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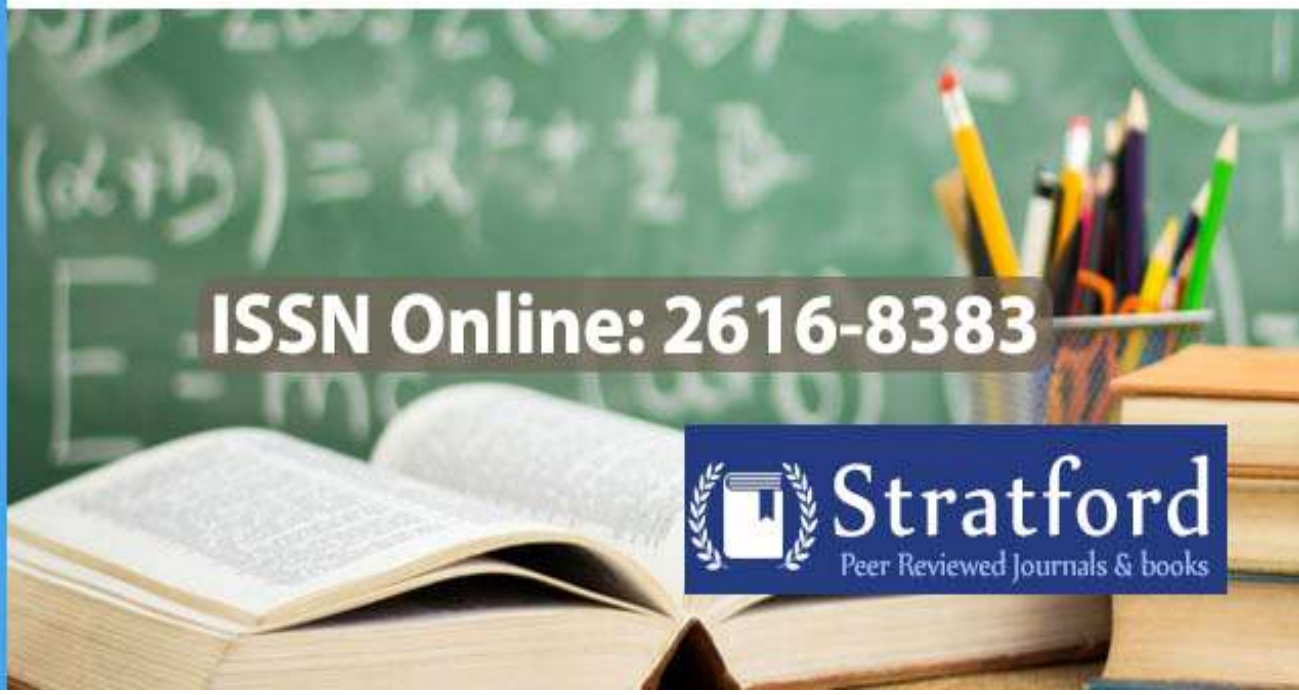

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Analyzing the VARK Model of Pre - Service Teachers PCK of Learning

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Abstract

The style of learning refers to the way an individual gains and applies creativity to acquire skills or knowledge. Teachers are accountable for delivering high-quality instruction. As a result, teachers must be able to create an engaging learning environment that draws students' attention to the material being taught. This study will explore the advantages of the VARK (Visual, Aural, Reading or Writing, and Kinesthetic) paradigm as a very effective learning approach. The study's purpose was to investigate whether there is a significant correlation between learning preferences of first-year undergraduate pre-service teachers using the VARK model and their age and programme of study. The population of the participants is 219 students in the B. Ed programme in St. Teresa's College of Education in Ghana. The purposive sampling was used to select participants for the study however, only 176 of them conveniently responded to the questionnaire. Of these 39 were Early Childhood Education (ECE) students, 116 Primary Education (PE) students and 21 Home Economics (HE) students. The VARK Questionnaire (Version 8.01) was adopted and used for data collection. Descriptively, it was noted that 22(12.5%) of the participants prefer Visual learning only, and 37(21.0%), 19(10.8%) prefer Aural, Reading/Writing and Kinesthetic learning only respectively. Meanwhile, some participants indicated that they prefer learning in more than one of the models, thus 30(25.6%) 13(7.4) and 10(5.7) prefer learning in Bimodal, Trimodal Quadrimodal respectively. Principal Component Analysis (PCA) with varimax rotation

