

# Learning Styles and Skills in General Mathematics Using Alternative Delivery Mode in Relation to Mathematics Performance

Renante A. Diamante<sup>1</sup> and Noel A. Banca<sup>2</sup>

<sup>1</sup>Iloilo State College of Fisheries, Philippines

<sup>2</sup>De La Paz National High School, Philippines

Email: <sup>1</sup>[rdiamantetip@gmail.com](mailto:rdiamantetip@gmail.com) and <sup>2</sup>[noel.banca@gmail.com](mailto:noel.banca@gmail.com)

**Abstract**— This study determined the relationship between the students' learning style and mathematical skills to their mathematics performance among Grade 11 students in the Municipality of Banate, Iloilo, for the first quarter of the school year 2020-2021. The descriptive correlational design was used. Data were gathered using VAK Learning Style, Researcher-made Mathematical Skills Test, and Mathematics Performance reflected on participants' form 9 or report card. Frequency count, percentage and mean were used for descriptive analysis while the t-test, One-Way ANOVA, Mann Whitney U, Kruskal Wallis and Pearson's r were used for inferential analysis. Results showed that there were significant differences were found in students' mathematics performance when classified according to their parents' highest educational attainment. Moreover, there was a significant relationship between students' level of mathematical skills and mathematics performance.

**Keywords**— Learning Styles, Mathematical Skills, Mathematics Performance, Alternative Delivery Mode.

## I. INTRODUCTION

Students follow their own unique way to learn and process information. They learn the materials in different ways. Some learn by oral repetition, some may learn by writing it out, while others may learn through practical work.

Learning is in fact a personal journey of discovery. Nobody or nothing should determine or curd the learning process except the learner. People learn in many different ways. Every individual has a unique style of processing and digesting information. This is known as his learning style. Every child's learning styles are as individual and unique as his characteristics.

In school, students have varied learning styles. Some students like to be guided, the rest may prefer to study in group and some can perform better if they are given the chance to be freely involved in their learning activities. Some students get actively involve, while others learn by listening quietly to music.

At home, students have varied learning styles. Some students like to be guided by their parents, siblings and colleagues. But some are preferring to study on their own by the aid of internet and module/learning materials.

Every teachers and parents hope that their students will succeed in school. Teachers and parents have the same final goals and objectives, that is, to promote and ensure that these children are enabled to perform academically.

The proficiency and capability of a student to make good in certain educational fields can be ascribed to certain elements, one of which is the development of his/her mathematical skills (Gloria, 2005). For students to succeed in the study of mathematics, they must believe that they can "do" mathematics, and it is worth "doing".

It is therefore, essential that educators reinforce or enhance the students' skills and their ability to "do" mathematics with the aid of modules now and in the future, and their need to learn continually.

The main objective of this study is to determine the relationship in learning styles and mathematical skills using alternative delivery mode to mathematics performance of Grade 11 students of De La Paz National High School and Banate National High School at the Municipality of Banate during the first quarter of the school year 2020 – 2021.

## II. CHIEF PURPOSE

### *Student's Learning Style Preferences*

Learning styles and mathematical skills are factors to be considered as predictors of mathematics performance. Hence, the researchers, who are a mathematics teacher, wanted to find out the relationship of alternative delivery modes in learning styles and mathematical skills to the mathematics performance of students.

The researchers also believed that through this study mathematics performance of students will be enhance if these two factors are carefully examined.

Learning styles were widely defined as the individual method of students frequently used for receiving, collecting, processing, and interpreting to become knowledgeable (Kolb, 1984; McCarty, 1987; Davis, 1993). Duff and Duff (2002) consistently defined the meaning of learning style as the student's behaviour expressed from individual capability and perception in cognitive, affective, and psychomotor domains when the students interacted with their classroom and school environments.

