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Describing the notion of teaching strategies to accommodate different learning styles in continuous professional education in nursing: An integrative review

Research proposal for the degree Masters in Nursing Education

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LIST OF ABBREVIATIONS / ACRONYMS

Abbreviation / acronym	Meaning
AC	Abstract Conceptualization
AE	Active Experimentation
CE	Concrete Experience
CPD	Continuous professional development
HBDI	Herrmann Brain Dominance Instrument
RO	Reflective Observation
SANC	South African Nursing Council
VARK	Visual, Auditory, Reading/writing and Kinesthetic

ABSTRACT

Learning is essential in all specialties of nursing. Continuous professional development in the form of in-service training became a resource of daily practice as nurses should stay competent throughout their career in an evolving healthcare environment and update their competence to enable improved patient care. Learning is more than gaining knowledge, it is a process, the building of long-lasting cognitive structures and deeper understanding. Teaching is a bidirectional, contributive, interactive, and creative process. Therefore, the teaching approach have a direct impact on learning, but there are contradicting opinions if different learning styles should be accommodated in teaching strategies and if it is only a myth that accommodating different learning styles improves learning.

The aim of the study was to explore and describe the value of teaching strategies that accommodate different learning styles in continuous professional development in the nursing environment, by means of an integrative review.

The results of this research study contributed to the understanding of the value of different learning styles in continuous professional development in the nursing environment, which in turn might assist with strategies for professional development planning. The main themes that were identified included time, environmental aspects, visual dominant, auditory dominant, reading/writing dominant, kinesthetic dominant and multi-modal. The Whole brain learning and Kolb's learning styles are represented by the multi-modal learning style.

CHAPTER 1: OVERVIEW OF THE STUDY

1.1   INTRODUCTION AND BACKGROUND

In all specialties of nursing, continuous professional development becomes a resource of daily practice. Nurses should stay competent throughout their careers in an evolving healthcare environment and update their competences to enable improved patient care (Jantzen, 2019:2566), but all nurses are responding differently to the call to remain competent and to learn. There is though a question what the value might be to accommodate different learning style in continues professional development activities.

The day one learns something new, should be seen as a memorable day. Because people are different, human diversity prompted the development of different learning styles according to Estrada, Monferrer and Moliner (2019:87). Learning styles is a personal preference on how an individual learn the best. Learning styles can be describe as the specific preferences an individual has for learning or internalizing new information (Bernard, Chang, Popescuc & Graf, 2017:94). Learning is a complicated and interactive process of gaining knowledge or skills considering the individual's physiological, cognitive and psychological dimension (Idrizi & Filiposka, 2018:2). Knowing and understanding the different learning styles can assist in improving the learning process and satisfaction, enhance learning outcome and reduce the time spend on learning according to Bernard et al. (2017:94). Billings, Hu, Lerda, Medvedev, Mottes, Onicas, Santoro & Petri (2019:29) are of the opinion that learning styles can be influenced by factors such as age, culture, environment, and experience. Bernard et al. (2017:94) conclude that individuals will find it beneficial to know and understand their own learning styles, their strengths, and weaknesses, which promote self-management towards learning.

Different frameworks developed over time to explain the varieties of learning styles. I In the following section three commonly used descriptions of the different learning styles will be addressed, namely the Hermann Whole Brain Learning Model, the VARK (Visual, Auditory, Reading/writing and Kinesthetic) learning style approach and the Kolb's description of learning styles.

In 1978, William Ned Herrmann developed the Herrmann participative survey to evaluate the individual's thinking styles and learning preferences (Allerton, 2000:459). This resulted into the theory of brain quadrants representing four different areas in the brain to have its own unique functional characteristics in terms of thinking and learning, apart from the anatomical differences (Allerton, 2000:459). Later in 1989, the Whole Brain Model was described by Herrmann, as a

metaphorical illustrated circle, representing the brain, divided in four quadrants (Sontillano, 2018:100). The four separate quadrants (shown in Diagram 2.1 are described as the two cerebral cortexes and the two lower limbic quadrants. Each quadrant is related to the individual's thinking processes and preferred learning style (Estrada et al. 2019:88). Individuals are likely to use one quadrant more than the other quadrants and this is called 'dominance' (Estrada et al. 2019:89). This whole brain model explains the impact of brain dominance on learning styles (Estrada et al. 2019:89), and holistic thinking implies that all four quadrants are used in a balanced manner (De Boer & Van den Berg, 2001:119).
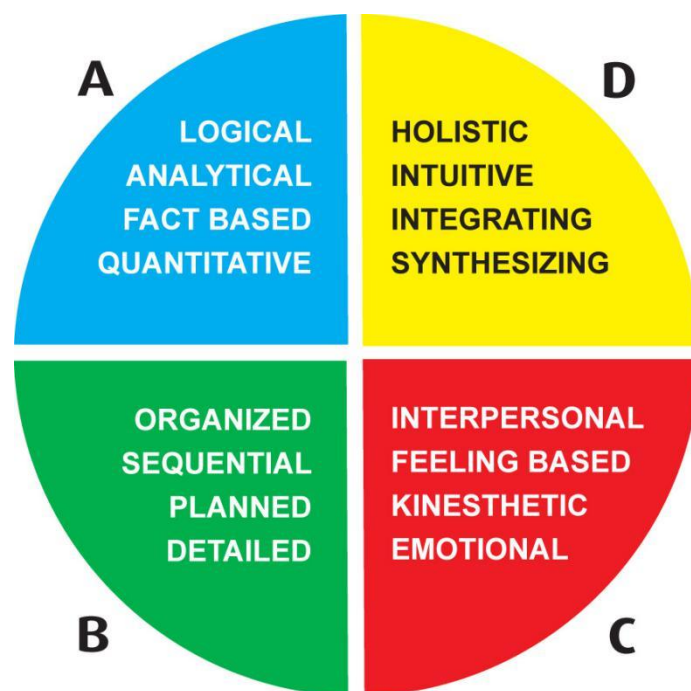
Diagram 1.1: Depiction of the four brain quadrants (Sontillano, 2018:100)

Quadrant A or the left cerebral hemisphere, the lower left limbic hemisphere (quadrant B), the lower right limbic hemisphere (quadrant C) and the upper right cerebral hemisphere (quadrant D). Quadrant A is concerned with logical, analytical, realistic, or critical thought process. This quadrant will be dominant in an introvert and critical thinking individual. This individual prefers to learn through external learning by means of attending lectures or studying textbooks (De Boer & Van den Berg, 2001:119). Quadrant B is visible in an individual being organized, with proactive and controlled thought processes (Eagleton & Muller, 2011:423). The dominance of Quadrant B is seen in an

individual who is task oriented and plan. These individuals prefer procedural learning by methodological steps, testing the learning content, continue practicing improving skills (De Boer & Van den Berg, 2001:120). About the right cerebral hemisphere, quadrant C is associated with emotions, interpersonal relations, and thoughts. Individuals with dominance in this area appear to be spontaneous and extroverted (Eagleton & Muller, 2011:423). This individual prefers interactive learning therefore, participating in discussions, trial and error via hands-on sensory-based experiments or verbal feedback (De Boer & Van den Berg, 2001:120). Lastly quadrant D relates to creative, abstract, and communicative thoughts. Individuals who are lateral thinkers and empirical are dominant in this quadrant (Estrada et al. 2019:89). They prefer to learn by visualization, insight and understanding concepts, called internal learning (De Boer & Van den Berg, 2001:119).

According to Herrmann in Sontillano (2018:100), an individual develops a dominant preference for learning in one or two quadrants and therefore may reject learning in the remaining quadrants. This emphasizes the importance of understanding learning styles and how to embrace individual diversity in teaching strategies. Hermann classified individuals according to their preferred thinking style, which represents a preferred learning style. Our thinking preference impact everything we do, for example how we learn, solve problems, and communicate to people around us. The moment we understand our own thinking style, we can improve our problem-solving skills, communication, relationships and most importantly, how we prefer to learn (Sharma & Sarraf, 2018:95).

The VARK learning style approach is developed and proposed by Neil Fleming and Collen Mills to determine the learning preferences and preferred method of understanding new information, also known as sensory modality, when processing the information. The acronym VARK are used to describe the physiological dimension of four modalities of the learning style, namely: Visual, Aural, Read/Write, and Kinesthetic (Idrizi & Filiposka, 2018:2). The visual dimension represents learners who learn through visual stimulation, description, and demonstrations. These learners can become distracted by external movements or noise. The aural dimension refers to learners learning by listening. They prefer verbal instructions and discussions to make sense of the learning concept. The aural learning can easily be distracted by external noise (Idrizi & Filiposka, 2018:2). The read and write dimension refer to learners who learn by taking notes or writing concepts down. They prefer practical tasks and will draw pictures to help them to remember a concept. The kinesthetic dimension refers to learners who learn by doing a task or moving while learning. These learners struggle to sit still and listen to a lecture (Idrizi & Filiposka, 2018:2).

David Kolb published his model for the Kolb's learning styles in 1984 and developed the Kolb's learning style inventory (McLeod, 2017:1). The Kolb's learning styles consist of four stages, namely: concrete learning, reflective observation, abstract conceptualization, and active

experimentation. Kolb believed that effective learning would take place if the learner progresses through the cycle (McLeod, 2017:1). Most of Kolb's theory is concerned with the learner's internal cognitive processes (McLeod, 2017:1). Kolb's model is designed to create knowledge by transforming one's individual experiences (McLeod, 2017:1). The Kolb's learning styles model was developed to locate individuals on a continuum between concrete experience (CE) and abstract conceptualization (AC); and active experimentation (AE) and reflective observation (RO) (McLeod, 2017:1). The diagram below represents the Kolb's learning styles model (McLeod, 2017:1).
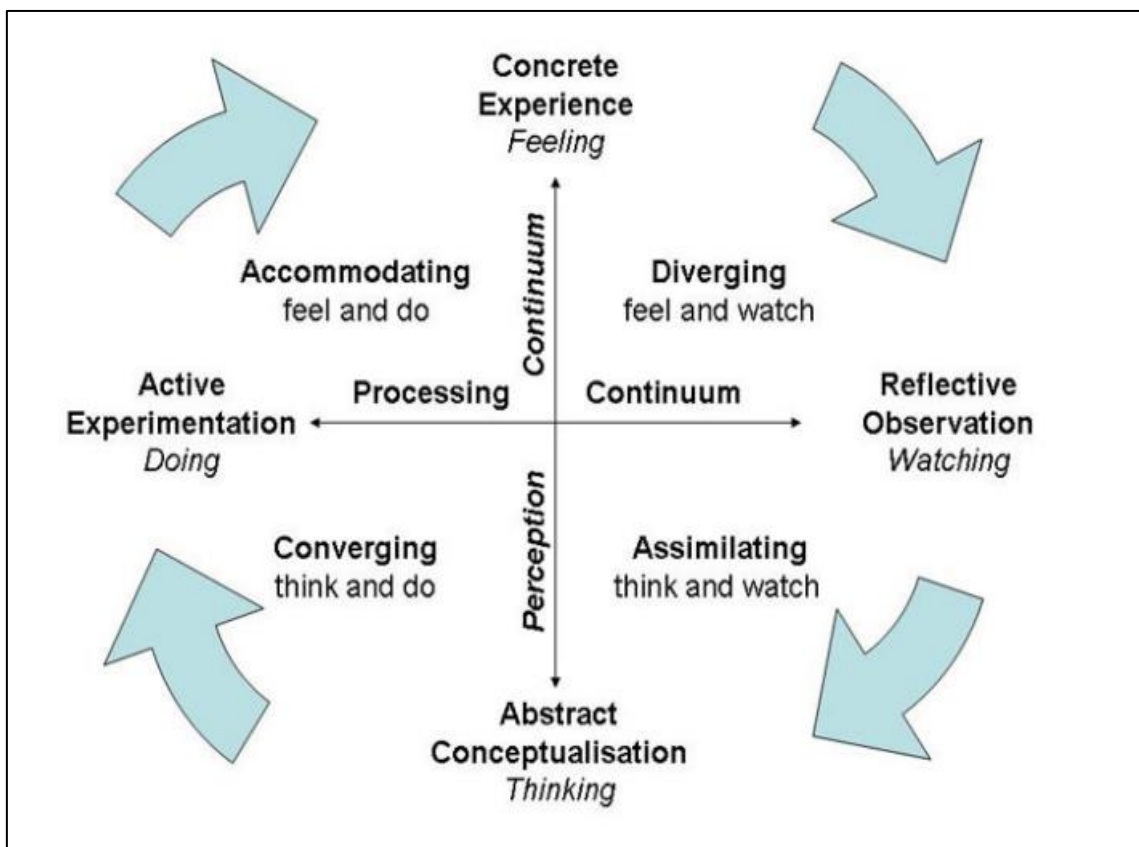
Diagram 1.2: Representation of Kolb's learning styles (McLeod, 2017:1)

The concrete experience refers to a learner looking at a concept or object as it is without changing detail. Abstract conceptualization is where a learner will look at an object or idea and process the detail into an internal model. Active experimentation is when a learner takes a concept and try to prove that it is correct, or it works. Reflective observation is it the learner believe in the concept and watch to see if it really works (McLeod, 2017:1). These dimensions can be combined to form a two learning dimensions namely: Concrete/Abstract and Active/Reflective. The Kolb's learning styles model believes that all individuals use a form of these learning dimensions, however every individual has a specific learning style (McLeod, 2017:1).

