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Research Article

Implementation example of TPACK model in health sciences education: Exploring of the students' views on clinical simulation in the acupuncture programme at a South African university[1]

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Abstract

Students' competencies in clinical practice is vital in health sciences. Clinical simulation is one approach used to support students' learning in clinical practice. There is a lack of research on clinical simulation in acupuncture programmes in the African context. This paper explored the experiences of students' views towards clinical simulation in the acupuncture programme to strengthen clinical teaching using the Technological Pedagogical Content Knowledge Framework as a theoretical lens. A qualitative research approach with an interpretivist paradigm was adopted. A single case study design was selected. Six undergraduate students voluntarily agreed to participate. The data were analysed inductively using the thematic analysis approach. Findings revealed that students were optimistic about clinical simulation because it assisted them in their practice. The findings highlighted students' views regarding the lack of knowledge and skills among instructors and poor infrastructure. The study also found that students gained more confidence in the clinical simulation since they were aware that the patients are not harmed. It is recommended that clinical simulation should be included and standardised in the acupuncture curriculum. To improve clinical simulation, the authors recommended that clinical simulations should be carefully planned and coordinated; training facilities needed upgrading to accommodate Covid-19 regulations and a detailed handbook on clinical simulation should be developed to standardise the simulation process.

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Introduction

Experts in health sciences place much emphasis on students' competencies in clinical practice to ensure that they (students) are competent, confident and capable of performing their clinical duties. Therefore, educators in the fields of health science endeavour to strengthen students' learning through various pedagogical approaches. Clinical simulation, according to Bewley and O'Niel (2013) is one approach that has been widely used in recent decades for medical training in different fields; since it provides real clinical experiences to students (Kapucu, 2017). It is an experimental tool to depict a 'real-life' situation. In this study, standardised patients were used in the clinical simulation of the acupuncture programme. The Covid-19 pandemic has encouraged alternative approaches to teaching and learning in educational institutions around the world. Globally, many educational institutions are facing rapid

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challenges to migrate from regular contact classes to online teaching and learning. According to Zalat, Hamed and Bolbol (2021), they found that most educational institutions have adopted the online or virtual teaching and learning approach. However, Ting et al. (2020), argue that online teaching cannot replace contact classes for programmes that require practical training (clinical practice). An educational institution in South Africa (SA) implemented online teaching and learning for its acupuncture programme. Students were introduced to clinical simulation for the first time. This paper explored students' views and experiences of the clinical simulation in the acupuncture programme.

Figure 1 below shows acupuncture education at the identified higher education institution (HEI).

The simulation centre and teaching clinic at the identified HEI

Students were practicing acupuncture techniques at the simulation centre at the identified HEI

Figure 1

Acupuncture Education at the Identified Higher Education Institution

To delve deeper into the student's lived experiences, the author's primary research question was formulated as follows: What were students' views and experiences of the clinical simulation in the acupuncture programme at the higher education institution? The authors agreed with Tosterud (2015) that educational experiences in other medical disciplines are of great importance to be used as references in a specific field; however, these experiences cannot be applied directly to other disciplines or contexts, for example, acupuncture. Regarding clinical simulation research in South Africa, no studies were conducted with acupuncture students. As a result, there is also a lack of existing literature of the practice in the country. Therefore, this study is significant to explore students' views and experiences of the clinical simulation in the acupuncture programme during the Covid-19 pandemic at an HEI in SA.

The authors approached a HEI in Gauteng province since the identified HEI provides an acupuncture programme in their curriculum. The authors were of the opinion that a clinical simulation was an effective approach in clinical training. The rapid shift to online teaching placed challenges on educational programmes that required practical training, especially the acupuncture programme and therefore it was necessary to implement clinical simulation to support students. Although the HEI implemented clinical simulation to its students, Ting et al. (2020) and Chick et al. (2020) both argue that most HEIs are not prepared for online teaching and learning due to various challenges such as readiness; infrastructure and staff competencies and skills.

A detailed literature review was presented and the theoretical framework was explained with justifications. The authors then explained the detailed research methodology that was employed in this study. The focus was on a qualitative case study design to elicit the views and experiences of students on clinical simulation. Finally, a critical discussion of the results of this study was presented.

Literature Review

Explanation of Clinical Simulation

Cook et al. (2011) define simulation as a tool, device, and environment (that) mimics an aspect of clinical care. Clinical simulation is a model that is used to replicate real-world healthcare scenarios in an environment that is safe for education and experimentation purposes. It is an education model of a phenomenon or activity that allows students to rehearse behaviours without placing their patients at risk or harm (Kapucu, 2017). Persico (2018) states that there are different forms of simulations, for example, the use of manikins, standardised patients, role-playing, skill station and technological-based critical thinking. In support of the previous statement Martinez et al. (2020) add that simulation is an activity that discusses content knowledge of a specific modality in a clinical context. They further emphasise that this activity takes place in a clinical setting, allowing students to apply theory into practice.

