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Learning Style Preferences, Study Habits, and Academic Performance in Mathematics: Perspectives of Freshmen College Students amidst the COVID-19 Pandemic

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Abstract

Students can attain higher academic comprehension and performance by using instructional tactics and approaches that naturally match their interests. Researchers investigated potential learning gaps that could occur due to disparities in students' learning abilities. As a result, this study determined students' preferred learning styles, study habits, and academic achievement in mathematics as a general education course. A total of 100 freshmen college students were non-randomly recruited for this study, which used a quantitative descriptive approach. The study adopted the Reid Perceptual Learning Style Questionnaire and Gilbert Wrenn's Inventory of Study Habits as tools for data collection. Furthermore, descriptive statistics such as mean, ANOVA, and Post-hoc Tukey HSD Test were used to investigate freshmen college students' preferred learning styles, study habits, and academic performance in mathematics. The survey's findings revealed that students favor the tactile, group, and individual learning styles as minor learning modes, despite having poor study habits. A high level of academic achievement was also revealed. Gender and course caused significant disparities in their study habits, according to a test of difference. When categorized by profile factors, no significant variations in learning styles or academic achievement were discovered. The study's recommendations can help teachers and future researchers develop and implement educational interventions.

Keywords: *Learning Styles; Study Habits; Academic Performance; Mathematics; Freshmen College*

INTRODUCTION

Mathematics has been essential in improving people's lives. Mathematics has aided mankind since the birth of human existence on Earth, according to The Scientific World (2018). Mathematics education has a good impact since it helps people develop mental discipline and improve problem-solving and reasoning abilities. Numerous studies have demonstrated the usefulness of mathematics in everyday life. The efficacy of learning Mathematics is influenced by several things. This research investigated freshmen college students' preferred learning styles and study habits. Inequality in education is one of the most pressing issues today. Due to differences in learning preferences, the researchers of this study wanted to reduce learning gaps that develop when studying Mathematics as a general education subject in college. To put a stop to poor, unequal, and

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ineffective mathematics instruction, learning style preferences and study habits must be discovered.

Preferences for learning styles, study habits, and academic success all play a part in learning. Understanding the learning styles and preferences of students may aid instructors in developing effective learning strategies. Furthermore, students who share the teacher's learning style remember information better and are more passionate about studying (Lohri-Posey, 2003). Because of the complexity of the environment in which humans live, students pick a variety of study habits to improve their learning. According to the previous study, good study habits include studying in a quiet environment, studying daily, turning off devices that interfere with study (such as TV and cell phones), taking notes on important content, taking regular rests and breaks, listening to soft music, studying according to one's own learning style, and prioritizing difficult content (Ebele & Olofu 2017).

Academic success is inextricably linked to learning preferences and study habits because they impact and demonstrate how they improve students' learning outcomes. Students who do not receive enough study method instruction do not attain effective and sustained learning and, as a result, do not realize their maximum academic potential (Arora, 2016). Furthermore, students with better academic achievements make more use of these abilities than those with lower academic achievements (Rezaie Looyeh et al., 2017). As a result, in order to boost students' learning and broaden their knowledge, people should think about ways to make studying easier for them, given that learning mathematics necessitates critical thinking, conceptual skills, and creative abilities. By providing effective instructional strategies and other instructional interventions to increase their academic accomplishment, the development of proper study skills will make them better learners. As a result, students enrolling in Mathematics as a general education subject had their Learning Styles, Preferences, Study Habits, and Academic Performance compared.

Understanding the diverse learning styles of college students taking Mathematics as a general education course will lead to more successful learning experiences in the long term. Similarly, Alavi and Toozandehjani (2017) discovered that knowing students' learning styles can assist them in improving their learning while also fostering self-actualization. Teevan et al. (2011) go on to say that understanding learning styles can help instructors use the right teaching strategies and methodologies to help students succeed in school. Individual, group, kinesthetic, tactile, visual, and auditory learning modes were studied. Metacognitive thinking and activities help students become more adaptive and imaginative. Understudies with specific educational obstacles in mastering learning tasks, self-organizing, and managing their own learning can benefit greatly from metacognitive or individual learning. Students' communication, personality, and leadership skills may benefit from group learning. Students' critical reasoning and analytical abilities improve with kinesthetic learning. As children learn through their tactile senses, it becomes increasingly important for their brain growth. Students who are exposed to tactile learning have better learning growth, which correlates with their academic achievement in the future.