Kolb discussed the individual learning styles as:

- Diverging (feeling and watching) learners are sensitive, open minded and artistic individuals who look at a concept from a different perspective and use imagination for problem solving (McLeod, 2017:5).

- Assimilating learners (watching and thinking) are task orientated rather than people orientated. They are learners who prefer a logical approach to solve a problem. These learners prefer clear explanations, reading, lectures and time to think (McLeod, 2017:6).

- Converging learners (Doing and thinking) refer to the learner who prefer technical tasks. These learners prefer to solve a problem through practical tasks, experiments with new ideas and simulate a scenario to find practical solutions (McLeod, 2017:7).

- Accommodating learners (doing and feeling) rely on intuition rather than logic. These learners prefer to work in teams to complete a task (McLeod, 2017:7).

Mazaheri and Ayatollahi (2019:118) are of the opinion that teaching focuses predominantly on left hemisphere teaching methods, because it is more structured, analytical, and controlled. A left dominant teaching approach is effective for individuals who follow a left dominant teaching approach but unfortunately ineffective for the individual who prefers a right hemisphere dominant approach (De Boer & Van Den Berg, 2001:119). As learning can become more stressful for some individuals, they rely more on the dominant brain hemisphere in the learning situation, therefore a controlling teaching style will lead to a missed learning opportunity (Mazaheri & Ayatollahi, 2019:123). If the teaching style is focused on more left-brain hemisphere approaches, the right brain hemisphere dominant individuals' learning needs are not met, which means the teaching was ineffective (Mazaheri & Ayatollahi, 2019:123).

In contradiction to the above models and support for accommodation of different learning styles to enhance learning, there are also a number of authors who disagree with the concept and describe it as a myth (Fury, 2020: n.p.; Newton & Miah, 2017:1-9; Lethaby, 2017: n.p.). Cimermanová, 2018, conducted a study indicating that learning styles have minimal contribution to academic performance (Cimermanová, 2018:229). He also mentioned that the teaching approach have no significant effect on academic performance (Cimermanová, 2018:229).

1.2   RATIONALE

It was deemed necessary to determine if accommodating the various learning preferences might ensure that no one is left behind during training sessions and optimal learning takes place, or if it is a waste of time or energy.

1.3   PROBLEM STATEMENT

Incidents reported that could have been prevented if the nursing staff involved had the needed knowledge and skills, are for example related to medication errors (Simonsen, Daehlin, Johansson & Farup, 2014:580), Continuous professional education is acknowledged as very important to ensure that the staff have adequate knowledge and skills to render quality nursing care to all patients in all areas of nursing, and prevent errors. Bender and Holmes (2019:26) indicated that dualism exists in nursing where there is a belief that nursing is a science as well as an art. Practicing nursing entails using the science of knowledge obtained to create the caring situation for patients (Reed & Shearer, 2017:33). Knowledge and skills are obtained during training. In-service training is the process to continually update the knowledge and skills of individuals at the workplace (Chaghari, Saffari, Ebadi & Ameryoun, 2017:26).

The importance of learning is how the individual transform experiences and information into competencies based on individual learning preferences (Gayathiri, Hendrickqs & Menon, 2019:41). An individual's learning preference is viewed as a personal process of how somebody interacts and responds to the learning content and environment (Gayathiri, et al. 2019:41).

There are though different opinions about the value of accommodating different learning styles to optimize continuous professional development. Neda, Namdar, Fariborz, Ebrahim, Karimi and Raheleh (2019:71) indicate that an efficient teaching approach accommodating different learning styles during training can contribute to the learning process. Fury (2020: n.p.) is of the opinion that "there is no evidence that designing lessons that appeal to different learning styles accelerates student learning" and that the idea of different learning styles is a myth.

The nursing educators need to use time available efficiently to ensure learning opportunities are not missed and that all learning preferences are accommodated. Overlooking individual diversity during training might indirectly have an unfavorable impact on patient care and organizational standards. This could be because, some staff might not benefit from learning opportunities if the teaching approach do not fit their learning preference (Neda, et al. 2019:71). The opposing opinion holds that teaching strategies might not make a difference to learning (Fury 2020: n.p.). Newton and Miah (2017: n.p.) acknowledge that there is no evidence to support the idea behind different learning styles, but it is still considered as an important strategy in higher education.

What is not very clear is what the actual value might be when different learning styles are accommodated in continuous nursing education. The researcher therefore indented to understand the different teaching strategies and describe the potential contribution to learning in the nursing environment.

1.4   SIGNIFICANCE OF THE PROPOSED STUDY

There are different notions amongst nurse educators regarding the incorporation of different teaching strategies that accommodate different learning styles in continuous nursing education and the potential value thereof to enhance learning. The study therefore might contribute to describing the potential value accommodating different learning styles, or the lack thereof, as found during an integrative review. This in turn is expected to improve the planning and execution of activities related to continuous professional education to enhance quality nursing care at the end.

1.5   RESEARCH AIM AND QUESTION

The following research question was posed for this study:
What is the potential value of teaching strategies that accommodate different learning styles in continuous education in nursing?

The aim of the study was to describe and explore the value of teaching strategies to accommodate different learning styles in continuous training in nursing practice.

1.6   CONCEPT CLARIFICATION

The following concepts are used in this study:

Learning style: Refers to the ability to obtain value from/create meaning from any interaction, program or learning facilitation (Patte, 2019:31). Human beings respond to experiences and therefore a comprehensive teaching approach aims to create a climate for learning. In this proposed study, learning styles refer to how nurses prefer to learn in accordance with different learning styles.

Teaching approach: Is described as established principles, opinions, or methods used in a classroom setting to facilitate learning (Patte, 2019:31). In this study, teaching approach refers to methods used to facilitate learning.

Value: Is describe by the Oxford dictionary as how much something or someone is worth (Matthews, 2014:427). In this study, value refers to the contribution different learning styles have towards learning in the nursing context.

1.7 DELINEATION

The study was conducted using previous research on the contribution of teaching strategies to accommodate different learning styles in nursing.

1.8 INTEGRATIVE REVIEW RESEARCH DESIGN

The researcher used an integrative review as it outlines the theoretical information, and it gives an additional understanding of the information. An integrative review concentrates on evidence-based practice and the theoretical information derived from the research and builds on knowledge that is known, therefore it leads to change in performance (Whittemore & Knafl, 2005:546).

According to Whittemore and Knafl (2005:547), an integrative review permits diverse types of research studies to contribute towards evidence-based practice. These diverse types of research studies include both experimental and non-experimental methods. This will provide a collection of different studies and literature sources to be integrated into the review to promote learning in the nursing profession. As a result, it allows a researcher to conceptually link the information together and to draw a research conclusion (Whittemore & Knafl, 2005:547).

1.8.1 METHODOLOGY

The methodology in research is to develop or refine methods of gathering, organizing, or analyzing data (Polit & Beck, 2017:843). The methodology in this study was an integrative review where the researcher used primary research to empower it's potential in evidence base practice.

1.8.1.1 UNIT OF ANALYSIS

The unit of analysis included published experimental and non-experimental studies which elaborated to the description of the value of teaching strategies that accommodated different learning styles in continuous nursing education.

1.8.1.2 INCLUSION CRITERIA

The inclusion criteria for the publications were as follows:
- They were published in English;
- The full text was accessible to the researcher;

- They were published less than 10 years ago (i.e. from 2013 to date);
- The studies were done in a nursing environment (practice or education);

Publications not related to the research question, as well as grey literature (guidelines, policies, and abstracts) were excluded.

1.8.1.3 DATA COLLECTION AND ANALYSIS

The methodology followed in the integrative review is described below, according to the description of Whittemore and Knafl (2005:549):

- **Problem identification**

The problem was identified as described in the background and the problem statement earlier mentioned. As mentioned, continuous professional education is an essential process to ensure the staff have adequate knowledge and skills to render quality nursing care to all patients in all areas of nursing, and prevent errors (Chaghari, Saffari, Ebadi & Ameryoun, 2017:26).

- **Literature search**

The published studies were searched using the following search engines: Google Scholar, Pubmed, OVID, CINAHL and Directory of Open Access Journals with the assistance of an academic information specialist. The key words used included: Whole brain learning and nursing and education; VARK and nursing and education; Kolb's learning styles and nursing and education. The data search and screening instrument that was used are displayed in Table 1.1. It illustrates how the results for each separate search term conducted were captured.

Table 1-1 Data Search and Screening Instrument

Database	Population	Intervention	Comparison	Outcome	Time
Google Scholar	Nursing (Students or in Practice	Whole brain learning teaching strategies	No comparison	Potential value	Between 2013-2022

One search engine at a time was accessed, using the key words as indicated. The above table was used to capture the number of items found.

- **Data screening**

The titles were read and those that appeared to be relevant were saved as potential articles. The abstracts were read to determine the relevance, and only the relevant articles were kept. Full text

copies of these were retrieved of those accessible to the researcher. The full text copies were then read by the researcher to determine relevance, and those that were relevant to provide an answer for the research question, was saved in a dedicated folder to be analysed.

Table 1-2 Criteria for Evaluation of Articles

Article Number and Reference	Year Published	Context	Research design	Study setting	Sample Frame	Sample Size	Results / Outcomes

Based on the above information captured, the decision was made about the quality of the article and if the article should be included. If the quality could not be determined due to lack of information, the article was excluded.

- **Data analysis**

The extracted articles were evaluated for inclusion in the batch for review according to the criteria stipulated in Table 2. Each article was categorized, coded, compared and synthesized to integrate the information to address the research question, as described by Whittemore and Knafl (2005:549). The information was captured in a Microsoft Excel spreadsheet.

The final list of articles identified during the data evaluation stage, was evaluated carefully by the researcher to identify the themes. The researcher designated preliminary theme and the themes were described. Each theme was then interpreted to answer the research question based on the title. The researcher evaluated the data before the conclusion was reached.

The extracted articles were evaluated for inclusion in the batch for review according to the criteria stipulated in Literature search. Each article was compared and synthesized to integrate the information to address the research question, as described by Whittemore and Knafl (2005:549). The information was captured in a Microsoft Excel spreadsheet. 33 Articles from primary sources and 3 articles from secondary sources were included in this research study for answering the research question.

The final list of articles will then be analysed looking for patterns, comparisons and contrasts, and relationships. The themes and sub-themes were presented in a conceptual framework to illustrate meanings and relationships, and lastly discussed as related to the study.

1.9   RIGOUR

Rigour confirms honesty, thoroughness, and carefulness in the research study so that readers can trust the study which the researcher compiled. Integrative research requires a standard of excellence with regards to methodological rigour for the product to contribute efficiently to clinical practice. Various measures were used to ensure rigour in this research study, namely credibility, confirmability, dependability, transparency, and transferability. Transparency in the procedures of identification, inclusion, and classification of the articles reviewed was an assurance for rigour in this integrative research. The rigour of an integrative research was guaranteed through presentation of a coherent conceptual structure of the phenomenon as indicated by Soares (2014:335).

Standards of rigour were followed, and the results were clearly presented, which gave the researcher confidence in the truth of the research data and the interpretation thereof. The researcher used all the articles which answer the research question, negative as well as positive contributions. Diverse publications were searched from different countries. The researcher refrained from plagiarism. In this research study, dependability was ensured through the involvement of experienced researchers who supervise the study. According to Denzin and Lincoln (2006:78) this is an important requirement to ensure rigour.

To achieve confirmability, the researcher ensured that the findings develop from data researched and that the data were not influenced by her own perceptions as suggested by Shenton (2004:63-75). The data was therefore analysed by the researcher. The researcher assembled a comprehensive report regarding the steps followed in this study. Following these steps, the researcher aimed to guarantee rigour as well as to expand on evidence-based practice. It was essential to ensure that the principles of rigour were met by refraining from research bias.

1.10 ETHICAL CONSIDERATIONS

The proposed study was based on the three major ethical principles from the Belmont Report for protecting study participants, namely respect for human dignity, beneficence and justice (Polit & Beck, 2017:258). In this study there were not study participants per se, but each ethical consideration was considered. The researcher was obligated to always adhere to the ethical principles during the research.

