The Learning Styles and Preferred Learning Modalities of Freshman Students in the New Normal: Their Impact on the Academic Performance in Mathematics in the Modern World

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ABSTRACT: The present study aimed to focus on finding out the Learning Styles and Preferred Learning Modalities and Academic performance of the students in Mathematics in the Modern World. The respondents comprised 830 freshman students enrolled in Mathematics in the Modern World for the First Semester School Year 2021-2022 at Isabela State University-City of Ilagan Campus. The factors were categorized as follows: Profile of the students, Learning Styles, Preferred Learning Modalities, and the Academic Performance of the students in Mathematics in the Modern World. Also, it aimed to determine if there is a significant difference in the academic performance of the students when grouped according to their profile; test if there is a significant difference in the learning styles of the student when grouped according to their profile; test if there is a significant relationship between the learning styles and the academic performance of the students; and to determine if there is a significant relationship between the preferred learning modalities and academic performance of the students in the Mathematics in the Modern World subject. The data gathered were analyzed and interpreted based on the Descriptive Statistics, Analysis of Variance or the F–test and the Chi–square test, and the Micro-Stat Software Program (SPSS) computer output. The descriptive method using the survey and correlational techniques were used in this study. The use of questionnaires and standardized instruments – The VARK Learning Style Inventory by Neil Fleming was used to evaluate the student's learning styles. The academic performance of the students was limited to the grade obtained in Mathematics in the Modern World validated by the Campus Registrar. The results reveal that in terms of profile socio-economic status, the majority of the respondents belong to families whose monthly income is at most P9, 520.00. Moreover, most students used mobile phones as the gadgets available at home for educational purposes. The results also revealed that the students have fairly satisfactory mathematics performance. There is a significant difference in the academic performance of the students in Mathematics in the Modern world in terms of sex, the field of specialization, the mother's source of income, and the family's monthly income. As to profiles of the father's source of income and the gadget available at home used for educational purposes, there is no significant difference in the academic performance of the students. Most students are classified as Auditory Learners, thus, they learn best through interactive listening. The learning styles of the students differ when grouped in terms of field of specialization and family's monthly income. Hence, students' learning styles vary when grouped according to the abovementioned profile. As to the relationship between the learning styles of the students and their academic performance, no statistically significant relationship was found between learning styles and the academic performance of students. Therefore, the earning styles of the students have no influence on their academic performance in Mathematics in the Modern World. Online learning is the preferred learning modality of the students which is 47.40 percent of the total respondents. The study also showed that there is a significant relationship between the preferred learning modality and the academic performance of the students.

KEYWORDS: Learning Styles, Preferred Learning Modality, Auditory Learners, Online Learning, Academic Performance

INTRODUCTION

Education in the Philippines has been receiving sufficient attention from the authorities and is one of the precedence sectors of the government alongside health, agriculture, and public works. The educational system in the country is comparable with other traditional practices in other neighboring countries. The traditional setup involves the physical engagement of teachers and learners within the corners of their classrooms where activities and learning assessments are administered onsite.

Conversely, in the advent of the COVID-19 pandemic wherein mobility and public activities had been put into Different levels of restriction, education systems around the world had been faced with many implications in the transition towards the "new

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normal". There are many adjustments and fine tunings needed to obtain a perfect scheme most applicable to the culture and conditions of the teaching-learning process.

Amidst the need to ensure learning continuity, traditional methods of education have been disrupted. The implementation of lockdowns and government-imposed restrictions on mobility has resulted in the physical closure of schools, colleges, and universities. As a consequence, alternative modes of teaching delivery have been adopted as substitutes for the conventional face-to-face learning. This significant disruption has not only impacted the educational institutions themselves but has also placed a burden on numerous families who are reluctant to assume the responsibility of home-schooling. It has become a profound shock, affecting not only the productivity of parents but also the social lives and learning experiences of students. In light of these uncertainties and developments, the academic community and its stakeholders are striving to find ways to uphold the delivery of quality services, so as not to compromise the most vital recipients, the students. School interventions must be established to support the government's efforts in safeguarding public health and facilitating recovery, while also mitigating the adverse effects on students and their education. Each student possesses a unique learning style, encompassing visual, auditory, reflective, active, logical, intuitive, and mnemonic aspects. Learning extends beyond mere retention of information and knowledge expansion; it involves comprehending how acquired knowledge can be applied in everyday life (Entwistle & Ramsden, 2015). To ensure continuous learning for students, Higher Education Institutions (HEIs) across the nation have adopted various delivery modalities. These modalities include the utilization of platforms such as Learning Management Systems (LMS), modular approaches, and more. When selecting a suitable platform for an academic institution, several factors must be taken into consideration, including the characteristics of teachers and students, as well as their technical capabilities, among others. However, despite these concerted efforts, concerns arise regarding students' poor performance and their level of proficiency in Mathematics (Carpio & Indama, 2021).

