Article

The Use of Drawing as Learning Activity in a Human Anatomy Course: Implications for Learning Scientific Foundation of Nursing

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Abstract

Human anatomy is perceived by health science students and educators to be a burdensome, challenging and labour-intense course. In order to enhance understanding of human anatomy, the use of student-centred approaches is encouraged, of which drawing is included. However, it is not explicitly known how nursing students in Kavango east region experience the use of drawing. This research was conducted to explore and describe the experiences of first-year nursing students from a resource-constraint setting on the use of drawing as a learning activity in a human anatomy course. A qualitative descriptive, explorative, and contextual study was conducted in Kavango east region, Namibia. Data were collected via focus-group interviews with 28 participants who were conveniently selected. A qualitative content analysis was followed, while trustworthiness was ensured according to the four principles of Lincoln and Guba. Ethical clearance and permission were granted by the School of Nursing Research Committee. The ethical principles of autonomy, non-maleficence, beneficence, and justice were adhered to. The experienced beneficial aspects of drawing are enhancement of course understanding, boosting creativity, and integration of theory into practice. Challenging aspects were related to lacking artistical skills, time constraints, complex and complicated drawings as well as a shortage of materials and learning resources. In order to improve drawing as a learning activity in human anatomy, recommendations were made for nursing students, educators and future researchers.

Keywords: drawing; human anatomy; learning activity; learning strategies; scientific foundation

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Introduction

Drawing defines the act of creating marks or lines on a suitable surface (Shapiro et al. 2020). The marks and lines may be colour shaded or simply in black and white. Drawing is an intricate activity involving visual and spatial coordination, which are associated with the fine motor ability to represent a 3-D object on a sheet of paper (Reid, Shapiro, and Louw 2019). Despite the availability of dictionary definitions of drawing, there seems to be no consensus in the academic literature on a definition of drawing; many related concepts such as diagram, sketch, external representation, external model, visualisation, illustration and picture are used interchangeably (Quillin and Thomas 2015). They seem to be defined differently in different academic works. In the subject of human anatomy, drawing may be used to represent all levels of structural complexity, which means it may represent atoms, molecules, cells, tissues, organs, systems, and the whole organism. The drawing may be done traditionally, using paper and pencils, or by means of digital drawing using smart pens such as 3-D pens, or by using drawing applications, which may be printed in textbooks, workbooks, or displayed as posters or in a notebook.

The act of drawing a diagram is one of the ancient educational methods used in science. According to Lombardero and Del Mar Yllera (2019), Leonardo da Vinci pioneered the use of drawing in human anatomy. He was an artist, scientist, painter, engineer, and anatomist, who was one of the most influential characters of his time, and who created numerous anatomical drawings of animal species, including human beings.

Human anatomy is essential to understanding how the body works as a structure and how functions of the human body are closely linked (Al-Mohrej et al. 2017). It enables health science students to know the microscopical and macroscopical structures that make up the human body, as well as correlations and connections of different structures (Edivaldo Xavier Silva Júnior 2019). Therefore, it is a keystone in understanding a clinical context, which leads to good progression and success in health sciences education. This is because human anatomy offers the building blocks that underpin the foundations for knowledge of disease processes and their management (Caswell, Venkatesh, and Denison 2015). Traditionally, human anatomy is perceived by health science students and educators to be a burdensome, challenging and labour-intense course, which in the past was mostly learnt via surface learning approaches and rote memorisation (Hopkins, Regehr, and Wilson 2011). More recently, Al-Mohrej et al. (2017) recommended that anatomy instructors adopt student-centred approaches, and also include the use of study aids such as models, images and diagrams. This means visual representations are a powerful teaching and learning tool in basic science as they aid to make the invisible seen and the complex simple (Quillin and Thomas 2015). In addition, active and engaging learning strategies such as poems, jingles, songs, skits, mimicry, games and posters are used to learn anatomy (Singh et al. 2019). They help students to retain and recall the gross anatomical concepts and terminologies. Moreover,

active and engaging strategies encourage peer-to-peer interactions, creativity and research (Singh et al. 2019).

