Review Article

Learning Style Preferences of Undergraduate Nursing Students: A Systematic Review

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Abstract

This study sought to synthesise evidence from published literature on the various learning style preferences of undergraduate nursing students and to determine the extent they can play in promoting academic success in nursing education of Namibia. A comprehensive literature search was conducted on electronic databases as a part of the systematic review. Although, kinaesthetic, visual and auditory learning styles were found to be the most dominant learning style preferences, most studies (nine) indicated that undergraduate nursing students have varied learning styles. Studies investigating associations of certain demographic variables with the learning preferences indicated no significant association. On the other hand, three studies investigating association between learning styles and academic performance found a significant association. Three studies concluded that indeed learning styles change over time and with academic levels. The more nurse educators in Namibia are aware of their learning styles and those of their students, the greater the potential for increased academic performance.

Keywords: learning styles; undergraduate nurse student; Namibia; academic performance

Background

In the realm of nursing education, learning styles have been at the centre of investigation for the past decade. The importance of learning styles potentially varies by subject or profession. Identifying learning style preferences in nursing students has the potential of helping nursing educators to improve on their teaching styles and to adapt to the diversity in learning styles (Alharbi et al. 2017). Bangcola (2016) revealed that each

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nursing student is most comfortable in a particular learning style which in turn has an influence on their academic performance.

A number of learning style tools have been used to investigate various learning styles of undergraduate nursing students. The commonly used learning style scales that have been found to be valid and reliable and have frequently been used in nursing education are the VARK Learning Style questionnaire, the Kolb Learning Style Inventory (LSI), Honey and Mumford's (2000) learning style questionnaire, the Myers-Briggs Type Indicator, the Felder-Silverman Learning Style Model, the Perceptual Learning Style Questionnaire, and the Productivity Environmental Preference Survey (PEPS).

VARK Learning Style Questionnaire

The VARK measures individual learning styles using perceptual preferences (visual, aural/auditory, read/write, kinaesthetic). Visual learners appreciate symbols, which are used to categorise information, aural or auditory learners prefer information to be presented using verbal communication, and are apt to audiotape content presentation, read/write learners use reading and writing as modes of learning and note taking supplements the original instruction, whereas kinaesthetic learners use field trips, role playing, demonstrations, or other activities that provide practice with respect to the information (Lee, Schull, and Ward-Smith 2016).

Kolb Learning Style Inventory

This scale is an inventory that measures an individual's learning styles based on four modes: Concrete Experience (CE) Reflect Observation (RO), Abstract Conceptualisation (AC) and Active Experimentation (AE) (Gebru, Ghiyasvandian, and Mohammodi 2015). Kolb LSI characterises individuals into one of the four quadrants of a learning style type grid, namely converger, diverger, assimilator and accommodator. Convergers combine AC and AE, have a strong ability to apply an idea practically and are good at problem-solving and decision-making, divergers combine CE and RO, look at problems from all perspectives and have a strong imagination and awareness of meanings and values, assimilators combine RO and AC, and have a strong ability to create theoretical ideas and plans, and accommodators combine CE and AE, engage effectively in new experiences and are interested in carrying out plans and getting the job done (Mitchell, James, and D'Amore 2015).

Honey and Mumford's Questionnaire

Honey and Mumford use an 80-item questionnaire to assess learning styles based on five categories: activists (concerned with the here and now, they like to experience by taking direct action and participation), reflectors (think about things in detail, observe and evaluate from a range of perspectives before taking action, they appreciate the opportunity to repeat a learning experience), theorists (like to see how things fit into the bigger picture, they adopt a logical, systematic and analytical approach to problem-

solving), and pragmatists (like to see how things work and can be applied to practice, like to experiment and see the relevance of their work and adopt a practical problem-solving approach to situations) (Honey and Mumford 2000).

Myers-Briggs Type Indicator

This scale is designed for group administration and determines learning styles on four dichotomies: extraversion/introversion (you prefer to focus on the outer world or on your own inner world), intuition/sensing (prefer to focus on the basic information you take in or prefer to interpret and add meaning), thinking/feeling (when making decisions you prefer to first look at logic and consistency or first look at the people and special circumstances), and perception/judgement (in dealing with the outside world, you prefer to get things decided or you prefer to stay open to new information and options) (The Myers and Briggs Foundation 2018).

Felder-Silverman Learning Style Model

This model consists of a 44-item self-report questionnaire focusing on four dimensions: input (visual: pictures, diagrams, graphs, demonstrations, or auditory-words, sounds), perception (sensory (external): sights, sounds, physical sensations, or intuitive (internal): possibilities, insights, hunches), processing (actively: through engagement in physical activity or discussion, or reflectively: through introspection), and understanding (sequentially: in continual steps, or globally: in large jumps, holistically) (Felder and Silverman 1988).

Perceptual Learning Style Questionnaire

This questionnaire assesses the preferences of student learning styles based on their perceptions utilising 30 self-report statements rated on a five-point Likert scale. The 30 items are distributed equally among the learning style preferences: five items each for statements regarding visual, auditory, kinaesthetic, and tactile preferences, and two social aspects of learning: group and individual preferences. The learning style categories with the most points determine an individual's preference for those categories (Bangcola 2016).

Productivity Environmental Preference Survey (PEPS) questionnaire

This is a learning style questionnaire that consists of 100 questions identifying 20 learning style elements. The elements include environmental preferences (sound, light, temperature and furniture design), emotional preferences (motivation, conformity, and persistence), social preferences (authoritative persons present, variation, learning alone, in pairs or as a team), and physiological preferences (perceptual strengths such as auditory, visual tactile or kinaesthetic, time-of-day energy levels, need for intake or mobility) (Hallin 2014).