Visuals simplify knowledge by breaking it down into smaller, more consumable parts. As a result, the student's excitement for the subject will grow. When a student learns in a way that they enjoy and appreciate, they pay more attention, and the results are more obvious. Students' critical listening, thinking, and comprehending abilities improve with auditory learning. As a result,

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auditory learning aids students' ability to think more clearly. It helps individuals focus better, pay more attention, and comprehend the material more thoroughly. Barman et al. (2014) looked at the link between learning style awareness and student academic accomplishment and discovered that students' understanding of their advantages, such as learning style, and how to leverage these advantages could help them achieve academic success. Learning styles may assist students in reflecting on their preferred learning techniques, allowing them to take greater ownership and control of their own education. The learning styles of each student serve as a reminder that they are all unique. Finally, they have the potential to make teaching more enjoyable while also expanding instructors' professional capabilities.

The study habits of freshmen college students enrolled in a mathematics course are another variable being investigated in this study. According to Jafari et al. (2019), study habits are key predictors of students' academic achievement, and study habits influence academic success. According to Ebele and Olofu (2017), there is a link between students' study habits and their academic achievement. Study habits and academic achievement are favorably and highly connected, according to Siahi and Maiyo's (2015) findings, as evidenced by the coefficient of correlation index "r" of 0.66. Mashayekhi et al. (2014) also concluded that there is a significant link between academic achievement and study habits.

As a result, through written and practical assessments, academic performance evaluates students' talents and learning. According to Caballero et al. (2007), academic success comprises meeting the goals, milestones, and objectives defined in the program or course in which a student is enrolled. According to previous studies, both intellectual and non-intellectual factors influence freshmen college students' academic progress.

As a result of this research, teachers will be able to better adapt and change their teaching approaches to their student's learning styles. This could also help teachers locate more appropriate and improved academic outcomes. Students will gain a better grasp of their learning styles and study habits because of the study's findings. This research may also aid students in determining their preferred learning method in mathematics. Because mathematics is so important in today's students' lives and the world at large, this research would be beneficial to society. This will come in handy when putting the findings of the study into practice. This study could be useful in choosing the best educational strategy to adopt in the future.

Statement of the Problem

There has been a lot of debate about which learning style will ensure that all children receive a good mathematical education. Learning gaps emerge because of variances in learning preferences that change from person to person. Each student's learning style and study habits significantly impact their ability to solve mathematical problems. Inadequacies, inequity, and poor mathematics teaching would result if students' choices were not assessed. This study focused on identifying freshmen college students' preferred learning methods, study habits, and academic performance in Mathematics from various higher education institutions in the Philippines to address current difficulties. This study investigated whether there is a substantial difference in learning styles, study habits, and academic achievement when respondents' profile characteristics are combined.

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Research Questions

This study aimed to determine the preferred learning styles, study habits, and academic performance in mathematics of freshmen college students in a private and public higher education institution in the Philippines during the A.Y. 2021-2022. Specifically, this study sought to answer the following research questions:

1. What is the average number of freshmen college students who prefer Individual? Group? Kinesthetic? Tactile? Visual? Auditory Learning Style in Mathematics?
2. What is the level of the Study Habits of freshmen college students?
3. What is the percentage number of students who excelled in Individual? Group? Kinesthetic? Tactile? Visual? Auditory Learning in Mathematics?
4. Is there a significant difference in the Perceptual Learning Styles, Study Habits, and Academic Performance when grouped according to their profile variables?

LITERATURE REVIEW

Perceptual Learning Styles and Academic Performance

Learning style refers to the characteristics, strengths, and preferences with which people comprehend and interpret information (Hsieh et al., 2011). The learning methods that students like have a substantial impact on their academic performance and conduct. Learning styles, on the other hand, clearly differ from one learner to the next due to the common concept of diversity. As a result, according to Gokalp (2013), learning style relates to the concept of each individual having their own learning mode or academic tactics. Learning styles, as stated, are a complicated process by which understudies successfully comprehend, acquire, organize, and retain academic experiences.

As a result, educational institutions must identify a wide range of learning styles in order to accomplish rapid growth in understudies' level of comprehension, motivation, and confidence. Indeed, Williams et al. (2013) discovered a beneficial relationship between learning styles and understudies' scholarly presentation in the scholarly circle. Khan et al. (2019) even described the students' learning styles and their association with academic accomplishment in their studies. According to the findings, college students' chosen learning styles have a high relationship with academic accomplishment.

Furthermore, success in mathematics is a key indicator of a country's educational system's presentation (Reddy, 2005). Mathematics is also an important topic for countries with growing economies since it allows students to pursue careers in sectors such as design, natural sciences, bookkeeping, and a variety of other fields that are critical to the financial turn of events (Makgato & Mji, 2006). Inadequate scholarly achievement and pessimism about a subject may also be related to the educator's approach, as delayed confounds between the educational strategy in the study hall and the learning patterns of most students can add to poor academic accomplishment and pessimism (Breckler et al., 2011).