On the other hand, learning styles provide a significant challenge for educational institutions in the twenty-first century, given that students are expected to engage in active involvement in increasing their sense of self and societal participation (Nuankaew et al., 2019; Truong, 2016). With the reasons mentioned above, this research is an attempt to respond to the challenge of mitigating students' difficulties in the learning process during this time of the pandemic. It aims to identify the learning styles and preferred learning modalities of the students in the 'New Normal' result which will serve as baseline data for teachers in planning class instruction and adapting their methods and techniques to the student's learning styles and their preferred learning modalities. When teachers are able to meet students 'learning styles and their preferred learning modalities in the execution of their classroom instruction, it is believed that despite the limitations brought about by the New Normal, classroom learning will still be maximized. Hence, students' academic performance will not be sacrificed. In addition, in order to achieve good academic performance in Mathematics in the Modern World, this study is intended to assist University administrators and faculty members in discovering answers and addressing challenges.

REVIEW OF RELATED LITERATURE and RELATED STUDIES

In the modern world, education is undergoing significant transformations, driven by advancements in technology, evolving pedagogical approaches, and a better understanding of individual differences in learning. One critical aspect that influences students' academic performance is their learning styles and preferred learning modalities. Learning styles refer to the preferred methods through which individuals acquire, process, and retain information while learning modalities encompass the various sensory channels through which learners engage with educational material. Understanding the diverse learning styles of freshman students can help educators tailor their instructional strategies to optimize the learning experience and improve academic outcomes. By identifying the learning styles and modalities that align with individual students, educators can create a supportive and engaging environment that caters to their unique needs.

Aside from learning styles and teaching strategies, academic achievement is also considered as the center of interest in educational research. Studying the issue of achievement has extended beyond simple to complex issues of intelligence and prior academic achievement into how learners interact with the learning material and teaching strategies. This issue on academic achievement is particularly true in the case of the Philippine basic education, as reflected in the overall performance of the high school students. Results of the National Achievement Test (NAT) among public high schools all over the country had been declining since 2010 (Valdez, 2016). NAT is just one of the country's criteria for measuring students' academic achievement in mathematics. The Philippine NAT results provide continuous documentation of the need to put greater emphasis on improving the teaching and learning of mathematics in the country. The question is: what more must be done and taken into greater account to be able to improve the academic performance of high school students in mathematics? Dalmolin, Eet al., (2018) found that there is a correlation between learning styles and students' academic success. Also, the study by Vizeshfar and Torabizadeh (2018) revealed

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that students prefer learning with diverse learning styles because it improves academic achievement. Magulod Jr. (2019) also conducted research on learning styles and academic performance and discovered a significant relationship between learning styles and student academic performance. Thus, learning styles are each person's own means of taking in, processing, understanding, and remembering knowledge. Environmental, emotional, and cognitive aspects, as well as prior experiences, influence students' learning styles.

Moreover, gaining an understanding of these learning styles is a method for cultivating a classroom environment that yields greater success compared to previous students. Consequently, it is crucial for faculty to comprehend these styles in order to develop instruction that is more suitable for individual students. The academic performance of students may be linked to their learning preferences. The success of a student is, to some extent, reliant on the teacher's understanding of their unique learning styles (Cabual, 2021).

Using a student learning style questionnaire, Hamidah and Kusuma (2020) also conducted a study to examine trends in students' learning styles during the COVID-19 pandemic period. They discovered that while students learning preferences varied, they tended to favor auditory learning styles (50%) over visual learning styles (42.11%) and kinesthetic learning (7.89%), respectively. 34 Dissimilarities between the conclusions of the already cited studies.

Moreover, as cited by Daron, C. E., (2013), Lapinig in her study concluded that many underachieving students fall behind because their learning styles are mismatched with the approaches used by their teachers and the learning modality. With the increasing use of technology in the educational process under the New Normal, it is important to evaluate the influence of learning styles in distance education and to provide empirical evidence of the impact of learning styles on academic performance in online education. Both teaching and learning styles play an essential role in learning development and achievement. Thus, the researcher shall pay great attention to discovering the students' learning styles, particularly under the New Normal.