Notwithstanding a number of investigations on learning styles, there is a paucity of literature on how learning styles contribute to academic success in nursing students (Bangcola 2016). The authors observed that nursing educators in Namibia are not conscious of their students' learning styles. Educators often have a tendency to focus solely on instruction, rather than considering learning styles. To the best knowledge of the authors there is no evidence in literature of the preferred learning style of undergraduate nursing students in Namibia and how it contributes to their academic success. Further, it is unknown what role learning styles can play in promoting academic success in Namibia. This study aims to synthesise evidence from published literature on the various learning styles or preferences of undergraduate nursing students and the potential role they can play in promoting academic success in nursing education of Namibia.

Methods

A systematic review of literature was undertaken on the learning style preferences of undergraduate nursing students for the past 10 years (2007 to 2017). In this study, all English-speaking countries worldwide were included. The search was conducted in January 2018.

Research Questions

To what extent can published literature provide evidence on the various learning style preferences of undergraduate nursing students? Further, what role can learning styles play in promoting academic success in nursing education of Namibia?

The objectives of the study were to identify the most prevalent learning style preferences of undergraduate students and to determine the role that learning styles play in their academic success.

Identification of Relevant Studies

Using the key phrase "learning style preference" to answer the research question, a search was made in English for all peer-reviewed literature in the following electronic bibliographic databases: Google scholar, Pubmed, EBSCOhost (MEDLINE, PsychINFO, Academic search, Education source, Health source), Sage Publications, Science Direct, and Web of Science. Relevant websites were also checked for articles and the reference lists of all included studies were screened to select studies.

Initially the key search phrase was limited to "learning style preference" to obtain a sense of the volume of literature. This initial search was limited to Google Scholar and Pubmed to determine the appropriateness and sensitivity of the key search phrase.

Secondly, to narrow down the search and include the relevant articles, an extensive search was conducted with other databases (EBSCOhost, Sage Publications, Science Direct, and Web of Science) utilising the following search words and phrases: "learning style AND preference AND undergraduate nursing students".

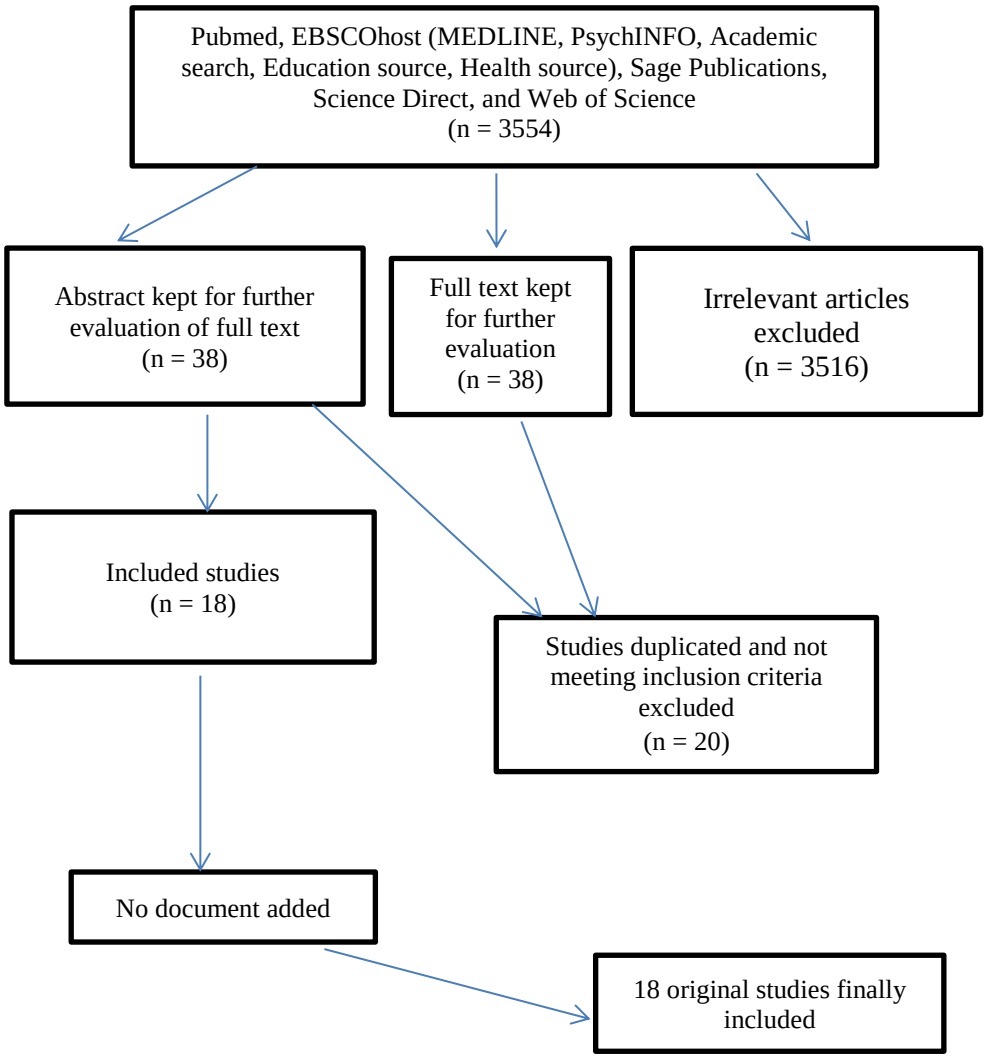
Two independent research personnel, researcher 1 (TS) and researcher 2 (SI) reviewed the retrieved articles. The review and selection process was guided by PICO (Cooke, Smith, and Booth 2012), as shown in Table 1, to screen out studies that did not focus on the research questions. Only articles written in English were included and articles without an abstract were excluded, as the procedure for selecting articles primarily involved reviewing the abstracts. Letters to the editor and short editorials were also excluded.

