have been able if a quantitative design with a survey was used.

5.4 Reflection on the status of curriculum mapping

Seven of the eight institutions which offer undergraduate medical training in South Africa offer an integrated curriculum over six years, while one offers it over a period of five years. All institutions have attempted to document the curriculum for accreditation purposes in some way or the other. It seems that none have completed a comprehensive curriculum mapping process that is equivalent to what has been described in the literature. Importantly, however, all institutions have strategies in place for curriculum review and renewal which might be used to drive mapping should it become a priority.

Institutions are challenged by complexities intrinsic to the curriculum and by external realities. There appears to be a growing awareness amongst institutions that curriculum

mapping might be a useful and required strategy for the future in order to review and manage the curriculum and that it might become a requirement for accreditation.

5.5 Red flag considerations for medical schools in South Africa

The following are important points for institutions to take note of:

1. Mapping is not to be confused with documenting a curriculum, because it implies displaying relationships between elements and not just listing content or timetables. Mapping is used to show important patterns and relationships for the purposes of curriculum management, analysis and reporting.
2. For medical schools in South Africa, it would be important to show that the curriculum can produce health care professionals able to meet the health care needs in society. Displaying various separate hard copy learning guides might soon become a non-preferred way to convince authorities that curricula meet the required standards.
3. The lack of coherence reflected in some of the curricula that were the focus of this study, as well as the perceived inability to formulate core content, is problematic and warrants an attitude change as well as deliberate effort from all academics involved in the undergraduate programme.
4. The reported lack of sufficient buy-in and involvement of clinical training educators, not taking full responsibility for curriculum review and renewal, is of further concern. Workload and commitment to educational matters seem to limit clinical educators' capacity to contribute and need to be considered in planning for human resources.

5.6 Suggestions and recommendations for mapping to be successfully implemented in the South African context

1. A mandate and educational support for mapping are needed at each institution for the institution. The mapping platform should be user-friendly and non-threatening in terms of interface design. A critical mass of staff needs to understand educational principles and concepts. Ongoing educational support is needed to assist all stakeholders to move beyond discipline-based and personal interests. Faculty leadership should provide the mandate and drive the process even if mapping is dispersed into different teams.
2. Participant expectations of mapping seem to require sophistication such as cross-referencing and click-on search functionalities, amongst other things. Curriculum planners will need to ensure that the mapping platform will meet specific institutional requirements, portray the unique structure and design of the local curriculum, is flexible and can develop as the needs change or arise.
3. The expectation speaking to benchmarking and collaboration amongst institutions, and to the standardisation of national undergraduate outcomes, warrant a sophisticated mapping platform, even for institutions where mapping is not an urgent priority. From the literature, it is clear that maps should be able to link freeform words, controlled vocabularies and ontologies in order to make benchmarking possible.
4. It is clear that a mandate for mapping of the post graduate programmes or other phases will need to be provided for by the accreditation body, while the drive will need to be provided for by national stakeholder groups that included leadership from all institutions.

5.7 Concluding remarks:

This study contributes extensively to the understanding of the status of curriculum mapping of undergraduate medical programmes in South Africa. The ‘what’, ‘why’ and ‘how’ of mapping were explored. Rich descriptions made it possible to obtain an in-depth understanding of the situation in the past and the vision for the future. In this regard, this study contributes to a baseline understanding of the status of curriculum mapping of undergraduate programmes at medical training institutions in South Africa. Additional research will be needed to establish if mapping could indeed address the expectations identified in this study.

All possible steps were taken to ensure quality and rigour, but as indicated earlier, limitations of this study speaks to social desirability and possible researcher bias and need to be taken into consideration.

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Addendum 1: Example of correspondence with institutions

Dear Ms Botha

Thursday, 20 August will be better.

Kind Regards

Khanyie

From: Gerda Botha [<mailto:gerda.botha@smu.ac.za>]

Sent: 21 July 2015 03:33 PM

To: [REDACTED]

Cc: [REDACTED]

Subject: MBChB Curriculum mapping at [REDACTED]

Prof [REDACTED]

Dear [REDACTED]

Thank you very much for your positive response below.

If possible I would like to meet you on Thursday 20 August, or Friday 21 August?

Your assistance will be appreciated.