- **Respect for human dignity**

Respect for human dignity involves the right to self-determination and the right to full disclosure (Polit & Beck, 2008:171). The researcher demonstrated integrity by using the principle of respect for the human being by ensuring that a true reflection of the research data was given, and to give credit to all the authors. To avoid any plagiarism, the researcher used the Harvard referencing method and a full reference list of all the literature was used in this study.

- **Respect for beneficence**

Beneficence is ensured through protecting the respondents from harm and protecting them from maltreatment (Polit & Beck, 2008:170). As there were no respondents involved in the study, this principle was not applicable.

- **Respect for justice**

The principle of justice is ensured through the right to privacy, the right to confidentiality, the right to informed consent and the right to fair treatment (Polit & Beck, 2008:173). This principle was also not applicable due to the absence of respondents.

1.11 OUTCOMES OF THE RESEARCH

In this research study the researcher aimed to describe evidence-based practice with the aim in improving nursing practice by determining the value of incorporating different learning styles to recommend appropriate teaching approaches for continuous nursing education. Having this phenomenon resolved, might contribute to receptiveness for different teaching strategies in a nursing environment. It might raise more suitable awareness to the nursing and multidisciplinary team of the benefits (or otherwise) of using different teaching strategies in a nursing environment. Findings might feasibly highlight gaps in research and identify those areas where additional research is required.

1.12 CONCLUSION

In this chapter the researcher introduces the reader to the study. The lay-out of the study is as follows, the introduction and background are stated to create the research environment. This is followed by the research problem statement, research aim and question and the concept clarification to explain the paradigmatic perspective of the researcher. This chapter provided an overview of the study. The methodology followed is discussed in more depth in the following chapter.

CHAPTER 2: LITERATURE SEARCH AND DATA COLLECTION

2.1 INTRODUCTION

In Chapter 1, the background, problem statement, significance of the study, research aim and question and the research design were described. As part of the discussion of the background to the problem, the researcher referred to literature regarding the diversity and uniqueness of every individual, therefore, learning should be considered an individualized process. The researcher describes the important continuous development in nursing and explore the value of learning styles in the nursing education.

In this chapter, the researcher described how the literature search and data collection was conducted. The researcher defined the steps taken to collect data and how rigour was ensured.

The data collection and literature search included articles that answered the research question, as the research question defined the data to be collected for an integrative review.

2.2 THE METHODOLOGICAL FRAMEWORK OF AN INTEGRATIVE REVIEW

An integrative review concentrates on evidence-based practice and the theoretical information derived from the research builds on knowledge that is known, which will lead to change in performance (Whittemore & Knafl, 2005:546).

Therefore, the researcher aimed to describe the contribution learning styles could make to nursing education. This in turn, can create awareness on adjusting teaching approaches and how to accommodate different learning styles.

According to Whittemore (2005), an integrative review permits diverse types of research studies to contribute towards evidence-based practice (Whittemore & Knafl, 2005:547). These diverse types of research studies outline both experimental and non-experimental research studies. This will provide a collection of different aspects from the researcher to be integrated into a research study and will act in the interests of the nursing profession. The researcher obtained articles from different fields of expertise which helped the researcher to evaluate and analyse the articles and in reference to the findings to help improve the learning in nursing education.

As a result, it allows the researcher to conceptually link the information together and to draw a research conclusion (Whittemore and Knafl, 2005:547). This will develop the format in which

information is collected. The researcher aimed for precision and accuracy regarding the information during data collected, in order to ensure a quality research report. The researcher conducted an electronic search to ensure that all the data is scientific.

The researcher used the strategies described by Whittemore & Knafl (2005:548) to improve rigour in this research. These strategies, as described below, includes a problem formulation stage, a literature search stage, a data evaluation stage, a data analysis stage, and a presentation stage (Whittemore and Knafl, 2005:548)

2.3   PROBLEM IDENTIFICATION

Continuous professional education is essential to ensure nursing staff have the knowledge and skills satisfactory to provide quality nursing care to all patients in all areas of nursing, and prevent errors (Simonsen, Daehlin, Johansson & Farup, 2014:580).

The focus of learning is how an individual transform experiences and information into competencies based on individual learning preferences (Gayathiri, Hendrickqs & Menon, 2019:41). However, individuals learn in their own unique way and therefore, individual's learning preferences need to be considered for optimal learning (Gayathiri, et al. 2019:41).

What is not very clear is what the actual value might be when different learning styles are accommodated in continuous nursing education. The researcher intent to understand the different teaching strategies and describe the potential contribution to learning in the nursing environment.

2.3.1   INCLUSION CRITERIA

The researcher aimed to ensure quality and representative data, therefore she included only published, peer-reviewed academic literature and literature reviews articles. The representational data indicates veracity and reliability of the results (De Sousa *et al.*, 2010:104).

The search was limited to teaching approaches in nursing education and included reviews, qualitative, quantitative and mixed method research studies, this is possible, because an integrative review accommodates multiple methodologies.

The inclusion criteria for the publications were as follows:

- They were published in English;

- The full text was accessible to the researcher;
- They were published less than 10 years ago (i.e. from 2013 to date);
- The studies were done in a nursing environment (practice or education);

Publications not related to the research question, as well as grey literature (guidelines, policies, and abstracts) were excluded.

2.3.2 EXCLUSION CRITERIA

Publications not related to the research question, as well as grey literature (guidelines, policies, and abstracts) will be excluded. The researcher did not use data older than ten years in the research report; therefore, the researcher will present a report of latest data.

The researcher also excluded abstracts where the full text articles were not available to the researcher, all unpublished articles, articles relating to patients with obvious learning difficulties, mental retardation, psychiatric disorders and/or a history of drug misuse or abuse. The reason for this exclusion was that the researcher could not ensure that the information would be reliable and conclusive. No changes were made to the inclusion or exclusion criteria when the researcher conducted the literature search and data collection.

2.3.3 SEARCH WORDS

The researcher used the components of PICOT to form search strings to incorporate all the important concepts relevant to the research. The PICOT components in this research were as follows (P) nurses/student nurses, (I) potential value of teaching strategies, (C) no comparisons will be made, (O) to accommodate different learning styles (T) articles published between 2013-2022.

The search strings were developed in consultation between the researcher and her supervisors. The key words in articles discussing teaching strategies and their impact on nursing education were used to formulate the search strings. The researcher used the following keywords Whole brain learning and nursing and education; VARK and nursing and education; Kolb's learning styles and nursing and education.

The Whole brain learning is a model suggest that our brain have 4 quadrants, two quadrants on the left hemisphere and two on the right hemisphere and each quadrant represent a specific learning preference. This means that a student learns a concept by using more than one quadrant of the brain and not just the left hemisphere or right hemisphere. The whole brain learning style was used as a keyword, because it represents a specific learning style.

The Kolb's learning style implies that learning requires the basic cognitive process of abstract concepts that can then be applied inflexibly to a variety of situations and improve the learning process. Therefore, through an experience, knowledge is formed. The Kolb's learning style was used as a keyword, because it represents learning styles suggested in the research aim.

The VARK learning style is a framework that focus of four main types of learners: visual, auditory, reading/writing and kinesthetic. The idea that students prefer one or more than one modality to optimize their learning. The VARK learning style was included in this research, because the framework identifies four main modalities as learning style preference. The researcher used the following as inclusion criteria: articles published in in English; full text is accessible to the researcher; published less than 10 years ago (i.e. from 2013 to date) and studies are done in a nursing environment (practice or education). The table below describe the search strings used.

Table 2-1 Search Strings

Database	Population	Intervention	Comparison	Outcome	Time
Google Scholar	Nursing (Students or in Practice	Whole brain learning teaching strategies	No comparison	Potential value	Between 2013-2022
Google Scholar	Nursing (Students or in Practice	VARK teaching strategies	No comparison	Potential value	Between 2013-2022
Google Scholar	Nursing (Students or in Practice	Kolb's teaching strategies	No comparison	Potential value	Between 2013-2022
PubMed	Nursing (Students or in Practice	Whole brain learning teaching strategies	No comparison	Potential value	Between 2013-2022
PubMed	Nursing (Students or in Practice	VARK teaching strategies	No comparison	Potential value	Between 2013-2022
PubMed	Nursing (Students or in Practice	Kolb's teaching strategies	No comparison	Potential value	Between 2013-2022
CINAHL	Nursing (Students or in Practice	Whole brain learning teaching strategies	No comparison	Potential value	Between 2013-2022
CINAHL	Nursing (Students or in Practice	VARK teaching strategies	No comparison	Potential value	Between 2013-2022
CINAHL	Nursing (Students or in Practice	Kolb's teaching strategies	No comparison	Potential value	Between 2013-2022
Directory of Open Access Journals	Nursing (Students or in Practice	Whole brain learning teaching strategies	No comparison	Potential value	Between 2013-2022
Directory of Open Access Journals	Nursing (Students or in Practice	VARK teaching strategies	No comparison	Potential value	Between 2013-2022
Directory of Open	Nursing (Students or in Practice	Kolb's teaching strategies	No comparison	Potential value	Between 2013-2022

Access Journals					

Database	Population	Intervention	Comparison	Outcome	Time
OVID	Nursing (Students or in Practice	Whole brain learning teaching strategies	No comparison	Potential value	Between 2013-2022
OVID	Nursing (Students or in Practice	VARK teaching strategies	No comparison	Potential value	Between 2013-2022
OVID	Nursing (Students or in Practice	Kolb's teaching strategies	No comparison	Potential value	Between 2013-2022

2.4   LITERATURE SEARCH

The relationship between the research and its results were established by the extent of the relevant available data. An electronic literature search was conducted to identify available literature on the different aspects of the topic. The search was perform using various electronic databases: Medline (via PubMed), OVID, Directory of Open Access journals and internet search engines (Google Scholar) to collect data and literature search.

There were eight articles excluded after being initially included, because they did not answer the research question. See Table 2.2 below indicating the eight excluded articles. The electronic search resulted in 7928 primary potential articles and 19 secondary potential articles. The researcher scanned the articles and excluded 7886 primaries and 15 secondary articles as they are not relevant to this research. All articles excluded are described under their specific headings.

Figure 2.1. Flowchart describing the article selection process
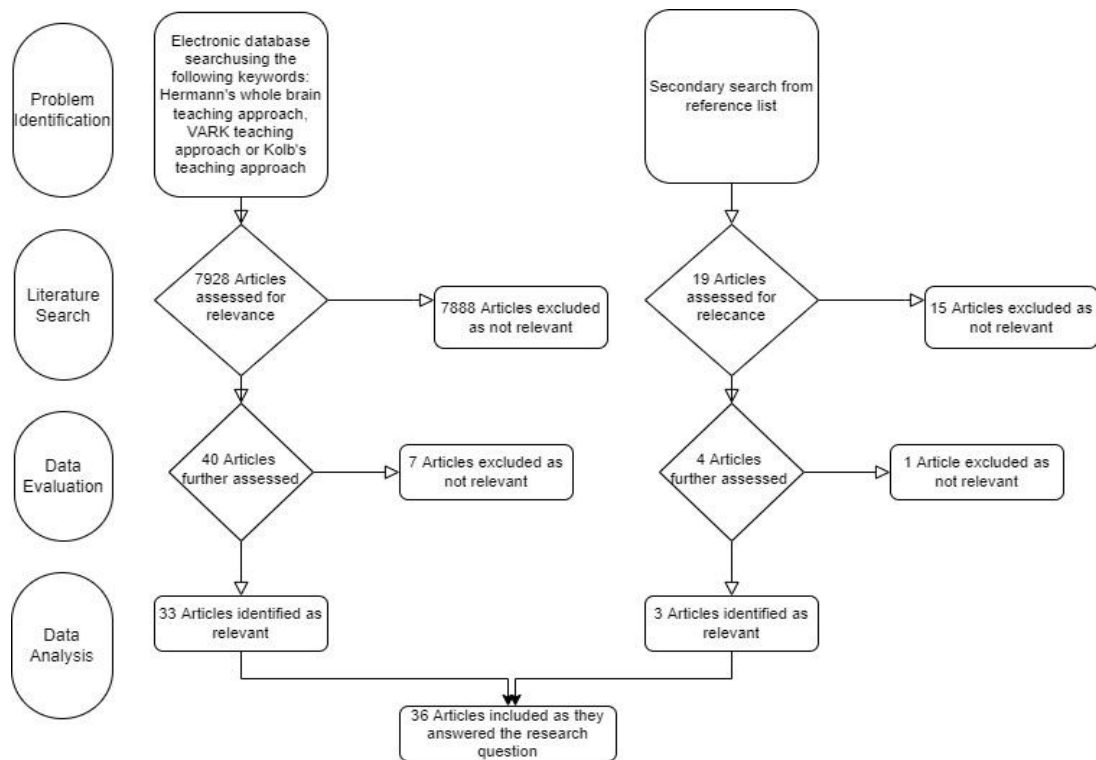
2.5 DATA EVALUATION

Data evaluation is a process of evaluating data using analytical and logical reasoning to examine each concept of the data collected (Brink, Van Der Walt and Van Rensburg, 2015:147).