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was conducted to assess the underlying structure for the 16 items of the VARK learning model. Analysis of Variance (ANOVA) of the main effect of age and programme of study on the VARK learning model of the pre – service teachers were assed. It was found that there is statistically significance difference between the mean scores of the pre – service teachers in the age brackets of 18-23 and 24-29 years of the study (F1, 174 =.001, $p < .05$). There was a statistically significant difference between programmes of study as determined by one-way ANOVA ($F(2,173) = 8.457$, $p = .001$). A Tukey post hoc test revealed that using the VARK learning model there was statistically significantly difference between PE (3.09 ± 1.5, $p = .001$) and ECE pre – service teachers (4.15 ± 1.7, $p = .001$) but not PE and HE pre – service teachers (3.75 ± 1.05, $p = .301$) programmes of study. Again, there was no statistically significant difference between the ECE and HE programme of study ($p = .646$). It is therefore, recommended teachers should vary their lessons to meet the needs and learning styles of all learnings by the VARK instructional tools or resources.

Keywords: *VARK, Model, Pre-service teachers, Professional Content Knowledge, St. Teresa's College of Education*

1.0 Introduction

The term "learning style" relates to the way a student learns and the most efficient method for a person to receive, process, and store knowledge. The learning style is said to correspond to the individual's characteristics, which are influenced by a variety of factors, including personality and environment. In an educational setting, teaching with an appropriate learning style increases the likelihood of increasing learning output. Additionally, one can regard the learning style as the most effective method of illustrating how a student concentrates, recalls prior knowledge, and stores new knowledge (Dutsinma & Temdee, 2020). The style of learning is the way in which someone acquires and uses creativity to achieve skills or knowledge. Because of its variable existence, based on human and intrinsic differences and the way they tend to learn new things, it can be called an individual style of learning. Style of learning focuses not on the weaker elements, but on the strengths. It is preferred to use a fusion of certain types and techniques for better learning, rather than sticking to only a single approach. Learning style helps a learner to be more effective with the development of his/her future achievement. It can allow a more innovative, honest, successful, timely decision-making and problem solver to be leaner (Hussain, 2017). To think about and appreciate, how learning takes place, students and teachers need a starting point. The type of learning is not a set of scores on a record or a set of alphabetic symbols or signifier paragraphs with marks. A learning style is a summary of a system, or of expectations. Any record that helps a learner to think about the way he or she learns is a helpful step in understanding learning and thereby enhancing it.

There are three primary modes of learning: visual, auditory, and kinesthetic, with the latter being the most prevalent. Neil Fleming's VARK student learning model incorporates several types of learning. Visual, auditory, reading/writing preference, and kinesthetic modes of learning are all referred to as VARK. The VARK model acknowledges that pupils have a variety of preferred modes of information acquisition (Fleming & Baume, 2006). It may be beneficial to identify your students' preferred modes of learning as visual, aural, reading/writing, or kinesthetic and to align your entire curriculum with these modes of learning. Bear in mind that this is frequently a combination of all three sensory modalities that is the optimal choice. It will boost your academic confidence and make data access easier for students. The four characteristics mirror the

experiences of both students and teachers in acquiring new information. This concept is based on the acquisition and learning of new information using simple sensory receivers. Due to its simplicity and efficacy, this learning model is regarded as a critical mode of instruction.

Inventories of learning styles are data processing models that seek to describe a student's preferred technique of data assimilation and processing. Visual learners (V) acquire knowledge by examining graphically rich data, graphs, and films. They prefer to visualise printed text through the use of symbolic tools such as arrows, flowcharts, graphs, models, and hierarchies. They educate others through the use of images or illustrations. Aural learners (A) pay close attention to the terms used by educators. They would rather listen to lectures than take thorough notes; they value debates and lectures and enjoy listening to speaker mp3 recordings. Aural learners may recall knowledge by reading aloud or by mouthing at a low volume while reading. Read/Write learners (R) collect data by reading printed materials. They appreciate lecture summaries, handouts, and textbooks. Furthermore, they are adept note takers. Kinesthetic learners (K) place a premium on hands-on experience, practical application, model application, and real-world knowledge. They prefer hands-on learning and typically incorporate touch, movement, and engagement into their educational environment. Even in an image-heavy setting, they dislike listening; kinesthetic students are often passive in the classroom.

1.1 Objectives of Study

i. The preferred learning style of the VARK learning model of first year undergraduate pre-service teachers.
ii. To determine whether there is statistically significant difference between the VARK learning model and pre – service teachers' ages.
iii. To determine whether there is statistically significant difference between the VARK learning model and pre – service teachers' programme of study.