Globally, health science students are taught and learn human anatomy in laboratories where they can make practical applications. Additionally, they do the study of cadaveric dissection by using multimedia technologies such as videos, virtual laboratories, 3D virtual tables, anatomical models and the preparation of teaching materials (Edivaldo Xavier Silva Júnior 2019). Johnson and Troupis (2015) report that traditional and innovative approaches are both embraced in a multimodal and hybrid-teaching model. They are complemented by traditional lectures and teaching aids such as models, imaging, computer-assisted learning, problem-based learning, team-based learning, and peer teaching. Spatial visualisation is important in learning human anatomy (Azer and Azer 2016); therefore, educators also offer opportunities for conceptual understanding learning activities such as creating large interactive tables, flow charts and flash cards based on subject areas (Johnston et al. 2015).

Students collect, process, interpret and organise subject-related information using different styles or approaches. The common learning styles are visual, auditory, reading/writing and kinesthetics (Joewono et al. 2018). The practice of drawing inclines towards visual and kinesthetics rather than auditory and reading or writing activities. This is because drawing involves understanding, coordination and exploration. However, the reading/writing students may also be accommodated when drawing is utilised, since it is required to read more to understand an activity to be undertaken; therefore, making drawing suitable for different learning styles (Joewono et al. 2018).

A previous study revealed that drawing as a learning activity in human anatomy was found to help students create a mental picture of anatomical parts. This leads to increased comprehension and deeper cognitive understanding of the details of anatomical parts, cavities within different organs and bones (Reid, Shapiro, and Louw 2019). Leung and Saxena (2017) discovered that drawing allows students to learn more in a short span of time and it creates a unique way of learning. Moreover, using drawing as a learning activity enhances a better understanding of cadaveric demonstration, compared to when conducted without prior drawing activities.

In a Bachelor of Nursing Science (clinical) (honours) programme offered at a public university in Namibia, human anatomy is offered as a stand-alone semester course during the first-year level of study. It is taught and learnt mainly by using didactical methods that are assisted by video, images, Power Point presentations and anatomical models of different body parts. In addition, students make use of textbooks, an atlas of the human body, colouring workbooks, note taking and the drawing of body parts. The students are frequently given learning activities, namely to draw anatomical structures on papers, posters and virtual drawings (students who have access to computers and smartphones are the ones who use virtual drawings). These are also used for formative

assessment and continuous assessment purposes. The two figures below present anatomical drawings done by nursing students as part of their learning activities.