Figure 2 illustrated a contact clinical simulation activity at the HEI.

Figure 2

A Contact Clinical Simulation at the HEI (one standardised patient was acting as a real patient at the simulation centre. Students were acting as clinicians to perform a consultation, physical examination and case discussion.)

So et al. (2019) point out that clinical simulation assists students in acquiring critical thinking in clinical practice and also encourage them to participate in clinical decision making. Martinez et al. (2020) agree with So et al. (2019) that clinical simulation is an effective method to deliver and enhance clinical content knowledge. The application of clinical simulation in educational programmes in the field of health sciences is of great significance. The authors concur that clinical simulation is a pedagogical approach to bridge theoretical content knowledge and actual clinical practice (real-life situations). In this paper, clinical simulation refers to an activity that focuses on promoting students' clinical critical thinking and decision-making skills, which takes place in a clinical setting using standardised patients. This activity can be either in a physical clinical setting or virtual clinical practice.

There are many benefits to adopt simulation as a clinical training approach. So et al. (2019) highlight that student can acquire clinical experiences without attending actual clinics. They can do this by employing simulation in a programme. Munroe et al. (2016) affirm that clinical simulation promotes learning outcomes and patient care. The authors agree that this is of great importance, especially during the Covid-19 pandemic, to minimise infection and health risks. The clinical simulation also provides a safe, professional environment where students are allowed and given an opportunity to learn from their mistakes without causing any harm, hurt or injury on their patients and to themselves (Munroe et al. 2016; Amod & Brysiewicz, 2017; So et al. 2019). Although clinical simulation has many advantages, the authors are of the view that each simulation should be well designed to ensure new information integrates into students' existing knowledge. This view is supported by Tosterud's (2015) who states that the content knowledge in a simulation activity must be at an appropriate level that allows students to develop from their previous experiences. So et al. (2019) further states that clinical simulation provides an opportunity that is not available in the working world, such as apprenticeship, and at the same time provides an opportunity to analyse critical but rare cases.

Importance of Clinical Simulation

Clinical simulation is a valuable approach to promote students' learning with regard to the content related to clinical practice. Similarly, Martinez et al. (2020) are in agreement with Munroe et al. (2016) who agree that clinical simulation is widely accepted in various modalities in healthcare education because it encourages students' engagement and enhances learning outcomes. They state that using clinical simulation as a pedagogy will allow students to gain experiences in clinics that are considered critical in the field of health sciences. It is crucial for students to gain adequate and appropriate clinical experiences to become competent and confident practitioners within a safe and conducive environment. This practice is necessary when there is a lack of training facilities or staff for the specific modality. This view concurs with Bogossian (2017), who points out that clinical simulation promotes effective teaching in a clinical setting which can be employed as a replacement of the clinical training due to the shortage and reluctance of registered professionals.

Persico (2018) indicates that most students are challenged to gain clinical experiences due to the increasing shortage of professionals and limited clinical placements within healthcare facilities. Simulation provides students with authentic clinical exposure, which is critical in the healthcare field (Goris, Bilgi & Bayındır, 2014). Both Amod and Brysiewicz (2017) and Kapucu (2017) assert that clinical simulation is a powerful strategy to fulfil this goal since the simulation aims to promote the efficiency, effectiveness and the safety of patients. Kapucu (2017) further concurs that

during a simulation activity, students are able to learn from their mistakes without causing any harm to patients. Clinical simulation also encourages peer and collaborative learning within a safe and conducive environment. The authors agree that this is of particular significance since no harm to patients is one of the essential ethical requirements in health sciences.

Views of Clinical Simulation

Clinical simulation is a critical approach in health sciences education to promote learning outcomes, for example in acupuncture, when face-to-face teaching and learning cannot take place during Covid-19. It intends to provide lived experiences to students in an authentic situation as genuine clinical practices. The clinical simulation centre should emulate the hospital setting and environment in which students can participate. This environment must include all the necessary equipment and infrastructure. It must replicate the 'real-life' situation. This view concurs with Munroe et al. (2016) and So et al. (2019), who state that the institution should take various factors that may potentially affect the real experiences into considerations, such as the design of different spaces, equipment and noise insulation. On the other hand, the process of a clinical simulation in a physical facility involves standardised patients who would require proper training to represent an authentic situation. So et al. (2019) state that the training for standardised patients must replicate the 'real situation.' These researchers also emphasise that ensuring appropriate training for standardised patients has a high financial constraint to the institutions implementing clinical simulation.