2.0 Literature Review

2.1 Pedagogical Content Knowledge

Pedagogy frequently disregards individual experience in favour of teaching all students the same subject at the same time. By involving children wherever feasible and expanding on what they already know and are interested in, you may incorporate their viewpoints and knowledge. Additionally, learners can benefit from their peers' expertise and experiences (Gravells & Simpson, 2014). PCK is advanced knowledge about the material to be learnt that is only retained by teachers. This knowledge is frequently disguised by instructors' failure to recognize that they possess it or that it is important. PCK also teaches students about what makes some subjects simple or difficult to learn: the concepts and preconceptions that students of varying ages and backgrounds bring to the study of the most often taught topics and lessons. PCK is a multidimensional construct, which implies that it may be explored on a variety of levels (Gess-Newsome, 2015). The critical point to remember is that the PCK's five component pieces provide a structure that may be utilised to teach a variety of different subjects. This PCK structure is related to crucial PCK that is present in a variety of scenarios. By gaining an awareness of their unique pupils and learning styles, each instructor will be able to incorporate the personal approach element of the PCK technique. While we understand the value of implementing the PCK method in the classroom, it does not take the place of the teacher's professional judgement in making work decisions and regularly reflecting on and altering their own practises (Rollnick & Mavhunga, 2017).

Shulman pioneered the concept that instructors must have a thorough comprehension of the subject matter taught in schools and the ability to read it in 1987, and this belief has now been made available to all educators across disciplines. Shulman theory regards subject knowledge and pedagogical content knowledge as key components of pre- and post-service teacher competency. CK and PCK are measures of instructors' expertise in regard to various educational subjects. As a result, the term "subject matter information" is applied to both CK and PCK. In the field of mathematics, which also encompasses CK and PCK, mathematical information was implemented for instructional reasons (Ball, Thames & Phelps, 2008). Although the terms CK and PCK are defined differently by each study group.

However, it appears as though there is consensus on a few crucial topics. The term "content knowledge" relates to instructors' perceptions of the subject matter being taught. Not only must teachers comprehend this, but they must also investigate why it is thus, according to (Shulman, 1986). As a result, the emphasis is placed on developing a solid comprehension of the material being taught.

Subject matter awareness develops because of exposure to a variety of learning opportunities. There is evidence that subject matter awareness grows through focused practise and reflective reflection in formal learning circumstances, rather than through casual teaching experiences. As a result, it appears plausible to suppose that, as noted previously, structural variations in teacher education can result in differences in instructors' subject matter expertise. Additionally, the tough selection procedure for college pre-service teachers may result in variations in CK and PCK scores between instructors on the academic and non-academic tracks (Kleickmann, et al., 2015). Additionally, they found that the pre-service teacher's subject matter experience varied greatly across participating students and throughout the various types of teacher training programmes offered by universities. Teachers who have been educated to teach all topics, including numeracy (math), should possess CK and PCK competence. Thus, upon completion of initial teacher education in Ghana, prospective teachers would be prepared for both CK and PCK.

2.2 Learning Theories/Techniques

Child learning is regarded as the cornerstone of each individual's education. The most effective method of education for a youngster must be understood. Learning styles start developing very early on and can be used to help youngsters learn more and learn to enjoy it. Once an underachiever is exposed to an erroneous preferred learning method, their results will suffer as a result (Dutsinma, Chaising, Srimaharaj, Chaisricharoen & Temdee, 2018). Simultaneously, a university atmosphere frequently necessitates a particular learning style. Universities are regarded as the foundation stone of contemporary society. Numerous educational institutions, on the other hand, are currently having difficulty identifying and effectively supporting their students' learning styles. Numerous earlier publications have focused on determining a student's learning style and success. Previous research has used the VARK model to identify students' learning styles in higher education. Similarly, using the VARK paradigm, it was possible to teach toddlers about style recognition (Pritchard, 2008).

There are various distinct hypotheses regarding how people learn. This section will discuss few of them briefly.

Cognitive learning theory: Students are impacted by cognitive learning theory, and their understanding of their reasoning process aids in their learning. Teachers should allow pupils to pose questions, struggle, and think aloud. These strategies will assist students in gaining a better

understanding of their thinking processes and utilising this awareness to create more opportunities for learning. New information is built on prior knowledge, and learning requires active participation on the part of the learner. Behavioral changes are detected, but merely as a proxy for what is occurring in the learner's mind.