According to Lathan (2023), while the teachers still hold authority, they act more as facilitators, coach students, and assist them in their learning. For this approach to become effective, the teachers should consider the students preferred learning styles. If students are aware of their learning styles, they will be able to cope with this approach with ease. Similarly, the term ''learning styles'' refers to the concept that individuals differ in regard to what mode of instruction or study is most effective for them. Proponents of learning-style assessment contend that optimal instruction requires diagnosing individuals' learning styles and tailoring instruction accordingly. Assessments of learning style typically ask people to evaluate what sort of information presentation they prefer (e.g., words versus pictures versus speech) and/or what kind of mental activity they find most engaging or congenial (e.g., analysis versus listening), although assessment instruments are extremely diverse. The most common—but not the only—hypothesis about the instructional relevance of learning styles is the meshing hypothesis, according to which instruction is best provided in a format that matches the preferences of the learner (e.g., for a ''visual learner,'' emphasizing visual presentation of information) (Pashler, et al., 2009)

The notion that individuals are responsible for their own education poses a significant barrier to learning. However, when students assume control over their own education, the learning process becomes more effective as they imbue it with purpose (Nzesei, 2015). It is essential for teachers to comprehend the concept of customized learning. Every individual interacts with their environment during the learning process, leading to varied knowledge processing and the need for diverse learning environments. Consequently, it becomes crucial to address the challenge of creating conducive learning environments while planning such encounters, with the aim of assisting individuals in maximizing their learning outcomes (Sighn, 2017).

Verde and Valero (2021) present a comprehensive examination of various teaching methodologies employed prior to, during, and after the COVID-19 pandemic. The study elucidates the diverse approaches to instruction, including inperson learning, blended learning, and remote education, implemented at two Spanish universities—one private and one public—during the pandemic. The study's findings indicate that the COVID-19 pandemic has necessitated adjustments in teaching methodologies for both teachers and students. Particularly during periods of high COVID-19 incidence, distance education or blended education became imperative, requiring teachers to swiftly adapt to these changes. This adaptation process has led to a significant expansion of their knowledge regarding new didactic resources for classroom instruction. The results of the study demonstrate a clear preference among public university students for in-person learning, as they expressed higher satisfaction with this method compared to other approaches. Online teaching emerged as their second choice due to its high-quality class experiences, while blended learning was the least favored option. Regarding private university students, their satisfaction levels were relatively similar across the three teaching methods employed at their institution. However, they exhibited a slightly higher preference for face-to-face teaching compared to the other approaches.

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Numerous prior studies have explored the correlation between learning styles and academic achievement among college students. Williams, Brown, and Etherington (2013) have corroborated a positive association between learning styles and academic performance specifically within university contexts. Recognizing and understanding the various learning style preferences of students enrolled in applied sciences courses can ultimately contribute to more impactful learning experiences. Additionally, Alavi and Toozandehjani (2017) determined that having knowledge of students' learning styles can enhance their learning outcomes while simultaneously promoting self-actualization among students.

CONCEPTUAL FRAMEWORK

This study operates on the fundamental premise that every individual is unique. Just like snowflakes, no two People are identical, even in the case of identical twins. While humanity shares equal worth, each person possesses distinct characteristics and attributes (Richards, S., 2020). Also, every student develops in his way including the way he learns. Different students learn in different ways, so requiring everyone to follow one particular method of learning could limit two-thirds or more of any given class. In addition, Neil Fleming's VARK Model, which classifies learners into four (4) groups according to their preferred learning styles, forms the basis of this study (New School of Architecture & Design, 2021). Education continues to promote learning styles as a way for teachers to support students and differentiate lessons. While there are multiple models related to learning styles, one of the most popular models for understanding learning styles is the VARK model. The study categorizes four distinct sensory modes and introduces a separate category for multimodal learners. Aural learners derive the greatest benefit from listening to lectures, participating in tutorials, and employing tape recorders. Visual learners, on the other hand, gain the most advantage from visual aids such as graphs, flow charts, and photographs. Kinaesthetic learners acquire knowledge through hands-on practice and real-life experiences, while read/write learners excel by taking meticulous notes and engaging in text-based reading.

The unexpected arrival of the COVID-19 pandemic caught society off guard, leaving little time for adequate preparation to mitigate its impact. The education system in the Philippines, in particular, found itself in a critical predicament due to the rapid spread of this health crisis. Higher Education Institutions faced the daunting task of prioritizing the safety of their academic community by minimizing the risks of infection. Consequently, in light of the imposed community quarantine measures, the continuation of regular face-to-face classes had to be immediately suspended. This presented a Herculean challenge: finding alternative ways to ensure teaching and learning could persist beyond the conventional in-person instruction. Therefore, there arose an urgent necessity to explore innovative learning modalities that would facilitate a transition from traditional methods to more flexible teaching and learning options.