Where a full article was not available, the main author of the article was contacted to obtain a reprint of the full article as abstracts may not capture the full scope of an article (Badger et al. 2000). Detailed arbitration was followed with each step (Cleaver and Nixon 2014) and the results of this process are shown in Figure 1.

Table 1: PICO for systematic review – learning style preferences of undergraduate nursing students

PICO elements	**Description of PICO concept**
Population – characteristics of the patient/population/ condition or disease of interest	The review included: • original peer reviewed research article that describes learning style preferences of undergraduate nursing students enrolled in a four-year programme; • article published between 2007 and 2017; and • all types of study design (e.g. qualitative, quantitative, mixed methods).
Intervention – phenomenon of interest	Description and understanding of undergraduate nursing students learning style preferences. The learning style scales and words used to describe the learning style preferences.
Context	Geographical – global. Only articles written in English. Learning style preferences of first to fourth year nursing student measured using any type of learning style scale.
Outcome of interest to the reviewer	Published concepts. The description of research methods, purposes, outcomes, implications for practice and recommendations for future research.

Source: Adapted from Cooke, Smith, and Booth (2012).



Source: Adapted from Moher et al. (2009)

Figure 1: Flow chart for the selection of the articles

Methodological Qualitative Rigour

The two independent reviewers utilised the Critical Appraisal Skills Programme (CASP) (Arksey and O'Malley 2005) to assess methodological qualitative rigour of the 18 included articles (see Table 2). The CASP is used to appraise a systematic review attempting to answer the following three broad issues: Are the results of the study valid? What are the results? Will the results help locally? The CASP consists of 10 questions to help reflect on these issues. The first two questions allow for quick screening, and a "yes" answer to both questions allows one to proceed with the remaining questions (Critical Appraisal Skills Programme 2018). There is a degree of overlap in the questions, requesting to answer "yes", "no" or "cannot tell". This checklist does not come with a scoring system and thus this study adapted a scoring system by M'kumbuzi and Myezwa (2016). Table 2 depicts the performance of the 18 included articles on the 10 CASP questions.

Table 2: Outcomes of CASP questions

Author	**Response**	**1. Did the review address a clearly focused question?**	**2. Did the authors look for the right type of papers?**	**3. Do you think all the important relevant studies were included?**	**4. Did the reviewers' authors do enough to assess the quality of the included studies?**	**5. If the results of the review have been combined, was it reasonable to do so?**	**6. What are the overall results of the review?**	**7. How precise are the results?**	**8. Can the results be applied to the local population?**	**9. Were all the important outcomes considered?**	**10. Are the benefits worth the harms and costs?**	**Total**
AlKhasawneh	Yes				√	√	√			√	√	6
	Cannot tell		√					√				
	No			√					√			

D'Amore, James, and Mitchell			Bangcola			Alharbi et al.	**Author**
Yes	No	Cannot tell	Yes	No	Cannot tell	Yes	**Response**
√			√			√	**1. Did the review address a clearly focused question?**
√		√				√	**2. Did the authors look for the right type of papers?**
√	√					√	**3. Do you think all the important relevant studies were included?**
√		√				√	**4. Did the reviewers' authors do enough to assess the quality of the included studies?**
√			√			√	**5. If the results of the review have been combined, was it reasonable to do so?**
√			√			√	**6. What are the overall results of the review?**
√			√			√	**7. How precise are the results?**
		√			√		**8. Can the results be applied to the local population?**
√			√			√	**9. Were all the important outcomes considered?**
√			√			√	**10. Are the benefits worth the harms and costs?**
9			6			9	**Total**

		Fleming, Mckee, and Huntley-Moore			El-Gilany and Abusaad			**Author**
No	Cannot tell	Yes	No	Cannot tell	Yes	No	Cannot tell	**Response**
		√			√			**1. Did the review address a clearly focused question?**
√					√			**2. Did the authors look for the right type of papers?**
√			√					**3. Do you think all the important relevant studies were included?**
		√			√			**4. Did the reviewers' authors do enough to assess the quality of the included studies?**
		√			√			**5. If the results of the review have been combined, was it reasonable to do so?**
		√			√			**6. What are the overall results of the review?**
		√			√			**7. How precise are the results?**
				√			√	**8. Can the results be applied to the local population?**
		√			√			**9. Were all the important outcomes considered?**
		√			√			**10. Are the benefits worth the harms and costs?**
		7			8			**Total**

		Ibrahim and Hussein			Hallin	Gebru, Ghiyasvandian, and Mohammodi	**Author**
No	Cannot tell	Yes	No	Cannot tell	Yes	Yes	**Response**
		√			√	√	**1. Did the review address a clearly focused question?**
		√			√	√	**2. Did the authors look for the right type of papers?**
√					√		**3. Do you think all the important relevant studies were included?**
		√			√	√	**4. Did the reviewers' authors do enough to assess the quality of the included studies?**
		√			√	√	**5. If the results of the review have been combined, was it reasonable to do so?**
		√			√	√	**6. What are the overall results of the review?**
		√			√	√	**7. How precise are the results?**
	√			√			**8. Can the results be applied to the local population?**
		√			√	√	**9. Were all the important outcomes considered?**
		√			√	√	**10. Are the benefits worth the harms and costs?**
		8			9	8	**Total**

Source: Adapted from M'kumbuzi and Myezwa (2016).

Charting the Data

A "data charting form" using an Excel spreadsheet was utilised to review the final selected 18 original research articles. The second author did a blind verification of a random sample of 20 per cent (4) of the articles to check the quality of the categorisation of the charting process. Inconsistencies in the charting process were resolved through discussion.

Initially, the following categories of information for each study were recorded: year of publication, geographical distribution, academic year of study, learning style scale, study design, and sample size. Secondly, a conventional content analysis (Namey et al. 2008) was undertaken to analyse the purposes, outcomes, implications and areas for future research. This process involved reviewing the articles and highlighting text that appeared to describe these four areas. These data were extracted verbatim for coding and the final codes (themes) were examined, followed by a tabulation of frequencies of each theme.