The *Principle of behavioral learning* is the concept that how a student acts depends on their relationship with their environment. The foundation for psychology that can be observed and quantified is behavioral learning theory. Positive reinforcement is a common aspect in behaviorism. Positive reinforcement can be used by teachers in a classroom to help students understand a concept better. When positive reinforcement is given, learners will replicate the desired action. When negative feedback is given, the action should not be replicated. It should encourage your learners to act in a certain way by providing immediate feedback, whether positive or negative.

Constructivism learning theory: Students assimilate what they are taught and incorporate it into their prior knowledge and experiences, thereby creating a new reality that is unique to them. In constructivist classrooms, teachers serve as a guide to assist students in developing their own knowledge and understanding. This is critical in assisting a variety of different sorts of pupils in integrating their own experiences into their learning process. The learner adds past experiences and cultural elements to a current situation, and each person has a unique interpretation and design of the information process. Social engagement is critical for cognitive development. The More Experienced Other (MKO) is someone who has a greater understanding or a higher level of expertise than the learner regarding a certain task, procedure, or idea. The Zone of Proximal Development (ZPD) is the point at which a learner's willingness to undertake a task under adult supervision and/or peer cooperation meets their capacity to solve the problem independently.

Humanism learning theory: focuses explicitly on the concept of self-actualization. Teachers can create classroom experiences that assist learners in achieving self-actualization. Educators can assist children in meeting their emotional and physical needs by providing a safe and pleasurable learning environment, ample food, and the resources necessary to succeed. This climate is the most suitable to supporting students in learning. Humanism is a perspective that assumes that learning should be viewed as a personal act. Rogers and others created the notion of facilitative learning on the premise that people have an innate human desire to learn and those learning entails enhancing one's own perception of oneself. The facilitator should establish an environment in which her pupils feel comfortable exploring new ideas and learning from their mistakes, as long as external forces do not jeopardise their safety.

Connectivism of learning: Connectivism is a relatively recent educational philosophy. This could be relationships with one another or with their tasks and duties in life. Teachers may utilise connectivism in the classroom to assist learners in making connections to things that excite them, so assisting them in learning. Teachers should utilise digital media to establish strong, meaningful connections to learning. (2020, University of Western Governors).

Experiential learning is about the learner encountering and learning from their own experiences. Kolb established a four-stage model of experiencing learning that he dubbed the experiential learning cycle. It is a method for individuals to comprehend their perceptions and alter their behaviour as a result. Individuals will continue to duplicate their errors without hesitation, according to this notion. Concrete experience is observing or immersing oneself in the assignment and is the initial step in which an individual just does the prescribed role. This is the process of

reflecting on your actions. Abstract conceptualization entails understanding and making sense of previously performed activities. This is the preliminary step toward determining how you can do things differently (Gravells & Simpson, 2014).

2.3 Empirical Studies

The study styles of 120 university students were analysed using the VARK questionnaire (French, Cosgriff & Brown, 2007). Thirty-three percent of the 120 children were kinesthetic learners, while one-eighth of one-eighth were quadmodal learners (the remainder were visual or aural, bimodal, or trimodal). The VARK questionnaire is used to study undergraduates' learning styles, as well as the effect of gender on academic success (Rathnakar, et al., 2014). 450 second-year students were enrolled in the study. According to the study's findings, 68.7 percent of respondents used multiple modes of transport. The most prominent sensory mode (45.5 percent) was aural, followed by kinesthetic (33.1 percent). Additionally, the study discovered that gender and prior academic success had no effect on education preference. Meehan-Andrews, 2009 conducted a study in which she examined students' learning styles in order to determine the benefits that each teaching technique should provide. In this study, the VARK questionnaire was employed to classify students' learning preferences. The findings suggested that most pupils (54%) were unimodal. Visual pupils accounted for 7% of unimodal pupils, aural pupils accounted for 3%, read/write pupils accounted for 10%, and kinesthetic pupils accounted for 36%. The remaining 46% were multimodal learners, including 20% who were bimodal, 10% who were trimodal, and 16% who were quadmodal. Another study examined adult learners' learning styles using the VARK questionnaire. The study enrolled 69 students from 17 different countries. Twenty-three respondents stated a preference for reading/writing. The remainder of the participants were approximately 12 multimodal learners, with 4% and 25% of visual, kinaesthetic, and audio-visual learners, respectively (Fundi, 2015).