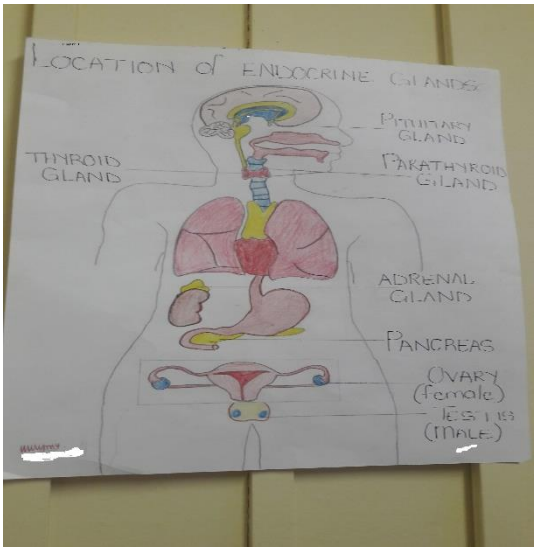

Figure 1: Location of endocrine glands

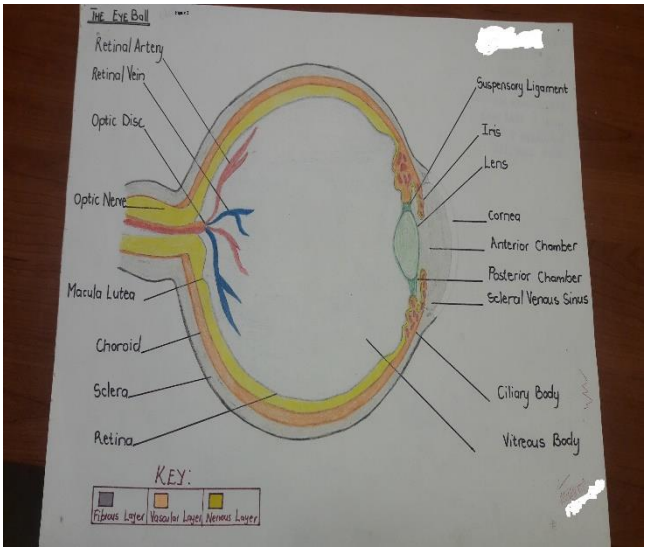

Figure 2: Anatomy of the eyeball

Source: Drawing tasks of the nursing students

Problem Statement

Learning human anatomy through drawing helps students to retain knowledge easier, it allows visualisation and facilitates a better understanding of anatomical planes. In addition, it makes learning more engaging and fun (Borrelli et al. 2018). The lecturer of human anatomy at a university campus located in Kavango east region, Namibia, introduced drawing as a learning activity in the 2018 academic year. However, it is not explicitly known how these nursing students experienced the use of drawing as a learning activity in this human anatomy course, as there was no study conducted before in this area within a research setting. While there are studies that have reported on teaching and learning strategies used in human anatomy classes (of which drawing is included), they dominantly focus on medical and health science students in general (Al-Mohrej et al. 2017; Husmann, Barger, and Schutte 2016; Reid, Shapiro, and Louw 2019; Leung and Saxena 2017; Singh et al. 2019). In addition, available research output was dominantly conducted in the developed world and well-resourced settings. The use and experience of nursing students on drawing in an anatomy class could differ from medical and other health science students due to the nature and scope of content in the curricula. Therefore, this research was conducted to explore and describe the experiences of first-year nursing students from a resource-constraint setting on the use of drawing as a learning activity in a human anatomy course.

Objectives of the Study

The objectives of the study were to:

- Explore experiences of first-year nursing students on the use of drawing as a learning activity in a human anatomy course.
- Describe experiences of first-year nursing students on the use of drawing as a learning activity in a human anatomy course.

Research Design

The study followed a qualitative descriptive, explorative, and contextual design. The ultimate point of departure for researchers to use qualitative study for this research was because it allowed descriptions and provided an in-depth understanding of human experiences from the stance of research participants (Brink, Van der Walt, and Van Rensburg 2018). The descriptive design was appropriate because it allowed researchers to describe the phenomenon (Polit and Beck 2017), which was drawing as a learning activity. The use of an explorative design was aimed at exploring key issues to gain greater insight into the use of drawing as a learning activity in a human anatomy course, therefore building a new understanding (Maree 2016). One of the features of qualitative research is that it is naturalistic and context-based, so it is centred around natural settings where interactions occur (Maree 2016). This is because a phenomenon experienced in the research population is unique to their context (Grove and Gray 2019); therefore,

drawing was understood from the context of first-year undergraduate degree nursing students' human anatomy learning experiences; which makes this research a contextual design.

Research Methods

Research Setting

This research was conducted at a public university campus located in Rundu, Kavango east region, Namibia. The unemployment rate in Rundu is estimated to be 40%, which is above the 33% national unemployment rate. Rundu is experiencing rapid urbanisation and it remains the most densely populated town in the country, with most job opportunities found in informal sectors such as agriculture, manufacturing, construction, and wholesale retail. The budget allocated for capital projects in Kavango east is the lowest compared to investments in other regions (Mwinga et al. 2018). Moreover, it is observed that most public and private infrastructures located in Rundu are not adequate for the residents, and some are in dilapidated conditions. Therefore, the research setting is considered resource constrained.

The campus offers programmes in education, economics and management sciences, and nursing. The nursing programme is a four-year undergraduate honours degree, which registers candidates who have obtained a grade-12 secondary education certificate with minimum university entry points, or candidates who are enrolled as nurses/midwives, and who have passed the entry test to upgrade their qualifications. Human anatomy is taught at the first level of study and resorts under the scientific foundations of nursing; and it is also a prerequisite to all courses offered in the second level of the programme. It is an NQF level five course with 16 credits, 160 notional hours, which requires four contact hours per week for each semester. The nursing programme in the study context is guided by constructivism as its educational philosophy (Nuuyoma and Aron 2020), therefore efforts are made to include learner-centred approaches, of which drawing is included. Drawing constitutes part of critical pedagogy and consequently generates critical thinking (Feeney and Hogan 2019).