Several studies have found that most students prefer to study with clusters of images, diagrams, graphs, and other visualization techniques. As a result, visual learners make up the majority of the students in a course (Nel et al., 2016). A large majority of auditory learners prefer

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to hear or speak information, which supports the conventional teaching method. Reading and writing are effective learning tools for auditory learners. Similarly, kinesthetic learners thrive on performance-based activities and find it difficult to learn just by sitting (Bennett, 2013). As a result, students who excelled academically were also stronger visual, auditory, and kinesthetic learners. Cabual (2021) also addressed how most students' preferred learning styles, as well as their chosen learning modalities, are primarily visual, auditory, read/write, and kinesthetic and that learning styles and preferred learning modalities are tightly linked among students. According to Banas (2018), students that did well in class are largely visual and auditory learners based on their academic success in terms of perceptual learning styles. Students who are kinesthetic, as well as visual and auditory learners, enjoy the class. The perceptual learning style of students has an impact on their academic success.

Significantly, if students' learning styles are recognized, this can serve as a springboard for developing more appropriate and effective learning tactics, as well as aligning the overall instructional content with the learning styles. Alzahrani (2017) found that mathematics education is important as a planned and intentional process. It is said that providing a model that assists both teachers and students in achieving this type of learning is critical. The findings revealed that evaluating students' reasoning when solving arithmetic problems is a basic foundation of learning. Furthermore, the findings emphasize the importance of learning methods in shaping students' attitudes and mentality.

Following Kanevsky's (2015) goal of determining whether high-ability learners prefer to learn alone or in a group, the general conclusion was that the percentage of high-ability learners who prefer or enjoy working alone is higher than working in a group. According to Wismath and Orr (2015), students' learning and thinking habits may influence their decision to work alone or with others.

According to Wismath and Orr (2015), students concentrate better in class when they employ their chosen learning style. Students, on the other hand, find it difficult to study when they are unable to apply their preferred learning method owing to an unsupportive atmosphere. Finally, the findings of this study will show that learning styles do have an impact on student learning outcomes since they influence students' willingness to learn as well. Learning style is defined as "the manner in which individuals begin to focus on, process, assimilate, and retain new and difficult lessons" in this context (Hawk & Shah, 2007). Because learning style is influenced by many factors such as age, gender, course, and culture, the previously described link between learning style and academic achievement is complicated.

Study Habits and Academic Performance

Study habits are the most important part of academic performance and have a large impact on a student's academic success (Jafari et al., 2019). Several relevant research has also been undertaken in this respect. According to Lawrence (2014), the goal of the study was to determine whether there was a significant association between study habits and academic achievement of higher secondary students, and the researchers employed the survey method to do so. The data revealed that higher secondary school students' study habits are moderate, and their academic

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accomplishment is moderate as well. Finally, in higher secondary schools, there is no substantial relationship between study habits and academic achievement.

Kyauta and Dachia (2018) conducted another study to determine how students compared their study habits to their academic performance. According to the findings, there was a significant correlation between study habits and academic success. As a result, students who practice good study habits are more likely to succeed academically. Akpan and Salome (2015) investigated the impact of study habits on the academic success of agricultural science students. There was also no significant link between students' academic performance and their study habits, such as individual studies, reading at the library, reading outside of the library, and reading during the day rather than at night, according to the research.

In an online programming language course, Çakıroğlu (2014) investigates the links between learners' learning styles, study habits, and learning outcomes. Kolb's Learning Style Questionnaire (LSI) and another inventory devised by the researcher were used to measure the student's learning styles. Their learning abilities were also assessed using achievement assessments. As a result, significant relationships between learning styles, study habits, and learning performance have been discovered. For instructors desiring to deploy synchronous courses and assist learners, the findings provide insight into the learning styles and study habits of distant learners.

In addition, Odiri (2015) investigated the relationship between students' study habits and their math ability. A correlational research design was used in this study. To assemble information on respondents' arithmetic performance, data was gathered from their individual universities. The main research questions led the investigation. They used regression and ANOVA to evaluate the data. Their studies revealed a high correlation between students' study habits and their mathematical achievement. Also, there was a substantial difference in math achievement between students who practiced good study habits and those who practiced bad study habits, according to the findings.

Sakirudeen and Sanni (2017) have also conducted research into the relationship between study habits and secondary school students' academic achievement in mathematics. The dependability coefficient was 0.91 using the Spearman-Brown formula. The data were analyzed with the Pearson Product Moment Correlation Coefficient (PPMC) and assessed for significance at the 0.05 level. As a result, the researchers discovered that taking notes, using the library, allocating study time, and a student's academic success in mathematics all had a significant relationship.