Hence, the study argues that in order to provide equal learning opportunities, it is crucial to consider different learning modalities, such as VARK. The study is based on Cabual's proposition that effective teaching and student learning can be achieved by acknowledging learners' styles and preferred modalities. Each student possesses their own unique learning style and preferences. Considering that learners have varying circumstances in terms of time, pace, and location, offering different delivery modes allows for customized learning experiences that cater to students' needs for accessible and high-quality education. Additionally, providing students with the option to choose their preferred delivery mode from the time of enrollment promotes convenience. The paradigm shifts in the teaching and learning processes within Philippine higher education require collaboration among stakeholders and the fostering of a culture of knowledge sharing, resource pooling, and the adoption of best practices. Every individual is called upon to participate in this transition or transformation towards the "new normal. To achieve this, leadership and solidarity among humanity are necessary to overcome the challenges posed by the coronavirus, as emphasized in the CHED Memo Order, Series 2020.

If the students are taking classes in a mixed classroom or hybrid learning environment for the first time, they could feel a little lost. They may have trouble transitioning to this new type of education, from adjusting to digital coursework to maintaining discipline without face-to-face connection — especially if their particular learning style isn't being taken into account. One of the things that educators should understand about the learning process is that students are different people, especially in terms of their learning preferences. Different learning styles indeed exist, as almost all educators are aware of; nevertheless, there has not been much success in incorporating this into the classroom. Gaining a comprehension of these learning styles is a means of fostering a classroom environment that yields greater success compared to previous cohorts. Consequently, it is crucial for faculty members to grasp these styles in order to develop instruction that aligns more effectively with students' needs. The academic performance of students may be connected to their individual learning preferences. Therefore, the success of students is partially contingent upon the teacher's understanding of their respective learning styles (Cabual, 2021).

While most students utilize multiple modalities in their learning, some may exhibit specific strengths and Weaknesses in certain modalities. For instance, if a student identifies as a "visual learner," relying solely on verbal lectures may leave them feeling
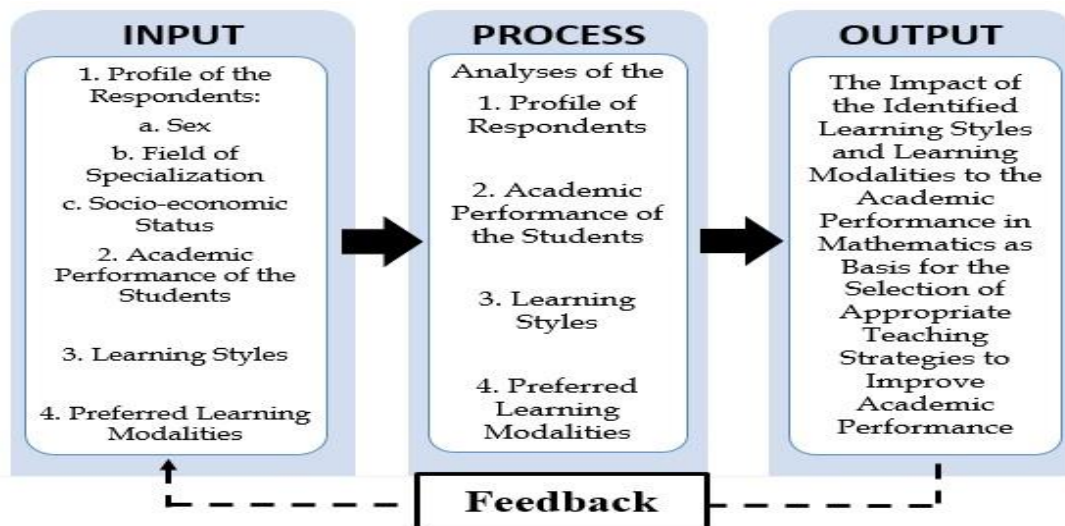
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disengaged, confused, and frustrated (Sphero Inc., 2023). According to Martin (2015), researchers such as Reiff, Eisler, Barbe, and Stronk have found that in a classroom setting, approximately 25-30% of students are visual learners, 25-30% are auditory learners, 15% are tactile/kinaesthetic learners, and 25-30% demonstrate a mix of modalities. Consequently, only 30% of students primarily retain information through visual means (Bertolini, 2023). A student's academic performance in school is influenced by their learning styles or modes of learning, as well as the use of appropriate learning modalities. Dayon (2018) also cited Felder and Brent (2005), who discovered that poor test performance among students can be attributed to a mismatch between their learning styles and their teachers' teaching modes.