Population Sampling Strategy

The focus of this research was on first-year nursing students registered in the Bachelor of Nursing Science honours degree programme at a rural campus. Therefore, the target population was 88 first-year students registered in the 2019 academic year. A total of 28 participants were conveniently sampled and no one withdrew from the study. The researchers did not predetermine the number of participants to interview, but the number was determined by data saturation, which is the point in data collection when responses begin to be repeated and further data collection becomes redundant (Hennink, Kaiser, and Weber 2019). First-year nursing students, who had registered for the human anatomy course in the 2019 academic year, were approached to participate in the research and they were considered for focus-group interviews when they indicated their willingness to participate in the research.

Data Collection

Data were collected by both researchers from September 2019 to November 2019. A pilot focus-group interview was conducted with four participants, who were from the research population group, and were not included in the main study data collection. The pilot interview assisted researchers to refine questioning techniques and data collection plans (Creswell 2013). Focus-group interviews were conducted in English, and took place during weekends and after working hours, in lecture halls, at the campus and an open area at a public gathering place. The participants were approached on campus during theoretical blocks and the researchers explained the purpose and objectives of the study. Options were given to them to indicate the time and date when they were available for the focus-group interviews. With permission from the participants, each focus-group interview was audio recorded to avoid loss of data. The researchers also made use of field notes to record observed non-verbal cues and body language. A total of four focus-group interviews were conducted, each consisting of seven participants, with a duration of 40 to 45 minutes. The duration and number of focus-group interviews conducted were determined by data saturation. The researchers made use of an interview guide, which consisted of the central question with prompts to explore the topic further. The central question was: Tell me about your experiences on the use of drawing as a learning activity in a human anatomy course? The researchers paraphrased responses to ensure they captured and understood what was said by participants.

Data Analysis

In the preliminary stage of data analysis, the researchers did a verbatim transcription of all audio records from the interviews. This stage was initiated soon after the interviews. Data analysis was conducted using a qualitative content analysis method (Polit and Beck 2017). This encompasses four steps, which are decontextualisation; recontextualisation; categorisation; and compilation (Bengtsson 2016). During decontextualisation, the researchers familiarise themselves with the data by reading through transcripts to obtain a sense of the whole. Data were then broken down into smaller units of meaning. In recontextualisation, the transcripts were read again alongside the final list of meaning units. At this stage, the researchers let go of unimportant information that did not match with the purpose and objectives of the study. In the categorisation step, themes and sub-themes were identified. In the compilation step, the researchers commenced with the writing up of findings. The focus was on how participants experienced drawing as a learning activity in a human anatomy course, and how they transformed experiences into consciousness. Lastly, consideration was given to how the new findings related to the literature (Bengtsson 2016).

Data to Ensure Trustworthiness

Trustworthiness was ensured according to the four principles of Lincoln and Guba (1985). Credibility was ensured through the use of field notes, the use of an audio recorder, collecting data till saturation, and member checking with participants during data collection. In addition, a reflexive journal was kept by the researchers to bracket

responses by noting any feelings, personal experiences and perceptions related to the phenomenon under study. Transferability was ensured through the rich description of study methods, and including direct quotations from participants in the findings section. Dependability was ensured by reviewing related literature, prolonged engagement, member checking, and peer debriefing with an experienced researcher. Confirmability was ensured through an inquiry audit to confirm the accuracy of the findings. This was achieved by engaging an external reviewer, who is an experienced researcher and was not involved in peer debriefing or any stage of the study. She was given interview transcriptions, field notes, themes and sub-themes generated as well as conclusions made from the study.