Fernandez et al. (2021) investigated Latinx students' achievement in college-level mathematics, as well as their mathematics anxiety and how it influences their study habits. Pairwise examinations of a sample of Latinx students in a Hispanic Serving Institution and their levels of mathematics anxiety reveal significant disparities among subgroups. Furthermore, regression analysis found a link between Latinx students' study habits and math anxiety.

Furthermore, Uslu and Korukcu (2021) did their research study to determine what middle school students believed about study habits and how they felt about them. Their research employed a mixed methods approach with a sequential explanatory structure. The quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS v. 24.0). Participants exhibited a moderate level of study habits, according to the findings. Study habits were unaffected by gender

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or grade level. Study habits were better in those who had adequate study areas. The participants connected good study habits to future success. According to the findings, the Internet, tablet computers, and television had negative effects on study habits, as well as positive and negative effects on parents and teachers.

Additionally, Nisar et al. (2017) did a research study that focused on secondary school students' socioeconomic background, school atmosphere, and study habits as variables of academic success. Their survey looked at the study patterns of students by gender and geography. The data were examined using descriptive and inferential statistics. Students' academic achievement was influenced by their parent's socioeconomic status, school climate, and study habits, according to their findings. Students study habits are also influenced by gender and geography. Based on the findings, it was determined that changing the school climate and fostering healthy study habits could help children achieve greater academic success.

Carbonel (2013) also did a study on characterizing and evaluating students' perceptual learning styles, study habits, and the impact of these aspects on their academic progress, particularly in College Algebra. Students study habits were average, and their performance in College Algebra was equally average, according to the statistics. Students study habits in College Algebra have a considerable impact on their performance in the subject, according to this finding. The children described their learning style as visual and aural rather than touch.

RESEARCH METHOD

Research Design

The study employed a descriptive research design. The descriptive component of the study also revolved around the personal profile of the respondents, their learning style preferences, study habits, and academic achievement. Thus, to assess if there is a significant difference in the perceptual learning styles, study habits, and academic performance of the freshmen college students when grouped according to their profile variables.

In fact, a descriptive research design is acceptable, according to Siedlecki (2020), when the researcher's goal is to explore a phenomenon that tends to seek the participants' opinions without attaching the researcher's value. Similarly, this research methodology did not only collect and tabulate data, but also included adequate analysis, interpretation, comparisons, and trend and association detection. This strategy is frequently used as a prelude to more quantitative research designs, with the overall overview providing helpful hints as to which factors might be tested quantitatively. In order to obtain relevant data, a descriptive research design was used in accordance with the study's aims.

Instrument

This study adapted quantitative structured survey questionnaires to obtain clear, in-depth data on the understudies' preferred learning styles, study habits, and academic achievement in mathematics education. Given the current public health crisis, personally handing out study surveys was difficult, so distribution was done online via Google forms. The survey form included a set of questions based on the Reid Learning Styles assessment by Reid (1987), notably the Perceptual Learning Style Preference Questionnaire, as well as Gilbert Wrenn's Study Habits

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Inventory (Wrenn, 1941) and the university's grading system's grade ranges. All of these statistical tools were useful in determining preferences for learning styles, study habits, and academic success, which were meticulously organized and gathered.

Participants

The population refers to the specific community or group of people who are part of a study. As a result, the study's population centered around freshmen college students from private and public higher education institutions in the Philippines to fully achieve the researchers' goal and interest for this paper. Similarly, the researchers chose and distributed the questionnaire to a total of 100 participants who were enrolled in a general education mathematics course as a pilot study in the university to serve as a basis for future expanded research studies. Thirty-four (34) male freshman college students and sixty-six (66) female freshmen college students were among the participants. The researchers used convenience sampling to determine the individuals' learning styles, study habits, and academic achievement in mathematics using the non-probability sample approach.

Procedure

After acquiring the necessary data, the study's findings were deciphered using relevant statistical tools. Mean, frequency, standard deviation, rank, and percentage were employed as descriptive statistics. To test the study's theories, inferential statistics such as the independent sample t-test and one-way ANOVA test were used. A post hoc Tukey HSD test was also utilized to determine whether the differences between the downright factors were statistically significant.

The assessment of the respondents on their learning style preferences used the following common scale: 1 (Strongly Disagree); 2 (Disagree); 3 (Undecided); 4 (Agree); and 5 (Strongly Agree). Furthermore, the scales used in study habits are 1 (Rarely or Never), 2 (Sometimes), and 3 (Often or Always). In like way, to decipher the major and minor learning style inclinations of the respondents, the accompanying score ranges were adapted: 40-50- Major Learning Style Preference; 25-39- Minor Learning Style Preference; and 0-24- Negligible Learning Style Preference. Consequently, in study habits, the legends used were: 4.20-5.00 (Always); 3.40-4.19 (Usually); 2.60-3.39 (Sometimes); 1.80-2.59 (Low); and 1.00-1.79 (Very Low).