It may be difficult for many institutions to afford the high cost of extra facilities, equipment, and training for staff and standardised patients, despite the benefits of simulation. For instance, the application of high technologies, such as virtual simulation programmes, as a replacement for physical simulation will benefit students and staff from the safety of Covid-19. This view is further supported by Weston and Zauche (2020), who agree that virtual simulation programmes are increasingly accepted and utilised by many institutions since it is an effective approach to improve students' clinical experiences. However, as argued by Bogossian (2017) and So et al. (2019), the cost of clinical simulation may be a threat to some institutions. Furthermore, institutions must ensure that there are appropriate debriefing sessions after each simulation.

Researchers agree that post-simulation debriefing between instructors and students is of great importance for students to gain an in-depth understanding of the topic presented (Munroe et al. 2016; So et al. 2019). This will require that instructors understand the content knowledge of what should be articulated during the simulation activities. This view is further supported by Motola et al. (2013), who emphasise the importance of instructors' knowledge on specific content in order to provide feedback to students during the debriefing after the simulation. If instructors possess inadequate content knowledge, Munroe et al. (2016) further point out that simulation may contribute to increasing anxiety among instructors and students.

These researchers all agree that clinical simulation is an effective strategy to strengthen students' competencies in clinical practice. However, there are several challenges in the implementation of simulation, such as the lack of qualified instructors and high costs. The authors are of the opinion that the high cost is particularly critical among African countries where poverty is prevalent (Mellor, 2014; Thou, 2018).

The Influence of Technology in the Clinical Simulation

Many countries have instituted the cancellation of contact classes in HEIs in order to prevent the further spread of the pandemic and have opted for online or virtual classes. Aristovnik et al. (2020) report that 86.7% of contact academic activities were cancelled and education institutions made the transition from contact to online teaching and learning. The South African President announced a national lockdown on 23 March 2020, which symbolised the urgent implementation of online teaching and learning [National Institute for Communicable Diseases (NICD), 2020]. Paideya (2020) concurs with Padilha et al. (2019) who state that the 21st century students are a digital generation who grew up with technologies. These students are able to access information using information and communications technologies. The authors agree that the use of technology for clinical simulation, such as virtual simulation, is of great significance during the Covid-19 pandemic since it minimises the risks of being infected. This is also a fundamental approach to accommodate the Covid-19 regulations in SA (Thaba-Nkadimene, 2020).

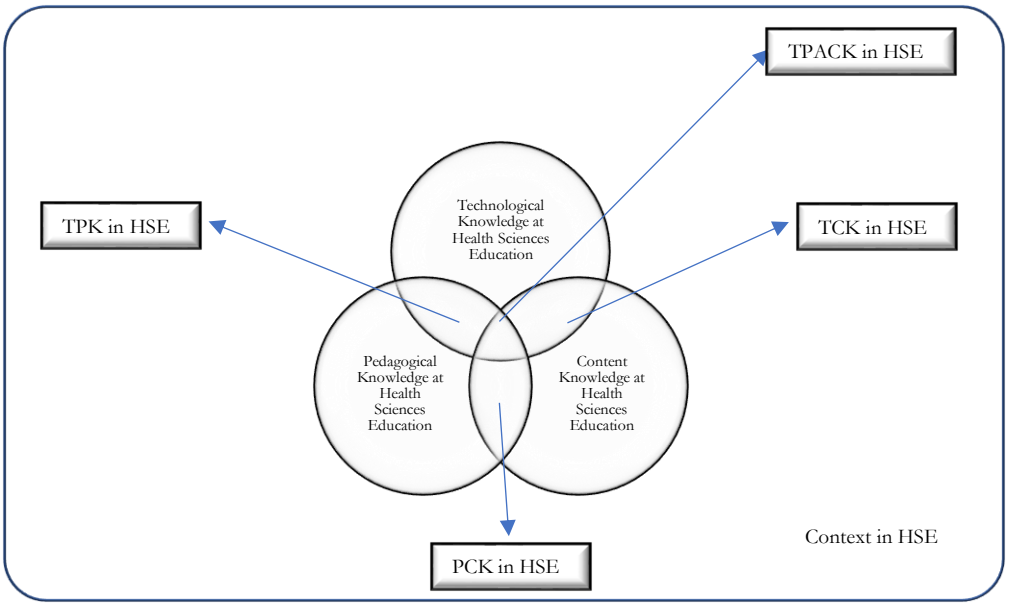
However, "digital inequality" is a real situation in the world which means that not all students have internet access and acquire computer skills. This is particularly critical in South Africa. What's more, both Thaba-Nkadimene (2020) and Hedding et al. (2020) report that virtual simulation as a form of online study has been negatively influenced by the lack of laptops and internet access. In SA, some HEIs are experiencing many challenges and cannot transform to online learning with a simple step, especially those inherited disadvantaged HEIs from apartheid (Thaba-Nkadimene, 2020). Thaba-Nkadimene (2020) further asserts that the infrastructure plays a critical role in ensuring distance study, while SA is still experiencing poor infrastructure in many regions.

