Learning styles and achievement in geometry

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ABSTRACT

This study aimed to compare the achievement in Geometry of the Grade 9 students of Abra State Institute of Sciences and Technology when grouped according to learning styles. A preference inventory was utilized to determine the learning style of the respondents while their achievement in Geometry was gauged using an achievement test. The quantitative-descriptive method of research was used in analysing and interpreting the data of the study. Majority of the respondents are visual learners. The kinesthetic learners performed best in all the three learning areas namely; Ratio and Proportion, Similar Triangles, and Pythagorean Theorem. The level of performance of the respondents in Geometry when grouped according to learning styles did not significantly differ. Whatever the learning style a student has, it does not affect his/her performance in school specifically in Geometry. Mathematics teachers may be encouraged to look and apply strategies that could enhance more the abilities of the learners which could also attract other learners with different learning styles to participate more actively the teaching-learning process.

Keywords: learning styles, geometry, achievement.

1 INTRODUCTION

A benchmark of learning styles is characteristic, cognitive, affective, and psychosocial behaviors that serves as relatively unchanging indicators of how learners observe and respond to the teaching-learning environment. The diversity of students engaged in higher education continues to expand. Students come to school with different cultural backgrounds and especially so, different learning styles. These variety of students led many educators to reconsider traditional, uniform instruction methods and stress the importance of considering students learning styles in the design, and delivery of the curriculum guide content. [1]

To know how really important learning style was, Reference [2] added that learning styles is defined as the different ways used by individuals to process and organize information or to respond to

environmental stimuli. Models of learning styles have been used regularly in the learning and teaching environment. The purpose of using learning styles is to find the best ways for students to learn both effectively and teachers to teach efficiently. [3]

Student learning styles can be described as student's preference on how they receive and process information [4]. Although there are a number of models related to learning styles, [5]-[7] this study uses the following mathematics learning styles which was taken from Kolb, D. A. (1984).

Mathematics can be such a powerful tool, it is important to study students' performance toward mathematics, as this has been shown to affect mathematics and could potentially affect who chooses mathematics [8]. Furthermore, students whose learning styles are compatible with the teaching style of the course instructor tend to retain information longer, apply it more effectively, and have more positive post-course attitudes toward the subject than to do their counterparts who experience learning-teaching style mismatches.[9]

As added by Reference [10], a Mathematics teacher who adopts a teaching style that considers visual learning may provide learners with a visual dictionary to illustrate mathematical concepts in English and in their own language. Likewise, a teacher may support the learning of visual learners through the use of appropriate Mathematics software, which provides a dynamic visualization of concepts [11]. Other learning styles also need to be considered in the classroom due to the fact that learning style preferences differ, and some learners are multimodal [12].

2 OBJECTIVES OF THE STUDY

The study aimed to determine the learning style preferences of the respondents and the level of their mathematics performance. It will also look on the significant differences on their mathematics achievements when group according to learning style preferences.

3 MATERIALS AND METHODS

3.1 RESEARCH DESIGN

This study was quantitative descriptive using quantitative approach to investigate the three research questions. This was followed by a small qualitative component to interpret the quantitative data.

3.2 POPULATION AND SAMPLE

The population of this study were the Grade 9 students of ASIST. Total enumeration of population was used. The data used in this study were collected during an exploratory study that examined the direct relationship between performance and learning style preference of the respondents.

3.3 INSTRUMENT

The study made use of two sets of measuring tool. The first part is a 30 –item learning style preference inventory which measured the learning styles of the respondents. There are 10 item indicators each of the learning styles along Auditory, Visual and Kinesthetic respectively. The second part is a 60 – item researcher made test in geometry which covered problems in ratio and proportion, similar triangles and Pythagorean Theorem.

3.4 DATA ANALYSIS

To substantiate the analysis of data results, weighted mean was employed to unveil and determine the level of learning style preferences and geometry performance of the respondents. However, ANOVA was used to obtain the differences in between the research needs of the respondents and their profile.

4 RESULTS AND DISCUSSION

Table 1. Learning Style of the Student-Respondents

Learning style	Frequency (f)	Percentage (%)
Visual	50	56.82
Auditory	24	27.27
Kinesthetic	14	15.91

Majority of the respondents are visual learners, followed by auditory learners then kinesthetic learners. Teachers may apply strategies that could enhance and motivate students with different learning styles in order to make them more active in the teaching-learning process.

The results holds true to what is posted in (http://www. studyingstyle.com/visual-learners.html) it is said that Visual learners comprise about 65% of all students. About 30% of all students are auditory learners and 5% of all students are kinesthetic learners. Moreover, this was supported by Cohen (1987) when he conducted research which showed that the majority of very young children are tactile and kinesthetic. In primary school only 12% of students are predominantly auditory learners and about 40% are visual. The older the students, the larger the number of predominantly visual and auditory learners.