### ***Gender and Mathematics Performance***

Historically, mathematics has always been viewed as a masculine field, although women have also made great contribution to formation and development of the main hypothesis in mathematics. In this field, traditional social influences have had a great influence in causing the current imbalance between men and women in their tendency towards learning and performance in mathematics. Women have always been known as to have greater mathematical stress or avoid mathematics (Bon Stetter, 2007). Tobiaz (1993, quoted from Fornd and Borman, 2008) acknowledged that the differences between men and women in terms of their mathematical experience cannot be attributed to their instinct.

Cowdry and Ress (in de Juan, 1994, as cited by Glorial, 2008), confirmed that gender is an obvious salient individual characteristic that influence mathematical ability. It is commonly observed that boys usually have fewer difficulties than girls do with course that emphasizes problem solving such as physics, chemistry, and higher mathematics.

### ***Family Structure and Mathematics Performance***

Lareau (2003) described this type of partnership as cultural capital, and Lareau's (2003) research showed a positive correlation between the combined efforts of families with educators. In fact, the family unit plays an integral part in the development of the child and his/her ability to achieve academically.

Hampden-Thompson (2009) concluded that students from single-family homes perform lower overall than their two-parent family counterparts, which suggests that the parent variable was vastly important. Redford, Johnson, and Honnold (2009) concluded that students from the traditional two-parent, binuclear home (meaning those students who live in a household comprised of both their biological parents) outperformed other students who did not have this common factor.

### ***Parents Highest Educational Attainment and Mathematics Performance***

For Canada as a whole, the average math scores of students whose parents had high school or less were significantly lower than the average scores of students whose parents had college or university. For example, the gap in average performance between students who had at least one parents with a university degree compared to those whose parents had no more than a high school education was about two-thirds of a proficiency level.

However, Larreau, 2003, revealed the same result in his study that some pupils whose parents' educational level was low still performed better than pupils whose parents were better educated. It would mean that pupils whose parents do not read with them can find other people to read with or to encourage them. So pupils whose parents are less educated could befriend other children whose parents are better educated to learn from those parents.

Economist Steven D. Levitt sifted through data from the 1990s U.S. Department of Education Early Childhood Longitudinal Study (ECLS) which measured the achievement of over twenty thousand kindergarten through fifth grade American students. In his detailed study of the correlations shown in the ECLS data, he concluded the real predictor of educational achievement is who the parents are. Academically successful children tend to belong to educated middle-class parents while academically challenged students tend to come from minority backgrounds and low SES status (Levitt & Dubber, 2006).

Learning is a lifelong process and is a continuous and never ending one. Teacher must assess individual's learning style preferences and then adapt their delivery technique to improve the pace of learning according to learning styles of their students. Learning styles can help students learn more easily and effectively (Prabhakar and Swapna, 2009; Kinshuk et. al., 2000).

Borja (in Prizas, 1996, as cited by Cerbo, 2008) also tried to ascertain the association of learning style and achievement in Science and Technology subject. Results revealed that there was a significant association between learning style and achievement.

### ***Mathematical Skills and Mathematics Performance***

In the light of the prominent role of mathematics among subject matters in school, it is not surprising that much educational and psychological research has been

devoted to the identification of factors that enhance the learning and teaching of mathematics. The majority studies confirmed that cognitive students characteristics explain a large part of the observed variance in achievement. Motivational and emotional factors, such as attitude, anxiety, interest, or task motivation (McLeod, 1990), were often found to be less important (Aiken, 1970, 1976; Scheider & Bos, 1985; Steinkamp & Maehr, 1983; Wilson, 1983). Cited by Schiefele, U et. al., 1995) in the study of Glorial, 2005).

The importance of mathematical skills to student performance in other quantitative disciplines is widely recognized. However, studies have found that high Scholastic Aptitude test (SAT) or American College test (ACT) mathematics scores or having taken calculus have a significant and beneficial effect on student grades in economic course (Johnson and Kuennen 2004).

