



MILLENNIAL FRESHMEN STUDENTS' MATHEMATICS LEARNING PREFERENCES

Dr. Catherine A. Yap^{1*}, Dr. Saul M. Muyco², Dr. Melba O. Jamon³,
Nestor L. Gicaraya⁴, Dr. Maria Teresa C. Carbon⁵,
Dr. Arlene D. Hortillosa⁶

^{1,2,3,4,5,6} Iloilo Science and Technology University, Iloilo City, Philippines
Email: ¹catherine.yap@isatu.edu.ph

Abstract

This study was conducted to determine the “mathematics learning preferences of millennial freshmen students”. Ninety freshmen college students of Arts and Sciences taking Mathematics subjects were randomly chosen as participants. They completed a researcher-made questionnaire. Results revealed that most of the participants were visual learners. The participants preferably learn Mathematics through hands-on activities/experiential/problem sets, which is the most dominant, followed by collaborative/teamwork/group work, and module/e-book/textbook.

Moreover, they preferably learn Mathematics when their teacher uses lecture/discussion methods, cooperative learning, and practice & drill methods. Most prefer an environment where they are in a small group and learn effectively in the morning.

Furthermore, they also prefer synchronous sessions. It is recommended that Mathematics classes be conducted during the morning using teaching strategies that will suit the learning styles and preferences of the students. This intervention can help the participants learn Mathematics towards better performance in Mathematics.

Keywords: *Millennials, Mathematics, Learning Preferences*

1. Introduction

Currently, the young generation of college students, specifically the millennials, have their way of thinking and doing things. To understand them, teachers should know their needs and preferences first.

In stark contrast to their Baby Boomer parents and the early members of Generation X, millennials, also known as Generation Y, were born after 1982 (Monasco & Martin, 2007).

Due to their distinct traits in comparison to earlier generations, the millennial generation has attracted a tremendous amount of attention. One of the biggest distinctions is that millennials were raised in a society where technology was pervasive. The research on millennials also reveals that in order to effectively teach this new generation of learners, instructors need to understand them. According to research, millennial students favour active and hands-on learning methods. (Phillips and Trainor, 2014).

As observed by the researchers, with the new trends in technology, mathematics teachers should find teaching strategies that will suit the learning preferences, needs, and interests of these millennials in learning mathematics, primarily when classes are conducted in

synchronous and asynchronous sessions. Thus, with the observed phenomenon, this study was conducted.

2. Literature Review

2.1. Millennials

According to Howe & Strauss's (2007) research, millennials were born between 1982 and 2005 (Phillips and Trainor, 2014). In addition to their reliance on technology, the millennial generation is seen as special in a number of other aspects. Because they have only seen a world with computers and the internet, millennials view these technologies more as tools than as essential components of their daily life (Merritt, 2002; Phillips & Trainor, 2014). Since millennials began attending college in 2000, it has been more obvious that they require a distinct teaching strategy. The setting of higher education will alter irrevocably thanks to millennial students, according to researchers.

Howe and Strauss (2000) state that the Millennial generation is the most recent to enrol in college (Elam et al., 2007), with Generation X making up the majority of students at colleges and universities.

These students, known as Millennials, learn in a distinctive way. It could be time to examine the Millennials, a new cohort of college students, in terms of their traits, skills, and values in order to help them learn as well. To fulfil the requirements of the widest range of pupils, a diversity of teaching techniques will be required in our diverse classrooms. Millennial students like group activities (McGlynn, 2019). Most students in the typical university environment belong to the Millennial generation (Toothaker & Taliafero, 2019).

In contrast to their predecessors who attended college 10, 15, or 20 years ago, millennial students are the most diverse and extensive generation to enrol in college. Traditional classroom procedures and instructional environments are not compatible with their personality, mental processes, and educational proclivities. This generation is notable for lacking professional boundaries influenced by socialisation, needing immediate feedback, feeling entitled, lacking critical thinking skills, having unrealistic expectations, having a high level of parental involvement, and expecting a how-to manual to succeed in and out of the classroom. The millennial generation seeks achievement with minimal effort and little time spent on tasks (Monasco & Martin, 2007).

Moreover, Howe and Strauss (1993), as cited by Monasco & Martin (2007), identified seven general characteristics of the Millennial student: "(1) Millennials feel they are unique; (2) Millennials are sheltered; (3) Millennials are team-oriented; (4) Millennials are confident and highly optimistic; (5) Millennials are pressured; (6) Millennials have a strong desire to achieve; and (7) Millennials are conventional".