Theoretical Framework

This study was anchored with the Technological, Pedagogical and Content Knowledge (TPACK) model proposed by Mishra and Koehler (2006). The reason being that this paper focused on students' views and experiences of clinical simulation as a pedagogical approach in the identified acupuncture programme. Due to the influence of the COVID-19 pandemic, technologies were expansively used in educational programmes (Chick et al. 2020). The TPACK model is widely utilised in the field of education to promote effective teaching, which allows researchers to understand the phenomena from different perspectives, such as technological knowledge, pedagogical knowledge and content knowledge (Koehler & Mishra, 2009; Venketsamy & Wilson, 2020). This would further validate the findings and recommendations of this study in order to strengthen clinical practice of the acupuncture programme for the 21st century through clinical simulation. Both Cohen et al. (2018) and Yin (2018) articulate that a theoretical framework helps investigators render research questions testable, and ensure the extension of knowledge to research inquiry, indicating which findings and conclusions appear to be valid and reliable.

The authors opined that integrating technologies in the acupuncture programme will strengthen teaching and learning. Hannaway (2019) agrees with Mishra and Koehler (2006) that digital technologies are an integral part of teaching and learning for the twenty-first century. For this reason, various scholars and researchers have used the TPACK model in order to integrate technologies in education and promote effective teaching (Venketsamy & Wilson, 2020).

The TPACK model proposes the effective integration of the knowledge of technology, pedagogy and content knowledge into teaching and learning. There are three core components to TPACK: pedagogical knowledge (PK), content knowledge (CK), and technological knowledge (TK) (Figure 3) (Mishra & Koehler, 2006; Koehler & Mishra, 2009). The primary claim of the model is that the appropriate combination of these components for teaching, learning and assessment generates another four other types of knowledge, namely content knowledge (what); pedagogical knowledge (how), and technological pedagogical content knowledge (which technology/ies) (Mishra & Koehler, 2006; Hannaway, 2019). The model presents technology as the third core domain of teacher knowledge, along with content and pedagogy (Harris et al. 2017; Hannaway, 2019). Harris et al. (2017) further argued that various other blended knowledge domains could be derived from the three domains, such as technological content knowledge (TCK), technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK) and TPACK.



HSE: Health Sciences Education **TPK**: Technological Pedagogical Knowledge **PCK**: Pedagogical Content Knowledge **TCK**: Technological Content Knowledge **TPACK** : Technological Pedagogical Content Knowledge

Figure 3

Adapted TPACK Model for Health Sciences Education by Researchers

In this paper, the authors utilised the TPACK model to analyse students' views and experiences of the clinical simulation.

Research Problem

The main problem of the research focused

- What are students' views and experiences of the clinical simulation in the acupuncture programme at the HEI?

Sub-problems

- What are the opinions of acupuncture students about the benefits of supporting the acupuncture programme with clinical simulation?
- What are the views of acupuncture students about the difficulties/obstacles in supporting students' learning using clinical simulation?

Method

Research Design

The authors opted for a qualitative descriptive approach in this paper to explore participants' views and experiences on the clinical simulation in the acupuncture programme. They were of the opinion that this approach is suitable to be utilised in this paper since it provides an opportunity to gain an in-depth understanding of the identified phenomenon (Creswell, 2014; Maree, 2020). The interpretivist paradigm was employed in this study since it is a subjectivist epistemology that relies on the researcher's comprehension when making sense of data (Yin, 2018). This paradigm allowed the authors to explore and understand participants' lived experiences on the clinical simulation during the Covid-19 pandemic within the acupuncture programme. The authors used a single case study design for this study since it allowed for an in-depth exploration of the selected phenomenon (Cohen, Manion & Morrison, 2018; Yin, 2018).

Participants

Purposive sampling technique was used in this study since this approach was most appropriate to access participants who were the students registered in the identified programme (Cohen et al. 2018). The sample of this study included six (6) Bachelor of Health Sciences in Complementary Medicine (BHsCM) students who were in their third year of study. This group was purposively selected because they were the only group of students who participated in clinical simulation in the acupuncture programme. The inclusion criteria were as follows: they had to be registered in the third year of BHsCM; they had to have participated in the clinical simulation programme and they were willing and consented to voluntary participation. The authors invited participants by displaying a research invitation notice on the campus student's notice board. The poster was displayed for a period of two months. Only Six (6) students agreed to participate in this study by signing the research consent forms (see Table 1). Pseudonyms were used in the reporting phase of the study. The table below represented the codes used for each participant to ensure their anonymity and confidentiality.