In comparison to other learning modes, the VARK model is more sophisticated and provides more desirable outcomes. Its purpose is to examine the relationship between the mind and linguistics in an individual's behaviour (Hawk & Shah, 2007). Because pre-university education is commonly supplemented by coaching centres and private tuition classes, Samarakoon, Fernando, and Rodrigo C. report that large lecture-based modules with a strong emphasis on reading/writing and aural presentation of content are regularly used (2013). Students' knowledge of these preferred modes of learning requires a shift away from large-group lectures and toward an immersive, small-group approach that incorporates a variety of teaching-learning strategies. In the majority of studies, students benefited greatly from the use of the learning platform. Lecture mp3 recordings, audio recordings of PowerPoint presentations, prolonged discussions and workshops, and distribution of lecture handouts are all examples of possibly more effective teaching practises. Teachers can use a variety of teaching tactics to meet the specific learning needs of their pupils, who demonstrate a range of learning styles.

While numerous students (participants) represent a single mode of learning (Visual, Aural, Reading/Writing, or Kinesthetic), the various authors' findings show that numerous students (participants) represent multiple modes of learning (Visual, Aural, Reading/Writing, or Kinesthetic). Most students use the combined learning style described in the VARK model, which combines bimodal, trimodal, and quadmodal modes of learning. When it comes to knowledge absorption and processing, students have various preferences. Fleming's VARK model of learning style establishes a category for identifying a person's preferred sensory modality for learning. Students have a diverse set of educational expectations. This helps teachers to work efficiently and

successfully in accordance with their students' needs. Multiple modes of information presentation are required to retain our students' interest and motivation, necessitating a move away from the traditional large-group teacher-centered lecture style and toward an engaging, student-centered multimodal educational strategy (Prithishkumar & Michael, 2014).

3.0 Materials and Methods

Participants: The study protocol was accepted by the College Research Committee, with all participants receiving informed consent. During data collection, full anonymity was preserved; only the age and program of study of the student had to be indicated. All level 100 students in all three areas of programme specialization namely Early Childhood Education (ECE), Primary Education (PE) and Junior High School (Home Economics option [HE]) were included in the study. The population of the participants is 219 students from the three areas of specialization named above. The purposive sampling was used to select participants for the study however, only 176 of them responded to the questionnaire. Of these 39 were ECE students, 116 PE students and 21 HE students.

Instrument: After the appropriate approvals were obtained from the developer, the 16-multiple choice VARK questionnaire version 8.01. Copyright (2019) owned by VARK-Learn Limited was used. Downloaded from *https://vark-learn.com/wp-content/uploads/2014/08/The-VARK-Questionnaire.pdf.*

Procedure of the study: During contact hours, pre-service teachers at level 100 were briefed on the study. The questionnaire was then distributed to individuals who consented via an online survey in the form of soft copies. The completed questionnaire was appraised according to the pre-service teachers' preferred modes of learning. Students were divided into the following categories: Preferring only one of the learning styles V, A, R, or K; Multimodal multiple preferences. That is, Bimodal individuals have two preferences; Trimodal individuals have three preferences; and Quadrimodal individuals have all four preferences. The results are analysed and presented statistically (descriptive, factor analysis, and ANOVA) using SPSS version 20.

4.0 Results and Discussions

Objective 1The sixteen elements of the VARK learning model's underlying structure were determined using Principal Component Analysis (PCA) with varimax rotation. (The random sampling assumption was met. All the following assumptions were tested: normality, linear relationships between pairs of variables, and moderate correlation between variables.) Four components were sought since the questions were designed to index four constructs: visual, aural, reading/writing, and kinesthetic means of learning. Following rotation, the first component explained 38.7% of the variation, the second component explained 19.6%, the third component explained 9.6%, and the fourth component explained 8.8%. The items and various components for the rotated component matrix are shown in Table 2, with loadings smaller than.40 deleted for clarity. Meanwhile, more over half of the objects 76.7% were properly categorised and accounted for.

Table 1: Average response of participants on the 16 items surveyed

Variables	Frequency	Percentage (%)
Visual	22	12.5
Aural	37	21.0
Reading / Writing	19	10.8
Kinesthetic	45	25.6
Bimodal	30	17.0
Trimodal	13	7.4
Quadrimodal	10	5.7
Total	176	100

It is shown from table 1 that of 16 question items regarding pre – service teachers learning preference categorized into Visual, Aural, Reading/Writing and Kinesthetic types of learning among students. Beside the four-learning approach some learning resort to the use of combining either two, three or all four namely bimodal, trimodal and quadrimodal. It was observed that, of 176 participants, majority 45(25.6%) of them positioned as *Kinesthetic learners* while only 10(5.7%) apply use of all the learning categories in the VARK model. The ages of participants range from 18 to 29 with the age of 22 approximately.