This study is based on the central theme that the students' Academic performance in Mathematics in the Modern World depends on their learning styles and preferred learning modalities. In this matter, the researcher conducted the study to help determine the relationship between learning styles and learning modalities in their academic performance in Mathematics in the Modern World.

RESEARCH PARADIGM
The study used the Input-Process-Output (IPO) paradigm to analyze the profile of the respondents, their learning styles, preferred learning modalities, and their academic performance in Mathematics in the Modern World.

Statement of the Problem:
This study aimed to determine the learning styles of the freshman students of the Isabela State University- City of Ilagan Campus in the New Normal and evaluate their impact on students' academic performance in Mathematics in the Modern World during the First Semester of School Year 2021-2022. Specifically, it sought to answer the following questions:
1.   What is the profile of the students in terms of:
1.1.   sex;
1.2.   field of specialization;
1.3.   socio-economic status;
1.4.   parents' source of income;
1.5.   monthly family income;
1.6.   available gadgets at home for educational purpose/s?
2.   What is the academic performance of the students in Mathematics in the Modern World during the first semester of School Year 2021-2022?
3.   Is there a significant difference in the academic performance of the students when grouped according to the selected profile variables?
4.   What are the students' learning styles?
5.   Is there a significant difference in the Learning Styles of the students when grouped according to the selected profile variables?
6.   Is there a significant relationship between the learning styles and the academic performance of the students?
7.   What is the preferred learning modality of the students?

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8. Is there a significant relationship between the preferred learning modalities and the academic performance of the students?

HYPOTHESES

This study was guided by the following hypotheses:
1. There is no significant difference in the academic performance of the students when grouped according to the selected profile variables.
2. There is no significant difference in the Learning Styles of the students when grouped according to the selected profile variables.
3. There is no significant relationship between the learning styles and the academic performance of the students.
4. There is no significant relationship between the preferred learning modalities and the academic performance of the students.

SIGNIFICANCE OF THE STUDY

Mathematics is often perceived as a challenging subject for many students. By examining the impact of learning Styles on mathematics performance, the study can help educators personalize their teaching methods and approaches to meet the diverse needs of students. This understanding can lead to the development of innovative instructional strategies that cater to different learning styles, making mathematics more accessible and engaging for students.

The study of the learning styles of freshman students in the new normal and their impact on academic performance in mathematics in the modern world has several significant implications. It helps identify the different ways in which students prefer to acquire, process, and retain information, and can aid educators in tailoring their teaching methods and materials to suit individual learning styles. The findings of the study can inform decisions regarding the integration of learning style-based approaches in educational policies, curriculum frameworks, and teacher training programs. Overall, the study has the potential to enhance teaching practices, promote student engagement, and optimize academic performance in mathematics by considering the learning styles of freshman students in the new normal.

METHODOLOGY

Research Design:

The study employed a descriptive correlational design. The descriptive component of the study also revolved around the personal profile of the freshman students, their learning style preferences, and their academic performance. Subsequently, the correlational component was centered on the relationship between learning style preferences to the academic performance of students enrolled in Mathematics in the Modern World.

Respondents of the Study:

The respondents of this study were the freshman students of Isabela State University–Ilagan Campus, City of Ilagan, Isabela consisting of 830 students enrolled in Mathematics in the Modern World subject for the First Semester School Year 2021-2022 who were selected through the total enumeration.

Research Instrument:

This study used a survey questionnaire and an informal interview to collect quantitative data from respondents. The questionnaire identified their learning styles and modalities and used them to identify their academic performance in Mathematics in the Modern World.

Questionnaire on Learning Style (Learning Style Inventory/LSI). The learning style of the students was measured using the VARK Learning Style Model, a questionnaire developed by Neil Fleming to evaluate the learner's preferred learning style namely visual, auditory, and kinaesthetic. Some parts or items of the questionnaire were simplified by the researcher and the student-respondents answered each item as to how they learn.

In the Learning Style Survey, the students indicated how much they agree with each item on a scale of 1, 3, or 5 in learning where **5 means Often**, **3 means Sometimes**, and **1 means Seldom**. The highest sum of scores among the preferences indicates the most dominant preferred learning style of the respondents. The classification of the Learning Style Inventory (LSI) is shown below.

