e-Bangi Faculty of Social Sciences and Humanities Universiti Kebangsaan Malaysia
Journal of Social Sciences and Humanities

Vol. 17, No.5 (2020), 119-131. ISSN: 1823-884x

LEARNING STYLES AS CORRELATES OF GRADE 6 LEARNER'S MATHEMATICS PERFORMANCE IN BUFFALO CITY MUNICIPALITY IN SOUTH AFRICA

Dr Kemi O. Adu, Dr Nicky Pylman & Prof Emmanuel O. Adu

ABSTRACT

The poor academic achievement and negative attitude of learners towards Mathematics are not only influenced by teaching styles but the learning styles as well. In other words, the mismatches between teaching and learning styles have a way of raising its ugly head in affecting effective classroom interaction and hence leads to poor performance in Mathematics. Therefore, this study investigated the correlation between learning styles and Grade 6 Mathematics performance. The study adopted correlational research design of quantitative approach. The target population for this study are Grade 6 learners in Buffalo City education district. Stratified sampling was used to select 1225 Grade 6 learners. The finding shows that Grade 6 learners with visual learning style ($\bar{x}$ = 13.242, SD = 5.565) had the best performance in Mathematics at Buffalo City, followed by learners with auditory learning style ($\bar{x}$ = 12.996, SD = 3.883), and learners with Kinaesthetic learning style ($\bar{x}$ = 11.525, SD =3.800). It is recommended that teachers should be trained to know the different type of learning style exhibit by their learners to use them to impact knowledge and disseminate information to them since learning style could be described as a set of factors, behaviours and attitudes that facilitate learning for an individual in a given situation.

Keywords: Educators, Learners, Learning styles, Mathematics, Performance

INTRODUCTION

Various scholars have defined learning Style mostly as a signal for individual differences. These differences may manifest itself in 'lifestyles' and even in personality types (Zhang & Sternberg, 2005). Honey and Mumford (2012) habitual and preferred ways of processing and transforming knowledge is described as learning style. According to Zhang and Sternberg (2005), psychological attributes, resulted from individual differences, determine the strategies a person chooses while learning. On the other hand, Keefe (2007) emphasizes learning styles, as the relative stable indicators of how learners respond, perceive and interact with learning environment in order to achieve desired learning outcome are traits of psychological, affective and cognitive domain. Moreover, Dunn and Dunn (2011) are of the view that new and difficult information stem from specific learning styles of individual's concentration are on mental process, retention and internalization of difficult information.

Learning style can also be described as a set of factors, behaviours and attitudes that facilitate learning for an individual in each situation. Styles influence how students learn, how teacher teach, and how the two interact during classroom activities. In my own view, the teacher

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and the students must be able to find desirable learning styles that can promote understanding of the subject matter and lead to desired outcome. Each person is born with certain tendencies toward particular styles, but these biological or inherited characteristics are influenced by culture, personal experiences, maturity level and development. Not only that, the background of the students can as well contribute to the style exhibits by the students. Style can be considered as 'Contextual' variable or construct because what the learner brings to the learning experiences is a part of the content as well as the important features of the learners experience itself. Each learner has distinct and consistent preferred ways of perceptions, organization and retention (Dunn & Dunn, 2011). Students learn differently from each other and it has been determined that brain structure influences language structure acquisition. It has also been shown that different hemispheres of the brain contain different perceptions avenues. Some researchers claim that several types of cells present in some brains are not present in others are responsible for different pattern of perception among individuals.

For Felder and Henriques (2009), the criterion for classifying learners is their perceptual behaviour. They make two categories: sensing and intuitive learners. 'Sensing' learners are concrete and methodical; they are good at memorizing facts and doing hands-on work and are more comfortable with following rules and standard procedures. On the other hand, 'intuitive' learners tend to be abstract and imaginative; they like innovation and dislike repetition. As to the ways in which learners prefer input information to be presented, they can be either visual or verbal learners. Visual learners are those who prefer to receive in the form of pictures, diagrams, films and demonstrations while verbal learners prefer words as a medium for information transfer. However, the researcher is of the view that the visual learners are better than the verbal since the Chinese philosophers believe that what learners see, they remember than what they hear.