Gerda

From: [REDACTED]

Sent: 09 July 2015 11:18 AM

To: Gerda Botha

Cc: [REDACTED]

Subject: RE: MBChB Curriculum mapping at [REDACTED]

Dear Gerda

Thank you. You are welcome to speak to us. I suggest that you approach [REDACTED], our School Academic Leader of Teaching and Learning (see email in cc above). She will assist you, and will involve our colleagues in other Schools where necessary. (The [REDACTED] MBChB programme is shared between three schools.)

I am not aware that you need anyone else's permission. If I hear to the contrary I will inform you.

We are in fact about to initiate a fresh curriculum mapping project. It is a while since we updated our information.

Kind regards

From: Gerda Botha <gerda.botha@smu.ac.za>

Sent: 07 July 2015 2:07 PM

To: [REDACTED]

Subject: MBChB Curriculum mapping at [REDACTED]

Dear Professors [REDACTED]

MBChB curriculum mapping at [REDACTED]

Interview with curriculum planner(s) at medical schools in South Africa.

Study in partial fulfilment of MPhil (Health Sciences Education) Ethics approval reference number: S15/05/123 (Stellenbosch University)

Supervisor: Prof Susan van Schalkwyk

I am currently doing a research project on the status of curriculum mapping of undergraduate medical curricula at all the medical schools in South Africa.

I would like to obtain permission to interview the relevant MBChB curriculum planner(s) / curriculum guardian(s) at [REDACTED] that could possibly participate in this research.

Your assistance will be highly appreciated in order to arrange for the following:

1. Indication if your institution needs to be approached formally before I can interview you or any other such person(s).

If yes, what forms to complete or documents to submit and process to follow, who to contact etc.

2. Indication of whom I should approach for such an interview (the Head/Director of School of Medicine, the chair of the curriculum committee?) The name and contact details of the person will be appreciated, if it is not yourself.
3. In the case of you being the person, and the necessary permission being obtained in time, I would like to schedule a meeting for the second or third week in August 2015? (I already have an appointment with another institution on 6 August).
4. In the case of you being willing to participate I will mail you the relevant forms and participant information leaflet in a separate mail.

Your help will be appreciated.

Thank you very much
Gerda Botha
Practice of Medicine Programme Leader
Cell: 071 3822 068
Office: 012 521 3318/9

Addendum 2: Participant information leaflet

TITLE OF THE RESEARCH PROJECT: The status of curriculum mapping of undergraduate medical programmes in South Africa

REFERENCE NUMBER: S15/05/123

Federal Wide Assurance number: 0000 1372

Institutional review board (IRB) number: IRB 0005239

PRINCIPAL INVESTIGATOR: Gerda Botha

ADDRESS: *Practice of Medicine, School of Medicine, Sefako Makgatho Health Sciences University, Skills Centre Building, Basement, Office 5&6*

CONTACT NUMBER: Cell: 071 3822 068 / Telkom line: 012 521 3318/9

Dear Colleague

My name is Gerda Botha and I am from SMU the Practice of Medicine Department. I would like to invite you to participate in a research project that aims to investigate the status of curriculum mapping at medical schools in South Africa.

Please take some time to read the information presented here, which will explain the details of this project and contact me if you require further explanation or clarification of any aspect of the study. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee (HREC) at Stellenbosch University** (Tygerberg Campus) and will be conducted according to accepted and applicable National and International ethical guidelines and principles, including those of the international Declaration of Helsinki October 2013.

The project aims to establish the status of curriculum mapping of the undergraduate MBChB programme at your medical school. If you have constructed a curriculum map I would like to explore with you what elements are included in the mapping, what successes you had with building maps, what challenges you have experienced and whether you foresee any opportunities for collaboration with other medical schools.

The study will be conducted as per appointment with you at your institution in a dedicated venue, or if not possible by telephone. All medical schools will be approached and the dean or director of the school will be asked to indicate the most likely person(s) able to participate in the study.

I hope to discuss the results of the study during a telephone conference end of 2015 / beginning of 2016 with you, and also to present the study at the SAAHE conference in 2016. All identifying information regarding the participant and the medical school will be kept confidential as all published material will refer to programme x or programme y only. As far

as I can see there are no risks or financial costs for to participate in the study. There will be no monetary reward for participating in this study.

If you are willing to participate in this study please sign the Declaration of Consent below and hand it to the investigator on the date of the interview, or in case of a telephone interview, print, scan, sign and mail back.