The researcher collected the data as described above, on different days. Thereafter the researcher read the data and evaluated it. Thirty-six articles were included for they were relevant and answer the research question. A list of references of all thirty-six included articles with source number was formulated in an Excel spreadsheet. Table 2.2 represents the Data Evaluation Instrument.

Table 2-2 Data Evaluation Instrument

Article Number and Reference	Year Published	Context	Research design	Study setting	Sample Frame	Sample Size	Results / Outcomes

The titles were read and 44 articles which appeared to be relevant were saved as potential articles. 40 Articles from primary sources and 4 from secondary sources. The abstracts were read to determine the relevance, and 7 articles from the primary sources and 1 from the secondary sources were excluded as they were not relevant.

Full text copies of these were retrieved of those accessible to the researcher. The full text copies were then read by the researcher to determine relevance, and those that were relevant to provide an answer for the research question, was saved in a dedicated folder to be analysed.

Based on the above information captured, the decision was made about the quality of the article and if the article should be included. If the quality cannot be determined due to lack of information, the article was excluded.

Table 2-3 Articles Excluded as well as the Reason for Exclusion

SOURCE NUMBER	REFERENCE	REASON FOR EXCLUSION (INCLUDING DUPLICATES)
1.	Putra, A., Soegiyanto, S. and Ridlo, S., 2018. P Developed a Standard Instrument for Measuring the Skills of Teaching Elderly Brain Gymnastics for Nursing Students. Journal of Research and Educational Research Evaluation, 7(1), pp. 37-43.	- This research aimed to develop a standardized instrument for measuring the skills of teaching elderly brain gymnastics for nursing students. Therefore, this article doesn't focus on learning styles.
2.	Qalehsari, M.Q., Khaghanizadeh, M. and Ebadi, A., 2017. Lifelong learning strategies in nursing: A systematic review. *Electronic Physician*, 9(10), pp. 5541.	- This article focused on lifelong learning strategies in nursing and not on learning styles in nursing education.
3.	Sáiz-Manzanares, M.C., Escolar-Llamazares, M.C. and Arnaiz González, Á., 2020. Effectiveness of blended learning in nursing education. International Journal of Environmental Research and Public Health, 17(5), pp.1589.	- This article focused on blended learning, which is a combination of online and traditional face to face learning. There is no indication of the value of learning styles in this article.
4.	Taylor, L.D., 2014. The affective domain in nursing education: Educators' perspectives. (Doctoral dissertation, The University of Wisconsin-Milwaukee).	- This article explored the meaning, experiences and the method of teaching in the affective domain described by experience nurse educators and therefore, doesn't answer the research question.
5.	Garrino, L., Bagnato, S. and Dimonte, V., 2013. The reflective journal: A tool for enhancing experience-based learning in nursing students in clinical practice.	- This article focused on the use of a reflective journal in nursing education and not on learning styles in nursing education.
6.	Adhami Moghadam, F., Ahmadi, S., Sahebalzamani, M. and Miri, J., 2018. Relationship between learning style and evidence-based practice in nurses working in hospitals affiliated to Kermanshah University of Medical Sciences. Journal of Nursing Education, 7(4), pp.1-8.	- In this article, only the abstract is in English and the full text in Islamic (Arabic). Therefore, the article doesn't comply with the inclusion criteria.
7.	Cuevas, J., 2015. Is learning styles-based instruction effective? A comprehensive analysis of recent research on learning styles. Theory and Research in Education, 13(3), pp.308-333.	- This article focused on learning styles in public education and not specific nursing education. Therefore, this article doesn't answer the research question.
8.	Newton, P.M. and Miah, M., 2017. Evidence-based higher education–is the learning styles 'myth' important. Frontiers in Psychology, 8, pp.444.	- This article focused on learning styles in higher education and not specific nursing education. Therefore, this article doesn't answer the research question

2.6   DATA ANALYSIS

Whittemore and Knafl (2005), describe data analysis as a process in which data from a primary source are organized, coded, categorized and summarized to form an integrated conclusion regarding the research problem (Whittemore & Knafl, 2005:547). According to Whittemore and Knafl (2005), to reach the goals of the data analysis stage, the researcher needs to complete an unbiased interpretation of primary sources (Whittemore & Knafl, 2005:547).

The data analysis process of of constant comparing the data was followed, as recommended by Whittemore and Knafl, (2005). The thirty-six articles identified during the data evaluation stage, was evaluated carefully by the researcher to identify the themes. The researcher designated preliminary theme and the themes were described.

Each theme was then interpreted to answer the research question based on the title. The researcher evaluated the data before the conclusion was reached. The extracted articles were evaluated for inclusion in the batch for review according to the criteria stipulated in Literature search. Each article was compared and synthesized to integrate the information to address the research question, as described by Whittemore and Knafl (2005:549). The information was captured in a Microsoft Excel spreadsheet. 33 Articles from primary sources and 3 articles from secondary sources were included in this research study for answering the research question.

The final list of articles will then be analysed looking for patterns, comparisons and contrasts, and relationships. The themes and sub-themes were presented in a conceptual framework to illustrate meanings and relationships, and lastly discussed as related to the study. The tables below describe the 36 Articles included in this research study.

Table 2-4 Included Articles

Article Number and Reference	Year Published	Context	Research design	Study setting	Sample Frame	Sample Size	Results / Outcomes
1. Amaniyan, S., Pouyesh, V., Bashiri, Y., Snelgrove, S. and Vaismoradi, M. 2020. Comparison of the conceptual map and traditional lecture methods on students' learning based on the VARK learning style model: a randomized controlled trial. *SAGE Open Nursing*, 6.	2020	Education	Randomized control trail	Nursing anaesthetic and Midwifery students	Convenience sampling	160 participants	Useful for students with a visual learning style but not necessarily so for all learning styles.
2. Madu, O.T., Ogbonnaya, N.P., Chikeme, P.C. and Omotola, N.J., 2019. A study to assess the learning style preference of undergraduate nursing students in southeast, Nigeria. *Asian Journal of Nursing Education and Research*, 9(2), pp. 177-184.	2019	Education	Descriptive cross-sectional study	Undergraduate nursing students from 2nd–5th year	Convenience sampling	310 participants	There is a wide range of learning style preferences among undergraduate nursing students, with a relatively even spread learning style preference across all four learning styles. However, two learning styles were dominant.
3. Sinaga, J., Siregar, R., Amila, A. and Sembiring, R., 2018. The VARK learning style of nursing and midwifery students. *Indonesian Nursing Journal of Education and Clinic (INJEC)*, 2(2), pp.158-161.	2015	Theory to practice	Descriptive cross-sectional study	1st and 2nd year nursing and midwifery students	Stratified random sampling techniques	241 participants	The nursing and midwifery students have varied on the learning preferences however the majority of the students used multi-modal. Therefore, an active learning method was recommended.
4. Ab Latif, R., bt Yusof, F., Mui, T.Y. and Ibrahim, N.S. 2019. Learning styles among Year 1 Semester 1 nursing students in	2019	Education	Descriptive cross-	Semester one diploma nursing students	Convenience sampling	51 participants	This finding correlate environmental as one of influencing factors that influence students' learning style. However, the

College of Nursing Kubang Kerian, Kelantan. *The Malaysian Journal of Nursing (MJN)*, *10*(4), pp. 3-11.			sectional study				most important aspect is the students themselves, their attitude of eagerness in improving knowledge and discipline in performing effective learning skill.
5. Abou Shousha, A.A. and Abd El Rahman, R.M. 2014. Learning styles of nursing administration students and their teaching mode efficiency. *Life Science Journal*, *11*(2s), pp. 236-246.	2014	Education	Comparative cross-sectional study	Nursing students enrolled in nursing administration course, 3rd and 4t year	Stratified random sampling techniques	353 participants	The results of this study revealed that there are relationships between academic studying year and both learning styles and teaching mode.
6. Mitchell, E.K., James, S. and D'Amore, A., 2015. How learning styles and preferences of first-year nursing and midwifery students change. *Australian Journal of Education*, *59*(2), pp. 158-168.	2015	Education	Cross-sectional survey with pre-post design	Self-reported mature age students (i.e. not school-leavers) with had previous healthcare experience worked as Licensed Practical Nurses/Enrolled Nurses.	Convenience sampling	96 participants completed pre- ad post test	Both learning style tools showed similar levels of change over a semester of undergraduate teaching.
7. McCrow, J., Yevchak, A. and Lewis, P., 2014. A prospective cohort study examining the preferred learning styles of acute care registered nurses. *Nurse Education in Practice*, *14*(2), pp.170-175.	2014	Education	Prospective cohort study design	Registered Nurses practicing in acute care environments	Volunteer participants	142 participants completed the survey	RNs in this study preferred learning through sight and physical sensation rather than abstract theoretically orientated methods. We have also discovered that very few of the RNs preferred to learn through reflective processes or through system-orientated
8. Li, Y.S., Yu, W.P., Liu, C.F., Shieh, S.H. and Yang, B.H., 2014. An exploratory study of the relationship between learning styles and academic performance among students in different nursing programs. *Contemporary Nurse*, *48*(2), pp. 229-239.	2014	Education	Descriptive and exploratory design	285 female nursing student's participants (50 students from each grade level)	Random cluster sampling	285 participants	Learners and educators can benefit by recognizing the different types in order to reach the highest level of academic performance and promote nursing education.
9. Ibrahim, R.H. and Hussein, D.A., 2016. Assessment of visual, auditory, and kinesthetic learning style among undergraduate nursing students. *Int J Adv Nurs Stud*, *5*(1), pp. 1-4.	2015	Education	Non-experimental study	The target population was an undergraduate nursing students (210) students (60 males and 150 female)	Stratified random sampling	210 participants	Females preferred auditory learning style more than males, while males preferred kinesthetic learning style more than females.

10. Stirling, B.V. and Alquraini, W.A., 2017. Using VARK to assess Saudi nursing students' learning style preferences: Do they differ from other health professionals?. *Journal of Taibah University Medical Sciences*, *12*(2), pp.125-130.	2017	Education	Cross-sectional survey design	125 responses were received. This represented approximately 45% of the 278 women in the nursing programme.	Volunteer participants	125 participants	While this study found no relationship between the read/write preference and high GPA, it did reveal that having a strong kinesthetic learning style preference was a positive and significant predictor of academic performance.
11. Kouhan, N., Janatolmakan, M., Rezaei, M. and Khatony, A., 2021. Relationship between Learning Styles and Academic Performance among Virtual Nursing Students: A Cross-Sectional Study. *Education Research International*.	2021	Education	Cross-sectional study	Virtual nursing students	Convenience sampling method	237 Virtual participants	Results showed the dominant learning styles in strong and weak students were kinetic and auditory, respectively. However, most students were uni-modal in both groups. No statistically significant difference between learning style and academic performance. Further studies with different designs are recommended.
12. Shelile, Z.M. and Ntsóhi, M.M.E., 2021. Learning styles of National University of Lesotho nursing students: foundation in improving teaching-learning process. *Indian Journal of Nursing Sciences. Sciences,* 6(4), pp.77-83.	2021	Education	Quantitative cross-sectional design.	National University of Lesotho (NUL) nursing students	Conveniently sampled	149 participants from a population of 189	The responses indicated that kinesthetic is the predominant learning style among NUL nursing students, addressing the student's learning preference can enrich the learning environments. This preference jointly with the read/write preference would suggest that teaching strategies that include hands-on experience and activities will be the most successful.
13. Zhu, H.R., Zeng, H., Zhang, H., Zhang, H.Y., Wan, F.J., Guo, H.H. and Zhang, C.H., 2018. The preferred learning styles utilizing VARK among nursing students with bachelor degrees and associate degrees in China. *Acta Paulista de Enfermagem 31*, pp.162-169.	2018	Education	Cross-sectional study	159 Enrolled bachelor degree nursing students and 199 enrolled associate degree nursing students	Conveniently sampled	358 Participants	Significant difference between bachelor degree nursing students and associate degree nursing students. The majority of bachelor degree nursing students preferred a multi-modal learning style, while most of the associate degree nursing students preferred the uni-modal learning style.