Ethical Considerations

The School of Nursing Research Committee gave ethical clearance for the research (letter dated 14 August 2019). Permission to conduct the research was sought and granted by the same committee. Ethical principles adhered to were autonomy, non-maleficence, beneficence, and justice. Autonomy was addressed through the following steps. The research participants gave informed consent by signing the form prior to participation in the study as well as for interviews to be audio recorded. Participation in this research was voluntary as no form of coercion or punishment was imposed on students who opted not to participate in the study. Moreover, the participants were ensured of their rights to withdraw from the study at any point and not to answer some questions if they were not comfortable. No names were used during the study as all participants were allocated numbers that were used during data collection. Audio recorders and transcribed data were stored in password-protected computers to which only researchers had access. Non-maleficence was adhered to, as participants were not exposed to unnecessary risks of physical or psychological harm, or discomforts during the study. Additionally, only data that were necessary for achieving the research objectives were collected from participants. Beneficence was ensured through not taking too much of participants' time for attending classes and clinical practice; and they could indicate whether they were too tired to continue or allowed not to answer questions if they were not comfortable. Lastly, justice was adhered to by approaching all available first-year nursing students who were registered for the human anatomy course in the 2019 academic year, to participate in the study. No incentives were given to bribe potential participants, and no coercion was used during the recruitment process.

Findings and Discussion

Characteristics of Study Participants

Of the 28 nursing students who participated in the study, 18 were females and their ages ranged between 18 and 25 years. Ten male students participated in the study and their ages ranged between 18 and 23 years. The large number of female participants came naturally, as the programme registered more female students than males. All participants had registered for the Bachelor of Nursing Science (honours) clinical programme for the first time in 2019—that means no participant was repeating the human anatomy

course in 2019. One participant had a certificate in nursing and midwifery, while the rest of the participants had no post-secondary education qualifications.

Themes

Two themes emanated from the data, which are: 1) the experienced beneficial aspects of drawing as a learning activity; and 2) the experienced challenging aspects of drawing as a learning activity. Table 1 presents the two themes and sub-themes that emanated from the data.

Table 1: Summary of study findings

Themes	Sub-themes
Theme 1: Experienced beneficial aspects of drawing as a learning activity	• Drawing enhances understanding of human anatomy course • Drawing boosts creativity • Drawing allows integration of theory into clinical practice
Theme 2: Experienced challenging aspects of drawing as a learning activity	• Lacking artistical skills • Drawing is time consuming • Drawing is complex and complicated • Shortage of materials and learning resources

Source: The authors

Theme 1: Experienced Beneficial Aspects of Drawing as a Learning Activity

The four focus-group interviews conducted highlighted that the participants had experienced beneficial aspects related to the use of drawing as a learning activity in the human anatomy course; and these beneficial aspects had enabled them to learn. The beneficial aspects of drawing include enhancing understanding of the human anatomy course, boosting creativity, and integration of theory into clinical practice.

- Sub-theme 1.1: Drawing Enhances Understanding of Human Anatomy Course

The participants encountered that the use of drawing as a learning activity in the study of anatomy makes the course easily understandable by students. This was positive in the sense that for one to understand something, it must basically be laid out, which makes it easy to remember. Participants further indicated that when the course content was illustrated as drawings, it would be easily comprehended by the students. This may lead to better performance among students. The following are responses from the study participants:

> Like for me … when learning anatomy through reading notes and textbooks, I tend to forget the content easily but when using drawings or diagrams, I remember everything so fast, and that diagram stays in my mind for so long. P[1]1 G1

> I personally like learning with drawings, for example with the anatomy of the cell, you are able to see where the mitochondria are located, how it looks like and other components of the cell. When the lecturer asks students to describe the cell in a test or exam, you have that picture in your mind and you can easily remember how it looks like and then describe it in your answer sheet [nodding head]. P2 G4

Takase, Niitani, and Imai (2020) emphasise that the nursing profession entails a wide range of in-depth knowledge so as to help in caring for patients and addressing the ever-rising health-related problems. Part of the knowledge required is human anatomy, which enables students to understand the anatomical structure of the human body. This study found that when drawing is used in learning about the human anatomy, it enhances understanding of the content. Similarly, Chan (2013) documented that knowledge presented in a drawing enables understanding of the concepts easily. Additionally, it is more stimulating to look at a drawing than to simply read the texts. Correspondingly, Shaia and Elzie (2019) conclude that drawing is an effective strategy for learning anatomical structures. This is because in their study, students' knowledge of structures and drainage of dural venous sinuses had increased significantly through the use of drawings.