Learning Style	No. of Items
Visual	2, 3, 7, 10, 14, 16, 19, 22
Auditory	1, 5, 8, 11, 13, 18, 21, 24
Kinesthetic	4, 6, 9, 12, 15, 17, 20, 23

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The Documentary Analysis. The academic performance of the respondents was limited to the grade obtained in Mathematics in the Modern World. To ensure the veracity of the grades, the School Registrar validated them and an informal interview was conducted among the respondents.

DATA GATHERING PROCEDURE

The researcher obtained data by asking permission, coordinating with the Campus Executive Officer, and giving orientation to the respondents. Questionnaires were given online and administered by the researcher. All information was kept confidential.

Statistical Treatment of Data

The following statistical tools were used to analyze and interpret the collected data in order to reach the desired results:

1. **Simple Frequency Count and Percentage Distributions**. These Tools were used to determine the result of the Learning Style Survey and the academic performance of the student-respondents in Mathematics in the Modern World and their profile.
2. **Weighted Mean**. This was used to analyze the students' Learning Styles in terms of visual, auditory and kinaesthetic.
3. **Post Hoc Analysis of Variance (F-Test)**. This was employed to distinguish the difference in the academic performance of the students when grouped according to the given variable and determine the difference in the Learning Styles of the students when grouped according to the selected profile variables.
4. **Chi-Square Test (X^2)**. This was used to determine if there is a significant relationship between the students' Preferred Learning Styles and their academic performance in Mathematics in the Modern World.

DATA ANALYSIS PROCEDURE

To determine the students' Learning Styles, the scoring procedures below were used: Place the point value on the line next to the corresponding item below. Add the points in each column to obtain the preference score under each heading. The Learning Style of the students will be based on the sum of the scores obtained among the eight (8) questions in each category. In this LSI, the Learning Style of the student corresponds to the highest sum obtained from the survey.

OFTEN = 5 points　　　**SOMETIMES** = 3 points　　**SELDOM** = 1 point

VISUAL		AUDITORY		KINAESTHETIC	
Item	Points	Item	Points	Item	Points
2		1		4	
3		5		6	
7		8		9	
10		11		12	
14		13		15	
16		18		17	
19		21		20	
22		24		23	
VPS =		APS =		TPS =	
VPS = Visual Preference Score		APS = Auditory Preference Score		KPS = Kinesthetic Preference Score	

Mean. This was used to identify the student's academic performance using the following scale as follows: (***Based on the grading system of Isabela State University***).

Grading Scale	Numerical value	Description
1.0	98-100	Excellent
1.25	95-97	Very Satisfactory
1.50	92-94	Satisfactory
1.75	89-91	Fairly Satisfactory
2.00	86-88	Good

2.25	83-85	Fairly Good
2.50	80-82	Fair
2.75	77-79	Below Fair
3.00	75-76	Passed
5.00	Below 75	Failed

RESULTS AND DISCUSSION

The data gathered were organized into tables which were thoroughly and completely analyzed and interpreted. The problems were answered and treated with appropriate statistical tools.

1. Profile of the Respondents

Table 1.1. Frequency & Percentage Distribution of the Students in Terms of Sex

Sex	Frequency	Percentage
Male	415	50.00
Female	415	50.00
Total	**830**	**100**

Table 1.1 presents the profile of the students in terms of sex. As shown in the table, there is an equal distribution of the respondents as to their sex. Noting the results, it can be concluded that the number of students enrolled in Mathematics in the Modern World during the First Semester School Year 2021-2022 is equal. Additionally, the results of the researcher's interview with students indicate that both male and female ISUI students place a high priority on education.

Table 1.2. Frequency & Percentage Distribution of the Students in Terms of Field of Specialization

Field of Specialization	Frequency	Percentage
Bachelor of Science in Architecture	163	19.60
Bachelor of Science in Civil Engineering	194	23.40
Bachelor of Science in Electrical Engineering	131	15.80
Bachelor of Science in Industrial Technology	127	15.30
Bachelor of Science in Midwifery	44	5.30
Bachelor of Science in Psychology	79	9.50
Bachelor of Secondary Education	92	11.10
Total	**830**	**100.00**

Table 1.2 displays the profile of the students in terms of their field of specialization. Out of the 830 respondents, 194 or 23.40% of the respondents enrolled in Bachelor of Science in Civil Engineering; while only 44 or 5.30% of the students enrolled in Bachelor of Science in Midwifery.