Table 1

Participant's Information

Participants	Gender	Age
P1	F	22
P2	M	24
P3	M	25
P4	F	22
P5	M	21
P6	F	23

Data Collection Tools

Data collection, as defined by Cohen et al. (2018) and Creswell (2014), is a systematic process of gathering information to answer research questions and general findings. For the purpose of this study, the authors employed semi-structured interviews with an online text-based open-ended questionnaire (Appendix 1). This approach ensured anonymity and any contact with the students, thus preventing the spread of the Covid-19 pandemic (Cohen et al. 2018). The questionnaire was available for participants to answer during a period of two months from 15 October 2021 to 15 December 2021. The data was transcribed and organised into themes and subthemes for thematic analysis.

Data Analysis

The data were analysed inductively according to the guideline of the six-step framework of thematic analysis, proposed by Creswell (2014). This approach assisted the researchers in making sense of the data transcripts and identifying critical themes. Creswell (2014) states that thematic analysis is a process of identifying similar and dissimilar opinions in qualitative studies. Qualitative validity criteria, including credibility, transferability, dependability, and confirmability, were ensured in this study by means of employing techniques of member checking, debriefing between authors and auditing by a second coder.

Ethical Committee Permission

Ethical clearance was approved by a Research Ethics Committee at a public university (Reference: EDU137/21).

Results

This study explored students' views and experiences of the clinical simulation in the acupuncture programme at an HEI in SA during the Covid-19 pandemic. During the data analysis, two major themes emerged which are presented below. Direct quotes are included in this section. Figure 4 illustrated a summary of the codes of themes and subthemes.

Theme 1: Students' Views of the Clinical Simulation

The findings of this study identified that students experienced both benefits and challenges in the clinical simulation in the acupuncture programme within the HEI in a South African context.

Sub-theme 1: Benefits of Clinical Simulation

Findings of this study revealed that all participants had positive views on the clinical simulation in the acupuncture programme. They agreed that clinical simulation effectively strengthened their knowledge, skills and confidence in clinical practice. All participants concurred that the simulation had been an integral part of their learning which assisted them in understanding the weak components in their content knowledge. The simulation encouraged their engagement in the study. They all recommended formalising more simulation sections into their curricula.

To this, P4 stated:

> "*I feel the simulation is very helpful since it allowed us to gain practical experiences and build confidence simultaneously, which I believe this experience will be beneficial when we start seeing patients and help boost independence.*" P1 wrote: "*I learnt so much about the acupuncture clinical practice by attending the simulation. Now, I won't make those mistakes in the future when I practise independently.*"

P5 indicated:

> "*I feel more comfortable practising in the simulation before seeing patients in the clinic because I can be sure that there won't be any severe consequences, even I had some mistakes in the process, although I wish there won't be any mistake*."

P6 highlighted: "*The simulation exposed us to real acupuncture practice*." P2 added: "*I really enjoy the simulation in our acupuncture programme since it is beneficial and much of assistance to do what you always read about*."

P3 revealed that

> "*I feel that I will be confident when seeing real patients in the clinic since I have practised exactly the same procedure in the simulation centre. I won't be stressed in looking for equipment or figuring out how to use different devices that are required for the practice in the clinic*."

P2 stated: "*I like the layout of the simulation centre because it makes me feel like a real doctor seeing patients in the clinic*."

Participants also recognised the importance of post-simulation debriefing with instructors. For example, both P3 and P2 agree that the discussion after the simulation is very helpful. This debriefing allowed them to recognise the misunderstandings in the learning. They both asserted that it was of great significance to have this section with experienced instructors who could answer their questions or confusion from both theoretical and clinical practice perspectives.

No participants in this study expressed that they were experiencing anxiety or increased stress levels.

Sub-theme 2: Challenges in the Clinical Simulation

Despite the advantages of the clinical simulation, findings of this study identified a number of challenges when conducting the clinical simulation.

According to P6, she was not comfortable in the limited space where the simulation activity took place. She felt that there were too many students in a confined space, and this had exposed them to the risk of Covid-19 infection.

Participants in this study neither reported experiencing the internet connection problem during the virtual simulation nor could not afford the devices, such as laptops or cellphones. However, there was still poor satisfaction on the virtual simulation that was expressed by participants.