Abidin, Rezaee and Abdullah (2011), described two groups of learners in their perpetual behaviour, these groups are intuitive and sensing learners, intuitive learners tend to be imaginative and abstract, such learners like to be innovative and do not like repetition. On the other hand, sensing learners are methodical and concrete; they like to do practical work facts memorizing and contented with standards procedures and rules. Learners have different ways of receiving information, some verbal while some visual. The verbal learners prefer medium for information transfer. Receiving teaching in form of demonstration, diagrams, pictures, video and films are favoured by visual learners. Apart from visual and verbal learner, there are also active and reflective learners in another category. The active learner as the name implies like to be fully involved in classroom activities. They play an active role in group discussion and interacted, examining and employing knowledge with others. They benefit from role paly, teamwork and dialogue. The reflective learners do have a deep thinking and employ self-examination. They are more disposed to contemplate on any perceived information.

The poor academic achievement and negative attitude of learners towards Mathematics are not only influenced by teaching styles but the learning styles as well. In other words, the mismatches between teaching and learning styles have a way of raising its ugly head in affecting effective classroom interaction and hence leads to poor performance in Mathematics (Mullis et al., 2012). When the learners are taught by using fascinating instructional materials in accordance with their learning styles, and when they consider their own styles while studying, their academic achievements seem to improve. In this regard, learning style is viewed as "the way in which individuals begin to concentrate on, process, internalize, and retain new and

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difficult information" (Hawk & Shah, 2017:9).

Learning behaviours are determined by learning styles and this influences effective teaching and learning. The learning environment has a way of influencing the preference of learning style and behaviour exhibit by the learners. Learners have a different way of perceiving, interacting and respond to this environment (Abidin et al. 2011). Teachers need to be conversant with the features and characters displayed by their learners; they also need to examine the variations in their students on the features of their learning styles, because the information about learner's preference can help teachers become more sensitive to the differences learners bring to the classroom (Abidin et al. 2011). Adjustments can then be made to accommodate the learners' varied needs.

When we think about a typical classroom situation, it is rare to find all three of these approaches (visual, auditory and kinesthetic) to learning incorporated into a class. While it may seem impossible to do this, it can be done through teacher thoughtful planning and preparation. These force teachers to conceptualize the class differently with a focus on the variety of ways in which students learn. The various inventories of learning styles allow teachers to gain insight into which areas they can use further development in and which are already well developed (Cuaresma, 2008). One of the most significant improvements in education has come from a considerable amount of research done in the area of learning styles, which recognizes that the students in classrooms have a variety of different learning profiles. Some of the magnitudes, which have been investigated in the area of learning style, are perceptual learning styles, field dependence/independence, analytic/global learning styles, and reflective/ impulsive learning styles. Some of the benefits of increasing learners' awareness of their own learning styles: "higher interest and motivation in the learning process, increased student responsibility for their own learning, and greater classroom community but little work could only be identified on the correlation of learning styles, instructional materials and learner academic achievement" (Cuaresma, 2008: 23).

It has also been shown that in any learner, there are different hemispheres of the brain, which, contain different perceptions avenues. Different pattern of perception among the learners are because of the cells in their brain as claimed by some researchers (Iyunade, 2014). There are different types of learners, such auditory, visual, and kinesthetic. The auditory appreciate listening to the teachers and sit down close to the teachers in class. Visual learners like to see things physically during teaching. They learn by materials like charts, graphs, and pictures. Kinesthetic learners learn by doing. Students can prefer one, two, or three learning styles (Iyunade, 2014). Teachers must be able to use their professional prowess to accommodate learners with all these preferences in order to help all students learn (Cuaresma, 2008). Kinaesthetic experience can improve discernment and deep thinking, also is involve action by imitation that is by doing, but the understanding does not travel through the fingertips and up the arm on like the visual and verbal learners who prefer seeing things and hearing things respectively directly from the teacher (Doren, 2007: 7).