Furthermore, a study by Monasco and Martin (2007) described the Millennials who emulate the traits of the Silent Generation, who were born between 1925 and 1942 and are now the grandparents of the Millennial. In comparison to Generation X, the Millennials are very different. The Millennial Generation's distinctive social traits are defined by key descriptors. To comprehend and apply when teachers implement learning, these traits are linked with a strategy.

2.2. Learning Preferences

Dunn & Griggs (2000) and Shaffer (2023) describe learning preferences as how students begin to focus on, process, internalise, and recall new and challenging academic information. Based on the idea that the majority of people can learn, the Dunn and Dunn Model; Individual instructional preferences exist and can be measured with reliability. In responsive environments, students achieve statistically higher achievement and aptitude test scores in classes that match their learning styles. Teachers can learn to use learning preferences as the foundation of their instruction. Everyone has strengths, but different people have different strengths. In order to take learner preferences into account, instructors can alter their teaching methods (Shaffer, 2023).

Felder & Soloman (1993) developed a learning styles inventory to determine the student's learning preferences on four dimensions: active and reflective, sensing and intuitive, visual and verbal, and sequential and global. "(1) Active and reflective learners tend to retain and comprehend information best by doing something active with it—discussing, applying, or explaining it to others. Reflective learners prefer to think about it silently first; (2) Sensing and intuitive learners - sensing learners tend to like studying facts, while intuitive learners often prefer discovering opportunities and relationships. Sensors often like solving problems by well-established methods and dislike difficulties and surprises; (3) Visual and verbal learners Visual learners learn best what they see—pictures, diagrams, flow charts, timelines, films, and demonstrations. Verbal learners get more out of words—written and spoken justifications; (4) Sequential and global learners -Sequential learners tend to follow logical step-by-step paths in finding solutions; global learners may be able to solve complex problems fast or put things together in novel ways once they have comprehended the big picture, but they may have difficulty explaining how they did it".

Learning preferences are to be determined by learning styles. The four sensory modalities used to describe various learning preferences are referred to in Fleming's VARK model. According to the paradigm, these modalities accurately represent how kids learn. Visual, auditory, reading/writing, and kinesthetic learners are the four main categories of learners identified by VARK learning styles. It is believed that children learn best when their preferred learning styles and techniques of instruction are used in the classroom. The VARK model categorises students into four groups based on their preferred learning styles: "(1) Visual learning (pictures, movies, diagrams); (2) Auditory learning (music, discussion, lectures); (3) Reading and writing (making lists, reading textbooks, taking notes); and (4) Kinesthetic learning (movement, experiments, hands-on activities)".

Mkonto (2015) examined students' preferences for learning, finding that 63% of them preferred kinesthetic or tactile learning. These students understand the material better when they actively participate in the learning process; they prefer to be hands-on learners and learn best when they do. They enjoy holding and handling the material. Auditory numerical (8%) and expressive oral (8%) were the less dominant learning modes in this faculty. When numbers are explained orally, students who acquire mathematics by auditory means do so more effectively. They read aloud and hear their own voices while they are learning. They have mental math computation skills. The findings showed that while some students preferred multimodal learning methods over dominant learning styles, some students still preferred dominant learning styles. Additionally, faculties tend to have certain learning styles.

The professor can gain useful knowledge by being aware of the students' learning preferences and their learning strengths and shortcomings.

Oblinger and Raines (2002; McGlynn, 2019) came to the conclusion after examining the specific learning preferences of millennials that these students value teamwork, experiential activities, organisation, and the use of technology. A collaborative learning style, goal focus, good attitudes, and multitasking are among the strengths of millennials. What makes the most sense in terms of cognitive learning is preferred by millennials, followed by discussion. Many millennials value the activity of teamwork and desire to learn by working together. They favour learning on their schedule and at their convenient times. They appreciate structured activities that permit innovation. They want to be involved with “real life” issues that are important to them. Most millennials are secure with and enjoy using technology.

2.3. Teaching and Learning

The majority of students found the lectures, tutorials, and practical sessions to be beneficial to their learning, according to Meehan-Andrews' (2008) study. The combination emphasises and restates a number of life science ideas. Practical training sessions were favoured above tutorials as the most effective approach. The kinesthetic sensory method, or hands-on learning, was favoured by most students for information retention.