The findings were interpreted, absolute values were determined, and significant prerequisites for developing a deep and meaningful understanding of first-year college students' chosen learning styles, study habits, and academic performance in mathematics were identified using descriptive statistics and appropriate statistical tools. The researchers used descriptive statistics like mean, frequency, and percentage to describe their findings. The researchers then used the Post-hoc Tukey HSD Test to evaluate whether there were any significant differences between the category variables.

FINDINGS AND DISCUSSION

Learning Styles of Freshmen College Students and the Test of Significant Difference when Grouped According to Profile Variables

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The assessment of freshmen college students enrolled in mathematics as a general education course at private and public institutions in the Philippines is shown in Table 1. Tactile learning styles, group learning styles, and individual learning styles were viewed as minor learning style preferences by students. Visual Learning Styles, Auditory Learning Styles, and Kinesthetic Learning Styles were their Negative Learning Style Preferences. Many freshmen students learn better with a Tactile, Collaborative, and Individual learning strategy, as evidenced by the data.

Table 1. Learning Style Preference Scores and Test of Significant Difference

Learning Styles	Total Mean Score (n= 100)	SD	Score Description	Age p-value	Gender p-value	Course p-value
Visual Learning Style	24	8.79	Negligible LSP	0.37	0.73	0.15
Tactile Learning Style	25	8.67	Minor LSP	0.52	0.15	0.56
Auditory Learning Style	24	9.06	Negligible LSP	0.59	0.93	0.49
Group Learning Style	27	8.18	Minor LSP	0.54	0.82	0.75
Kinesthetic Learning Style	24	8.83	Negligible LSP	0.75	0.74	0.25
Individual Learning Style	25	8.82	Minor LSP	0.97	0.75	0.25

*The mean difference is significant at the 0.05 level
Legend: 40-50- Major Learning Style Preference; 25-39- Minor Learning Style Preference; 0-24- Negligible Learning Style Preference

A closer examination of the table reveals a more detailed picture of the student's preferred learning approaches. The table shows that the Group Learning Style is the highest, yet it is still one of the respondents' smaller learning preferences, with a total mean score of 27 ($\sigma = 8.18$). According to the findings, most respondents preferred collaborative or group learning. They learn more when they collaborate because they exchange different perspectives, ideologies, and expertise. Nonetheless, group participation in college classes through group projects can help them learn more efficiently. Allowing students to learn in small groups and absorb knowledge as a group is a cooperative learning strategy that develops higher understanding (Acikgoz, 2002).

Tactile Learning Style also received a total mean score of 25 ($\sigma = 8.67$). It is the respondents' second preferred learning style and one of their minor learning style preferences. Students have a greater comprehension of a tactile approach to learning, according to the findings. Similarly, most first-year college students like to study by taking notes, listening to music, and being physically

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active. Additionally, children who prefer the tactile learning technique demonstrate a greater understanding by doing something rather than just hearing. Role-playing, field trips, and active engagement will eventually help children improve their learning abilities. "Movement during the day helps children re-energize their bodies and minds, allowing them to focus and improve concentration," says Ferlazzo (2021).

Individual Learning Style came in second with a total mean score of 25 (σ = 8.82), indicating that the respondents have a modest learning style. It means that responders learn more effectively on their own. They prefer and perform best when they may go at their own pace. Several studies (Westwood, 2004; 2008) found that students learn mathematics best in classes where teachers emphasize academics, use challenging activities, hold all students (including poor achievers) to high standards, and implement an individual learning plan. As a result, Magulod (2018) suggests that students use multi-sensory learning aids to adapt to their various learning styles, helping them to be more successful in their academic activities.

However, the respondents did not consider Visual, Auditory, or Kinesthetic Learning Styles, as the results suggest that freshmen college students have a Negligible Learning Style preference. This indicates in the table that when learning mathematics, students do not consider using images, films, or objects. The total mean score for visual learning style was 24 (σ = 8.79). The Auditory Learning Style had an overall mean score of 24 (σ = 9.06). Finally, the total mean score for the kinesthetic learning method was 24 (σ = 8.83). This demonstrates that respondents liked learning at their own pace, being physically active, and learning in groups. The data show that freshmen college students in the Philippines favor learning approaches that include constructing models, working alone, and collaborative learning.

Furthermore, when students taking the subject Mathematics are classified according to their profile variables, Table 1 demonstrates that there is no significant difference in learning style preferences. The researchers took the average per learning style according to age, gender, and course after categorizing the raw data by learning style. They then gathered the data and ran the One-Way ANOVA test and T-Test. It includes years 18, 19, 20, 21, 22, and 24, for which the ANOVA single-factor test revealed a significant difference. Because all p-values in this category were greater than the alpha level of 0.05, it suggests that under the age variable, all learning styles exhibited no significant difference, implying that age is not a relevant factor in determining the learning style preferences of freshmen college students.