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Table 2: Results from Principal Component Analysis with Varimax Rotation for a Four-Component for VARK learning model Questionnaire (N =176)

Items	Component Matrix				
	1	2	3	4	**Communality**
11. I am interested in learning about a new initiative. I would request the following:	0.936				0.892
4.When it comes to picking a career or field of study, the following factors are critical to me:	0.919				0.889
7. I am interested in learning how to play a new board or card game. I would:	0.830	0.420			0.868
9I want to learn a new skill on the computer. I would:	0.826				0.767
5. When I am studying, I:	0.789				0.797
12. I want to like to improve my photography skills. I would:	0.731				0.633
15. I want to find out about a house or an apartment. Before visiting it I would want:	0.565				0.514
6. I want to save more money and choose from a variety of possibilities. I would:		0.862			0.859
16. I am attempting to build a hardwood table that arrived in pieces (kitset). I would gain the most knowledge from:		-0.818			0.706
3. I want to learn more about a tour that I'm about to embark on. I would:		0.798			0.748
2. A website has a video demonstration of how to create a unique graph or chart. A person speaks, there are some lists and words describing what to do, and there are some illustrations. I would gain the most knowledge from:			0.744		0.744
13. I prefer a presenter or teacher who employs :	0.495		0.601		0.664
1.I am looking for directions to a shop that a friend recommended. I most certainly would.				0.938	0.889

Note: factors < .40 are omitted

The factors are ranked in descending order of magnitude, the first component which seems to index *Visual learning style*, had strong values on the first seven items. The second component, which seemed to index *Aural learning style*, had high values on the next three items in Table 4.2. One of the items though "I want to assemble a wooden table that came in parts (kitset). I would learn best from:" indexed high *Visual learning style* but had negative value. The third component, which seemed to index *Reading/ Writing*, loaded high values on the item 2 and 13 in the table. However, "13. I prefer a presenter or a teacher who uses:" had its highest value from *Reading/Writing*

component but also had a strong value from the *Visual* component. The fourth component which indexed *Kinesthetic learning style*, had a high value on the last item in the table, i.e., item 1.

The scree plot is a graph that display clarity of the total variance explained table where we have the extraction sum square loadings and rotation sum square loadings. From figure 1, it is noted that all items with less 1.0 eigenvalues could not form a component. In this figure although we have five components one was omitted based on the construct components of interest.