Further, Ballard and Johnson (2004) find that mastery of very basic mathematics concepts-of the kind covered in remedial or developmental mathematics courses-are positively and statistically significantly related to student's success in introductory economics. Grillo, Latif, and Stolte (2001) find mathematics skills important for pharmacology students, and document the importance of math skills for finance majors.

### III. RESEARCH METHODOLOGY

The descriptive-correlational research design was used in this study. According to David (2002), the descriptive type of research finds answer to the questions who, what, when, where and how. It describes a situation or a given state of affairs in terms of specified aspects of factors.

The researcher deemed this design appropriate to this research because its main purpose is to determine the relationship between students' learning style and mathematical skills to their mathematics performance among Grade 11 students.

#### **Respondents of the Study**

This study utilized the selected Grade 11 students who enrolled in De La Paz National High School and Banate National High School in the Municipality of Banate, Iloilo during the school year 2020-2021.

A fish bowl method was employed by the researcher in selecting the participants of the study from the students who enrolled in grade 11 curriculum at De La Paz National High School and Banate National High School in the Municipality of Banate, Iloilo. The Slovin formula was used by the researcher to get the actual

number of the participants. Out of 828 grade 11 students, 270 of them were the participants of the study with the margin of error of 5%.

#### **Data Gathering Procedure**

The researcher prepared two sets of instruments which were used in the study.

The VAK Self-Assessment Questionnaire adopted from <http://www.swinburne.edu.au>, April 7, 2016. The instrument was made up of 30 questions with 3 choices while the researcher-made Mathematical Skills test which was composed of 30 multiple choice test includes basic computations, comprehension and application and analysis in Mathematics.

After it was checked by the panel of experts or validators, the VAK Self-Assessment Questionnaire and researcher-made Mathematical Skills test were reproduced according to the number of the participants of the study.

The researcher requested permission from the school head of De La Paz National High School and Banate National High School in the Municipality of Banate to conduct the study. Upon approval, the data gathering instruments were personally administered to the respondents. After the administration, the researcher retrieved it immediately for tabulation.

#### **Research Instrument**

The data needed for the study were gathered through the use of standardized test, the VAK Self-Assessment Questionnaire to determine the learning style of the participants and the researcher-made Mathematical Skills Test to determine the level of mathematical skills of the participants and the participants' grade in General Mathematics during the first grading period as their mathematics performance.

#### **Validity of the Instrument**

To establish the validity of the instrument, the initial draft of the test was reviewed by the thesis adviser and was presented for face and content validation and item inspection to a panel of experts in the field of mathematics, test and measurement, and statistics.

The panel experts inspected each item based on appropriateness on suitability, relevance, clarity of language used, correctness of sentences, and others. The corrections, recommendations and suggestions for the refinement of the instrument was incorporated in the final draft of the instrument.



### **Reliability of the Instrument**

Reliability refers to the consistency of the responses or scores obtained by an individual in a test to whom the instrument is administered and the consistency of scores given to the items included in the questionnaire.

The data gathered for this study were subjected to appropriate computer-processed Statistics employing the Statistics package for Social Sciences by using Cronbach's Alpha in SPSS Statistics of (Fraenkel and Wallen, 2007).

### **Data Processing Procedure**

After the validity and reliability of the test was established, permission to conduct study was assured. The needed data for this research were obtained through a VAK Self-Assessment Questionnaire, researcher-made Mathematical Skills test and the general mathematics grade of the participants in the first grading period reflected on their form 9 or report card. Results of the VAK Self-Assessment Questionnaire will have served as the tool in determining the learning style of the participants. The scores obtained in the Mathematical Skill of the participants.

The students' grade in general mathematics that were reflected in the form 9 or report card of the participants served as the basis of their level of performance in mathematics.

### **Scoring of the Variables**

There are 30 items in the VAK Self-Assessment Questionnaire. Each item has 3 choices mark as a, b, and c. The responses of the participants was tallied, whatever choices get a frequent response will be the learning style of the participants.