Results

The initial search yielded 3 554 articles of which 3 516 did not meet the inclusion criteria and 38 were retained for review. A final 18 full-text articles were included for review. Based on the performance of the 18 included articles on the 10 CASP questions, it was difficult to tell if the results are applicable to the local population because none of the studies were conducted in Namibia, or anywhere else in Africa (Question 8). However, all the articles were considered to be valuable (Question 10).

Table 3 charts the narrative description of the studies following these categories of information: year of publication, geographical distribution, academic year of study, learning style scale, study design, and sample size.

Year of Publication

All articles were published from January 2010 to October 2017. The results showed that over this period there was a small, but increasing interest in investigating the learning style preferences of undergraduate nursing students.

Demographical Location

The majority of the studies were conducted in the Middle East (six), with the balance in Australia (four), Asia (three), Europe (two), South America (two), and North America (one). It was observed that no articles published in Africa were found in any of the database searches.

Population and Sample

Half of the studies (nine) included a population of all nursing undergraduate academic levels (year 1–4). Five studies focused only on first-year students, one study on second-year students only, and one study on final-year students only. Two studies compared the learning styles preferences of first-year and final-year students. The sample sizes ranged from 56–345 with most studies (13) utilising a sample size above 100.

Research Design

The majority of the studies (12) employed a cross-sectional descriptive design, one study utilised prospective correlational study and another study used a longitudinal, descriptive comparative design.

Learning Style Scale

The commonly used learning style scales were the VARK Learning Style questionnaire (seven studies) and the Kolb LSI (six studies). Two studies utilised Honey and Mumford's (2000) learning style questionnaire. The Myers-Briggs Type Indicator, the Felder-Silverman Learning Style Model, the Perceptual Learning Style Questionnaire, and the Productivity Environmental Preference Survey (PEPS) questionnaire were utilised once.

Table 3: Narrative description of the studies

Description		**Number of articles**	**List of articles (by authors)**
Year of publication	2007	1	Rassool and Rawaf 2007
	2011	4	Fleming, Mckee, and Huntley-Moore 2011; James, D'Amore, and Thomas 2011; Koch et al. 2011; Li et al. 2011,
	2013	2	AlKhasawneh 2013; El-Gilany and Abusaad 2012
	2014	1	Hallin 2014
	2015	4	D'Amore, James, and Mitchell 2012; Gebru, Ghiyasvandian, and Mohammodi 2015; Mitchell, James, and D'Amore 2015; Shinnick and Woo 2015
	2016	4	Bangcola 2016; Ibrahim and Hussein 2016; Lee, Schull, and Ward-Smith 2016; Nair and Lee 2016
	2017	2	Alharbi et al. 2017; Stirling, Wadha, and Alquraini 2017
Geographic location	Middle East	6	Alharbi et al. 2017; AlKhasawneh 2013; El-Gilany and Abusaad 2012; Gebru,

Description		Number of articles	List of articles (by authors)
			Ghiyasvandian, and Mohammodi 2015; Ibrahim and Hussein 2016; Stirling, Wadha, and Alquraini 2017
	Australia	4	D'Amore, James, and Mitchell 2012; James, D'Amore, and Thomas 2011; Koch et al. 2011; Mitchell, James, and D'Amore 2015
	Europe	2	Fleming, Mckee, and Huntley-Moore 2011; Hallin 2014
	North America	1	Lee, Schull, and Ward-Smith 2016
	South America	2	Rassool and Rawaf 2007; Shinnick and Woo 2015
	Asia	3	Bangcola 2016; Li et al. 2011; Nair and Lee 2016
	Africa	0	
Population	All academic levels(year 1–4)	9	Alharbi et al. 2017; AlKhasawneh 2013; El-Gilany and Abusaad 2012; Gebru, Ghiyasvandian, and Mohammodi 2015; Ibrahim and Hussein 2016; Li et al. 2011; Nair and Lee 2016; Rassool and Rawaf 2007; Shinnick and Woo 2015
	1 years	5	D'Amore, James, and Mitchell 2012; James, D'Amore, and Thomas 2011; Koch et al. 2011; Lee, Schull, and Ward-Smith 2016; Mitchell, James, and D'Amore 2015
	2nd year	1	Bangcola 2016
	3rd year	0	
	4th year	1	Hallin 2014
	Mixed (1st and 4th year)	2	Fleming, Mckee, and Huntley-Moore 2011; Stirling, Wadha, and Alquraini 2017
Sample size	Fewer than 100	5	Alharbi, et al.2017; Fleming, Mckee, and Huntley-Moore 2011; Koch et al. 2011; Lee, Schull, and Ward-Smith 2016
	100–200	4	AlKhasawneh 2013; Rassool and Rawaf 2007; Shinnick and Woo 2015; Stirling, Wadha, and Alquraini 2017
	200–300	4	El-Gilany and Abusaad 2012; Gebru, Ghiyasvandian, and Mohammodi 2015; Hallin 2014; Ibrahim and Hussein 2016
	300+	5	Bangcola 2016; D'Amore, James, and Mitchell 2012; James, D'Amore, and Thomas 2011; Li et al. 2011; Nair and Lee 2016
Research design	Cross-sectional descriptive	12	Alharbi et al. 2017; D'Amore, James, and Mitchell 2012; El-Gilany and Abusaad 2012;, Gebru, Ghiyasvandian, and Mohammodi 2015; Hallin 2014; Ibrahim and Hussein