Similarly, in another study carried out by Bansilal (2015), visual learners on like kinaesthetic are the largest group in any situated classroom (Nel & Nel, 2013). The visual learners prefer the presentation of information to them in class by means of diagrams, graphs and other physical resources that they can see, touch and feel (Fleming, 2015). Auditory learners, who usually make up 20% or less of a class (Nel & Nel, 2013), prefer information that is spoken and heard, and they thus learn through lectures and group-

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discussions (Fleming, 2015; Juškevičienė & Kurilovas, 2014). Learners with a reading/writing learning style prefer information displayed as words and they learn effectively by reading and writing (Fleming, 2015; Juškevičienė & Kurilovas, 2014). These learners appreciate physical resources (Prithishkumar & Michael, 2014), and make notes during their study (Fleming, 2015; Khanal, Shah & Koirala, 2014). Kinaesthetic learners learn best by moving, doing and acting (Amran, Bahry, Yusop & Abdullah, 2011; Juškevičienė & Kurilovas, 2014). They are very active and not reflective as alluded to above, they do not like being hazy, they are hyperactive, as they flourish on investigation (Bennett, 2013; Leopold, 2012) rather than 'chalk and talk' teaching (Şimşek, 2014).

Rawashdeh et al. (2010) explored learning styles in relation to academic success (achievement) and this has pointed out an association amongst different learning styles and academic achievement in various subjects founded on various scales of learning styles. Adeyemo et al. (2013) found that the effect of learning styles on academic achievement correlates positively with high scores in Mathematics and Physics. Aljaberi (2015) conceded that learners exhibited a clear deficiency in mathematical problem-solving abilities and found that learners' ability to solve mathematical problems diverges in their learning styles. The objective of the paper is to examine how learning styles affect Grade 6 learners Mathematics performance in Buffalo City while the tested hypothesis is "there is no significant influence of Grade 6 learners learning style (visual, auditory, and kinesthetic) on their mathematics performance"

LITERATURE REVIEW

Various scholars have defined learning Style mostly as a signal for individual differences. These differences may manifest itself in 'lifestyles' and even in personality types (Zhang & Sternberg, 2005). Honey and Mumford (2012) habitual and preferred ways of processing and transforming knowledge is described as learning style. According to Zhang and Sternberg (2005), psychological attributes, resulted from individual differences, determine the strategies a person chooses while learning. On the other hand, Keefe (2007) emphasizes learning styles, as the relative stable indicators of how learners respond, perceive and interact with learning environment in order to achieve desired learning outcome are traits of psychological, affective and cognitive domain. Moreover, Dunn and Dunn (2011) are of the view that new and difficult information stem from specific learning styles of individual's concentration are on mental process, retention and internalization of difficult information.

Students learn differently from each other and it has been determined that brain structure influences language structure acquisition. It has also been shown that different hemispheres of the brain contain different perceptions avenues. Some researchers claim that several types of cells present in some brains are not present in others are responsible for different pattern of perception among individuals.

For Felder and Henriques (2009), the criterion for classifying learners is their perceptual behaviour. They make two categories: sensing and intuitive learners. 'Sensing' learners are concrete and methodical; they are good at memorizing facts and doing hands-on work and are more comfortable with following rules and standard procedures. On the other hand, 'intuitive' learners tend to be abstract and imaginative; they like innovation and dislike repetition. As to the ways in which learners prefer input information to be presented, they can be either visual or

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verbal learners. Visual learners are those who prefer to receive in the form of pictures, diagrams, films and demonstrations while verbal learners prefer words as a medium for information transfer. However, the researcher is of the view that the visual learners are better than the verbal since the Chinese philosophers believe that what learners see, they remember than what they hear.

Moreover, with respect to the way knowledge is processed, learners can be put into two categories, namely 'active' and 'reflective'. An active learner, as suggested by the name, is someone who prefers to be actively involved in examining and employing knowledge with others. He or she does so in group discussions and interactions with others. Reflective learners tend to employ their introspection. Active learners benefit the most from a dialogue, role-play, cooperative and teamwork learning activities while reflective learners are more inclined to ponder on perceived information. Learning styles were found to affect learners' learning behaviours. Learners having different learning style preferences would behave differently in the way they perceive, interact, and respond to the learning environment (Ma et al. 2013). Since learners differ in their preferences to certain learning styles, it will be important for teachers to examine the variations in their students on the features of their learning styles, because the information about learner's preference can help teachers become more sensitive to the differences students bring to the classroom (Felder & Spurlin, 2015). Adjustments can then be made to accommodate the students' varied needs.