Yours sincerely

Gerda Botha
Principal Investigator

Addendum 3: Ethical clearance Stellenbosch University



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Approved with Stipulations New Application

30-Jun-2015
BOTHA, Gertruida Catherina

Ethics Reference #: S15/05/123

Title: The status of curriculum mapping of undergraduate medical programmes in South Africa.

Dear Mrs Gertruida BOTHA,

The **New Application** received on **27-May-2015**, was reviewed by Health Research Ethics Committee 2 via Committee Review procedures on **17-Jun-2015**.

Please note the following information about your approved research protocol:

Protocol Approval Period: **17-Jun-2015 -17-Jun-2016**

Present Committee Members:

Jordaan, Gerharduspaulus G
Rosenkranz, Bernd B
Barsdorf, Nicola N
Etoe, Sheila SL
Holgate, Sandilee S
Davids, Mertrude MA
Fernandez, Pedro PW
Naidoo, Vikesh VT
Van der Merwe, Anita AS
Makiwane, Memela MM
Fortuin, Ashleen A
Ronacher, Katharina K
Engelbrecht, Susan S
Marais, Debra D
Edwards, C E

The Stipulations of your ethics approval are as follows:

1. Application form:

1.1 The protocol has also been submitted at Sefako Makgatho University; however there is no protocol approval number.

2. Checklist:

2.2 Head of Department and Supervisor's signatures not checked (section12).

3. Participant Information Leaflet:

3.1 Please refer to the latest Declaration of Helsinki 2013, not 2008.

3.2 "All medical schools were approached and the dean or director of the school indicated the most likely person(s) able to participate in the study." Please change this sentence to future tense.

•3.3 "As far as I can see there are no risks or financial costs for to participate in the study." Please correct this sentence and preferably use third person e.g. "the study team..." OR "we".

•3.4 "You will not be paid for participating". Please rephrase and put this across in a polite manner e.g. "there will be no monetary reward for participating in this study..."

4. Protocol:

• Ethical consideration: paragraph 2 line 2 – participants should be requested not required to sign the consent form since participation is

voluntary. This should also be changed in the synopsis.

Please remember to use your **protocol number (S15/05/123)** on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:

Please note a template of the progress report is obtainable on www.sun.ac.za/rds and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372

Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel: +27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and documents please visit: www.sun.ac.za/rds

If you have any questions or need further assistance, please contact the HREC office at 219389207.

Included Documents:

Declaration G Botha

Checklist

CV G Botha

Protocol Synopsis

Declaration S van Schalkwyk

Application form

Participant information leaflet & consent form

CV S van Schalkwyk

Application form_signature page

Protocol

Sincerely,

Mertrude Davids

HREC Coordinator

Health Research Ethics Committee 2

Investigator Responsibilities

Protection of Human Research Participants

Some of the responsibilities investigators have when conducting research involving human participants are listed below:

1. Conducting the Research. You are responsible for making sure that the research is conducted according to the HREC approved research protocol. You are also responsible for the actions of all your co-investigators and research staff involved with this research.
2. Participant Enrolment. You may not recruit or enrol participants prior to the HREC approval date or after the expiration date of HREC approval. All recruitment materials for any form of media must be approved by the HREC prior to their use. If you need to recruit more participants than was noted in your HREC approval letter, you must submit an amendment requesting an increase in the number of participants.
3. Informed Consent. You are responsible for obtaining and documenting effective informed consent using **only** the HREC-approved consent documents, and for ensuring that no human participants are involved in research prior to obtaining their informed consent. Please give all participants copies of the signed informed consent documents. Keep the originals in your secured research files for at least fifteen (15) years.
4. Continuing Review. The HREC must review and approve all HREC-approved research protocols at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period**. Prior to the date on which the HREC approval of the research expires, **it is your responsibility to submit the continuing review report in a timely fashion to ensure a lapse in HREC approval does not occur**. If HREC approval of your research lapses, you must stop new participant enrolment, and contact the HREC office immediately.
5. Amendments and Changes. If you wish to amend or change any aspect of your research (such as research design, interventions or procedures, number of participants, participant population, informed consent document, instruments, surveys or recruiting material), you must submit the amendment to the HREC for review using the current Amendment Form. You **may not initiate** any amendments or changes to your research without first obtaining written HREC review and approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the HREC should be immediately informed of this necessity.
6. Adverse or Unanticipated Events. Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research-related injuries, occurring at this institution or at other performance sites must be reported to the HREC within **five (5) days** of discovery of the incident. You must also report any instances of serious or continuing problems, or non-compliance with the HREC requirements for protecting human research participants. The only exception to this policy is that the death of a research participant must be reported in accordance with the Stellenbosch University Health Research Ethics Committee Standard Operating Procedures www.sun025.sun.ac.za/portal/page/portal/Health_Sciences/English/Centres%20and%20Institutions/Research_Development_Support/Ethics/Application_package All reportable events should be submitted to the HREC using the Serious Adverse Event Report Form.
7. Research Record Keeping. You must keep the following research-related records, at a minimum, in a secure location for a minimum of fifteen years: the HREC approved research protocol and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence from the HREC
8. Reports to the MCC and Sponsor. When you submit the required annual report to the MCC or you submit required reports to your sponsor, you must provide a copy of that report to the HREC. You may submit the report at the time of continuing HREC review.
9. Provision of Emergency Medical Care. When a physician provides emergency medical care to a participant without prior HREC review and approval, to the extent permitted by law, such activities will not be recognised as research nor will the data obtained by any such activities should it be used in support of research.
10. Final reports. When you have completed (no further participant enrolment, interactions, interventions or data analysis) or stopped work on your research, you must submit a Final Report to the HREC.
11. On-Site Evaluations, MCC Inspections, or Audits. If you are notified that your research will be reviewed or audited by the MCC, the sponsor, any other external agency or any internal group, you must inform the HREC immediately of the impending audit/evaluation.