Furthermore, a two-sample t-test with equal variances was used to determine gender, with male as variable 1 and female as variable 2. This test revealed that there is no statistically significant variation in learning methods based on gender. Finally, the researchers divided the courses into three categories: health-related courses, arts, and science-related courses, and engineering-related courses in the course section. Doctor of Dental Medicine, Doctor of Optometry, BS Psychology, and BS Nursing are among the health-related courses. BS Information Technology, BS Accountancy, BS Criminology, BS Hospitality Management, BS TechVoc Teachers Education, BA Multimedia Arts, BS Architecture, BS Computer Science, BS Information System, and BS Legal Management were among the arts and science-related courses. Finally, BS Civil Engineering, BS Mechanical Engineering, BS Marine Engineering, BS Computer Engineering, BS Aeronautical Engineering, and BS Air Transportation are engineering-related courses.

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Because the respondents were unbalanced in terms of number, especially in courses with just one (1) response, this grouping strategy was perfect for the study. As a result, there was no discernible difference between the three (3) sub-categories in the course section. When grouped by age, gender, and course, the test of difference in learning styles of freshmen college students with a subject of Mathematics indicates no statistically significant difference.

Study Habits of Freshmen College Students and the Test of Significant Difference when Grouped According to Profile Variables

The information in Table 2 illustrates the study habits and skills of freshmen college students who are studying Mathematics. According to the calculated grand mean of 1.99, respondents have poor study habits and skills. This shows that the students have not yet acquired strong positive attitudes about the set of skills that will assist them in preparing for the subject in question. As a result, strengthening students' study habits will assist them in becoming better students. According to Mark and Howard (2009), the most prevalent obstacle to students' success is a lack of productive or pleasant study habits.

Table 2. Study Habits Scores and Test of Significant Difference

Study Habits and Skills	**Mean**	**SD**	**DI**	**Rank**	**Age p-value**	**Gender p-value**	**Course p-value**
Time Management	1.94	1.52	Low	6	0.74	**0.04***	0.26
Concentration	2.08	1.68	Low	2	0.73	0.17	0.24
Note Taking	1.83	1.40	Low	7	0.59	0.84	0.16
Reading Comprehension	2.02	1.56	Low	4	0.41	0.37	**0.00***
Test Preparation and Test Taking	2.04	1.59	Low	3	0.56	0.70	**0.01***
Reading Speed	1.94	1.50	Low	6	0.81	0.43	0.24
Writing Skills	1.97	1.54	Low	5	0.12	0.44	0.74
Test Anxiety Management	2.09	1.66	Low	1	0.08	**0.01***	**0.01***
Grand Mean	**1.99**		**Low**				

*The mean difference is significant at the 0.05 level

Legend: 4.20-5.00 - Always; 3.40-4.19 - Usually; 2.60-3.39 - Sometimes; 1.80-2.59 - Low; 1.00-1.79 - Very Low

The data in Table 2 depicts the study habits and skills of first-year college students studying Mathematics. Respondents have weak study habits and skills, according to the estimated grand mean of 1.99. This indicates that the students have not yet developed strong positive attitudes toward the set of skills that will help them prepare for the subject at hand. As a result, improving students' study habits will help them improve their grades. The most common barrier to students' success, according to Mark and Howard (2009), is a lack of effective or enjoyable study habits. Also, Werner (2003) analyzes the impact of self-awareness regarding learning styles on learning strategy choice and comprehension process development to back up this notion.

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According to the findings of this study, most students rate themselves as having a low level of proficiency in all their study habits and skills. Test Anxiety Management, Concentration, Test Preparation, Test Taking, and Reading Comprehension are the top four study habits and skills in learning mathematics. To summarize, freshmen college students' skills and habits must be further strengthened and enhanced for them to better understand the lessons of Mathematics. According to Hill and Ballow (2000), students' study habits reflect the quality of their education and their mathematical ability. According to Odiri (2015), good study habits contribute to improved mathematical achievement, while a lack of good study habits leads to bad mathematical academic performance. Students who have excellent study habits and skills perform better than those who do not.

For the gender variable only, the table shows the tested One-Way ANOVA p-value and the T-test Two-Sample Assuming Equal Variances p-two-tail values. These tests were performed to investigate if there were any significant differences in the study habits of students taking the subject of Mathematics when they were grouped by age, gender, and course. Similarly, the p-value must be greater than the alpha level of 0.05 to determine if a variable has no significant difference. Tukey's HSD Post Hoc test will be utilized if the p-value is less than the alpha threshold.