14. Grech, J., 2022. Exploring nursing students' need for social presence and its relevance to their learning preferences. *Nursing Open*, *9*(3), pp. 1643-1652.	2021	Education	Qualitative descriptive design	Undergraduate nursing students	Purposive sampling	67 Participants	Despite varying learning preferences, all students remarked the need for social presence in online education.
15. Van Der Wege, M., 2020. VARK: Linking Teaching Strategies to Preferred Learning Styles. *International Journal of Nursing,* 7(2), pp. 1-5.	2020	Education	Descriptive design utilized self-reported survey data.	Convenience sample	Convenience sample	94 Participants	Classroom activities are a fun way to capture students' attention and facilitate engagement. Faculty have the opportunity to incorporate a variety of activities into the classroom that meet the learning needs of diverse students. Those activities that appeal to the most students can be implemented to increase success for the class as a whole.
16. Wong, J.S. and Chin, K.C., 2018. Reliability of the VARK questionnaire in Chinese nursing undergraduates. *US-China Education Review*, *8*(8), pp.332-340.	2018	Education	Multi-trait-multi-method (MTMM) is a design	Nursing Undergraduates	Convenience sample	177 Participants	It may indicate that many university students are capable of managing different situations or different kinds of knowledge with different sensory modalities in order to obtain the best outcome or it may relate to the nature of the discipline as the same phenomenon is only found in health-related or science subjects. This may not be the case in other disciplines.
17. Olímpio, C.G., Fulquini, F.L., Garbuio, D.C. and Carvalho, E.C.D., 2021. Learning style and level of satisfaction in nursing clinical simulation. *Acta Paulista de Enfermagem*, *34*.	2020	Simulated clinical experiences	Exploratory descriptive	Undergraduate nursing students	Convenience sampling	46 Participants	The results show the importance of professors choosing the teaching strategies that can contemplate the different learning styles of the students
18. Absin, M.A.P., Caorong, I.R., Cubero, L.M.L., Eslit, S. and Abad, G.R. 2021. Learning styles and academic performance among Bachelor of Science in Nursing. *Learning*, *4*(01).	2021	Practice	Descriptive correlational	Bachelor of Science in Nursing students	Purposive sampling	136 Participants	VARK models are evident among nursing students as their mode of learning style. Furthermore, it is concluded that the preferred learning styles has no significant difference as to Age, Gender, Year level, Socioeconomic status. It has

							also found that preferred learning styles of the nursing student has no significant association as to its Academic Performance.
19. Frantz, J. and Mthembu, S., 2014. Learning styles among nursing students, the implications for higher education institutions: a systematic review: part 1: contemporary issues in nursing. *South African Journal of Higher Education*, *28*(6), pp. 1814-1829.	2014	Practice	Systematic review	Articles of learning styles of undergraduate nursing students	Non-probability (purposive, quota, convenience and snowball sampling)	11 Articles	At present, the strength and extent of the evidence base for the inclusion of learning styles in the undergraduate setting is positive.
20. Mohammadi, I. and Thaghinejad, H., 2014. Learning styles of nursing students in Iran using the Kolb\'s Theory: A review study. *Journal of Basic Research in Medical Sciences*, *1*(1), pp. 8-14.	2014	Practice	Pre-test post-test quasi experimental design study	Pre-test post-test quasi experimental design study	Purposive sampling	10 Articles	Literature review showed that students have different learning styles not only in Iran but also in other countries
21. Hallin, K., 2014. Nursing students at a university—a study about learning style preferences. *Nurse Education Today*, *34*(12), pp. 1443-1449.	2014	Practice	A descriptive cross-sectional study	Nursing students	Convenience sampling	263 Participants	Based on the results, most tuition should be varying and interactive, discussed and confirmed between teachers and students and between cooperating teachers
22. Aina-Popoola, S. and Hendricks, C.S. 2014. Learning styles of first-semester baccalaureate nursing students: A literature review. *Institute for Learning Styles Journal*, *1*(1), pp. 1-10.	2014	Practice	Literature Review	First-Semester Baccalaureate Nursing	Purposive sampling	34 Articles	Nursing students differ in various ways from the learning styles to learning preferences. Orientation to studying, motivation, perseverance, and approaches to learning will differ among the first-semester nursing students. Research also indicated that demographics and age affect the learning styles of nursing students in the first year,

							but there were no significant differences in the final year of nursing.
23. Katowa-Mukwato, P., Chapima, F., Nambala-Sianchapa, B. and Mwiinga-Kalusopa, V., 2017. Learning styles and intelligence types versus academic performance of nursing students of the University of Zambia. *Journal of Nursing Education and Practice*, 7(10), pp. 83-90.	2017	Practice	Descriptive correlation study	Nursing students	Purposive sampling	146 Participants	Concluded that the negative correlation between learning styles and intelligence types, and academic performance could be an indication that the teaching methods utilized for nursing students are diverse and therefore capable of promoting learning across different learning styles and intelligence types without necessarily favoring a specific style or type.
24. Gonzales, L.K., Glaser, D., Howland, L., Clark, M.J., Hutchins, S., Macauley, K., Close, J.F., Leveque, N.L., Failla, K.R., Brooks, R. and Ward, J., 2017. Assessing learning styles of graduate entry nursing students as a classroom research activity: a quantitative research study. *Nurse Education Today*, (*48*), pp. 55-61.	2016	Practice	A descriptive design	Graduate and baccalaureate nursing students	Volunteer participants	202 Participants	As a classroom activity, this research project design engaged students and faculty in data collection, analysis, and dissemination of results.
25. Gayathiri, M.N., Hendricks, M.M.R. and Menon, M.R., 2019. Learning styles among nursing students in selected college of nursing, Bangalore. *International Journal of Research in Medical and Basic Sciences*. 5(1).	2019	Practice	Quantitative approach and cross sectional descriptive design	Undergraduate nursing students	Proportionate Stratified random sampling	260 Participants	This study reveals that majority of the nursing students prefer kinesthetic learning style. This is a valuable finding which can help nurse educators provide effective learning strategies for nursing students through practical skill based training, preparing them to be skilful nurses.
26. McAllister, B. 2015. *Nursing student preferred learning styles and predicted NCLEX® success* (Doctoral dissertation, College of Saint Mary).	2015	Practice	Quantitative non-experimental	PN and RN nursing students	Convenience sample	113 Participants	They concluded that nurses are varied in their preferred ways of learning and that the finding is significant finding for the educator of practicing nurses.

27. Razaghpoor, A., Namdar, P., Panahi, R., Yekefallah, L., Javanmardi, E. and Dehghankar, L., 2021. Learning Styles and Their Relationship with Self-Esteem and Self-Efficacy among Nursing Students in Qazvin. *Modern Care Journal*, *18*(1).	2021	Practice	Cross-sectional study	Nursing students	Convenience sample	150 Participants	This study identified that most of the nursing students preferred one learning style, and the most preferred one was the auditory style. Determining students' preferences for learning style is the first step to improve their educational outcomes.
28. Shirazi, F. and Heidari, S., 2019. The relationship between critical thinking skills and learning styles and academic achievement of nursing students. *The Journal of Nursing Research*, *27*(4), pp. 38.	2019	Practice	Cross-sectional study	Cross-sectional study	Simple random sampling	139 Participants	Results: mean scores of critical thinking skills and subdomains were low among nursing students who were surveyed for this study. Strategies may be used to improve critical thinking in this population include frequent use of individual and group active learning strategies, empowering instructors to prepare tests that target high levels of cognitive domain and present probing questions, encouraging students and instructors to participate in problem analysis and discussions, providing different ideas and opinions, and promoting self-directed learning
29. Almasi, K., Bavani, S.M. and Mohammadpour, Y. 2018. Examining the preferred learning styles (PLSs) of nursing and midwifery students of Urmia University of Medical Sciences. *Middle East Journal of Family Medicine*, *7*(10), pp. 241.	2018	Practice	Descriptive cross-sectional	Students in nursing and midwifery	Purposive sampling	100 Participants	This means that the common learning style of nursing and midwifery students in Urmia is the visual style where learners learn the content better by viewing and presenting information such as viewing images, symbols and diagram
30. Azari, S., Mokhtari, S., Mousavi, H., Mohammadi, M., Aliyari, A., Salimi, M. and Azari, G.H., 2015. Relationship between learning styles and interpersonal communication skills of nursing student in Medical Sciences Tehran University in	2015	Practice	Regular detailed cross-sectional analysis	Nursing undergraduate in Medical Sciences	Non-accidental single sampling system	320 Participants	The level of students' communicative abilities is independent of their learning method and also to their information about it. Also, the nursing students' achieved score did not have a satisfactory level.

2012. *Journal of Medicine and Life*, *8(*3), pp. 178.							
31. Subramoney, L., 2019. *Preferred learning styles of first and third year nursing students in a diploma programme at a college in KwaZulu-Natal: a comparative study*. (Doctoral thesis).	2019	Practice	Quantitative cross-sectional survey	First and Third Year Nursing students	A census sampling survey method	290 Participants	The majority of the respondents were found to be multi-modal (77, 6%), preferring two or more sensory modalities, while the remaining 22, 4% were found to have uni-modal learning style preferences. The most dominant learning style preference iii was Kinesthetic, with a mean score of 6.54/SD=2.607 and the Visual modality was the least preferred (M=4.36/SD=2.315).
32. Baraz, S., Memarian, R. and Vanaki, Z., 2014. The diversity of Iranian nursing students' clinical learning styles: A qualitative study. *Nurse Education in Practice*, *14*(5), pp. 525-531.	2014	Practice	Qualitative design	Baccalaureate nursing students	Purposive sampling	15 Participant	According to the findings of this study, nursing students in Iran adopt different learning strategies to promote their learning. Clinical setting is an unstable learning environment wherein students are faced with unpredictable and stressful situations.
33. Fogg, L., Carlson-Sabelli, L., Carlson, K. and Giddens, J., 2013. The perceived benefits of a virtual community: Effects of learning style, race, ethnicity, and frequency of use on nursing students. *Nursing Education Perspectives*, *34*(6), pp. 390-394.	2013	Practice	Comparative approach	First-semester baccalaureate nursing students	Convenience sample	350 Participants	In light of the under representation of minority students in nursing education, this finding suggests the need for further exploration of the relationships among ethnicity, race, learning style, and learning outcomes.
34. Fisher, G., 2015. *An investigation of learning style preferences of nurses in training at two nursing schools in public health facilities in Cape Town* (Master's thesis, University of Cape Town).	2015	Practice	Non-experimental cross-sectional descriptive survey	Learner nurses i.e. enrolled/staff nurses and auxiliary nurses	Convenience sample	133 Participants	The results of the study illustrate that most of the study population displayed a multi-modal learning style preference with the majority being either quad modal or uni-modal within the multi-modal style.
35. Purba, I.E., Sinaga, J., Siregar, R. and Sembiring, R., 2015. Learning preferences	2014	Translate theory into practice	Descriptive cross-	Nursing and Midwifery Students	Stratified random sampling	241 Participants	Based on the study, it was concluded that nursing and midwifery students had a

			sectional study	Nursing and Midwifery Students			variety of learning preferences but the majority used multi-modal.
36. Rassool, G.H. and Rawaf, S., 2007. Learning style preferences of undergraduate nursing students. *Nursing Standard*, *21*(32), pp .35	2016	Practice	Classic descriptive survey using quantitative methods	Undergraduate nursing students	Convenience sampling	135 Participants	The results of this study implied that with the variations in the learning styles identified, the possibility exist that diversity of educational strategies, can make the educational practice more satisfying and productive

2.7 CONCLUSION

This chapter provided a description of the methodology followed to address the research aim. The following chapter provides a description of the findings, as well as a discussion thereof.

CHAPTER 3: DATA EVALUATION AND ANALYSIS

3.1   INTRODUCTION

In this chapter the researcher discusses the process of data evaluation as well as data analysis to answer the research question. A summary of the findings and statements are set out in line with the steps of an integrative literature review.

3.2   DATA EVALUATION

The researcher conducted a literature search in accordance with the methods of integrative literature reviews, which resulted in 7928 initial articles. The use of keywords in in the form of search strings guided the search in a specific direction. The different search strings used, gave rise to the inclusion of relevant articles and exclusion of irrelevant articles.

The researcher aimed to pursue rigour by analyzing all the articles. This resulted in forty-four articles which were found to be potentially relevant. this process was done through the collection of data on five data bases viz. Google Scholar, Pubmed, OVID, CINAHL and Directory of Open Access Journals.

The researcher collected the data on different days. Thereafter the researcher read the data and evaluated it. After evaluation of the forty-four articles, the researcher eliminated eight articles, which was not relevant. These eight articles were described in Chapter 2 under excluded articles. A list of references of the remainder thirty-six included articles with source number was formulated in the table below. Table 3.1 represent the relevant included articles.

3.3   DATA ANALYSIS

Whittemore and Knafl (2005), describe data analysis as a process in which data from primary sources are organized, coded, categorized and summarized to form an integrated conclusion regarding the research problem (Whittemore & Knafl, 2005:547). According to Whittemore and Knafl (2005), to reach the goals of the data analysis stage, the researcher needs to complete an unbiased interpretation of primary sources (Whittemore and Knafl, 2005:547). The data analysis process of constant comparing the data was followed, as recommended by Whittemore and Knafl, (2005).