Description		Number of articles	List of articles (by authors)
			2016; James, D'Amore, and Thomas 2011; Lee, Schull, and Ward-Smith 2016; Li et al. 2011; Nair and Lee 2016; Rassool and Rawaf 2007; Stirling, Wadha, and Alquraini 2017
	Prospective correlational	1	Koch et al. 2011
	Descriptive correlational	1	Bangcola 2016
	Cross-sectional longitudinal	2	Fleming, Mckee, and Huntley-Moore 2011; Mitchell, James, and D'Amore 2015
	Cross-sectional comparative	2	AlKhasawneh 2013; Shinnick and Woo 2015
Learning style scale	VARK Learning Style questionnaire	7	AlKhasawneh 2013; Ibrahim and Hussein 2016; James, D'Amore, and Thomas 2011; Koch et al. 2011; Lee, Schull, and Ward-Smith 2016; Mitchell, James, and D'Amore 2015; Stirling, Wadha, and Alquraini 2017
	Kolb LSI	6	D'Amore, James, and Mitchell 2012; El-Gilany and Abusaad 2012; Gebru, Ghiyasvandian, and Mohammodi 2015; Mitchell, James, and D'Amore 2015; Nair and Lee 2016; Shinnick and Woo 2015
	Felder-Silverman Learning Style Model	1	Alharbi et al. 2017
	Honey and Mumford scale	2	Fleming, Mckee, and Huntley-Moore 2011; Rassool and Rawaf 2007
	Myers-Briggs Type Indicator	1	Li et al. 2011
	Perceptual Learning Style Questionnaire	1	Bangcola 2016
	Productivity Environmental Preference Survey (PEPS) questionnaire	1	Hallin 2014

One study (Mitchell, James, and D'Amore 2015) used a combination of two scales. Other studies by El-Gilany and Abusaad (2012), Koch et al. (2011), and Shinnick and Woo (2015) combined one learning style scale with a questionnaire.

Purposes, Outcomes and Implications of Studies

Table 4 presents the different purposes that the studies investigated, the outcomes and implications of the studies.

Purposes

Five main purposes were explored by the studies. The majority of studies explored more than one purpose. Ten of the studies aimed at identifying learning style preferences, while eight investigated associations of certain demographic variables with the learning preferences. The association between learning styles and academic performance was investigated by six studies, while four examined changes in students' learning styles over time. Noteworthy is that one study analysed the link between learning preference and language proficiency.

Outcomes

Although, kinaesthetic, visual and auditory preferences were found to be the most dominant learning style preferences, most studies (nine) indicated that undergraduate nursing students have varied learning styles.

The seven studies investigating associations of certain demographic variables with the learning preferences indicated no significant association. On the other hand, the three studies investigating the association between learning styles and academic performance found a significant association. Three studies concluded that indeed learning styles change over time and with academic levels.

Implications of the Studies

Several implications for practice for each outcome are indicated in Table 4. For example, Bangcola (2016) urged teachers to be cognisant of the efficacy of more learning styles that allow students to achieve optimal learning.

Table 4: Purposes, outcomes and implications of practice

Purpose identified	**No of studies**	**Outcomes**		**No of studies**	**Implications for practice**
Identifying learning styles	10	Most preferred learning style	Kinaes-thetic mode	5	"'Examine the effectiveness of teaching strategies in continuing education programs that incorporated the predominant learning styles of course participants" (Gebru, Ghiyasvandian, and Mohammodi 2015). "Because most students are kinaesthetic there is need for more hands on with laboratory work, demonstrations,
			Visual and auditory	5	
			Reflector	2	
			Diverger and assimila-tor	3	
			Abstract	1	

Purpose identified	No of studies	Outcomes		No of studies	Implications for practice
			conceptu-alisation		simulations, videos, etc. Low scores with aural means that traditional method of teaching with lectures in not receptive and preferred by modern students" (James, D'Amore, and Thomas 2011). "Employing more practically based modules in curricula is important" (Koch et al. 2011) "The converger learning style has a positive implication for their education and post-employment continuing nursing education. Encourage colleges to adopt self-directed learning policies" (El-Gilany and Abusaad 2012)
		Multimodal: Nursing students have varied learning styles		9	"Teachers at nursing program should use more than one teaching modality to be able to make their students satisfied with their learning experience" (AlKhasawneh 2013). "Teachers should be aware that efficacy with more learning styles will allow students to achieve the optimal learning environment" (Bangcola 2016). "There is need for a wide variation and interactive teaching approaches, conscious didactic actions between cooperating teachers and conscious learning strategies for nursing students. Teachers should reflect on their learning style before planning courses" (Hallin 2014). "It is important that students utilise all learning styles, as opposed to solely relying on one, as this will help the students to be better and more adaptable life-long learners. Therefore, it is important for their learning that students are motivated to develop all learning styles" (Mitchell, James, and D'Amore 2015). "Particular skills need to be learned and maximised thus a balanced profile is not ideal for specialised professions like nursing" (Shinnick and Woo

Purpose identified	No of studies	Outcomes	No of studies	Implications for practice
				2015).
Associations of certain demographic variables with the learning preferences	8	Significant association was identified between certain demographic variables with the learning preferences	1	"There is need to emphasize the importance of knowing student learning styles, and completing the learning style profile at the start of a course" (Bangcola 2016).
		No significant association was identified between certain demographic variables with the learning preferences	7	"Nursing educators need to deal with student differences in order to offer support services and educational strategies for student learning needs and to match individual differences. Using a learning style approach can empower staff development to create an optimal environment that ensures retention" (Li et al. 2011).
Association between learning styles and academic performance	4	Significant relationship between learning styles and performance	3	"A mismatch between teaching style and the learning styles of students has been found to have serious consequences (students tend to be uninterested, do poorly on tests, become discouraged about the course, and may conclude that they are no good at the subject and give up). Understanding the learning style preferences of students can enhance learning for those who are under-performing in their academic studies. Those who are 'at risk' may be provided with individual tutorials where tailor-made supplementary learning programmes can be devised and initiated" (Rassool and Rawaf 2007). "Nurse educators need to acknowledge the diversity of learning styles among students and develop curricula that support a balanced teaching approach that promotes flexibility in the acquisition and application of knowledge" (Fleming, Mckee, and Huntley-Moore 2011). "Learning style has an effect on course presentation preference. Inclusion of student learning preference may influence the development of critical thinking
		No significant relationship between learning styles and performance	1	