- Sub-theme 1.2: Drawing Boosts Creativity

Participants experienced drawing as beneficial in learning about the human anatomy because it stimulates their brains to think creatively and produce drawings in a creative way. Instead of focusing on learning alone, participants also experienced that drawing keeps them entertained, bringing innovative ideas and artistical skills into the learning context. This was stated by participants:

> Drawing in anatomy was fun for me because I did not only focus on knowing the content, but I also learnt to draw, combine different colours. I had more experience in art instead of just focusing on studying alone [sounding confident]. P7 G2

> I had [a] good time with drawing activity because it promoted my mind to be creative even though I do not know how to draw [smiling]. P3 G1

These findings concur with the study of Chan (2013), who reveals that when drawing is used in learning, students make an effort to make their drawings as thought-provoking as possible and this helps with the development of creativity. In the context of the current study, nursing students had loads of practical and theoretical activities to attend to and had less time for leisure activities. The use of drawing could offer students an

1 Participant code number and focus-group interview number.

opportunity to participate in creative work, which is a way of relaxing from the curricular pressure (Lyon et al. 2018).

- Sub-theme 1.3: Drawing Allows Integration of Theory into Clinical Practice

The research participants experienced an expansion in their capabilities when using drawings in learning about human anatomy. They could relate the drawing to real nursing situations, for example, during physical examination procedures. In addition, it also helped them to understand different procedures and interventions conducted in clinical settings. This was mentioned:

> If one is allocated in theatre and where mostly medical doctors do [a] biopsy on patients, we tend to know what exactly they are going to look for in the cells since we drew structures of the cell when we were learning anatomy in class. P6 G3

> I like to draw histology and gross anatomy of different body organs, for me … when I go for clinical attachment, every time I check the patients' diagnosis, I think of anatomical diagrams in the textbooks and the ones I drew myself. They help me understand how the body part is affected by microorganisms and procedures carried out [sounding confident]. P 5 G2

Nursing students often notice that there are discrepancies between the theory taught and what they see in clinical practice (Tiwaken, Caranto, and David 2015). The current study revealed that when drawing is used in studying anatomy, students can link what is taught in theory with clinical practice, therefore reducing the theory-practice gap. The relation of utilising drawing within clinical practice is also revealed by Chan (2013), who reports that drawing helps students to strengthen their memory and knowledge of what a nurse is required to do during pre-operative care. In a study conducted in London, United Kingdom, to assess whether drawing should be incorporated into the teaching of anatomy, the findings reveal that drawing assists students to apply and translate conceptual knowledge from the classroom environment into real-life structures they observe in pro-section and cadaveric demonstration (Borrelli et al. 2018). Although cadaveric demonstrations were not conducted in the context of the current study, when drawing was used as a learning activity, students were able to relate the knowledge gained to real body structures they observed in clinical practice.

Theme 2: Experienced Challenging Aspects of Drawing as a Learning Activity

This theme includes the uncomfortable experiences of nursing students when using drawing as a learning activity in the human anatomy course. Sub-themes that formed this theme were lacking artistical skills; time constraints; drawing being complex and complicated; and a shortage of materials and leaning resources.