Addendum 4: Participant consent form

Declaration by participant

By signing below, I agree to take part in a research study entitled *The status of curriculum mapping of undergraduate medical programmes in South Africa*

.

I declare that:

- I have read the attached information leaflet and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

Signed at (*place*) On (*date*) 2015.

.....

Signature of participant

Addendum 5: Checklist of probing questions for semi-structured interviews**Research Question:**

What is the status of Curriculum Mapping of Medical programmes in the Medical Schools in South Africa?

Definition: curriculum map:

A Curriculum map can be thought of as akin to a roadmap of a curriculum, guiding its users – students, educators, curriculum planners, evaluators and coordinators – through various elements of the curriculum and their interconnections.

Semi-Structured interview questions:

1. Do you know if curriculum planners at your medical School are constructing a curriculum map and what stage they are at?
2. Which elements do you think should typically be included into curriculum map?
3. What are the successes in building maps for your undergraduate medical programme?
4. What are the challenges encountered while building maps for your undergraduate medical programme?
5. Do you foresee any opportunities for collaboration with other medical school(s) regarding curriculum mapping?

Follow-up probes used:

- Have you ever attempted mapping of the curriculum and if so, how did you attempt it?
- What do you think are the successes and/or strengths of your curriculum mapping endeavours?
 - If you have not attempted a whole curriculum mapping process yet, and your team decide it important, what do you think will help you to be successful?
- What are the challenges of mapping of your undergraduate medical programme?
 - If you have not attempted a mapping process in the past, but would consider it for the future, what do you think will your challenges be?
- You have indicated that you think a map could assist in (the researcher referred to what was indicated), is there any other function or use for a curriculum map?
 - If you ever decide mapping is important, what specifically would you like to achieve by it?
- In order to achieve what you have said, what type of map would you prefer and why that type exactly?
- You already indicated some components you would need for a map such as (the researcher referred to what was reported already) is there any other components that should typically be included in a curriculum map?
- You already indicated the stakeholders that will be involved in mapping or in using the map, such as (the researcher referred to those already mentioned), is there any other stakeholders you want to suggest?
- You have referred to / you have not referred to collaboration, could you perhaps explore the ideas around possible opportunities for collaboration with other medical schools

Addendum 6: Letter from external coder



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To whom it may concern:

DECLARATION OF QUALITATIVE DATA CO-CODING

I, Dr B.Y. Uys hereby declare that I executed independent coding in the M. Phil study of Gerda Botha on the qualitative data collected during the study.

Title: The status of curriculum mapping of undergraduate medical programs in South Africa
Author: Ms. GC Botha
Supervisor: Prof S van Schalkwyk
Qualification: M.Phil in Health Sciences Education
Institution: Stellenbosch University

For any further information, my contact information is hereby attached.

A handwritten signature in black ink, followed by the date '15/9/16'.