Purpose identified	No of studies	Outcomes	No of studies	Implications for practice
				skills" (Lee, Schull, and Ward-Smith 2016). "The need for nursing educators to have an awareness of the different learning styles, so that they can remediate their teaching strategies to match the learning styles prevailing in the classroom to improve quality of education and in turn promote academic success" (Nair and Lee 2016).
Examine changes in students' learning styles over time	3	Learning styles change over time	3	"Need to investigate all fresh entry students as the cohort of students are continuously changing" (James, D'Amore, and Thomas 2011). "There is need for educators to continue to assess information processing styles throughout the degree programme to plan specific educational experiences aimed at developing a balanced learner" (Mitchell, James, and D'Amore 2015). "Each academic level has its own properties and learning preferences which the lecturer should consider while teaching" (Ibrahim and Hussein 2016). "The reduction in balanced learners over the years necessitates careful consideration in the planning and delivery of second and third year curriculum, by considering providing more experiences in abstract conceptualisation and active experimentation to promote balanced learners" (Mitchell, James, and D'Amore 2015).
Link between learning preference and language proficiency	1	Students who spoke English had high mean values compared to those who are non-English speaking	1	"Effect of rural and non-English speaking poses a challenge to educators to embrace diversity in students and accommodate different planning and assessments with learning styles" (James, D'Amore, and Thomas 2011).
Total studies	25		40	

Note: The total articles of this study are 18. However, some of the articles explored more than one purpose and had more than one outcome.

Recommendations for Future Research

Table 5 depicts the recommendations for future research that the studies suggested.

Table 5: Recommendations for future research

Authors	Future research
Alkhasawneh	Assess whether multiple-mode learners learn better than others. Correlate learning preference with student grades on different classes (clinical and theoretical). Assess trends in changing learning style and academic level.
Alharbi et al.	Identify whether matching of student learning preferences and educator learning styles is more or less effective in improving teaching learning strategies and learning skills.
Bangcola	Use alternative approaches to study the different learning styles of students, such as a qualitative study focusing in depth on only one or two learning styles, such as the kinaesthetic or tactile or auditory learning styles, so frequently found in nursing. Since the ability to process information quickly and efficiently is vital to learning, conduct a study focusing only on concept attainment using the cognitive style.
D'Amore, James, and Mitchell	Investigate significance in correlating student learning styles to teaching styles.
Fleming, Mckee, and Huntley-Moore	Conduct further research to determine the influence of these factors on the learning experiences and changing learning styles across the academic period of students: the use of a variety of learning styles according to the subject being studied (Sutcliffe 1993), the course design, the assessment strategy utilised (Rassool and Rawaf 2007), the influences of socialisation and education during one's nursing career (Ramprogus 1988), and also possibly the developmental growth process (Kolb 1984).
Gebru, Ghiyasvandian, and Mohammodi	Conduct action research that would apply specific techniques to target diverse perspectives, communication with faculty and peers, asking questions in class, class discussions, perceived difficulty of course work, and preparation for class. Conduct research on the persistence between gender groups, which was another serious issue in this finding.
Hallin	Determine trends in learning styles with new students particularly those from technologically advanced homes. Combine learning style questionnaires and compare results. Triangulate quantitative and qualitative studies of learning styles.
James, D'Amore, and Thomas	Investigate changes with learning styles over the degree programme as a result of awareness. Adopt multimodal learning styles and evaluate their effect on student learning. Investigate correlation of learning styles and learning outcomes with their effect on retention rates of commencing students.

Authors	Future research
Koch et al.	Investigate reasons why the kinaesthetic mode is a high predictor of academic performance. Investigate why the VARK mean scores change with improved English proficiency. Investigate whether mean scores change when the VARK questionnaire is administered in vernacular languages.
Lee, Schull, and Ward-Smith	Conduct more research to better understand the relationship between learning outcomes, learning preferences, and teaching pedagogies.
Rassool and Rawaf	Identify in nursing education if any particular teaching style, or a variety of teaching styles, is more or less effective for learners with a diversity of learning styles. Explore the role of learning style preferences in the application of theory to clinical practice.
Shinnick and Woo	Determine the impact of learning style preferences in areas such as skills attainment, clinical judgement and patient safety.
Stirling, Wadha, and Alquraini	Assess different modes of learning and nursing student success.

Discussion

Given the increasing interest in investigating the learning style preferences of undergraduate nursing students, this review did not find any conducted in Africa. The authors assume that there are numerous studies going on in Africa, but that they are possibly not documented in peer-reviewed journals. Fleming, Mckee, and Huntley-Moore (2011) argued that knowledge and practise in nursing profession are not static, but ever-changing. Nurse educators are encouraged to upgrade their delivery of instruction to match the student abilities and learning styles (Bangcola 2016). To this end, there is a need for more funding for investigating learning style preferences of undergraduate nursing students that could be shared with the wider community, ensuring the evolution and growth of nursing education. Further, nursing educators need to document their studies in peer-reviewed journals regarding the learning styles of undergraduate nursing students.