- Sub-theme 2.1: Lacking Artistical Skills

The participants verbalised a challenge regarding limited and lacking artistical skills required to create a drawing while learning human anatomy. The participants further

indicated that these challenges led to negative emotions such as a lack of confidence and trust in self, because they failed to draw and label diagrams correctly. Moreover, the participants indicated that although some students owned laptops and smartphones, they did not have the know-how to use them to create and enhance anatomical drawings. This is what participants said:

> It is so frustrating, like for me, the challenge I face is I can't draw, I can't come up with a good drawing because I'm not an artistic person. P3 G4

> I remember there was a day we were asked to draw a neuron in our notebooks. In the textbook, the neuron looks simple, but when I took my pencil to draw, I can't. I guess drawing requires some special skills which I am lacking. I am no more confident whenever I see an activity that asks me to draw. You know … [long silence], I just do not trust myself anymore [sounding disappointed]. P2 G3

Nursing is art in action, which may be formally expressed in forms of poetry, drawings, stories and music that reflect and communicate the symbolic meanings embedded in nursing practice. Furthermore, the nurses' actions take on an element of artistry and create unique, meaningful, and stirring interactions with others (Chinn and Kramer 2018). Despite the fact that nursing is artistic in nature, there is no formal art training in nursing education. Similarly, in the context of the current study, nursing students had no provision to attend art classes, though some came to nursing with artistic skills acquired from primary and secondary school subjects. The computer literacy course offered during the first-year level of the programme does not introduce students to smart tools that may be used in technology-assisted learning. The participants in the current study recognised that lacking and limited artistic skills would limit their ability to use drawing as a learning activity in human anatomy. These findings concur with those of Borrelli et al. (2018) who report that participants in their study perceived "inadequate skill to draw" as one of the biggest constraints for drawing anatomy. However, it is emphasised that due to learning preferences and difficulty to recreate diagrams, the ability to draw should not be considered as a standalone parameter for evaluating the knowledge or intellect of a student (Kumar and Rajprasath 2019). This is because the purpose of drawing in anatomy is not to produce a perfect diagram but to clearly illustrate key anatomical structures and planes, and students should be able to explain the meaning of each line on the diagram—so, drawing capability is not essential (Borrelli et al. 2018).

- Sub-Theme 2.2: Drawing Is Time Consuming

The participants experienced that when drawing was used to learn anatomy, they tended to use more time studying human anatomy compared to using other strategies. They further indicated that a lot of time spent in drawing might negatively affect students' performances, as there was not sufficient time to cover a lot of course work required for examination or tests. Other negative experiences related to time constraints were that some students indicated they were slow when it comes to drawing, and this was usually

associated with efforts to create good quality and presentable diagrams. This was mentioned:

> My problem is that I am very, very slow when it comes to drawing. I really take a lot of time to draw, but I have to take time, because I have to draw a better diagram which I can use in future. But sometimes there's also other tasks to do like reading through the textbook to understand what I have to draw; I think drawing really need[s] a lot of time. P3 G2

According to Leung and Saxena (2017), an art-based demonstration can be time consuming compared with a lecture-based teaching programme. Although the current study focused on drawing as a learning activity conducted by students, they also found it to be time consuming. On the same note, Borrelli et al. (2018) also report time constraint as one of the challenges of using drawing in anatomy. There was no evidence of findings from the literature that opposed this finding.

- Sub-Theme 2.3: Drawing Is Complex and Complicated

The participants verbalised experiencing challenges to simplify most of the human anatomy drawings in the textbooks and internet sources. They further indicated that anatomical drawings in the textbooks and internet sources are taken displayed from complicated planes and viewpoints, therefore students find it difficult to draw the exact diagram. The participants described it as follows:

> I find anatomy diagrams very complicated. You can find a small diagram, very small like this [demonstrating with hands] … but may [be] composed of 10 parts. That is very complicated and not simple for students to draw. P5 G1

> It is hard for me to really draw a diagram exactly [the] same size as it is in the textbook. P4 G2

Most diagrams in the human anatomy textbooks show schematic representations of the structures which give a clear view to the readers. However, students in the current study found diagrams they encountered to be complex and complicated. This could be because students in the first year are still learning the anatomical planes and basic anatomical concepts, therefore they find it difficult to imagine the angle from which the diagram was made. In order to address this, in many cases, anatomical structures or processes can be represented by simple shapes that are easy to create (Quillin and Thomas 2015). While students from art schools are required to make larger diagrams for learning purposes, health science students generally prefer to make small-sized drawings (Lyon et al. 2018). Therefore, they are finding it challenging to make a small-sized diagram, especially when there are many structures to label.