### **The Statistical Tools**

The data gathered for this study were processed to appropriate computer-processed Statistics employing the Statistics package for Social Sciences (SPSS) software. All inferential statistical test was set at 0.05 alpha level of significance.

### **The Statistical Tools**

The data gathered for this study were processed to appropriate computer-processed Statistics employing the Statistics package for Social Sciences (SPSS) software.

All inferential statistical test was set at 0.05 alpha level of significance.

## **IV. RESULTS**

### **Students' Dominant Learning Style When Taken as an Entire Group and When Classified According to Sex, Family Structure and Parents' Highest Educational Attainment**

When classified according to sex, male students manifested "visual" (48 or 41% learning style as their dominant in learning, this was followed by "kinesthetic" learning style (43 or 38%) and "auditory" learning style ranked last with 23 or 21%). Female students manifested "visual" (70 or 45%) learning style as their dominant style in learning. This was followed by "kinesthetic" (51 or 33%) learning style, and lastly the "auditory" (35 or 22%) learning style became their least preferred learning style.

Majority (102 or 42%) of the students belong to intact families manifested "visual" learning style as their dominant style in learning. Eighty-seven (87 or 36%) employed "kinesthetic"; (53 or 22%) fall in auditory learning style.

On the part of those belonging to dispersed families, most of the students manifested "visual" learning style as their dominant style in learning (16 or 57%). Seven (7 or 25%) employed "kinesthetic" and 5 or 18% falls in "auditory" learning style.

### **Differences in the Students' Dominant Learning Style When Classified According to Sex and Family Structure**

The result contradicts many researchers who have consistently found that there are significant differences in learning styles between males and females.

For example, Matthews (2004) found that, although males and females prefer learning in ways that are more applied, females are more independent in their learning styles than males. Several researchers who have found the same pattern have echoed these results (Litzinger, Lee, & Wise, 2005).

### **Differences in the Students' Dominant Learning Style When Classified According Parents' Highest Educational Attainment**

The result implies that parents' highest educational attainment was not significantly related to the learning style of students.

Regardless of the parents' level of education, students have their preference style was not affected by their parents' education level.

**Students' Level of Mathematics Skills When Taken as an Entire Group When Classified According to Sex, Family Structure and Parent's Highest Educational Attainment**

Based on the results of the data gathered, parents' highest educational attainment of students greatly affects their level of mathematical skills.

Regardless of the parents' level of education, this study found that the education level of parents influences pupils' mathematical skills positively. Although, students whose parents with low level of educational attainment perform their mathematical skills properly, it was found out that the students whose parents have high level of educational attainment increased their mathematical skills and can perform their task positively.

**Difference on the Students' Mathematics Performance When Classified According to Sex, and Family Structure**

Generally, students differ significantly in their performance in mathematics when classified according to sex,  $t(268) = -5.157, p < .05$  and family structure  $t(268) = 2.800, p < .05$ .

This shows that male and female students vary in their performance significantly in mathematics. It is also true that intact families have positive impact in the performance of students while dispersed families showed a low impact in the performance of students.

**Different on the Students' Mathematics Performance when Classified According to Parents' Highest Educational Attainment**

The One-Way ANOVA results in Table 10 reveal that the students did not differ significantly in their Mathematics performance when classified according to parents' highest educational attainment,  $F(2,267) = .341, p > .05$ . This means that the performance of students was not affected by their parents' level of education.

Larreau (2003) revealed the same result in this study that some pupils whose parents' education level was low still performed better than pupils whose parents were better educated. It would mean that pupils whose parents do not read them can find other people to read with or to encourage them.

So pupils whose parents are less educated could befriend other children whose parents are better educated to learn from other parents.