Kinaesthetic, visual and auditory learning styles were found to be the most preferred learning styles, suggesting the need for more hands-on laboratory work, demonstrations, simulations, videos, etc. Understanding the predominant learning style has the potential to guide the development of the curriculum and teaching strategies (Gebru, Ghiyasvandian, and Mohammodi 2015). However, other studies recorded low scores with aural learning styles, indicating that the traditional method of teaching with PowerPoint presentations and lectures is not preferred by modern students (James, D'Amore, and Thomas 2011). Although the kinaesthetic, visual and auditory learning styles were found to be the most preferred learning styles, most students had more than

one (multimodal) preferred learning style. Educators are encouraged to reflect on their learning style before preparing their lessons (Hallin 2014). However, the authors take cognisance of the fact that some nurse educators might not be aware of the various learning styles that exist. There is a potential for those who are aware of their learning style to be biased towards their preferred learning style resulting in an unbalanced learning environment. Moreover, both learners and educators are encouraged to have an awareness of the available learning styles at the beginning of the course to stimulate a balanced learning environment and to enable learners to grow in learning as they can draw from each learning style (D'Amore, James, and Mitchell 2012).

Noteworthy is that almost all the studies in this review, investigating the association of learning styles with demographic characteristics, found no association. In order to embrace student diversity, educators need to tailor support services and educational strategies for student learning needs (Li et al. 2011). On the other hand, one study (Bangcola 2016) revealed an association between learning styles with demographic characteristics, indicating the need to profile student learning styles at each academic year level. Thus a greater emphasis should be placed on profiling student learning styles at each academic year to ensure academic success. James, D'Amore, and Thomas (2011) observed that cohorts of nursing students are changing and therefore there is a need to profile all fresh entry students. This will allow for individual tutorials to be tailor-made for students who are having challenges in grasping concepts.

The reviews also found that there is an association between a learning style and academic performance. A study of Australian nursing students revealed that a strong kinaesthetic mode was a predictor of academic success (Koch et al. 2011). Similarly, a study in China on nursing students affirmed that academic success is significantly related to learning style (Yi et al. 2014). However, Rassool and Rawaf (2007) stated that a mismatch between the student and educator learning style can hamper success as students lose interest in the subject, do poorly on tests or exams, and might give up as they conclude that they are no good at the subject. Importantly, educators should note that each academic year has new courses and presents different challenges. Thus each academic level curriculum should be aligned to the student learning styles as learning style preferences change over time.

Critical to nursing education is language proficiency. Evidence has shown that there is a link between a learning preference and language proficiency. James, D'Amore, and Thomas (2011) found that students who spoke English had high mean values compared to those who are non-English speaking. Thus, nursing educators in Namibia may need to embrace the diversity of English proficiency for students who are school-leavers or mature entry, from rural and urban backgrounds and from English and non-English speaking backgrounds.

The researchers premised the selection of systematic review as a choice of methodology based on the fact that they synthesise knowledge that is essential to advance practice

and research through consolidation of evidence. Systematic reviews are aimed at informing nursing education, programmes, and policy, and providing direction to future research priorities. Systematic reviews can be utilised to answer a range of research questions and to reveal research gaps. Evidence indicates that they can also help enhance knowledge of research methods and improve research productivity.

Limitations

Although multiple electronic databases were searched, the search could have been more comprehensive had social science databases been included. Further, including only English articles could have excluded important articles. Future searches could potentially include social science databases and articles in a variety of languages.

Conclusion

Despite some studies indicating that the most preferred learning styles of undergraduate nursing students are primarily kinaesthetic, visual or auditory learning styles, the majority concluded that they are multimodal learning styles. Nurse educators need to embrace diversity in student backgrounds and demographic characteristics to foster an environment conducive to learning. The current study revealed that there is a significant association between learning style preferences and academic performance and thus it is critical to investigate student learning style preferences to ensure improved curriculum development and teaching methods aimed at increasing academic success. The more educators in Namibia are aware of learning style, their own learning styles and the learning styles of their students, the greater the prospects are for increased student academic performance. Several recommendations for future research were identified (as shown in Table 5).

References

Alharbi, A. H., A. F. Almutairi, E. M. Alhelih, and A. S. Alshehry. 2017. "The Learning Preferences among Nursing Students in the King Saud University in Saudi Arabia: A Cross-Sectional Survey." *Nursing Research and Practice* 2017:1–7. https://doi.org/10.1155/2017/3090387.

AlKhasawneh, E. 2013. "Using VARK to Assess Changes in Learning Preferences of Nursing Students at a Public University in Jordan: Implications for Teaching." *Nurse Education Today* 33 (12): 1546–9. https://doi.org/10.1016/j.nedt.2012.12.017.

Arksey, H., and L. O'Malley. 2005. "Scoping Studies: Towards a Methodological Framework." *International Journal of Social Research Methodology* 8:19–32. https://doi.org/10.1080/1364557032000119616.

Badger, D., J. Nursten, P. Williams, and M. Woodward. 2000. “Should all Literature Reviews be Systematic?” *Evaluation and Research in Education* 14 (3–4): 220–30. https://doi.org/10.1080/09500790008666974.

Bangcola, A. A. 2016. “Learning Styles as Predictor of Academic Performance in the Nursing Department of an Asian University and Colleges.” *International Journal of Learning Teaching and Educational Research* 15 (4): 22–31.

Cleaver, S., and S. Nixon. 2014. “A Scoping Review of 10 Years of Published Literature on Community-Based Rehabilitation.” *Disability and Rehabilitation* 36 (17): 1385–94. https://doi.org/10.3109/09638288.2013.845257.

Cooke, A., D. Smith, and A. Booth. 2012. “Beyond PICO, the SPIDER Tool for Qualitative Evidence Synthesis.” *Quality Health Research* 22 (10): 1435–43. https://doi.org/10.1177%2F1049732312452938.

Critical Appraisal Skills Programme. 2018. CASP (Systematic Review) Checklist. Accessed 20 February 2019. https://casp-uk.net/wp-content/uploads/2018/01/CASP-Systematic-Review-Checklist_2018.pdf.

D’Amore, A., S. James, and E. K. Mitchell. 2012. “Learning Styles of First-Year Undergraduate Nursing and Midwifery Students: A Cross-Sectional Survey Utilising the Kolb Learning Style Inventory.” *Nurse Education Today* 32 (5): 506–15. https://doi.org/10.1016/j.nedt.2011.08.001.