Additionally, according to research, millennial students favour experiential and interactive learning opportunities (Phillips & Trainor, 2014).

Furthermore, according to a study by Monasco and Martin from 2007, each generation enters college with unique qualities that set them apart from their forebears. Learning-centered classrooms that prioritise student learning over instructor delivery have become the norm in education. They want to introduce the Millennial Student and pinpoint the various traits that influence both teaching and learning. The college classroom has drawn in a new generation of students. They are driven, focused achievers who rely on technology and their network of allies. Ten years ago, teaching methods were different from how this generation learned. Their traits are similar to those of the grandparents of the Millennials, those born between 1925 and 1942, known as the Silent Generation. In comparison to Generation X, the Millennials are very different. The Millennial Generation's key qualities as a society are defined by a few key adjectives. With a system to comprehend and use as teachers execute learning, these traits are recognised. Higher education cannot overlook these students' requirements in light of the current paradigm change. To ensure that students learn and that they receive effective instruction, teachers assume a variety of duties both inside and outside the classroom. The Millennial Generation benefits from athletic training education in both the clinical setting and the classroom. Learning skills can be developed both didactically and therapeutically thanks to a better knowledge of this student among educators. Advantages: Teachers must comprehend their audience in order to create instructional strategies and delivery techniques that will result in successful learning outcomes for Millennial Students as society, media, technology, and communication evolve.

Additionally, Toothaker and Taliafero's (2017) study on nurse educators identifies challenges in creating instructional methods that undergraduate Millennial nursing students find interesting and relevant. The purpose of this study was to determine how Millennial students

perceived using traditional teaching methods and what that meant for nursing education. The lived experiences of Millennial nursing students in conventional classrooms were documented through interpretive phenomenological analysis. Five themes were found in the data, according to the study's findings: being physically there but mentally disoriented; unspoken peer pressure; seeking more from the instructors; surface learning; and lack of confidence. The essence centres on the idea of belonging, and students named instructors' lack of engagement as the biggest issue in the classroom. It is advised to use blended teaching pedagogies that offer both conventional and contemporary techniques.

The flipped classroom technique, which often entails the preparation of brief audio or video lectures that students examine before going to class, was also the subject of a study by Phillips & Trainor (2014). The goal of the study is to examine the flipped-classroom method of teaching accounting to the millennial generation of students and to see what accounting students think of this increasingly common teaching strategy. The study's findings indicate that although most students are exposed to the lecture paradigm, they prefer to learn by doing rather than by hearing.

3. Purpose of the Study

This study attempted to determine the learning preferences in mathematics of millennial freshmen students.

Specifically, this study sought answers to the following questions:

1. What are the most dominant learning preferences in mathematics of the participants concerning learning style, study time, and learning environment?
2. What is the most appropriate teaching strategy that will suit the learning preferences of the participants?

4. Significance of the Study

This study may benefit the mathematics teachers teaching mathematics to freshmen college students. The result of the study may help them determine appropriate teaching strategies that will suit the learning preferences in mathematics, needs, and interests of the millennials. This study may also enhance the learning of freshmen college students, which will help improve their mathematics performance.

5. Methodology

5.1. Research Design

This study utilised a descriptive research design. Descriptive research is a research method that depicts the characteristics of the population or phenomenon studied. This methodology centres more on the “what” of the research subject than the “why” of the research subject (Bhat, 2021). This study aimed to determine millennial freshmen students' mathematics learning preferences.

5.2. Participants

Ninety (90) freshmen students of the College of Arts and Sciences of Iloilo Science and Technology University (ISAT U) taking Mathematics subjects this second semester, the school year 2020-2021, were randomly chosen as participants. Participants came from these courses: Bachelor of Science in Information Technology (61), Bachelor of Science in Mathematics (11), and Bachelor of Science in Human Service (18).

5.3. Instrument

The data gathering instrument used is a 10-item validated researcher-made learning preferences questionnaire. This questionnaire comprised ten questions on learning preferences in mathematics concerning learning style, study time, learning environment, and teaching strategies.

5.4. Data Gathering Procedure

The instrument was administered to the participants in Google form via messenger group chat. The scope of the data gathered is limited due to internet accessibility. The data gathered was interpreted and analysed.