Table 2. Level of Geometry Performance

Content Learning Area	Groups	Mean	Descriptive Rating
Ratio and Proportion	Visual	5.78	Satisfactory
	Auditory	5.08	Satisfactory
	Kinesthetic	7.21	Very Satisfactory
Composite Mean		**6.03**	**Very Satisfactory**
Similar Triangles	Visual	5.33	Satisfactory
	Auditory	4.71	Satisfactory
	Kinesthetic	6.07	Very Satisfactory
Composite Mean		**5.37**	**Satisfactory**
Pythagorean Theorem	Visual	13.70	Very Satisfactory
	Auditory	14.08	Very Satisfactory
	Kinesthetic	16.64	Excellent
Composite Mean		**14.81**	**Very Satisfactory**
As a whole	Visual	24.81	Very Satisfactory
	Auditory	23.88	Satisfactory
	Kinesthetic	29.93	Very Satisfactory
Composite Mean		**26.21**	**Very Satisfactory**

In the Ratio and Proportion part, the kinesthetic learners performed best followed by visual learners then auditory learners. In general, the respondents performed very satisfactorily on ratio and proportion. Likewise, in the Similar Triangles part, kinesthetic learners obtained the highest mean followed by visual learners then auditory learners but as a whole, the respondents performed satisfactorily only. In the Pythagorean Theorem part, kinesthetic learners has the highest mean followed by auditory learners then visual learners. As a whole, the respondents performed very satisfactorily along this content learning area. The overall mean revealed a very satisfactory Geometry performance of the respondents.

Looking deeper on the results, among all other learners it is evident that Kinesthetic Learners are the significant achievers in all the content learning areas and performed best on the content learning area along similar triangles. This may be due to the fact that most of the covered topics are taught with games and associated with manipulative materials and in the process most learners do learn best by doing. Some of manipulative are figures for triangle similarities and dice for ratio and proportion problems.

Moreover, it is significant to say also that from the results under the Pythagorean Theorem content learning area, the Visual and Auditory Learners performance was very satisfactory and still kinaesthetic learners performs best. This may be due to the fact that in this content learning area, learners needs more focus and the nature of the topic is more on lecture and guided formula and representations and after learning the theory it is best performed when applying already the formula and still kinaesthetic in nature as what was transpired through simulations and sample problems. This was supported by reference [13]

entitled Developing Students' Understanding of Figures: a Perceptual Approach wherein he exclaimed that process is striving for symbolic representation is derived from an operation and vice versa. And was supported by [14] where he claims that the introduction of symbolic notation is necessary for reification. Understanding the relationships inherent in similar figures and representing them with numerals is not only necessary for quantification, but also for the students to view these relationships as functional.

Table 3. ANOVA Summary Table Showing Differences in the Level of Performance of the Respondents when Grouped According to Learning Styles

Content Learning Area	F-Comp Value	F-Crit value	F-Prob	Decision
Ratio and Proportion	1.982	3.099	0.144	Not Significant
Similar Triangles	1.141	3.099	0.324	Not Significant
Pythagorean Theorem	2.357	3.099	0.101	Not Significant
As a whole	**2.163**	**3.099**	**0.121**	**Not Significant**

The performance of the respondents on the three content learning areas namely; Ratio and Proportion, Similar Triangles, and Pythagorean Theorem did not significantly differ when respondents are grouped according to learning styles. This means that all learning styles of the respondents are as effective in learning the content learning areas covered in this study. This may be due to the fact that in learning geometry you may need the mixed learning styles to get along with the teaching styles of teachers to best learn the concepts. As what was claimed by Reference [15] of Sciencing.com that the modern-day math classroom is interactive and hands-on. In addition to presenting mathematical concepts visually and orally, teachers extend their teaching to another significant portion of the learning population: the kinesthetic learner who must move around and touch objects to grasp elusive concepts.

5 CONCLUSION AND RECOMMENDATION

Majority of the respondents are visual learners. The kinesthetic learners performed best in all the three learning areas namely; Ratio and Proportion, Similar Triangles, and Pythagorean Theorem. Students learn better through manipulation and practices, use a lot of gestures, and busily engaged in the teaching-learning process.

The level of achievement of the respondents in Geometry when grouped according to learning styles did not significantly differ. The Geometry performance of the respondents is not affected by their learning style, whether he/she is a visual, auditory or kinesthetic learner. Teachers may be encouraged to

use strategies that would enhance the abilities of students and at the same time could attract other learners with different learning styles.

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