The participants are divided into age groups of 18, 19, 20, 21, 22, and 24. The One-Way ANOVA results revealed that there is no significant difference between the study habits factors since all p-values generated were bigger than the alpha level. Furthermore, raw data were analyzed using the T-test Two-Sample Assuming Equal Variances, which revealed that there is a significant difference in terms of time management and anxiety management, with p-values of 0.04 and 0.01, respectively, being lower than the expected alpha level of 0.05. The t-test results suggest that students' gender has a significant impact on their anxiety control. Because the T-test is designed to detect significant differences, Tukey's HSD Post Hoc test is not necessary.

Finally, the researchers divided the courses into three sub-categories in the course area: health-related courses, arts and science-related courses, and engineering-related courses. Reading comprehension, test preparation, test-taking, and anxiety management p-values of 0.00, 0.01, and 0.01, respectively, were found to be less than 0.05 alpha level using One-Way ANOVA, indicating that there are significant differences under these variables. Tukey's HSD Post Hoc test was also applied to the p-values that were less than the 0.05 alpha threshold.

Table 3. Summary Results of Post Hoc Tukey HSD Test in Study Habits

Grouped Courses	**Reading Comprehension**		**Test Preparation and Test Taking**		**Anxiety Management**		**Remarks**
Combination of Courses	CD	AVCD	CD	AVCD	CD	AVCD	

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Health-related courses and arts and science-related courses	0.21	0.36	0.20	0.25	0.33	0.41	**Significant Difference**

Note. CD – Critical Difference; AVCD – Absolute Value Critical Difference

The data revealed a substantial difference in students' study habits in terms of reading comprehension, test preparation, test-taking, and anxiety management between the groups of health-related courses and arts and science-related courses solely, as shown in Table 3. There is a considerable difference between the two-course sub-categories because the absolute value crucial difference between the three study habits is bigger than the critical value.

Academic Performance of Freshmen College Students and Test of Significant Difference when Grouped According to Profile Variables

The percentage of students who excelled in Metacognitive, Collaborative, Kinesthetic, Tactile, Visual, and Auditory learning styles in mathematics is shown in the table. The survey had a total of one hundred (100) respondents, which is the frequency of the results. The standard deviation is 14, and the average mean of these findings is 89, indicating excellent performance. Many responders received a 3.50, which is like a score of 91–95 on an excellent scale. The response rate was 43 percent overall. The second highest score is 3.00, which corresponds to a performance level of 87-90. There was 39 percent of persons responded. The third-best response received a 4.00 with an exceptional rating, which is equal to 5%. They both earn the same score of 1.50 with a fair performance level of 78-80. Answering 2.00 with a decent level, which is equivalent to 81–83, and 1.00 with a passing level, which is equivalent to 75–77, yields the same result. They all make up 2% of the population. The ultimate lowest score was 0, with a performance level of only 1%, which is considered a failure.

Table 4. Academic Performance Scores and Test of Significant Difference

Grade Range	**Description**	**Frequency**	**Percentage**
4.00 (96-100)	Excellent	5	5%
3.50 (91-95)	Outstanding	43	43%
3.00 (87-90)	Very Good	39	39%
2.50 (84-86)	Good	3	3%
2.00 (81-83)	Satisfactory	2	2%
1.50 (78-80)	Fair	5	5%
1.00 (75-77)	Passing	2	2%
0	Failing	1	1%
Total Mean Average = 89 (Very Good)			**SD** = 14
	Age p-value	= 0.44	
	Gender p-value	= 0.23	
	Course p-value	= 0.16	

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*The mean difference is significant at the 0.05 level

The respondents' highest midterm grade was 3.50, and they have an outstanding academic performance level, excelling in group learning style, according to these findings. Group learning had a grand mean of 27 with a minor learning style preference level, indicating that they prefer this learning style for studying mathematics, according to the results in table 3.1. The tactile and unique learning approach, which has a 25 grand mean, is the second most favored learning style. With a failing level, the lowest result is 1 percent, which is equal to zero (0). The results of visual, auditory, and kinesthetic with an insignificant level, as well as the 24 grand, mean, were substantially equal. When visual, auditory, and kinesthetic learning styles are split down, the proportion of students studying mathematics is the least desired. Learning styles have a considerable impact on a student's academic success, according to Castolo and Rebusquillo (2008).

The table shows the results of the One-Way ANOVA Test, which is used to see if there is a significant difference in academic performance among students when they are grouped by profile characteristics like age, gender, and course. When the students are divided into age groups of 18, 19, 20, 21, 22, and 24, it is evident that there is no statistically significant difference in their academic achievement, with a p-value of 0.44, which is higher than 0.05 alpha level.