- Sub-Theme 2.4: Shortage of Materials and Learning Resources

The participants encountered a shortage of human anatomy textbooks that have well-presented diagrams to use during drawing activities. This is because they prefer to make a diagram copying from a source instead of starting to draw without any original picture to imitate. In addition, the participants found it difficult to access colouring pencils and hard papers for drawing that would make the diagram real and thought provoking. Using notebooks were not conducive, as they usually attempted the drawing many times, using up the space meant for anatomy notes. Lastly, it was also mentioned that students found it challenging to use technology-assisted drawings with smart pens, computers and software or applications that may be used to make better drawings. This was mentioned:

> I do not have a text book and my laptop does not access internet on campus, so I have to run around looking for a text book and some of my classmates may refuse to lend me their textbook and the library didn't have any. It is difficult to visualise and draw, I prefer to see how it look like and then imitate, in that case I remember the structure easily when studying for exams and test. P4 G4

> Sometimes you want to make a good colourful diagram to help you remember structures but you do not even have highlighters or colouring pencils. I do not know if we really have to buy all those just to use them once in a month? Ooomh [long silence], I heard people use computers and smartphones to draw but some of us do not even have smartphones, so the paper and pencils are the only tools. P3 G4

The nursing students in the context of the current study provided their own stationery and basic learning materials needed, such as prescribed textbooks. However, they had access to prescribed and recommended books from the university library. No materials such as drawing posters and pencils were provided. This is opposite to the report of Leung and Saxena (2017), who indicated that students were provided with pre-drawn anatomical structures for labelling, as well as papers and pencils to draw throughout the drawing activities. Although their work focuses on giving tips for enhancing anatomy teaching and learning using radiology, Caswell et al. (2015) encourage educators to invest in suitable resources.

Limitation

One of the researchers was a lecturer in the nursing science unit at the university campus where the study was conducted. This could be a limitation because participants may not have expressed themselves freely during interviews. To address this, the researchers explained the purpose and objectives of the study as well as guiding ethical principles during the participants' recruitment stage.

Conclusions

This study explored and described the experiences of first-year nursing students from a resource-constraint setting on the use of drawing as a learning activity in a human

anatomy course. The central question that guided the study was: Tell me about your experiences on the use of drawing as a learning activity in a human anatomy course? It is concluded from the findings that the use of drawing by nursing students brought positive experiences into learning anatomy. However, several challenges were also experienced. Positive experiences were related to the understanding of the human anatomy course content. This is beneficial because the course is perceived by educators and health science students as challenging and labour intense. Other positive experiences demonstrated were related to boosting creativity and the integration of theory into clinical practice. The negative experiences among nursing students related to lacking artistical skills, time constraints, drawing being complex and complicated, as well as a shortage of materials and learning resources. The latter negative experience could be because the study was conducted in a rural and resource-constraint setting. This study adds value to the academic literature by exposing nursing students' experiences of drawing as a learning activity in a human anatomy course. Lastly, the study makes recommendations directed to the nursing students, educators as well as future researchers.

Recommendations

The study recommends that educators continue allowing students to participate in drawing activities for learning anatomy. This is because of the positive experiences revealed in the current study as well as in the literature reviewed. Nursing students should be encouraged not to be concerned too much about their artistical skills, but should rather focus on the learning that is taking place. Due to the experienced time constraints, nursing students are advised to practise time management and design workplans for learning sessions that should reflect the number of activities and time allocated for each. In order to facilitate the learning of human anatomy through drawing activities, nursing students should be encouraged to purchase the required materials such as pencils, colour pencils and notebooks, while the school management should motivate for the purchase of flipcharts, drawing posters, white and blackboards that may be used for drawing. In addition, the university libraries should acquire more prescribed and other human anatomy textbooks for students to use as references during drawing activities. Further researchers may explore the use of drawing in the assessment of a human anatomy course and how it influences students' performances.

Competing Interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this research.

Authors' Contributions

EJ was involved in conceptualisation; literature review; methodology; data collection and analysis; resources; and the writing of original draft preparation.

VN was involved in conceptualisation; literature review; methodology; data collection and analysis; project administration; the writing of the review and editing.

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