Table 1.3.1. Frequency & Percentage Distribution of the Students in Terms of Parents' Source of Income

Source of Income of Mother	Frequency	Percentage
Self-Employed/Business Owner	2	0.20
Farming	90	10.80
Fishing	11	1.30
Government Employee	103	12.40
None	344	41.40
Non-Government Employee/Private Agencies Employee	69	8.30
Daily Wage Earner	211	25.40

Source of Income of Father	Total 830 Frequency	100.00 Percentage
Self-Employed/Business Owner	90	10.80
Farming	338	40.70
Fishing	13	1.60
Government Employee	80	9.60
None	158	19.00
Non-Government Employee/Private Agencies Employee	85	10.20
Self-Employed/Business Owner	66	8.00
Total	**830**	**100.00**

Table 1.3.1 displays the profile of the students in terms of their mother's source of income. As gleaned in the table, most of the mothers of the respondents which is 344 or 41.40% of 830 respondents have no source of income; while there are 2 or 0.20% who are self-employed or have their own business. This implies that the mothers of the respondents are plain housewives and do not earn an income. This can be concluded that the family of the students come from low-income families.

Table 1.3.1 also exhibits the profile of the students in terms of the father's source of income. Out of 830 respondents, 338 or 32.70% of the students responded that the source of income of their fathers is Farming; while 13 or 1.60% of the students responded that the source of income of their fathers is fishing. Results imply that most fathers' source of income is Farming.

Table 1.3.2. Frequency and Percentage Distribution of Students in Terms of Family's Monthly Income

Family's Monthly Income	Frequency	Percentage
At least PhP190, 401.00	45	5.40
Between PhP114, 241.00 to PhP190, 400.00	14	1.70
Between PhP66, 641 to PhP114, 240.00	21	2.50
Between PhP38. 081.00 to PhP66, 640.00	41	4.90
Between PhP19, 041.00 to PhP38, 080.00	102	12.30
Between PhP9, 521.00 PhP19, 040.00	188	22.70
PhP9, 520, and below	419	50.50
Total	**830**	**100.00**

Table 1.3.2 shows the profile of students in terms of the monthly income of parents. It can be seen in the table that out of 830 respondents, 419 or 50.50% of them responded that their family monthly income is PhP9, 520.00 and below; while only 14 of the respondents answered that the monthly income of their family is between PhP114, 241.00 to Php190, 400.00. The results show that most of the family monthly income of the respondents is PhP9, 520.00 and below. This is supported by the findings in Table 1.3.1 since most of the mothers of the respondents have no work. Hence, most of the respondents have a very low family monthly income. The findings of this study do not coincide with the survey conducted by the Philippine Statistics Authority (PSA) on "*Highlights of the Preliminary results of the*

2021 Family Income and Expenditure Survey (FIES) Visit 1" which showed that the average income of Filipino families from January to June 2021 was estimated at PhP149, 980.00 thousand or PhP12, 498.33 per month. Hence, compared to the results of the study, the family monthly income of the students is much lower than the average monthly income as stated by the PSA. (PSA 2021)

Table 1.3.3. Frequency and Percentage Distribution of Students in Terms of Available Gadgets at Home for Educational Purpose/s

Available Gadgets at Home for Educational Purpose/s	Frequency	Percentage
Cellular Phone/Mobile Phone	757	91.20
Desktop	13	1.60
Laptop	55	6.60
Tablet or Ipad	5	0.60
Total	**830**	**100.00**

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It is shown in the table that there are 757 or 91.20% of students used Cellular Phones or Mobile Phones during the conduct of their online classes while only 5 responded that Tablet or Ipad is their gadget for their online classes. The majority of students used Cellular Phones or Mobile Phones during their online classes, which is consistent with Noah Darko-Adjei's (2019) study that distance learning students find it easier to use a smartphone.

Table 2. Frequency and Percentage Distribution of the Academic Performance of Students in Mathematics in the Modern World

Academic Performance	Range	Frequency	Percentage
1.00	98–100	2	0.20
1.25	95–97	23	2.80
1.50	92–94	94	11.30
1.75	89–91	177	21.30
2.00	86–88	134	16.10
2.25	83–85	127	15.30
2.50	80–82	110	13.30
2.75	77–79	116	14.00
3.00	75–76	16	1.90
5.00	Below 75	2	0.20
INCOMPLETE	INC	29	3.50
Total		**830**	**100.00**
Mean = 2.11			

Table 2 reflects the academic performance of the students in Mathematics in the Modern World. It is depicted from the table that out of 830 students, 177 or 21.30% have an academic performance of 1.75 with an equivalent numerical value of 89–91; while there were 2 students who received a grade of 5.00, which is a failing grade. The majority of Filipino students have performed fairly satisfactorily in mathematics, but this does not coincide with the PISA 2018 National Report of the Philippines, with more than 50% obtaining scores below the lowest proficiency level.