5.5. Data Analysis

The data gathered were retrieved from Google Drive. The descriptive statistical tool applied in the analysis and interpretation were the frequency count, percentages and ranking. The frequency count and percentages were used to determine the most dominant learning preferences. The ranking was used to determine the rank order of the learning preferences. The Statistical Packages for Social Sciences (SPSS) software processed the data.

6. Results and Discussion

The study results were based on participants' responses to the 10-item researcher-made learning preferences questionnaire.

As shown in Table 1, the results of the study showed that the learning preferences of the participants concerning learning styles were most of the participants were visual learners (47 or 52.2%), followed by auditory learners (35 or 38.9 %), and the tiniest kinesthetic/tactile learners (8 or 8.9%). This result may be because the teaching mode during the pandemic is online or virtual, so there are limited hands-on activities. The result may contradict the study conducted by Mkonto (2015) about students' learning preferences, where the dominant learning style for students was kinesthetic/tactile (63%). These students learn best when they participate directly; they want to be hands-on in learning and understand the work better when they are active participants.

Table 1. The Learning Preferences of the Participants Concerning Learning Styles

Learning Styles	f	%
I preferably learn Mathematics by:		
A. Visual	47	52.20
B. Auditory	35	38.90
C. Kinesthetic/Tactile	8	8.90
Total	90	100.00

As shown in Table 2, the results of the study revealed that the most dominant learning preferences of the participants are through the use of hands-on activities/experiential/problem sets, which is ranked 1 (28 participants), followed by collaborative/teamwork/group work which is rank 2 (23 participants) since hands-on activities/ experiential/problem sets are rank one already; and module/e-book/textbook which is rank 3 (22 participants). The result of the present study is supported by the study of Meehan-Andrews (2008) of the sensory mode most students preferred to grasp information was kinesthetic, the hands-on approach to learning. In addition, it is also supported by the study of McGlynn (2019), cited by Oblinger and Raines (2002), that millennials want to learn by working collaboratively; many of them appreciate the activity of teamwork.

Table 2. The Participants' Learning Preferences

Learning Preferences	f	f	f
	Rank 1	Rank 2	Rank 3
I preferably learn Mathematics thru the use of:			
A. Technology	16	19	17
B. Collaborative/Team Work/Group Work	25	23	16
C. Hands-on Activities/Experiential/Problem Sets	28	26	17
D. Independent Study/Individual Work	6	11	14
E. Module/e-book/Textbook	11	11	22
F. Multitasking	4	---	4
Total	90	90	90

As shown in Table 3, the results of the study revealed that the most appropriate teaching strategy that the participants preferably learn Mathematics when their teacher use the lecture/discussion method, which is the most appropriate and ranked 1 (67 participants), followed by cooperative learning, which ranked 2 (21 participants); and practice and drill method which is rank 3 (20 participants). The result of the study is supported by the study conducted by Meehan-Andrews (2008), which identified that most students discovered the lectures, tutorials, and practical sessions to be beneficial to their learning. In addition, the result is also supported by the study of McGlynn (2019) that millennial students incline toward group activity. Furthermore, the result is supported by the study of Phillips & Trainor (2014) that students are mostly exposed to the lecture paradigm but prefer to learn by doing than by listening.

Table 3. The Learning Preferences of the Participants when the Teacher Use Teaching Strategies

Teaching Strategies	f Rank 1	f Rank 2	f Rank 3
I preferably learn Mathematics when my teacher uses:			
A. Lecture/Discussion Method	67	13	6
B. Cooperative Learning	4	21	16
C. Pure Discovery Learning/Guided Discovery	1	12	16
D. Mixed/Blended Learning	9	17	14
E. Peer Tutoring Method	1	5	8
F. Problem-based Method	4	12	10
G. Practice and Drill Method	4	10	20
Total	90	90	90

As shown in Table 4, the study results revealed that most participants prefer an environment in a small group of 4-9 students, with a frequency of 41 or 45.6%. The least preferred is learning in an environment where they are in a class of 30-40 students (11 or 12.2%). The result may be attributed to the fact that small groups can have more interactions and discussions and fewer distractions, more focus and conducive to learning.