The thirty-six articles identified and included in this research study represented qualitative studies (27 articles), quantitative studies (6 articles), mixed methods studies (1 article) and meta-analysis (2 articles) during the period of 2013 to 2022.

The included articles represented a variety of populations and different countries, both male and female, and a wide academic spectrum ranging from enrolled and auxiliary nurses, undergraduate nursing students, both diploma and baccalaureate nursing students and postgraduate registered nursing students.

During the data evaluation stage, the researcher carefully evaluated the thirty-six articles which was included in this study. The researcher identified the themes, each theme was then interpreted to answer the research question based on the title of the publication.

3.3.1 CONSTANT COMPARISON METHOD

The constant comparison method has four phases, namely the data reduction phase, the data display phase, the data comparison phase and the drawing of a conclusion and verification phase (Whittemore & Knafl, 2005:550).

3.3.1.1 DATA REDUCTION

Whittemore and Knafl (2005:550), describe data reduction as a process of abstracting data from primary research articles, organizing the data to create themes which facilitate data analysis.

During the data reduction phase, the researcher analysed the dominant learning preference discussed in each of the thirty-six included articles. Therefore, the themes that was created was as follows:

- Time,
- Environmental aspects,
- Visual dominant,
- Auditory dominant,
- Reading/writing dominant,
- Kinesthetic dominant and
- Multi-modal

3.3.1.2 DATA DISPLAY

The data display is the second part of the process, where the data obtained are formulated in visual display, for example a graph or chart, etc. This display of data improves the understanding of a large

number of data synthesize patterns or connections (Ridley, 2012:64). The researcher formulated a pie graft and a table complementing the graph.

Table 3-1 Data Display Instrument

Themes	Time	Environment	Visual	Auditory	Reading/ writing	Kinesthetic	Multi-modal
No. Of articles	1/36	2/36	5/36	1/36	1/36	7/36	19/36
%	2,77%	5.55 %	13.88%	2,77%	2,77%	19.44%	52.77%

Pie Chart 3.1: Data Display Chart

Legend: ■ Time variable. ■ Environment. ■ Visual. ■ Auditory. ■ Reading/writing. ■ Kinesthetic. ■ Multimodal.
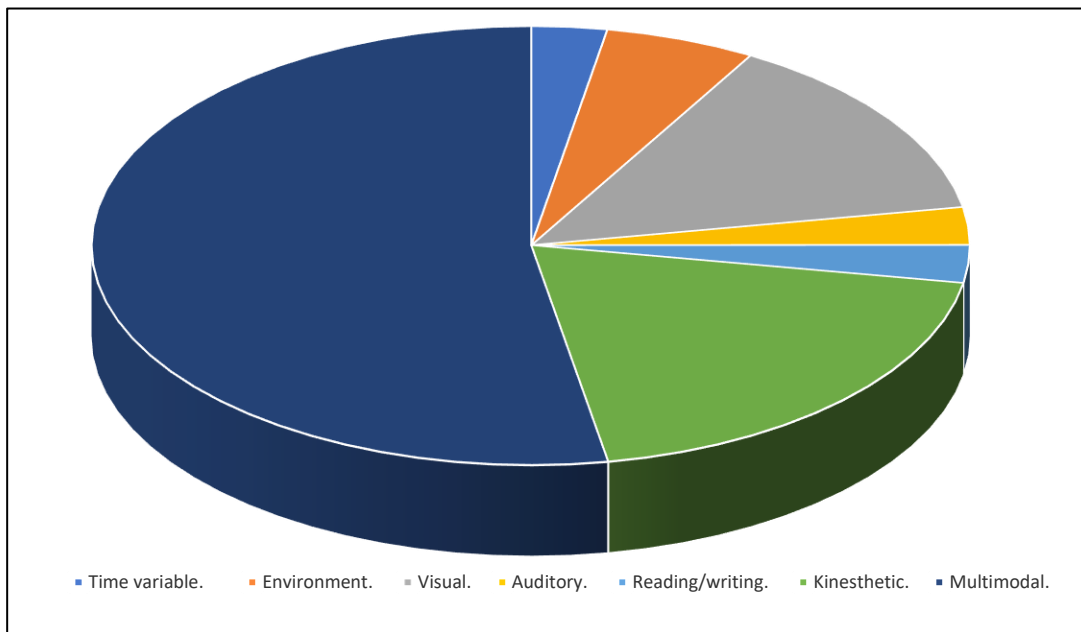
3.3.1.3 DATA COMPARISON

The third part of the process is the data comparison phase. Data comparison involves a repetitive process in studying the data displays for patterns, themes, commonalities, and differences across

the review sample (Whittemore & Knafl, 2005:551). This part of the process is important in drawing a conclusion, which is the final part of the data analysis process.

The researcher compiled a data display instrument and a Pie chart, as described in the previous section. Furthermore, she colour-coded the data collection instrument, using the same colours as in the pie chart to ensure the correct conclusions were conceptualized.

3.3.1.4 CONCLUSION DRAWING AND VERIFICATION

This is the final phase of the data analysis process. This part of the process supports the developing of clarifications produced during the previous stages. This part is important to ensure truthful conclusions were made.

3.4   FINDINGS

Thirty-six articles were included that met the inclusion criteria and were considered relevant to answer the research question. During the data analysis process, these articles were sorted according to themes. The themes were as follows: time, environmental aspects, visual dominant, auditory dominant, reading/writing dominant, kinesthetic dominant and multi-modal learning preference.

3.4.1   TIME

One of the articles (2,77%) (James & D'Amore, 2015:164), described time as a variable in learning. This article explains the importance of learning preference as a dynamic process or an evolving characteristic that an individual has and therefore change as a person mature, not related to a specific teaching strategy. James and D'Amore (2015:164) described the change in the first-year nursing and midwifery students' preferred learning style after one semester. The pre-test post-test study indicated that the students changed their learning style to multi-modal within the first semester. According to the study, the students changed their learning preference as time elapse (James & D'Amore, 2015:164).

3.4.2   ENVIRONMENT

Two of the articles (5.55%) (Aina-Popoola & Hendricks 2014:8; Baraz, Memarian & Vanaki 2014:530) described environment as a theme, where the environment determines the learning

preference. The environment can be a physical setting or an individual's background, culture or economic status.

Aina-Popoola and Hendricks (2014:8) indicated that an individual's demographic characteristics influenced the learning style preference of the first-year undergraduate nursing and midwifery students, however with regarding to the final year students, there were no significant difference.

In the second article, Baraz, Memarian and Vanaki (2014:530) explained how the physical environment can influence an individual's learning style. According to them, a student experienced a more structured form of learning as appose to the clinical setting, which appears to be unplanned and more direct interaction. This study focused on how the students adopted their learning styles to the environment to promote their learning. Baraz, Memarian and Vanaki (2014:529) explains that the students enhanced their own learning through witnessing their instructors, clinical staff nurses, physicians, and peers in the clinical setting. They suggest that by working and networking with role models benefits the students and resulted in empowering their professional skills.

3.4.3 VISUAL DOMINANCE

Five articles (13.88%) (Pouyesh, Bashiri, Snelgrove & Vaismoradi, 2020:6; Ibrahim & Hussein, 2016:3; Gonzales, Glaser, Howland, Clark, Hutchins, Macauley, Close, Leveque, Failla, Brooks & Ward, 2017:59; Almasi, Bavani & Mohammadpour, 2018:241), indicated visual stimuli as the preferred learning preference.

Pouyesh, Bashiri, Snelgrove and Vaismoradi, (2020:6), aimed to find a comparison between conceptual maps and the traditional lecturer method by using the VARK learning style model. Their results indicated that when teaching with the conceptual map method there was a significant impact on the students' learning as oppose to traditional lecture. According to them, the conceptual map method is a graphical teaching and learning method, which improves complex information perception as well as facilitating creativeness and thoughtful critical thinking.

Ibrahim and Hussein, (2016:3) believed the reason visual learning preference is dominant among some individuals, is because visual learning is easy. In their research, they assessed visual, auditory, and kinesthetic learning styles among undergraduate nursing students. They explained their results as the visual learning style to be the favourite, because an individual uses less power to learn, therefore learning become a passive process as oppose to kinesthetic learning style which is an active process. They further explained a variance between male and female learning styles. According to them, males prefer more kinesthetic and visual learning as well as an informal

environment, where females prefer a classroom setting with desks and chairs with a more visual and auditory preferred learning style.

Gonzales, Glaser, Howland, Clark, Hutchins, Macauley, Close, Leveque, Failla, Brooks and Ward (2017:59) conducted a quantitative research study where they assessed the learning styles of graduate entry nursing students as a classroom research activity. The results after a five-year cohort study, they reported graduate entry nurses as being pre-logical minded who are facts-based and prefer pictures, diagrams, flowcharts and demonstrations, therefore visual and verbal. They also noted that these students enjoy working in a group together to enhance problem-solving.

Almasi, Bavani and Mohammadpour (2018:241) examined the preferred learning styles of nursing and midwifery students of Uramia University of Medical Sciences. Their findings indicated that the most popular learning style preference in their study was the visual learning style. According to them, students learned better by viewing images, symbols and diagrams. They concluded that the level of human learning by sight are about 75% more that with the other senses.

Absin, Caorong, Cubero, Eslit and Abad, (2021:263) researched the learning styles and academic performance among bachelor nursing students. They indicated that although the nursing students preferred a variety of learning styles to learn as described by the VARK model, this study indicated that the majority of the nursing students preferred visual learning style. They concluded that the preferred learning styles had no significant difference as to age, gender, year level or socioeconomic status and that the learning styles of the nursing students had no significant association with their academic performance.

3.4.4   AUDITORY DOMINANCE

The auditory learning style was dominant in one of the articles (2.77%). Razaghpoor, Namdar, Panahi, Yekefallah, Javanmardi and Dehghankar (2021:5) conducted a study on learning styles and their relationship with self-esteem and self-efficacy among nursing students in Qazvin. The majority of nursing students preferred a single learning style over bimodal or multi-modal learning styles, and the most preferred style was the auditory style. However, this study discovered there was no relationship between the students' self-esteem and their learning style.

3.4.5   READING AND WRITING DOMINANCE

Reading and writing as a dominant or preferred learning style was discussed in one of the articles (2.77%). Rassool and Rawaf, (2013:29) explored learning styles preference of undergraduate

nursing students. The results of their study displayed the relative quantity of the students who preferred a single mode of information presentation. According to them, 29% of the students preferred reading and writing as a learning style. They also explained that the study inferred that variations in learning styles were definite and a diversity of educational strategies could make the educational practice and learning more satisfying and productive.

3.4.6   KINTESTHETIC DOMINANCE

Kinesthetic learning preference were indicated as being dominant in seven of the articles (19.44%). Stirling and Alquraini (2017:127) conducted a study using VARK learning style model to assess Saudi nursing students 'learning style preferences to determine how it differed to other health professionals. They explained that the kinesthetic learning style was the most preferred, which might be related to nurses performing a variety of clinical skills and therefore they might have a stronger preference to hands-on learning. They indicated that a similar preference was observed in a group of Australian students who preferred by learning-while-doing.

Zhu, Zeng, Zhang, Wan, Guo and Zhang (2018:168) focused on the preferred learning style utilizing the VARK model among nursing students with bachelor's degrees and associate degrees in China. They explained that a learning style is a relatively stable individual characteristic and is shaped over a period of time by several factors like demography, internal personality traits, external teaching environment, etc. The results of their study indicated that the kinesthetic learning style had a high preference. They recommended that educators should focus on hands-on teaching methods, which could enhance learning efficiency and learning achievements among students.

The study of Olimpio, Fulguini, Garbuio and Carvalho (2021:6) focused on learning styles and levels of satisfaction in nursing clinical simulation. They explained that students seem to understand information better by actively partake, discuss, work, apply or explain the information. Their study indicated how the students were able to improve their learning by using a realistic simulation to build competes and critical thinking by participation and interaction. The kinesthetic learning style obtained the highest value both with satisfaction and with cognitive simulation.

Gayathiri, Hendricks and Menon (2019:52) reviewed learning styles among nursing students from a selected college of nursing in Bangalore. The results showed that the majority of the students preferred a kinesthetic style of learning. They suggested that nursing educators use effective skill-orientated practical strategies to promote practical skilled-based training for skilful nurses.