When answering the question: Please describe your experiences on the virtual simulation in the acupuncture programme; P1, P4 and P5 all expressed that

> they understood the need of employing virtual simulation in the acupuncture programme in this year (2021), which was due to the influence of Covid-19 pandemic. They agreed that the virtual simulation was interesting. However, they all indicated that the virtual simulation was not real, and they didn't feel the same when

compared with the physical situation on campus. They would prefer to have contact simulation on campus if they could.

According to P2, "*I enjoy contact simulation; I feel that the course can benefit from more contact simulations*." P3 wrote, "*I have enjoyed the virtual simulation. However, I would prefer more contact simulations on campus. But it is unrealistic due to Covid-19*."

Theme 2: Incompetence of Instructors and Standardised Patients

Findings of this study also identify that competencies of instructors and standardised patients played a significant role in ensuring the successful implementation of the simulation. The incompetence of instructors and standardised patients also negatively affected students' satisfaction towards the simulation. Both P3 and P5 indicated on their forms that the instructor sometimes could not provide satisfactory and correct answers to students if the questions were not on his memo. They realised that they had learnt incorrect information from the instructor. They further affirmed that this situation negatively affected their study. They expressed their concerns about the content which confused them immensely.

According to P2:

"*During the simulation, the standardised patient does not understand what he should or should not say in the consultation. There was once that the standardised patient gave all answers according to the memo before any inquiry from me. This indeed disappointed me.*"

Summarily: Graphically

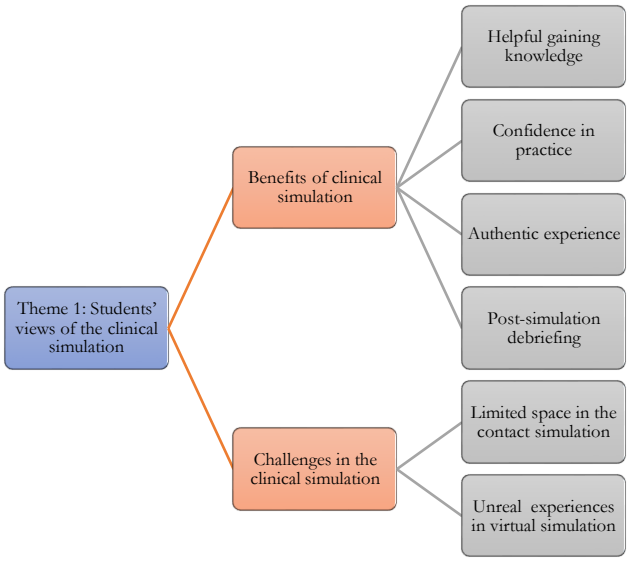


Figure 4

Codes of Theme 1 and sub-themes: Students' Views of the Clinical Simulation

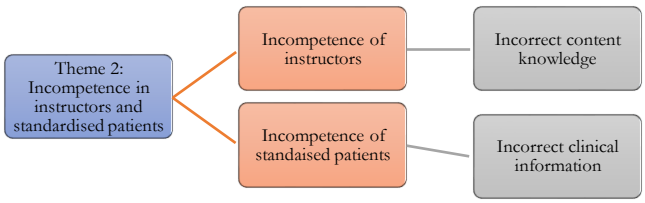


Figure 5

Codes of Theme 2 and sub-themes: Students' Views about Incompetence in Instructors and Standardised Patients

Discussion and Conclusion

Importance of Clinical Simulation In Acupuncture Programmes

Studies revealed that clinical simulation had been widely accepted in professional education in the fields of health sciences (Amod & Brysiewicz, 2017; Kapucu, 2017; Martinez et al. 2020). Researchers agree that clinical simulation effectively strengthens clinical teaching and learning (Munroe et al. 2016; Martinez et al. 2020). So et al. (2019) concur with Amod and Brysiewicz (2017) who affirm that clinical simulation is an effective pedagogical approach to facilitate students' learning (Munroe et al. 2016). These researchers agree that clinical simulation enhances teaching and learning effectiveness by means of developing students' competencies in clinical practice. In this study, the authors concurred that simulation promoted effective teaching and learning. This finding made contribution to reveal the effect of clinical

simulation in the acupuncture programme in the South African context. This was of significance since there was a lack of literature that reflects South African students' views on clinical simulation in acupuncture programmes. According to the TPACK model, the lectures are recommended to select the appropriate pedagogical approaches for delivering specific content knowledge (Koehler & Mishra, 2009; Hannaway, 2019). The authors were of the view that it was of great importance for lecturers to acquire adequate PCK and TPCK, which would assist them in promoting the effective delivery of specific CK.