The term learning style refers to the concept that individuals differ in regard to what mode of instruction, way of assimilating and receiving information in the class with how study is most effective for them (Pashler, Daniel, Rohrer, & Bork, 2008:105). According to Silver, Strong, and Perini (2010), the concept dates back to ancient Greek all the way to the Renaissance. They linked the learning style concept to Hippocrates "FOURNESS". When not in equilibrium cause PERSONSTO exhibit four types of personalities and William Blake's description of the four ZOAS of human existence: the body and its senses; the heart and its capacity for love; the head and its ability to reason; and the spirit and its potential for creative imagination seem similar to that of Hippocrates. Silver et al. (2010) believed that evidence of the learning style concept could also be found in the spiritual stories of Indians of the North American Plains. The four human personality traits are given as wisdom, clarity of perception, introspection, and understanding one's emotions. Murray (2013) reclassified human "FOURNESS" and advanced that humans use perception and judgement as cognitive functions to process information.

Small (2011) opined that teaching should be student-centred, make use of appropriate technology and aim to develop communication skills via small group activities and projects to infuse positive experiences and confidence among students. While no specific learning style was implied by Small (2011). The suggested learning activities could be used to describe the three types of learners identified by Silver et al. (2010) for instance mastery, intuitive and interpretative. Further, Ng, Pinto, and Williams (2011) investigated the effects of learning styles on Mathematics performance of approximately forty students (40) in Cyprus. They used an interpretive and learner-centred approach as well as learning activities that emphasised the applicability of Mathematics to the real world. The study found that learning style was not a significant determinant of students' overall Mathematics scores for the entire group of students despite designing Mathematics to facilitate the diverse ways in which students processed information and emphasising deeper approaches to learning. However, learning styles were

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significantly related to the average obtained at examination for some subjects from the same sample used in the investigation discussed.

In our ever-evolving society, it has become increasingly apparent that 'each student plays an integral role in his individual learning experience' (Weinstein & Hume, 2008: 6). While teachers prepare lessons and present information, ultimately the student interprets, understands, and retains such information in a way that permits simplistic retrieval and recall for application. In order to perform these tasks, students employ different preferences for and habits of sense making. Learning style in this context is defined as the way in which a person 'begins to concentrate on, process, internalize, and remember new and difficult academic information' (Hall, 2008: 6). Learning styles therefore indicate how the student 'perceives, interacts with, and responds to the learning environment and what they are receiving in form of teacher in the classroom (Hall, 2008: 6).

Although the concept of learning styles appeared as late as the 1970s, there have been many ways to approach this concept. Nevertheless, it is reasonable to classify learning styles from two main perspectives. One pertains to individual processing of information (auditory, visual, and kinaesthetic) (Pashler et al., 2009); the other pertains to individual relationship with other learners (competitive and cooperative). Competitive and cooperative as learning styles are the focus of the present research.

Furthermore, in a classroom setting, most especially in South Africa and beyond, the competitive learner implements an individualistic personal learning plan and employs learning strategies that enable the learner to achieve learning goals (Ma & Ma, 2014). Competitive learners often see all students in the class as working towards the same goal of learning. However, the competitive learner wants not to only become the first in achieving that goal but also achieve that goal in a more outstanding manner than the peers (Ma & Ma, 2014). Consequently, competitive learners often see academic performance as a system of few winners and many losers. The chief benefit of the competitive learning style is the motivation that stimulates great learning effort (Burguillo, 2010). On the other hand, some educational psychologists have argued that competitive learning may not be desirable because it produces high stress, low self-concept (in the case of failure), cheating, and aggression in the classroom (Ma & Ma, 2014).