El-Gilany, A-H., and F. E. S. Abusaad. 2012. “Self-Directed Learning Readiness and Learning Styles among Saudi Undergraduate Nursing Students.” *Nurse Education Today* 33 (9): 1040–4. https://doi.org/10.1016/j.nedt.2012.05.003.

Felder, R. M., and L. K. Silverman. 1988. “Learning and Teaching Styles in Engineering Education.” *Engineering Education* 78 (7): 674–81.

Fleming, S., G. Mckee, and S. Huntley-Moore. 2011. “Undergraduate Nursing Students’ Learning Styles: A Longitudinal Study.” *Nurse Education Today* 31 (5): 444–9. https://doi.org/10.1016/j.nedt.2010.08.005.

Gebru, A. A., S. Ghiyasvandian, and N. Mohammodi. 2015. “Learning Styles among Undergraduate Nursing Students in School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran.” *Iran American Journal of Applied Psychology* 4 (4): 147–53. https://doi.org/10.11648/j.ajns.20150404.11.

Hallin, K. 2014. “Nursing Students at a University – A Study about Learning Preferences.” *Nurse Education Today* 34 (12): 1443–9. https://doi.org/10.1016/j.nedt.2014.04.001.

Honey, P., and A. Mumford. 2000. *The Learning Styles Helper's Guide*. Berks: Peter Honey Publications.

Ibrahim, R. H., and D. A. Hussein. 2016. “Assessment of Visual, Auditory, and Kinesthetic Learning Style among Undergraduate Nursing Students.” *International Journal of Advanced Nursing Studies* 5 (1):1–4. https://doi.org/10.14419/ijans.v5i1.5124.

James, S., A. D’Amore, and T. Thomas. 2011. “Learning Preferences of First Year Nursing and Midwifery Students: Utilising the VARK.” *Nursing Education Today* 31 (4): 417–23. https://doi.org/10.1016/j.nedt.2010.08.008.

Koch, J., Y. Salamonson, J. X. Rolley, and P. M. Davidson. 2011. “Learning Preference as a Predictor of Academic Performance in First Year Accelerated Graduate Entry Nursing Students: A Prospective Follow-Up Study.” *Nurse Education Today* 31 (6): 611–6. https://doi.org/10.1016/j.nedt.2010.10.019.

Kolb, D. A. 1984. *Experiential Learning Experience as the Source of Learning and Development*. New Jersey: Prentice-Hall.

Lee, K., H. Schull, and P. Ward-Smith. 2016. “Active versus Passive Learning: Perceptions of Undergraduate Nursing Students.” *Journal of Nursing Education and Practice* 6 (9). https://doi.org/10.5430/jnep.v6n9p63.

Li, Y. S., H. M. Chen, B. H. Yang, and C. F. Liu. 2011. “An Exploratory Study of the Relationship between Age and Learning Styles among Students in Different Nursing Programs in Taiwan.” *Nurse Education Today* 31 (1): 18–23. https://doi.org/10.1016/j.nedt.2010.03.014.

Mitchell, E. K. L., S. James, and A. D’Amore. 2015. “How Learning Styles and Preferences of First-Year Nursing and Midwifery Students Change.” *Australian Journal of Education* 59 (2): 158–68. https://doi.org/10.1177%2F0004944115587917.

M’kumbuzi, V. R. P., and H. Myezwa. 2016. “Conceptualisation of Community-Based Rehabilitation in Southern Africa: A Systematic Review.” *South African Journal of Physiotherapy* 72 (1): a301. http://dx.doi.org/10.4102/sajp.v72i1.301.

Moher, D., A. Liberati, J. Tetzlaff., D. G. Altman, and The PRISMA Group. 2009. “Preferred Reporting Items for Systematic Reviews and Meta analyses: The PRISMA Statement.” *PLoS Medicine* 6 (7): e1000097. https://doi.org/10.1371/journal.pmed.1000097.

Nair, M. A., and P. Lee. 2016. “An Exploration of the Learning Style among Undergraduate Nursing Students from an Indian Perspective.” *Journal of Nursing and Health Science* 5 (5): 1–4. https://doi.org/10.9790/1959-0505010104.

Namey, E., G. Guest, L. Thairu, and L. Johnson. 2008. “Data Reduction Techniques for Large Qualitative Data Sets.” In: *Handbook for Team-Based Qualitative Research*, edited by G. Guest, and K. M. Macqueen.

Ramprogus, V. K. 1988. “Learning how to Learn Nursing.” *Nurse Education Today* 8 (2): 59–67.

Rassool, G. H., and S. Rawaf. 2007. “Learning Style Preferences of Undergraduate Nursing Students.” *Nursing Standard* 21:35–41.

Sutcliffe, L. 1993. “An Investigation into whether Nurses Change their Learning Style according to Subject Area Studies.” *Journal of Advanced Nursing* 18 (4): 647–58.

Shinnick, M. A., and M. A. Woo. 2015. “Learning Style Impact on Knowledge Gains in Human Patient Simulation.” *Nurse Education Today* 35 (1): 63–67. https://doi.org/10.1016/j.nedt.2014.05.013.

Stirling, P. V., A. Wadha, and M. N. Alquraini. 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): 125–30. https://doi.org/10.1016/j.jtumed.2016.10.011.

The Myers and Briggs Foundation. 2018. “My MBTI® Personality Type.” Accessed 19 February 2019. https://www.myersbriggs.org/my-mbti-personality-type/home.htm?bhcp=1.

Yi, Y., W. Yi, C. Lui, S. Sheih, and B. Yang. 2014. “An Exploratory Study of the Relationship between Learning Styles and Academic Performance among Students in Different Nursing Programs.” *Contemporary Nurse* 48 (2): 229–39. https://doi.org/10.1080/10376178.2014.11081945.