Scholars assert that the clinical simulation allows students to make mistakes and learn from their own mistakes while ensuring safe practice (Amod & Brysiewicz, 2017; So et al. 2019). In this study, the authors concurred that the clinical simulation provided an opportunity for students to witness the consequence of mistakes in clinical practice without any harm to patients.

The authors were of the opinion that the real environment would assist students in acquiring authentic clinical experiences. This would further contribute to students' confidence when faced with the actual practice since students were familiar to the environment. Findings from this study supported the opinion that participants appreciated the real clinical setting in the simulation facility since it provided authentic lived experiences. The findings of this study were in agreement with Munroe et al. (2016) and So et al. (2019), who both confirm that the design of the simulation facility is recommended to be the same as hospitals in the working world. This will assist students in gaining clinical experiences that are similar to clinical practice, although this may increase the financial constrain to the institutions (Bogossian, 2017; So et al. 2019).

Barriers in Instructors' and Standardised Competencies in Clinical Simulation

The post-simulation discussion is of paramount importance, as asserted by Munroe et al. (2016) and So et al. (2019) since this process strengthens students' knowledge and understanding of situations. Finding from this study supported this view that students recognised the importance of post-simulation debriefing. The authors agreed that post-simulation discussion (debriefing) ensured students acquire adequate content knowledge according to the simulation plan. This view agrees with Motola et al. (2013), who highlighted the importance of well-trained instructors for the clinical simulation. However, this debriefing would require training for instructors or employing registered clinicians who were practising. Both approaches would significantly increase the financial constrain to institutions, especially in SA, where the economic situation is still a critical issue (Mellor, 2014; Thou, 2018). The authors were of the opinion that this barrier can be bridged by developing a handbook of acupuncture clinical simulation by documenting detailed guidelines of requirements in each simulation plan with standardised CK in each section. These will include the aim and purpose, the explicit content, and the outcomes of the simulation (Munroe et al. 2016).

The authors believed that there was a lack of instructors who would be able to facilitate the simulation since the debriefing requires both adequate content knowledge and clinical experiences. So et al. (2019) state that instructors should be released from their duties to attend the training course with clinicians, increasing the burden on both hospitals and educational institutions. The findings of this study were in agreement with Persico (2018), who specified that the professionalism of standardised patients or instructors may significantly affect the success of the simulation. It was critical for instructors to have adequate CK and standardised patients were well trained to understand their roles in the simulation. The instructors' inadequate CK in a particular field will significantly affect the delivery of the simulation. For this reason, both So et al. (2019) and Munroe et al. (2016) affirm that it is of great importance to provide proper training to both instructors and standardised patients. According to the TPACK model, the authors agreed that all instructors should be in possession of adequate CK and have an in-depth understanding of the CK in order to achieve the best teaching outcomes. This view was in agreement with Hannaway (2019) and Venketsamy and Wilson (2020), who highlighted the importance of appropriate and adequate CK in teaching.

Findings from this study disagreed with other studies in the literature which argued that students might experience an increased stress level during the simulation (Munroe et al., 2016). No participants in this study expressed that they were experiencing anxiety or increased stress levels. The possible reason for the low stress and anxiety level could be due to the support the students received from the instructors. The findings of this study further confirmed the importance of CK, TK, PK and other interacted knowledge in the delivery of the acupuncture programme through planned clinical simulation. Selecting an appropriate pedagogical approach for particular CK in the acupuncture programme will further promote effective teaching and improve students' experience.

Influence of Online Technology in Clinical Simulation

Higher education in the twenty-first century is profoundly influenced by the development of technology (Padilha et al. 2019; Aristovnik et al. 2020). Globally, many HEIs embrace technologies in the process of transforming their

modes of delivery to accommodate students during the Covid-19 pandemic lockdown (Thaba-Nkadimene, 2020). As revealed by Thaba-Nkadimene (2020) and Hedding et al. (2020), many South African students experience negative effects of online teaching and learning due to the poor infrastructure in some regions in the countries and the high cost of devices. Participants in this study neither reported experiencing the internet connection problem during the virtual simulation nor could not afford the devices, such as laptops or cellphones. This might be because that the identified HEI in this study was in an urban region where infrastructure was well developed. However, there were some participants who were dissatisfied with the planning and organisation of the virual clinical simulation. The findings of this study revealed that participants were not satisfied with the virtual simulation since they felt it was not real and that they wanted to experience the 'real-life situation'. This is understandable since HEIs are in a lockdown mode and real-life clinical practices were impossible.