Ma and Ma (2014) argued that to promote academic success, educators need to understand how students differ in their approaches to learning tasks and use that understanding to create strategies for appropriate learning styles. Johnson et al. (2012) examined eight cooperative learning methods and found that all of them indicate significantly positive effects on academic achievement. Specific to Mathematics education, Ma & Ma, (2014) asserted that, to increase Mathematics performance, how students learn in Mathematics must be analysed. Hall (2008) also asserted that learning styles are a significant determinant of Mathematics performance. In general, review of educational research has indicated a positive relationship between learning styles and Mathematics achievement (Ma & Ma, 2014). Overall, it is important to investigate learning styles as a critical variable in explaining Mathematics performance.

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People are not born to share a genetic predisposition in terms of the learning approach; instead, they learn how to conduct learning through a socialization process that is unique to each culture. Of course, some learning styles can be common to students around the world. For example, if tests require students mainly to reproduce knowledge, then memorization dominates their learning styles (Ma & Ma, 2014). However, other learning styles can be very culturally specific. They stated that every culture has unstated assumptions about people and how they learn, and these assumptions invisibly guide the educational process in that culture.

Kolb's Experiential Learning Theory

This paper is anchored by Kolb's experiential learning theory. According to Kolb, experiential learning requires qualities such as self-initiative and self-evaluation. For experiential learning to be timely effective, it should employ the completely learning wheel, from goal setting, to experimenting and observe, to reviewing and finally to action planning. This complete process allows students to learn new skills in many subjects especially Mathematics, new attitudes and new ways of thinking. Learning through fun (instructional materials) helps the learner to retain information for a longer period and students are encouraged to direct involvement in the experience, in order that they gain a better understanding of the new knowledge and retain the information for a longer time. Kolb experiential theory, which involves four-stages of learning, "do, observe, think and plant", helps students to participate actively in learning **(**Akinoso, 2012:24).

Among the various learning style models, Kolb's Experiential Learning Model (ELM) and Learning Style Inventory (LSI) (Learning-Centred Processed-Based Approach /Information Processing Style) has been widely utilized and modified to address the various educational contexts. Kolb proposes a four-stage hypothetical learning cycle. Individuals will show a preference for or will cope with some stages better than others will and learning is seen as continuous, interactive process (Nzesei, 2015). The four stages of the ELM are described as:

- Concrete experience (CE; experiencing) which favours experiential learning;
- Abstract conceptualization (AC; thinking) where there is a preference for conceptual and analytical thinking in order to achieve understanding;
- Active experimentation (AE; doing) involving active trial-and-error learning; and
- Reflective observation (RO; reflecting) where extensive consideration is given to the task and potential solutions before there is any attempt at action. The four learning orientations form two orthogonal bipolar dimensions of learning.

The first dimension is comprehension- the grasping of information from experience- and is constituted by the bipolar orientations CE-AC. The second dimension described is transformation-the processing of grasped information- and is constituted by the remaining orientations AE-RO. Relative positioning along these dimensions defines the learning styles described by Kolb as convergence, divergence, assimilation and accommodation. The individual who adopts a convergent approach uses abstract conceptualization to drive active experimentation. Action is based on abstract understanding of the task and projected strategies for successful completion of the task. Diverge learners combine reflective observation with concrete experience to devise an often-creative solution. Multiple potential

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strategies for learning and problem solving are used to describe creative leaners (Nzesei, 2015).

METHODOLOGY

Research Approach

This study adopted the quantitative approach. The purpose of using this approach for this study is because it can predict human behavior or predict likely outcomes (identify relationships among variables) which particularly this study is all about, to show how learning styles affect Grade 6 learners' Mathematics performance.

Research Design

The study adopted correlational research design. Correlational research design is a form of quantitative design that is non-experimental. Therefore, the correlational design is the most useful and appropriate research design for this article due to the high levels of uncertainty and ignorance about the subject, because of the paucity of existing research and literature on the research topic. This type of research is usually flexible without a formal structure.

Population, Sample and sampling techniques

The target population for this study are Grade 6 learners in Buffalo City education district. Stratified sampling was used to select 1225 participants which are Grade 6 learners.