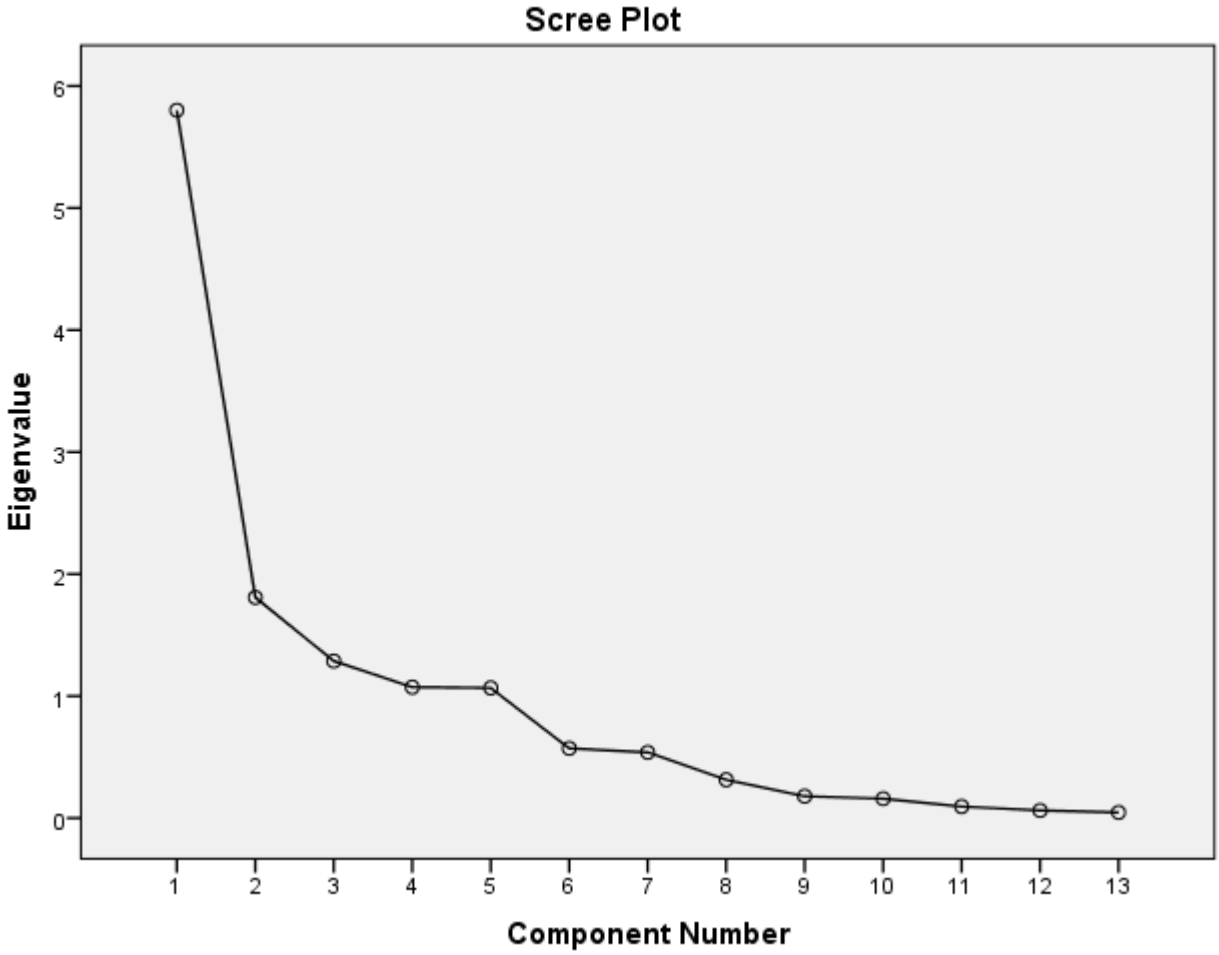

Figure 1: Scree Plot indicating the item included in the model

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Objective 2: Influence of VARK learning model and Pre – service teachers age groups

Table 3: *Summary of univariance Analysis of Variance (ANOVA) of the main effect of age on the VARK learning model of the pre – service teachers in the study*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	291.690	1	291.690	236.031	.000
Intercept	2512.918	1	2512.918	2033.415	.000
Ages	291.690	1	291.690	236.031	.000
Error	215.031	174	1.236		
Total	2769.000	176			
Corrected Total	506.722	175			

The result from Table 3 shows the summary of univariance Analysis of Variance (ANOVA) of the main effect of age on the VARK learning model of the pre – service teachers. It shows that there is statistically significance difference between the mean scores of the pre – service teachers in the age brackets of 18-23 and 24-29 years of the study (F1, 174 =.001, $p < .05$).

Objective 3: *Comparing pre – service teachers learning style and programme of study*

An ANOVA was computed to determine whether is significant difference between pre – service teachers learning style using VARK model and their programmes of study in college. From the result it was shown that there were no outliers and data was normally distributed for each programme of study assessed by using boxplot and normally distributed histogram. There was a statistically significant difference between programmes of study as determined by one-way ANOVA ($F(2,173) = 8.457$, $p = .001$). A Tukey post hoc test revealed that using the VARK learning model there was statistically significantly difference the PE (3.09 ± 1.5, $p = .001$) and ECE pre – service teachers (4.15 ± 1.7, $p = .001$) unlike PE and HE pre – service teachers (3.75 ± 1.05, $p = .301$) programmes of study. Again, there was no statistically significant difference between the ECE and HE programme of study ($p = .646$).

5.0 Conclusion

Due to its simplicity and efficiency, this model is considered a popular mode of learning in conjunction with its pedagogical implications. At higher levels of learning, any teacher or learner may have a mixture of distinctive leaning styles if one has an established a mature meaning way of learning. He will efficiently teach them to keep their desired learning style in mind. Visual learners can learn better from the prevailing context as they see, observe and are in touch with things. The auditory learners who learn best when they listen or hear stuff are very contrary to visuals. It is emphasized that their sense of hearing is predominant and the need to inculcate auditory aids such as songs, melodies and audio tapes to teach such learners effectively for beneficial results in terms of their successful learning was highlighted. They only learn better when they empirically do stuff based on principles, as far as kinesthetic learners are concerned. Apart from conceptually getting in touch with certain concepts, they literally enact those things. Writing learners are those who are interested in the traditional way of learning. For such learners to master any idea, repetition of written work is fundamental.