The use of technology will definitely promote teaching and learning effectively according to the TPACK model, as articulated by Venketsamy and Wilson (2020) and Mishra & Koehler (2006). For this reason, technologies are well accepted in many educational programmes in various fields. However, the authors were of the view that it was crucial for lecturers to select particular technology and pedagogical approaches when delivering specific CK. This would require lecturers to acquire an in-depth understanding of the advantages and disadvantages of each technology that was adopted. Lecturers should employ appropriate technology for specific CK in a particular context.

So et al. (2019) agrees with Munroe et al. (2016) that the layout of the simulation centre should be the same as clinics in a real situation. In this study, the authors agreed that it was essential for intuitions to offer proper facilities for simulation activities. This would further promote the successful delivery of the clinical simulation and improve students' satisfaction.

Conclusion

Clinical simulation is an effective approach to enhance students' learning to ensure their competencies in clinical practice (Kapucu, 2017; O'Niel, 2013). It enables students to gain authentic clinical experiences and skills which are critical in achieving learning outcomes of the acupuncture programme (O'Niel, 2013). The authors believed that students' competencies was of great importance to optimise patients' care in clinical practice. It was of particularly significance in the acupuncture programme to promote students' learning in SA; since clinical simulation benefits HEIs where there was a lack of training capacity, namely on-site staffing and facilities. Despite technologies have been widely accepted in the field of education globally (Hannaway, 2019), the use of technologies in clinical simulation should be well designed by taking into consideration specific content knowledge.

This paper highlighted students' views and experiences on the clinical simulation in the acupuncture programme in the South African context. The findings of this study were considered to be of great significance since it was the first research to investigate South African students' views and experiences on the delivery of the acupuncture programme in a particular context. This study also made contributions through its findings by revealing students' attitudes towards clinical simulation in the acupuncture programme. The findings highlighted that clinical simulation was an effective method to strengthen effective teaching. However, some disadvantages should be addressed, as specified in the recommendation.

Recommendation

The findings in this study reveal that students appreciated this mode of teaching and learning-clinical simulation. For the successful delivery of the clinical simulation in the acupuncture programme, the authors agreed on the following recommendation.

For Applicants (Curriculum Developers, Educators)

- Clinical simulation is an effective strategy in the delivery of acupuncture CK. It is recommended that this teaching and learning strategy should be included and standardised in the acupuncture curriculum (Munroe et al. 2016).
- Due to the lack of appropriate training and inadequate CK among instructors, it is recommended to develop a handbook for acupuncture clinical simulation with detailed guidelines as support for instructors, which will ensure the proper CK is delivered in each section and the learning outcomes are met.
- A lack of simulation facility. It is recommended that institutions provide proper facilities for clinical simulation to accommodate the Covid-19 regulations, further ensuring students and staff safety (Munroe et al. 2016; So et al. 2019).

- Although virtual simulation was adopted in some HEIs, it is recommended to be used as a supplementary approach to teaching which should only contribute a limited portion of clinical simulation. Programme, such as acupuncture, which require physical practice cannot be replaced by technologies completely. In this respect, it can be used to prepare a blended learning curriculum.

Recommendations for Further Research

Since this study was limited to a small sample size, the researchers believe that this study should be explored with a large sample size at more higher education institutions. They further recommend that this study should be conducted at an international university or universities. The identified acupuncture programme was integrated into a four-year Bachelor of Health Sciences in Complementary Medicine programme, which included Homeopathy and Phytotherapy. Further studies should also be conducted to investigate the effectiveness of clinical simulation in promoting teaching and learning of other integrated modalities in complementary medicine since this study focused particularly on acupuncture.

Limitations of the Study

This study was limited to exploring students' experiences on clinical simulation in the acupuncture programme at one HEI in Gauteng Province in SA, therefore the results limited comparisons. Another limiting factor was the small sample size in this study. The researchers believe that since the sample size was small, the findings may yield different results with a large sample. Further studies are recommended to include a larger sample size to yield different results and recommendations; to investigate other technological and pedagogical approaches which can benefit the effective delivery of the acupuncture programme within the African context.

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Appendix 1

Online Text-based Semi-structured Interview Form

Instructions

The purpose of this interview is to explicit your views and experiences of the clinical simulation in the acupuncture programme. Please complete this form in detail. If you need more space, you can add more lines. There are no right or wrong answers to these questions.

Thank you for your time.

Semi-structured Interview Form

Q1. Describe your experiences of the clinical simulation in the acupuncture programme.

Q2. What are the benefits of employing clinical simulation in the acupuncture programme.

Q3. How can the clinical simulation strengthen your clinical practice skills? Explain.

Q4. Please describe your experiences on the virtual simulation in the acupuncture programme (advantages and disadvantages).

Q5. How would you like to be supported in the acupuncture programme to improve your skills in clinical practice?