Shousha and Rahman (2014:241) studied the learning styles of nursing administration students and their teaching mode efficiency. They clarified that the majority of nursing students in their study preferred a uni-modal learning style, which was the kinesthetic learning style for information presentation. They concluded that when an educator understands the individual's learning style it is beneficial to the individual to be successful in educational undertakings. In turn, it leads to an opportunity to affect positive change through the improvement in educational strategies, increased nursing graduates, and a greater opportunity for nurse educators to meet the demands of an ever-changing healthcare environment.

Shelile and Ntsóhi (2021:82) explored the learning styles of the National University of Lesotho's nursing students, with the purpose of improving the teaching-learning process. They indicated that the students had various learning styles. The feedback from the study participants pointed out that the kinesthetic learning style was the predominant learning style preferred among nursing students at the University of Lesotho. They suggested that by addressing the students' learning preference one can enrich the learning environments and implementing teaching strategies that include hands-on experiences and activities.

McAllister (2015:71) submitted a dissertation on nursing students' learning styles and the National Council Licensure Examination (NCLEX). The results of the study determined that the kinesthetic sensory mode as well as reading and writing learning style was preferred and had a positive and significant predictor to academic performance. The finding indicated that there is a need for using multiple educational methods in a classroom would target all or most of the students 'learning style and should lead students to successfully pass the NCLEX® on the first attempt.

3.4.7   MULTI-MODAL

Multi-modal was seen as the most popular learning preference. Nineteen of the articles (41.66%) indicated that using multiple stimuli promote learning and are preferred by most. Multi-modal refers to learning preferences that highlight multiple modalities in the real learning environment. This is when the individual has two (bi-modal), three (tri-modal) or four (quad-modal) learning style preferences which optimize learning (Gilakjani, Ismail & Ahmadi, 2011:1325).

McCrow, Yevchak and Lewis (2014:5) researched a prospective cohort study where they examined the preferred learning styles of acute registered nurses. They identified that the majority of registered nurses' preferred learning styles were combining sight (visual) and physical (kinesthetic) learning styles, and that nurses were not reliant on only one learning style. They furthermore preferred to use a variety of learning styles rather that abstract theoretical orientated methods.

Wong and Chin (2018:339) researched the reliability of the VARK questionnaire in undergraduate Chinese nursing students. They revealed that the majority of the students in their study preferred multi-modal learning. They stated that human beings have five senses, namely vision, touch, taste, hearing and smell, and since early development one uses these senses to learn. They stated that various healthcare professions, for example medicine, dentistry, physiotherapy and health science preferred the use of multiple senses in the form of multi-modal learning styles to optimize their learning.

Fisher (2015:57) investigated the learning style preference of nurses in training at two nursing schools in public health facilities in Cape Town. This study indicated that the nursing students preferred multi-modal learning, especially combining visual and kinesthetic learning styles, which stimulate the seeing and doing actions to promote learning.

Purba, Sinaga, Siregar and Sembiring (2015:11) conducted a study on learning style differences among nursing and midwifery students, and compared the learning style differences between first- and second-year students. They concluded that there was no significant difference in learning styles between nursing and midwifery students. They also concluded that there was no significant difference in the learning style preferences between first- and second-year students. They further concluded that nursing and midwifery students chose a variety of learning styles. For each learning style on its own they remembered approximately 20% of what they read (reading and writing), 30% of what they heard (auditory), 40% of what they saw (visual), 50% of what they said (verbal), and 60% of what they did (kinesthetic). This average increased to 90% when the different styles were combined for information they said, heard, saw and did. The multi-modal learning style was therefore indicated as the best learning style.

Latif, Yusof, Mui and Ibrahim (2019:8) explained in their study the learning styles among first year, first semester nursing students at the College of Nursing of Kubang Kerian. The results indicated that most of the respondents had a combination between kinesthetic and auditory learning preferences. The researchers suggested that due to the variety in learning styles, it was important for nurse educators to incorporate multiple modalities to improve learning for all students.

Li, Yu, Liu, Shieh and Yang (2014:236) conducted an exploratory study of the relationship between learning styles and academic performance among students in different nursing programs. This study indicated the students preferred perception of information through immediate experiences as well as facts, observation (visual), and practical (kinesthetic) learning as learning preference, therefore multi-modal learning preference. The students prefer to use their five senses during the learning process as well as physical application and a practical style. They state that nursing educators need to be aware of this multi-modal learning style for direct experience and 'hands-on' learning.

Grech (2022:8) explored the needs for social presence and its relevance to nursing students' learning preference. The researcher did not explain the preferred modalities, only that that all the participants claimed multi-modal learning as their learning style preference. He concluded that despite the variety learning style preferences, all students remarked on the need and relevance of social presence in online learning for a collaborative constructivist learning experience, drawing on the diversity of their community, in terms of learning styles, for a better learning experience.

Van Der Wege and Keil (2020:2) researched the VARK learning style preference to link the teaching strategies to the preferred learning styles in nursing. The results revealed that the vast majority of the respondents reported to be multi-modal in learning style preferences. They stated that nursing is a complex profession with many challenges, and unfortunately, nursing as a profession continues to become more challenging due to increase in patient acuity, combined with nurse shortages. To win this battle, more well-trained nurses who are prepared for the profession are needed. Therefore, nurse educators need to identify methods to help students to better understand concepts in order to promote students' success. One method to achieve this goal is to consider learning styles when planning classroom activities and instruction.

Frantz and Mthemby (2014:1825) conducted a systematic review on learning styles among nursing students, and the implications for higher education institutions. They used the VARK questionnaire to determine the nursing students' learning styles. They stated that it was visible that nursing students learn effectively with different learning styles if they are multi-modal. Their study indicated a high prevalence of read/write and kinesthetic learning style as the most preferred learning styles. They also explained that nursing educators need to understanding the different learning styles and create a variation in teaching strategies and assessment methods.

Hallin, (2014:1447) conducted a study about nursing students' learning style preferences and found that there was a need for a variety of interactive teaching approaches, conscious didactic actions between cooperating teachers and conscious learning strategies for nursing students. She stated that although it might appear that multi-modal students are easier to teach; it is not the case. She stated that students with multi-modal learning preference adapt to teaching methods without specific attention as long they are fascinated by the topic. When the topic doesn't interest them, learning become superficial and they engage only their short-term memory. Therefore, reasonably interested multi-modal students need to have two, three or four modalities involved in learning before they are satisfied.

Katowa-Mukwato, Chapima, Nambala-Sianchapa and Mwiinga-Kalusopa (2017:88) researched the learning styles and intelligence types versus academic performance of nursing students of the

University of Zambia. The participants had wide a wide variety learning styles from uni-modal to bi-modal and tri-modal styles. The dominant learning style preference in this study are kinesthetic followed by reading and writing and auditory learning style preference. They also add that the majority of the participants had logical mathematical intelligence, followed by Bodily-Kinesthetic while the combination of the two; Logical-mathematical and Bodily-kinesthetic was the third most common type of intelligence with participants. They indicate that from their study, both learning styles and intelligence types showed had no significant contribution to academic performance. This could be either, the teaching methods utilized for nursing students varied and therefore capable of promoting learning across different learning styles and intelligence types without necessarily flavoring a specific style or type.

Azari, Mokhtari, Mousavi, Mohammadi, Aliyari, Salimi and Azari (2015:180) researched the relationship between learning styles and interpersonal communication skills of nursing students at the Tehran University. They explained that based on Warok's learning methods questionnaire, more than half of the students (58.8%) preferred a multi-modal learning style. However, the results indicated no significant difference between the nursing students' interpersonal communication skills and the learning styles. The researcher mentioned that the level of skills could be improved by creating some new educational methods for the nursing students' communication skills.

Kohan, Janatolmakan, Rezaei and Khatony (2021:3) compiled a cross-sectional study where they investigated the relationship between learning styles and academic performance among virtual nursing students. The researchers had 2 groups: the weak group and a strong group. They explained that in the weak group of students, 1.7% were tri-modal and 19.7% were bimodal, with the highest prevalence of 7.6% related to the combination of auditory and reading/writing learning styles. In the strong group of students, no student indicated a bimodal learning style and 7.1% were tri-modal which included a combination of visual, reading/writing, and kinesthetic learning styles. The results indicated no statistically significant difference between students' learning styles and academic performance. They suggested that nurse educators need to be aware of the students' learning style in order to provide efficient learning situations, present quality online courses, and improving the teaching-learning process.

Sinaga, Siregar, Amila and Sembiring (2018:159) described the learning style preferences of nursing and midwifery students according to the VARK model. They explained that nursing students had a variety of learning style preferences, however, most of the nursing and midwifery students preferred multi-modal learning styles. They stated that it can be challenging for nurse educators to have multi-modal learners, since they need to have at least two, three or four modes involved in learning before

their learning needs are met, as oppose to a single preference learner who understand the information from their preferred mode.

In a study done by Madu, Ogbonnaya, Chikeme and Omotola (2019:179) the authors identified the learning style preferences of undergraduate nursing students in Nigeria using the Kolb's learning style inventory as being a diverger, assimilator, converger or accomodator. The divergers are people with a big imagination and creativity and people who prefer this learning style have the ability to understand the bigger picture in a situation and are able to generate new ideas. The assimilators are people who perceive information in an abstract way, and they are rational and logic thinkers. The converger refers to students who prefer situations where there are a single or one concrete answer. And the accomodator prefer concrete or active experimentation, this is seen in students who enjoy performing experiments. The results of their study indicated that the two dominant learning preferences were diverger and assimilator

Mohammadi and Thaghinejad (2014:8) conducted a study on learning styles of nursing students in Iran using the Kolb's theory. The results of the study were that assimilator and converging styles were the most preferred learning styles. The converging learning style are known as doing and thinking, whereas the assimilator learning style is described as watching and feeling. The four Kolb's learning styles are described in detail in Chapter 1.

Shirazi, Heidari and Fatemeh (2019:5) described the relationship between critical thinking skills and learning styles and the academic performance of nursing students. The researcher described their results as diverging, assimilating, accommodating, and converging with the preferred learning styles listed from most to least. Most participants adopted and preferred the assimilating learning style and the least preferred the converging learning style.

Fogg, Carlson-Sabelli, Carlson and Giddens (2013:393) described the perceived benefits of a virtual community, the effects of learning style, race, ethnicity and frequency of use on nursing students. The results indicated that convergers and assimilators were the preferred learning styles among most of the nursing students. However, there were no differences in the perceived benefit found according to learning style. Nursing students who frequently made use of the virtual community indicated significantly greater learning benefits than those with infrequent use, regardless of learning style.

3.5 DISCUSSION

Bender and Holmes (2019:26) indicated that dualism exists in nursing. The art is demonstrated by the elegance in the skills performed and the science in the knowledge. For every nurse in every specialty continual learning is essential. Most learning take place in the form of in-service training and guide professional development. Continuous professional development in the form of in-service training became a resource of daily practice as nurses should stay competent throughout their career to improved patient care (Chaghari, Saffari, Ebadi & Ameryoun, 2017:26).

Learning is process where an individual build long-lasting cognitive structures and deeper understanding of a product, procedure of technique (Gayathiri, Hendrickqs & Menon, 2019:41). Teaching is a bidirectional, contributive, interactive, and creative process. Therefore, the teaching approach have a direct impact on learning, however learning is directly impacted by a personal learning style preference.

Continuous professional education is acknowledged as critical to ensure that the staff have competent knowledge and skills to provide quality nursing care to all patients in all areas of nursing, and prevent medico-legal risks. Practicing nursing entails using the science of knowledge obtained to create the caring situation for patients (Reed & Shearer, 2017:33). Knowledge and skills are obtained during training. In-service training is the process to continually update the knowledge and skills of individuals at the workplace.

There are very different opinions about the value of accommodating different learning styles to optimize continuous professional development. Neda, Namdar, Fariborz, Ebrahim, Karimi and Raheleh (2019:71) indicate that an efficient teaching approach accommodating different learning styles during training can contribute to the learning process. Fury (2020: n.p.) is of the opinion that "there is no evidence that designing lessons that appeal to different learning styles accelerates student learning" and that the idea of different learning styles is a myth.

The nursing educators need to use time available efficiently to ensure learning opportunities are not missed and that all learning preferences are accommodated. Overlooking individual diversity during training might indirectly have an unfavorable impact on patient care and organizational standards. This could be because, some staff might not benefit from learning opportunities if the teaching approach do not fit their learning preference (Neda, et al. 2019:71).

The aim of the study was to explore and describe the value of teaching strategies that accommodate different learning styles in continuous professional development in the nursing environment, by means of an integrative review.

There were one questions were posed for this study. The research question as: What is the potential value of teaching strategies that accommodate different learning styles in continuous education in nursing?

The researcher recognized that learning styles are individual characterized. The way we prefer to learn is shaped and formed during our lifetime and there are multiple factors influencing our learning style preference. The researcher describes time, environment and senses in this study. Time as an influencing factor explains the importance of learning preference as a dynamic process or an evolving characteristic that an individual has and therefore change as a person mature. Whereas the environment as an influencing factor is described by either the physical setting, (classroom or clinical setting) or an individual's background, culture or economic status.