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Addendum 7: Letter from language practitioner

I, Susanna Elizabeth Louw, hereby declare that the document **The status of curriculum mapping of undergraduate medical programmes in South Africa**, by Ms GC Botha, with the exception of verbatim quotes, has been professionally language edited and reference checked by me.

For further information, my contact information may be obtained from Ms Botha



Susanna Elizabeth Louw

2016-09-30

Date

Addendum 8: Summarised results of the study

Status of curricula documentation	U1	U2	U3	U4	U5	U6	U7	U8
Record with case descriptions					Yes	Yes		
Graphical image of the structure	Yes		Yes				Yes	Yes
Separate detailed guides	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Attempted electronic package	Yes	Yes			Yes	Yes		
Observed web-based platforms		Yes				Yes		
Investigate costing of platform	Yes			Yes			Yes	
Developing mapping platform							Yes	
Strategies for curriculum review	U1	U2	U3	U4	U5	U6	U7	U8
Strategies for curriculum planning	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Involved internal stakeholders	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Discipline-based process for seniors		Yes		Yes	Yes	Yes	Yes	Yes
Involved public					Yes			
Big picture owned by certain role players	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Challenges experienced	U1	U2	U3	U4	U5	U6	U7	U8
Intrinsic to complexities of curricula and internal to the institution								
Curriculum design:	Yes	Yes		Yes		Yes	Yes	Yes
Curriculum transparency:	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Teamwork:	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Academic staff attitude:		Yes		Yes				Yes
Clinician as teacher	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Student preparedness and attitude:				Yes	Yes			
Logistical challenges	Yes				Yes		Yes	
Uniformity:		Yes	Yes	Yes				Yes
External realities								
Burden, changes in disease profile		Yes	Yes	Yes	Yes		Yes	
Human resource		Yes	Yes	Yes	Yes			Yes
Training platforms		Yes						
Political pressures		Yes		Yes	Yes			
Supervision & standards		Yes		Yes				Yes
Preferred mapping tools & reasons	U1	U2	U3	U4	U5	U6	U7	U8
Aware of accreditation requirement	Yes			Yes	Yes		Yes	
Prefer non complicated paper-based map		Yes			Yes			
Prefer electronic mapping platform	Yes			Yes		Yes	Yes	Yes
Not specific in preference			Yes					
Cautious to find the right type mapping platforms				Yes		Yes		
Cautious of the cost involved	Yes						Yes	Yes
Mapping not regarded as a priority		Yes	Yes		Yes	Yes		Yes
Urgency for a mapping platform	Yes			Yes			Yes	
Expectations of a mapping platform	U1	U2	U3	U4	U5*	U6	U7	U8
Shared vision & transparency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Curriculum review and renewal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Accreditation, benchmarking and collaboration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provide data for various purposes	Yes	Yes		Yes	Yes		Yes	Yes
Elements to be mapped	U1	U2	U3	U4	U5*	U6	U7	U8

Structure of the curriculum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Content (themes, topics)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Outcomes & competencies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Learning opportunities & strategies	Yes	Yes	Yes	Yes	Yes	yes	Yes	Yes
Time-tables & schedules	Yes	Yes	Yes	Yes **	Yes	Yes	Yes	Yes
Teaching platforms & venues	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department and facilitator detail	Yes	Yes	Yes	Yes **	Yes	Yes	Yes	Yes
Assessment strategies, methods & tasks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Links to outcomes frameworks such as HPCSA's CanMeds	Yes	Yes	Yes		Yes		Yes	
Links to controlled vocabularies such as MESH terms							Yes	
Links to e-learning systems and resources		Yes	Yes	Yes			Yes	
Learning opportunities booking system (patients, peers)							P	
Stakeholder group involvement	U1	U2	U3	U4	U5*	U6	U7	U8
Curriculum planners & academic planning committees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other academic staff & educators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Administrative and support staff	Yes	yes	Yes	Yes	Yes	Yes	Yes	
Students	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Authorities (such as accreditation teams and external examiners)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Others ('outsiders', public, visitors)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Educational researchers		Yes						Yes
Requirements for successful implementation of mapping	U1	U2	U3	U4	U5*	U6	U7	U8
Mandate, buy-in and commitment from all stakeholders	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Resources (time, mapping platform, funding and specific expertise/human resources)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* U5 did not prefer electronic platform, but indicated nonetheless that they need to above in continuing building and responding to their paper-based map

** U 4 indicated this as a lesser priority

P: U7 indicate this as a possibility