**Students' Mathematics Performance When Classified According to Learning Styles**

Generally, the students had "very satisfactory" ( $M=85-89$ ) mathematic performance when classified according to learning style and mathematical skills. Visual learners had a mean of 86.53, Auditory learners ( $M=85.90$ ) and kinaesthetic learners ( $M=86.45$ ). This means that even students have different learning style, they perform equally in mathematics. Therefore, learning style was found out as not an influencing factor on students' performance.

**Relationship between Students' Mathematical Skills and Mathematical Performance**

The data in Table 12 reveal that there was a significant relationship existed between students' mathematical skills and their mathematics performance,  $r(.282), p = .000, p < .05$ . This is because mathematical skills are one of the important factors that affect the student's mathematical performance. As the level of mathematical skills increased, there is also a positive change in mathematics performance.

**V. CONCLUSION**

Based on the aforementioned findings, the following conclusions were drawn:

Carbon (2014), in her research journal, found out that mathematics teachers when taken as an entire group and when classified according to field of specialization, educational level and length of service was tactile or kinesthetic in terms of their teaching styles. This is to justify that majority of the students' preferred visual learning style in learning, because students are active participants through visualizing on what the teachers are doing inside classroom where teaching and learning process are happening.

In contrast to the present result, Vaishnav (2013), conducted a study on Learning Style and Academic Achievement of Secondary School students, findings of the study revealed that, kinesthetic learning style was found to be more prevalent than visual and auditory learning styles among secondary school students.

Students learn in different ways. Many factors influence students' learning – such factors include (but are not limited to) students' learning style preferences, their interest in the material under study, and the learning environment. A student's learning style preferences, their interest in the material under study, and the learning environment. A student's learning style preference refer to the way they respond to stimuli in a learning context, and to their characteristic way of acquiring and using information. These learning styles

recognize that individuals learn different ways, and thus students in any course will place a variety of different interpretations onto their lessons (Bailey and Garratt, 2002).

Most of the grade 11 students in the Municipality of Banate appeared to be visual learners. Learning style was not affected by any factors. This can be contributed to their mathematical skills and mathematics performance. It was also concluded that, since visual style was the dominant learning style among the students, they prefer to learn by just sitting down and watching their teacher doing some activities for them. They are not active in participating inside the classroom discussions through involving their physical abilities.

Learning style was not created rather it was developed, it is therefore unique to every individual. Regardless of the sex, and individual's learning style is not affected by it. Furthermore, family structure cannot affect each child's learning style. Learning style is an innate ability, whether the child was born under intact or dispersed family his/her learning style was already formed that even his/her parents' highest educational attainment has no effect on it. Mathematical skills is developed, therefore it should be properly managed by each students in order to preserve it. Mathematical skills were not affected by sex, family status and even with students' parents' highest educational attainment.

Generally, the participants' level of mathematical skills was average. Sex and family structure of students do not affect their level of mathematical skills. However, when it comes to parents' highest educational attainment, it follows that the children whose parents have low level of education perform their mathematical tasks less good compare to those students whose parents have high level of educational attainment.

Finally, a significant relationship existed between students' mathematical skills and mathematics performance. Mathematical skill is a factor that can predict the students' performance in mathematics. Learning mathematics require mathematical skills. Therefore, mathematical skills are important skills that one should possess in order to perform better in mathematics.

#### **RECOMMENDATIONS**

The study found out that the students have different ways in learning mathematics. These learning style preferences are the students' strengths, the traits through which they most easily master the new and difficult

information or skills leading to the improvement of their mathematical skills and performance in mathematics.

In view of the aforementioned findings and conclusions, the following recommendations are advanced:

Teachers should identify the learning styles of their students and provide an instructional environment rich in opportunities and responsive to the learner's strategies in learning mathematics.

Teachers should modify the self-learning modules or SLMS based on the needs and availability of students learning materials at home.

Teachers should employ a variety of teaching styles when teaching in order to respond to the delivery of learning styles of the students.