Furthermore, the researchers achieve a p-value of 0.23 when students are sorted by gender, with variable 1 being male and variable 2 being female, which is greater than the alpha level of 0.05. It is then assumed that when students are classified by gender, there is no substantial difference in academic achievement. Finally, the One-Way ANOVA findings show a p-value of 0.16, which is higher than the 0.05 alpha level, in the course area, which is sub-categorized as health-related courses, arts and science-related courses, and engineering-related courses. This finding indicates that when students are classified according to their course, there is no statistically significant difference in their academic achievement.

CONCLUSION

The preferences for learning styles, study habits, and academic performance of freshmen college students studying mathematics as a general education course were investigated in this study. The survey found that students enjoyed Tactile, Group, and Individual Learning Styles the most, even though these are minor learning styles. While Visual, Auditory, and Kinesthetic learning modalities are considered minor by students. As a result, it appears that freshmen college students in the Philippines favor learning strategies such as constructing models, working alone, and collaborative learning.

Study habits and skills such as Time Management, Concentration, Note Taking, Reading Comprehension, Test Preparation and Test Taking, Reading Speed, Writing Skills, and Anxiety Management was also found to be lacking in the students. Similarly, it was revealed that most of the students perform well academically. Knowing one's preferred learning styles will help a person maximize his ability when using his preferred learning methods.

Notably, the test of difference revealed that students' perceptual learning styles are not affected by their age, gender, or course. As a result, the idea has been rejected in terms of learning styles. Similarly, statistically significant differences in their study habits were found when they

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were classified by gender and course, indicating that the hypothesis was accepted. Finally, when students taking Mathematics are grouped by their age, gender, and course, there is no statistically significant difference in their academic achievement, rejecting the hypothesis.

The findings of the study can help instructors design a plan for delivering appropriate instructional changes and interventions. The following instructional strategies may be applied by various academic institutions because of the study's findings:

1. Using a cooperative, experiential, and solitary learning ways to implement teaching and learning exercises will take great care of the respondents' group, tactile, and individual learning styles. While formed using the profile factors, these learning styles were regarded as minor learning styles with no critical distinction.
2. The low level of understudies' study habits could be improved with online seminars, counseling, and workshops conducted by the guidance and counseling office and an office of students' administrations and welfare assistance, focusing on all study habits and skills, primarily time management, improving concentration, encouraging taking notes, advancing reading comprehension, managing test preparation, and test-taking, developing reading speed, and improving writing skills.
3. Providing in-house training for faculty members who teach the Mathematics course, with a focus on effective instructional approaches. In addition, collaborate with the teacher to help more Mathematics students achieve academic success, as study habits are linked to academic performance.
4. Providing a suitable online learning environment and areas for students to expand their learning options.

LIMITATION & FURTHER RESEARCH

As to the limitations of the study and future research directions, this present study is subjected to a few recommendations. Based on the conclusions, this study has the following recommendations:

1. Future researchers should use various technologies to investigate learning preferences in each demographic to widen and precisely collect the Preferred Learning Styles in Mathematics of Freshmen College Students. As a result, educators must be innovative while teaching freshmen college students as they acclimate to their new surroundings. As a result, assisting students in identifying their learning styles will have a substantial impact on their understanding and performance in mathematics.
2. Because study habits are one of the most important factors influencing students' academic success, larger research with a larger sample size is recommended to obtain more accurate results. Furthermore, future researchers should investigate what factors influence students' study habits.
3. The goal of this grade range is to figure out what percentage of students succeed at individual, group, kinesthetic, tactile, visual, and auditory math learning. When determining the relationship between the acquired midterm grade and academic performance and the learning techniques chosen by students when studying mathematics,

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it is recommended to be specific. Discovering and explaining why students obtained such a low or high midterm mark in their favorite learning modality is also ideal.

4. Because there was no significant difference in the test of difference in Perceptual Learning Styles, the researchers recommend including more profile characteristics such as culture and family history, as these may play a key influence in determining students' learning styles. Similarly, when students study habits were grouped according to their profile factors, the researchers recommended that they analyze and consider the relevance of each component to one another further. It will also assist students in better understanding how their opinions of themselves and their surroundings may influence future performance. According to the study's findings, students' academic performance did not differ considerably when grouped by profile characteristics; thus the researcher recommends conducting additional research to address these differences. To learn more about this issue, potential researchers will need to look at different demography or another set of data.

Overall, the researchers propose using proportionate stratified sampling rather than non-random sampling to collect and assess data from diverse subgroups since it provides more precision. Also, consider incorporating a bigger population from several universities and include more variables. Finally, similar or equivalent research should be conducted to understand more about students' preferred learning styles, study habits, and academic success in Mathematics and other courses.

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