Table 4. Learning Preferences of the Participants for Classroom Environment

Learning Environment	f	%
A. I am alone	20	22.2
B. I am in a small group of 4-9 students (small)	41	45.6
C. I am in a class of 10-20 students (medium)	18	20.0
D. I am in a class of 30-40 students (large)	11	12.2
Total	90	100

As shown in Table 5, most participants learn more effectively during the morning, with the highest frequency of 50 or 55.6 %. They preferred learning mathematics at midnight (6 or 6.7%). This study is supported by the study of McGlynn (2019), cited by Oblinger and Raines (2002), that millennials prefer to learn in their own time and during their periods.

Table 5. Learning Preferences of the Participants Concerning Study Time

Study Time	f	%
I preferably learn Mathematics during the:		
A. Morning	50	55.6
B. Afternoon	15	16.7
C. Evening	19	21.1
D. Midnight	6	6.7
E. Early Dawn	---	---
Total	90	100

As shown in Table 6, most participants prefer synchronous online class sessions (71 or 78.9%), and the least is an asynchronous session (19 or 21.1%). This result may be attributed to the fact that Mathematics lessons need to be explained and discussed by the teacher, especially if the solutions/proofs are complicated for the students to understand the lesson more clearly.

Table 6. Learning Preferences of the Participants during Online Classes

Learning Preferences	f	%
I preferably learn Mathematics during the:		
A. Synchronous Session	71	78.90
B. Asynchronous Session	19	21.10
Total	90	100.00

7. Conclusions and Recommendations

The learning preferences in Mathematics of the participants may be attributed to the fact that during the pandemic, the teaching and learning modes are conducted online. It may vary depending on the learning preferences or styles of the participants and the teaching strategies used by their Mathematics teachers.

It is recommended that Mathematics classes may be conducted in the morning for better learning using teaching strategies and instructional materials that will suit the needs of the learners and their learning styles and preferences. This intervention can help the participants learn Mathematics more effectively towards better performance in Mathematics.

References

- [1] Bhat, A. (2021). Descriptive research: definition, characteristics, methods + examples. questionpro. Retrieved from <https://www.questionpro.com/blog/descriptive-research>
- [2] Cherry, K. (2023). Overview of VARK learning styles. Retrieved from <https://www.verywellmind.com/vark-learning-styles-2795156>

- [3] Elam, C. et al. (2007). Welcoming a new generation to college: the millennial students. Retrieved from <https://files.eric.ed.gov/fulltext/EJ783953.pdf>
- [4] Felder, R. & Soloman, B. (1993). Learning styles and strategies. Retrieved from <https://www.engr.ncsu.edu/wp-content/uploads/drive/1WPAfj3j5o5OuJMiHorJ-lv6fON1C8kCN/styles.pdf>
- [5] Meehan-Andrews, T. (2008). Teaching mode efficiency and learning preferences of first-year nursing students. Retrieved from <https://doi.org/10.1016/j.nedt.2008.06.007>
- [6] McGlynn, A. (2019). Teaching millennials, our newest cultural cohort. Retrieved from http://www.sciencetheearth.com/uploads/2/4/6/5/24658156/mcglynn_teachingmillennials.pdf
- [7] Mkonto, N. (2015). Students' learning preferences. Retrieved from https://www.researchgate.net/profile/Nosisana-Mkonto/publication/305495746_Students'_Learning_Preferences/links/5b55db810f7e9b240ffeb2ef/Students-Learning-Preferences.pdf
- [8] Monasco M. & Martin M. (2007). The millennial student: a new generation of learners. Retrieved from https://www.researchgate.net/publication/228343335_The_Millennial_Student_A_New_Generation_of_Learners
- [9] Nicholas, A. (2008). Preferred learning methods of the millennial generation. Retrieved from https://www.researchgate.net/publication/41951985_Preferred_Learning_Methods_of_the_Millennial_Generation
- [10] Phillips, C. & Trainor, J. (2014). Millennial students and the flipped classroom. Retrieved from [http://www.asbbs.org/files/ASBBS2014/PDF/P/Phillips_Trainor\(P519-530\).pdf](http://www.asbbs.org/files/ASBBS2014/PDF/P/Phillips_Trainor(P519-530).pdf)
- [11] Shaffer, S. (2023). Learning preferences. Retrieved from <https://sites.psu.edu/shafferpsy/teaching-learning-resources2/teaching-learning-topics-resources/learning-styles/>
- [12] Toothaker, R. & Taliaferro, D. (2019). A phenomenological study of millennial students and Traditional Pedagogies. Retrieved from <https://www.sciencedirect.com/science/article/abs/pii/S8755722316300424>