But the biggest influencing factor are the individualizes senses. Wong and Chin (2018:339) state that human beings have five senses, namely vision, touch, taste, hearing and smell, and since early development one used these senses to learn. An individual make use of either one preferred sense or learning modality as preferred learning style of some individuals use multiple learning modalities as preferred learning style.

In this research, the majority of the articles on nursing and their preferred learning style indicate that the preferred learning style is multi-modal learning style. In our brain the learning process acts as information processor, which can integrate multiple sensory inputs. Multi-modal learners prefer to access information via all their senses, which include touch, smell, sight, taste and hearing.

3.6   CONCLUSION

The process of data evaluation and analysis led the researchers to having thirty-six articles for the inclusion criteria, which the researcher used in the data analysis process and synthesis of results in the research study. The articles answered the research question.

CHAPTER 4: INTERPRETATION AND PRESENTATION OF THE RESULTS

4.1 INTRODUCTION

In this chapter the researchers provided the interpretation of the research as well as a presentation of such results for the research paper.

In Chapter 1 the researcher posed the research question: What is the potential value of teaching strategies that accommodate different learning styles in continuous education in nursing? The aim of the study was to describe and explore the value of teaching strategies to accommodate different learning styles in continuous training in nursing practice.

An individual's learning style is a personal preference on how the individual learns the best. Learning styles can be describe as the specific preferences an individual has for learning or internalizing new information (Bernard, Chang, Popescuc & Graf, 2017:94). Learning is a complicated process, where an individual actively gaining knowledge or skills with considering the individual's physiological, cognitive and psychological dimension (Idrizi & Filiposka, 2018:2). Comprehension and insight of the different learning styles and the value individualized learning styles have to individuals will improving the learning process and satisfaction, enhance learning outcome, and reduce the time spend on learning according to Bernard et al. (2017:94).

It was deemed necessary to determine if accommodating the various learning preferences might ensure that no one is left behind during training sessions and optimal learning takes place. There are different notions amongst nurse educators regarding the incorporation of different teaching strategies that accommodate different learning styles in continuous nursing education and the potential value thereof to enhance learning. This in turn is expected to improve the planning and execution of activities related to continuous professional education to enhance quality nursing care.

The researcher used an integrative review as it outlines the theoretical information, and it gave an additional understanding of the information. An integrative review concentrated on evidence-based practice and the theoretical information derived from the research and built on known knowledge, therefore it led to change in performance (Whittemore & Knafl, 2005:546). This allowed the researcher to have a collection of different research studies and literature sources to be integrated into the review to promote learning in the nursing profession. As a result, it allows a researcher to conceptually link the information together to draw a research conclusion (Whittemore & Knafl, 2005:547).

The included articles represented an variety of populations and different countries, both male and female, and a wide academic spectrum ranging from enrolled and auxiliary nurses, undergraduate nursing students, both diploma and baccalaureate nursing students and postgraduate registered nursing students.

4.2 METHODOLOGY

The researcher included thirty-six articles in this study to answer the research aim and question. These articles were identified during an electronic literature search that was conducted through various electronic databases: Medline (via PubMed), OVID, Directory of Open Access journals and internet search engines (Google Scholar) to collect data and literature search. The researcher developed search strings with key words in articles discussing teaching strategies and their impact on nursing education. The researcher used the following keywords; Whole brain learning and nursing and education, VARK and nursing and education and Kolb's learning styles and nursing and education.

During this search, the researcher identified thirty-six articles which were included in this research study represented qualitative studies (27 articles), quantitative studies (6 articles), mixed methods studies (1 article) and meta-analysis (2 articles) during the period of 2013 to 2022.

The included articles represented a variety of populations and different countries. Both male and female and a wide academic spectrum ranging from enrolled and auxiliary nurses, undergraduate nursing students, both diploma and baccalaureate nursing students and postgraduate registered nursing students.

During the data evaluation stage, the researcher carefully evaluated the thirty-six articles which were included in this study. The researcher identified the themes. Each theme was then interpreted to answer the research question based on the title of the publication.

The researcher used the constant comparison method with four phases namely the data reduction phase, the data display phase, the data comparison phase and the drawing of a conclusion and verification phase (Whittemore & Knafl, 2005:550).

4.3   RESULTS

Learning is essential in all specialties of nursing. Continuous professional development in the form of in-service training became a resource of daily practice as nurses should stay competent throughout their career in an evolving healthcare environment and update their competence to enable improved patient care. Learning is more than gaining knowledge, it is a process. The building of long-lasting cognitive structures and deeper understanding. Teaching is a bidirectional, contributive, interactive, and creative process. Therefore, the teaching approach has a direct impact on learning, however learning is directly impacted by a personal learning style preference.

During the data reduction phase, the researcher analysed the dominant learning preference discussed in each of the thirty-six articles. The themes that emerged were as follows:
- Time,
- Environmental aspects,
- Visual dominant,
- Auditory dominant,
- Reading/writing dominant,
- Kinesthetic dominant and
- Multi-modal

There are very different opinions about the value of accommodating different learning styles to optimize continuous professional development. The researcher recognized that learning styles are individually characterized. The way we prefer to learn is shaped and formed during our lifetime, and there are multiple factors influencing our learning style preference. The researcher describes time, environment and senses in this study. Time as an influencing factor explained the importance of learning preference as a dynamic process or an evolving characteristic that an individual has and therefore change as a person matures. Whereas the environment as an influencing factor is described by either the physical setting, (classroom or clinical setting) or an individual's background, culture or economic status.
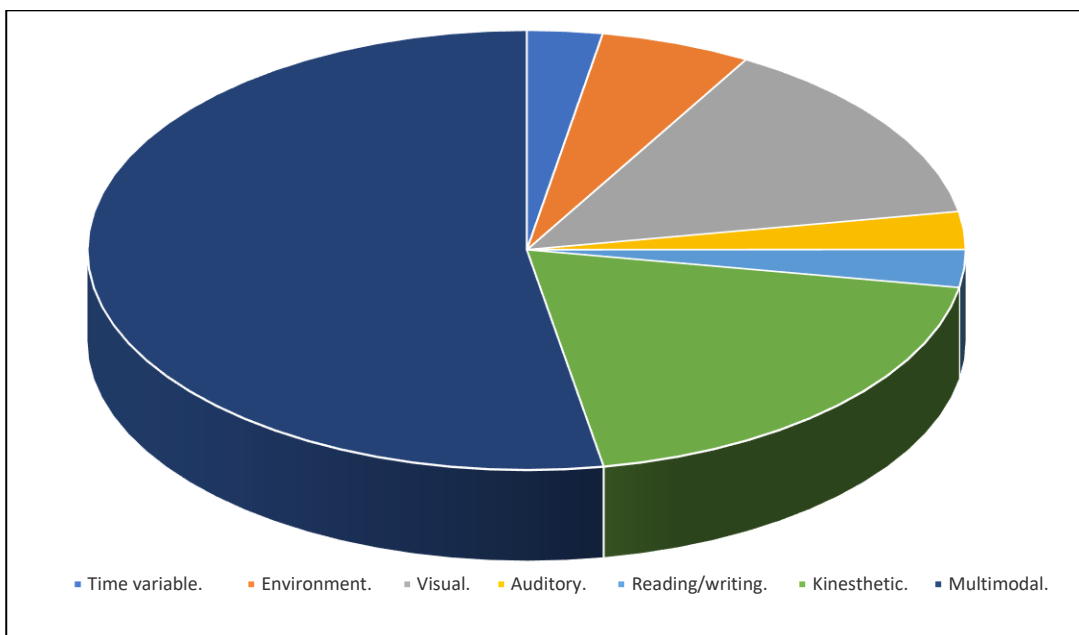
But the biggest influencing factor were the individualized senses. Wong and Chin (2018:339) state that human beings have five senses, namely vision, touch, taste, hearing and smell, and since early development one uses these senses to learn. An individual make use of either one preferred sense or learning modality as preferred learning style or some individuals use multiple learning modalities as preferred learning style.

In this research, the majority of the articles on nursing and their preferred learning style indicated that the preferred learning style are multi-modal learning style. In our brain the learning process acts

as information processor, which can integrate multiple sensory inputs. Multi-modal learners prefer to access information via all their senses, which include touch, smell, sight, taste and hearing.

The aim of the study was to describe and explore the value of teaching strategies to accommodate different learning styles in continuous training in nursing practice. As result if the study, multi modal learning was the most favored learning styles. This result is presented in the pie graph below.

Pie Chart 4.1: Data Display Chart

Legend: Time variable. ■ Environment. ■ Visual. ■ Auditory. ■ Reading/writing. ■ Kinesthetic. ■ Multimodal.

4.4 LIMITATIONS

The limitation to this research was the combination of different methodologies and study designs used in the different articles included in the integrative review, which could lead to bias.

The focus of the integrative review was on learning preferences in nursing, but was not limited to a particular group of nurses, which might lead to different perspectives.

In spite of the limitations, the inclusion of 36 articles was considered valuable to answer the research question and aim.

4.5 RECOMMENDATIONS

The results of this study form the basis for the following recommendations; pertaining to further research, nursing education and nursing practices.

4.5.1 RECOMMENDATIONS FOR FURTHER RESEARCH

Future research may provide more information on learning styles and their value in nursing education, including the following:
-       The nurse educators' perceptions of the different learning styles;
-       The nurse educators' utilization of learning styles in nursing education;
-       The relationship between ethnic background, age, gender and learning style preferences of student nurses;
-       The relationship between application of multi-modal in-service training and competency in practice.

4.5.2 RECOMMENDATIONS FOR NURSING EDUCATION

There are different notions amongst nurse educators regarding the incorporation of different teaching strategies that accommodate different learning styles in continuous nursing education and the potential value thereof to enhance learning. The following recommendations are therefore recommended:

-       Nurse educators need to be aware of the students' preferential learning styles.
-       Nurse educators need to understand and incorporate nursing students' learning style when planning a lesson or develop curricula.
-       Nurse educators should understand that each student has his/her own unique learning style and therefore need to incorporate multiple different learning styles in each lesson to accommodate all.
-       Nurse educators need to understand their own teaching approach preferences   and   their own learning style preferences with the objective of being aware not to enforce it on their students.
-       The students themselves should be aware of their own learning style preferences.

4.5.3   RECOMMENDATIONS FOR NURSING PRACTICE

-       In-service training should be part of nursing practice.
-       During in-service training the educator need to be aware about the factors which might influence learning.
-       In-service training should focus on the individual's learning style preference.

4.6   CONCLUSION

This study concluded that nursing students have a variety of preferred learning styles. There are multiple influencing factors which implicate learning. However, this study concluded that the learning style of preference among student nurses revealed predominantly multi-modal learning style preference. Favoring two or more learning style modalities. The potential value that learning styles will contribute to nursing education during in-service training are boundless. Individuals are unique and learn best targeting the individualized learning preferences.

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ANNEXURE A: Declaration Regarding Plagiarism

Full names of student: Maria Dorothea Rothmann

Title of study: Describing the notion of teaching strategies to accommodate different learning styles in continuous professional education in nursing: An integrative review

Declaration:

1.   I understand what plagiarism is and am aware of the University's policy in this regard.
2.   I declare that this dissertation is my own original work. Where other people's work has been used (either from a printed source, Internet, or any other source), this has been properly acknowledged and referenced in accordance with departmental requirements.
3.   I have not used work previously produced by another student or any other person to hand in as my own.
4.   I have not allowed and will not allow anyone to copy my work with the intention of passing it off as his or her own work.

Signature: Maria Dorothea Rothmann   Date: 01/03/2023

ANNEXURE B: Ethical Approval Letter

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences

Faculty of Health Sciences Research Ethics Committee

13 July 2022

Approval Certificate
New Application

Dear Mrs MD Rothmann

Ethics Reference No.: 383/2022
Title: Describing the notion of teaching strategies to accommodate different learning styles in continuous professional education in nursing: An integrative review

The **New Application** as supported by documents received between 2022-06-23 and 2022-07-13 for your research, was approved by the Faculty of Health Sciences Research Ethics Committee on 2022-07-13 as resolved by its quorate meeting.

Please note the following about your ethics approval:
- Ethics Approval is valid for 1 year and needs to be renewed annually by 2023-07-13.
- Please remember to use your protocol number (383/2022) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, monitor the conduct of your research, or suspend or withdraw ethics approval.

Ethics approval is subject to the following:
- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

We wish you the best with your research.

Yours sincerely

_____
On behalf of the FHS REC, Dr R Sommers
MBChB, MMed (Int), MPharmMed, PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 and 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, Second Edition 2015 (Department of Health)