References

Ball, D. L., Thames, M. H., & Phelps, G. . (2008). Content knowledge for teaching: what makes it special? . *Journal of Teacher Education*, 59, 389e407. http://dx.doi.org/10.1177/0022487108324554. https://doi.org/10.1177/0022487108324554

Dutsinma, F. L., Chaising, S., Srimaharaj, W., Chaisricharoen, R., & Temdee, P. (2018). *Identifying child learning style by using human physiological response and Vark model.* Chiang Rai, Thailand: In The 6th Global Wireless Summit. https://doi.org/10.1109/GWS.2018.8686547

Dutsinma, L. I. F. & Temdee, P. (2020). VARK Learning Style Classifcation Using Decision Tree with Physiological Signals. *Springer Science+Business Media, LLC, part of Springer Nature 2020*. https://doi.org/10.1007/s11277-020-07196-3

Fleming, N. & Baume, D. (2006). Learning Styles Again: VARKing up the right tree! *Educational Developments, SEDA*, Ltd, Issue 7.4. https://doi.org/10.1016/S1471-0846(06)70627-8

French, G., Cosgriff, T., & Brown, T. (2007). Learning style preferences of Australian occupation therapy students. *Australian Occupational Therapy Journal*, 54, 58-65. https://doi.org/10.1111/j.1440-1630.2007.00723.x

Fundi, S. (2015). The VARK Learning Theory. *https://kibogoji.com/2015/04/06/the-vark-learning-theory/*, April 6.

Gess-Newsome, J. (2015). *In A. Berry, P. Friedrichsen & J. Loughran (Eds.), Re-Examining Pedagogical Content Knowledge (pp. 28-42).* Oxford: Routledge.

Gravells, A. & Simpson, S. (2014). Teaching and Learning Theories. *Published by Sage Publishing Company*, Retrieved 23/12/20 from https://tomprof.stanford.edu/posting/1505.

Hawk, T. F., & Shah, A. J. . (2007). Using learning style instruments to enhance student learning. *Decision Sciences Journal of Innovative Education*, 5(1), 1–19. https://doi.org/10.1111/j.1540-4609.2007.00125.x

Hussain, I. (2017). Pedagogical Implications of VARK Model of Learning. *Journal of Literature, Languages and Linguistics* , ISSN 2422-8435, Vol. 38.

Kleickmann, T., Richter, D., Mareike Kunter, M., Elsner, J., Besser, M., Krauss, S., Cheo, M. & Baumert, J. . (2015). Content knowledge and pedagogical content knowledge in Taiwanese and German mathematics teachers. *Teaching and Teacher Education*, 46 (2015) 115e126. https://doi.org/10.1016/j.tate.2014.11.004

Meehan-Andrews, T. (2009). Teaching mode efficiency and learning preferences of first year nursing students. *Nurse Education Today*, 29, 24-32. https://doi.org/10.1016/j.nedt.2008.06.007

Pritchard, A. (2008). *Ways of learning: Learning theories and learning styles in the classroom.* Abingdon: Routledge. https://doi.org/10.4324/9780203887240

Prithishkumar, I. J. & Michael, S. A. (2014). Understanding your student: Using the VARK model. *. J Postgrad Med 2014*, 60:183-6. https://doi.org/10.4103/0022-3859.132337

Rathnakar, P., Ashwin, K., Sheetal, U., Ashok, K., Nandita, S., & Laxminarayana, A. . (2014). Assessment of learning styles of undergraduate medical students using the VARK Questionnaire and Influence of sex and academic performance. *Advances in Physiology Education*, 38(3), 216-220. https://doi.org/10.1152/advan.00024.2014

Rollnick, M. & Mavhunga, E. (2017). Pedagogical Content Knowledge. *In book: Science Education (pp.507-522)*. https://doi.org/10.1007/978-94-6300-749-8_37

Samarakoon L, Fernando T, & Rodrigo C. (2013). Learning styles and approaches to learning among medical undergraduates and postgraduates. *BMC Med Educ*, 3:42. https://doi.org/10.1186/1472-6920-13-42

Shulman, L. S. (1986). Those who understand: knowledge growth in teaching. *Educational Researcher*, 15(2), 4e14. http://dx.doi.org/10.3102/0013189X015002004. https://doi.org/10.3102/0013189X015002004

Univeristy, Western Governors. (2020, May 30). *The five educational learning theories*. Retrieved from TEACHING & EDUCATION: https://www.wgu.edu/blog/five-educational-learning-theories2005.html