The learning style of students should be reported also to their parents. Parents should provide their children the facilities and support when they are studying their mathematics lesson or when doing assignments at home.

Students should be engaged in various mathematical activities to practice their skills which could help them to improve their mathematics performance.

Guidance counselors should conduct the learning style assessment of students every beginning of the school year and make the result available to all teachers in the school for them to be aware of the preferred learning style of their students.

School Heads, teachers, and curriculum planners, who play an important role in the academic setting, should look into the improvement of teaching in school, and see to it that the students' needs are given proper situation. They should provide a variety of teaching-learning activities in mathematics students will engaged in so that they could improve their performance in the said subject.

Students should be exposed to different teaching styles to better assist their learning style that will result to positive learning outcomes.

#### **REFERENCES**

- [1] Aguirre, N. M., Amo, R. A. (2008). Difficulties Encountered in Teaching High School Mathematics. Unpublished Undergraduate Thesis, College of Education, West Visayas State University, La Paz, Iloilo City
- [2] Albalahn, Eisa M. (2007). Learning Styles in Relation to Academics Performance in Middle

- School Mathematics. Retrieved from: [http://www.assulearning.com/gradschool\\_course/fdn\\_5000/research\\_proposal.pdf](http://www.assulearning.com/gradschool_course/fdn_5000/research_proposal.pdf). March 4, 2016.
- [3] Anasarias, et. al. (2009). Problem Solving Difficulties and Mathematics Performance of Second Year High School Students. Unpublished undergraduate Thesis, College of Education, West Visayas State University, La Paz, Iloilo City.
- [4] Ariola, Aleli M. (2011). Learners' Preferences and Teaching Strategies in Teaching Mathematics of Fourth Year High School at Mabitac, Laguna.
- [5] Bacalangco, Cherryl (2011). Students' Learning Styles and Academic Achievement in Mathematics. University of Iloilo, Iloilo City, Philippines.
- [6] Besa, Charlie (2011). Teaching Strategies: Their Relationship to Students' Mathematical Skills in Contemporary Mathematics. University of Iloilo, Iloilo City, Philippines.
- [7] Cerbo, Wilhelm P. (2008). Students' Learning Style and Mathematical Skills as Related to their Performance in Contemporary Mathematics. West Visayas State University, La Paz, Iloilo City, Philippines.
- [8] Gappi, Lorna L. (2008). Relationships between Learning Style Preferences and Academic Performance of Students. Center for General Education, Humanities and Social Sciences Department.
- [9] Mathematics Achievement of 8th – Grade Math Students. State University. Retrieved from: [http://www.assulearning.com/gradschool\\_course/fdn\\_5000/research\\_proposal.pdf](http://www.assulearning.com/gradschool_course/fdn_5000/research_proposal.pdf). March 31, 2016.
- [10] Peacock, Matthew (2001). Match or Mismatch? Learning styles and Teaching styles in EFL. *International Journal of Applied Linguistics*, Jun2001, Vol. 11 Issue 1, p1, 20p; (AN 6632951). Retrieved from <http://www.onlinelibrary.wiley.com/doi/10.1111/1473-4192.00001/abstract>. March 4, 2016.
- [11] Sneed, Bobby L. Jr. (2015). Effects of Student Family Structure and Attendance on Academic Achievement in Middle Grades Mathematics. Liberty University, Lynchburg, VA.
- [12] Wehrwein, Erica A., et. al. (2007). Gender Differences in Learning Style Preferences Among Undergraduate Physiology Students. *Advances in Physiology Education*. Retrieved from <http://advan.physiology.org/content/31/2/153>-January 6, 2017.
- [13] Wilson, Mary Lynne (2011). Students' Learning Style Preferences and Teachers' Instructional Strategies: Correlations between Match Styles and Academic Achievement. Liberty University.
- Retrieved from: <http://files.eric.ed.gov/fulltext/EJ995172.pdf>, March 31, 2016.