Data Collection Instrument

The data collection instrument is students' learning style scale (SLSS) which has two sections, section A and B. section A consists of biodata information; which are, Name, School and Gender. Section B has seventeen (17) items with the following response scales; **GE** = Great Extent, **SE** = Some Extent, **LE** = Little Extent, **NA** = Not at All (**See Appendix A)**

Validity and reliability of SLSS

According to Setati (2011), for a research study to be accurate and its findings reliable and valid, there is need for measuring validity and reliability of any instrument. Different writers addressed the issue of validity and reliability differently. A co-efficient value of 0.87 was obtained. In this study, the questionnaire was regarded as valid and that these instruments elicited for accurate information. They provide a real measure of examining the learning style, availability, and utilization of instructional materials as it affects Grade 6 learners' Mathematics performance.

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Data analysis

Inferential statistics of Pearson Product Moment Correlation (PPMC) was employed to test the hypothesis raised in this paper as it measures relationships between independent variable (Learning styles) on the only dependent variable (Mathematics performance)

RESEARCH FINDINGS

Hypothesis: There is no significant influence of learning styles on Grade 6 learners' Mathematics performance.

Table 1: Descriptive Aspect of One-way Analysis of Variance

Mathematics_Performance

	N	Mean	Std. Deviation	Std. Error
Visual_Learning_Style	231	13.2424	4.56572	.30034
Auditory_Learning_Style	836	12.9964	3.88348	.13431
Kinesthetic_Learning_Style	158	11.5253	3.80027	.30233
Total	1225	12.8531	4.04060	.11545

Table 1 shows that Grade 6 learners with visual learning style ($\bar{x}$ = 13.242, SD = 5.565) had the best performance in Mathematics at Buffalo City, followed by learners with auditory learning style ($\bar{x}$ = 12.996, SD = 3.883), and learners with Kinaesthetic learning style ($\bar{x}$ = 11.525, SD =3.800). The above table is expedient according to Amran et al. (2011) stated that for any student to be empowered to perform better academically, their preferred learning styles must be considered. Learners' preferred learning styles will improve and enhance their understanding of what is being taught.

The finding supports the argument of Felder and Henriques (2009), which categorised visual learners as sensing learners. 'Sensing' learners are concrete and methodical; they are good at memorizing facts and doing hands-on work and are more comfortable with following rules and standard procedures, hence, they perform better than the other categories. However, it contradicts Chuah Chong-Cheng (2008), who say, learners retain 30% of what they see and 50% of what they see and hear while 90% of what they say as they do something since visual learners learn visually by means of charts, graphs, and pictures.

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Table 2 Output of ANOVA: the combination of the three types of learning styles understudy

Mathematics_Performance

	Sum of Square	Df	Mean	F	Sig.	Remark
Between Groups	330.739	2	165.369	10.283	.000	Sig.
Within Groups	19652.812	1222	16.082			
Total	19983.551	1224				

Table 2 shows the combination of the three learning styles influence on learners Mathematics performance. It revealed that there is a significant influence of learning style (visual, auditory, and kinaesthetic) on Grade 6 learners Mathematics performance ($F(2,1222) = 10.283$, $p<0.05$). Therefore, hypothesis one is rejected.

The above findings is supported by Abidin et al. (2011), who are of the view that learning styles make an impact on the students‘ overall achievement and students in their study possessed multiple learning styles or a combination of different learning styles, thus, they are able to learn effectively. The above findings are congruent with Kolb's experiential theory which emphasises the importance of a student's preferred learning style, depending on the available instructional materials. According to Kolb, a learning style is not a fixed trait but a differential preference for learning which changes slightly from situation to situation and influence by availability of instructional materials (Azevedo & Akdere, 2010:192; Bhatti & Bart, 2013:2).

CONCLUSION

The study investigated the relationship between learning styles and Grade 6 Mathematics performance. There are different types of learners, such auditory, visual, and kinesthetic. The auditory appreciate listening to the teachers and sits down close to the teachers in class. Visual learners like to see things physically during teaching. They learn by materials like charts, graphs, and pictures. Kinesthetic learners learn by doing. Students can prefer one, two, or three learning styles. The findings of the study revealed that all the three major types of learning styles have positive effect on learners' academic performance in Mathematics. Nevertheless, the visual learning styles proved to be the best, this shows that learners need to see things before they can understand it better. This is in line with Chinese philosophers that says "what I see, I remember and what I hear, I forget. Teachers need to play significant role in making sure that learners are shown what is relevant and what that can enhance their performance.

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ACKNOWLEDGEMENT

The authors acknowledge all and sundry whose research works are used in this paper. We also appreciate the research assistant and data analyst for job well done.

RECOMMENDATIONS

It is recommended that teachers should be trained to know the different type of learning style exhibit by their learners to use them to impact knowledge and disseminate information to them since learning style could be described as a set of factors, behaviours and attitudes that facilitate learning for an individual in a given situation. These styles influence how students learn, how teacher teach, and how the two interact during classroom activities.

REFERENCES

Abidin, M.J., Rezaee, A.A. & Abdullah, H.N., Singh, K.K. (2011). Learning styles and overall academic achievement in a specific educational system. *International Journal of Humanities and Social Science.1 (10):143-157*

Adeyemo, S.A., Babajide, V.F., & Amusa, J.O. (2013). The relationship among Teachers'

Problem-Solving Abilities, Students' Learning Styles and Students' Academic Achievement in physics. *Australian Journal of Basic and Applied Sciences,* 7(4).102-116.

Akinoso, S.O. (2012). *Effects of concrete-representational-abstract and explicit instructional strategies on senior secondary school students' achievement in and attitude to Mathematics*. Unpublished Ph.D. Thesis University of Ibadan, Ibadan.

Aljaberi, N.M. (2015). University Students' Learning Styles and their ability to solve Mathematical Problems. *International Journal of Business and Social Science,* Vol.6 No.4 (1), pp. 152-165.

Amran, N., Bahry, F.D.S., Yusop, Z.M. & Abdullah, S. (2011). Learning styles of non-science and non-technology students on technical courses in an information management program. *Education for Information*, 28(2):325-339.

Azevedo, M., & Akdere, T. (2010). *What students abroad are expected to know about mathematics*? Washington, DC

Bansilal, S. (2015). Learners engaging with transformation geometry. *South African Journal of Education*, *32,* 26-39.

Bennett, T. (2013). *Teacher proof*. Oxon: Routledge.

Bhatti, R. & Bart, W.M. (2013). On the effect of learning style on scholastic achievement. *Current Issues in Education,* 16(2):1-6.

Burguillo, A.C (2010). A Comparative study of public and private secondary schools in the provision of quality education. *Journal of Educational Administration and Planning* 5:88-95.

Chuah Chong-Cheng. (2008). Sinar Cendekia. Malaysia, Penang: Universiti Sains Malaysia (USM).

Cuaresina, F. (2008). Learning Styles and Pedagogy in Post-16 Learning. *A Systematic and Critical Review.* Learning and Skills Research Centre, London.

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Doren, D. (2007). *Using resources to support mathematical thinking in primary and early years,* Learning Matters Ltd.

Dunn, R., & Dunn, K. (2011). *Teaching students through their Individual learning styles. A practical approach.* Prentice Hall, Reston, VA., ISBN: 10: 0879098082, 336.

Hall, M. (2008). The effect of cooperative learning groups and competitive strategies on Math facts fluency of boys and girls. Retrieved from https://commons.kennesaw.edu/gpc/sites/commons.kennesaw.edu.gpc/files/Paper%20Hall_0.pdf.

Hawk T.F. & Shah A.J. (2017). 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

Felder, R.M. & Henriques, E. R. (2009). Learning and teaching styles in foreign and second language acquisition. *Foreign Language Annuals*, 28(1): 21-31.

Felder, R.M. & Spurlin, J. E. (2015). Application, reliability, and validity of the index of learning styles. *Intl. Journal of Engineering Education,* 21(1): 103-112.

Iyunade, P.N. (2014). Refocusing the use of improvised educational media: A case of Mathematics instruction in Imo State. *Knowledge Review 15.* (3), 45-50.

Johnson, B., & Christensen, L. (2012). *Educational research: Quantitative, qualitative, and mixed approaches.* Sage publisher, London.

Johnson, D. H., Howland, J., Moore, J., & Marra, R. M. (2012). *Learning to solve problems with technology: A constructivist perspective* (2nd Ed.). Upper Saddle River, NJ: Pearson Education.

Juškevičienė, A. & Kurilovas, E. (2014). On recommending Web 2.0 tools to personalise learning. *Informatics in Education,* 13(1):17-31.

Keefe, J. W. (2007). Learning styles: Theory and practice. Reston, VA: National Association of Secondary School Principals.

Khanal, L., Shah, S. & Koirala, S. (2014). Exploration of preferred learning styles in medical education using VARK modal. *Russian Open Medical Journal,* 3:1-8.

Ma, M. D. L., Monteiro, V., & Peixoto, F. (2013). Attitudes towards mathematics: Effects of individual, motivational, and social support factors. *Child Development Research, 2012*.

Ma, V. J. & Ma, X. (2014). A comparative analysis of the relationship between learning styles and mathematics performance. *International Journal of STEM Education*. 1(3): *1-13.*

Mullis, I.V.S., Martin, M. O., Foy, P. & Arora, A. (2012). *TIMSS 2011 international results in Mathematics*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Murray, J. (2013). The Factors that Influence Mathematics Achievement at the Berbice Campus. *International Journal of Business and Social Science 4(10):150-165.*

Nel, E. l. & Nel, Y. (2013). Gender and Mathematics Education in Africa. The Proceedings of the 12th International Congress on Mathematical Education Sung Je Cho Editor *Intellectual and Attitudinal Challenges* Springer International Publishing AG Switzerland. *Pp 145-151.*

Ng, P., Pinto, J. & Williams, S.K. (2011). The effects of learning styles on course performance: A quantile regression analysis. *Academy of Educational Leadership Journal,* 15(1):15 37.

Vol. 17, No.5 (2020), 119-131. ISSN: 1823-884x

Nzesei, M.M. (2015). *A correlation study between learning styles and academic achievement among secondary school students in Kenya*. M.Ed. dissertation submitted to the Department of Psychology. University of Nairobi.

Pashler, H., McDaniel, M., Rohrer, D. & Bjork, R. (2009). Learning styles: Concepts and evidence. *Psychological Public Interest,* 9(3):105-119.

Prithishkumar, I.J. & Michael, S.A. (2014). Understanding your student: Using the VARK model. *Journal of Postgraduate Medicine*, 60(2):183-186.

Rawashdeh, I.; Nawafleh, W., & Alomari, A. (2010). Learning Styles of Ninth Grade Students in Irbid and its Effects on their achievement in Chemistry. *Jordan Journal of Educational Sciences,* 16(4), pp. 163-176.

Sanni, S. (2011). Learning styles of prospective teachers: Kocaeli University case. *Journal of Educational and Instructional Studies in the world*, 3(2):1-12.

Setati, M. (2011). *When language is transparent: supporting Mathematics learning multilingual contexts* page 235 - 241. AMES a Congress 2009 proceedings

Şimşek I (2014). Öğrenme stillerini belirlemek için bir karar destek sistemi geliştirilmesi [Developing decision support system to determine learning styles]. *Hasan Ali Yücel Eğitim Fakültesi Dergisi (Journal of the Hasan Ali*.)

Silver, H. F., Strong, R. W., & Perini, M. J. (2010). *So, each may learn: Integrating learning styles and multiple intelligences*. Alexandria: Association for Supervision and Curriculum Development.

Weinstein, C.E. & Hume, L.M., (2008). Study strategies for lifelong learning. Washington DC.

ABOUT THE AUTHORS

DR KEMI O. ADU
University of Fort Hare, South Africa
kemiadu78@yahoo.com

DR NICKY PYLMAN
University of Fort Hare, South Africa
jpylman@ufh.ac.za

PROF EMMANUEL O. ADU
University of Fort Hare, South Africa
eadu@ufh.ac.za