TABLE 3. Comparison of the Academic Performance of the Students When Grouped According to Their Profile

Students' Academic Performance and the Following Profile	Probability of F	Decision	Remarks
Field of Specialization	0.000	Reject Ho	Significant
Sex	0.008	Reject Ho	Significant
Gadgets Available at Home	0.055	Accept Ho	Not Significant
Mother's Source of Income	0.033	Reject Ho	Significant
Father's Source of Income	0.155	Accept Ho	Not Significant
Family's Monthly Income	0.000	Reject Ho	Significant

As indicated in the table, there is no significance in the Academic Performance of the students when grouped according to Gadgets available at home used for educational purpose/s and the Father's Source of Income. Hence, gadgets available at home for educational purposes do not affect the academic performance of the students. This is also true when respondents were grouped according to their father's source of income. The finding shows that the academic performance of the students is not affected by the source of income of their fathers.

Conversely, the profile of the students in terms of Field of Specialization, Sex, Mother's Source of Income, and Family's Monthly Income. Results show that there is a significant difference in the Mathematics achievement of the male and female students since the mean grade of the female students is 2.084 while the mean grade of the male students is 2.122. The result coincides with the findings of the study of Lee & Kung which revealed that boys had significantly higher math self-concept than girls, whereas girls exhibited higher mathematics achievement than boys. (Lee, C-Y., Kung H-Y., 2018). Also, some researchers who investigated the influence of gender stereotype as a predictor of secondary school students' academic achievement found that gender stereotype has a significant influence on students' academic achievement in favor of male students (Igbo, et al., 2015). Similarly, the academic performance of the students is related to their family's monthly income Machebe, et al.,

(2017) found that the income level of parents impacts the academic achievements of the students. Results of their study showed that greater academic achievement for a student is attained by those students from financially buoyant families. Furthermore, a study revealed that academic achievement had a positive influence on the parents' education, parents' occupation, and parents' income (Dahie, et al., 2016). In addition, a report (PhD Essay 2018) revealed that there was a positive correlation between the parent's level of education, income, and occupation with the pupil's educational performance. The researcher concluded that parents' low socio-economic status impacted negatively pupil's performance, by denying the children access to resources that are readily available to children from higher socioeconomic status. The result implies that the three constructs have statistically significant positive effects on students' achievement. However, the results of another study are in contrast with the findings of this study, which revealed that there was no relationship concerning gender and performance in Mathematics among students in the schools they investigated (Musimenta, et al., 2020). The implication here is performance in Mathematics cannot be attributable to gender disparity because there were instances when girls performed better than boys, and other instances where boys took the lion's share in performance.

TABLE 4. Frequency and Percentage Distribution of the Students' Learning Styles

Learning Style	Frequency	Percentage
Visual	257	31.00
Auditory	260	31.30
Kinesthetic	69	8.30
Multiple Learning Styles	244	29.40
Total	**830**	**100**

 Table 4 exhibits the students' learning styles. It can be gleaned in the table that out of 830 students, 260 or 31.30% of students were classified as Auditory Learners, thus, they learned best through listening. Only 69 or 8.30% were classified as Kinaesthetic Learners which means that these students learned best while they perform, do things or being physically involved in a classroom situation. The finding coincides with the results of the study of Caraballe, M.R. (2015) which revealed that the preferred learning style of the respondents in her study was auditory which infers that the students learn best by way of using their listening skills compared to seeing and moving.

TABLE 5. Comparison in the Learning Styles of the Students when Grouped According to Their Profile

Students' Learning Styles and the Following Profile	Probability of F	Decision	Remarks
Field of Specialization	0.000	Reject Ho	Significant
Sex	0.862	Accept Ho	Not Significant
Gadgets Available at Home	0.089	Accept Ho	Not Significant
Mother's Source of Income	0.161	Accept Ho	Not Significant
Father's Source of Income	0.165	Accept Ho	Not Significant
Family's Monthly Income	0.000	Reject Ho	Significant

The learning styles of students differ when grouped according to their profile in terms of Sex, Gadgets, Mother's source of income, and Father's source. This is supported by Rahman, et al., (2017) who found no relationship between learning styles, genders, and interaction of learning styles with genders. On the hand, when students are grouped in terms of Field of specialization and Family's monthly income, there is a significant difference in their learning styles. This means that the learning styles of the students differ when grouped in terms of field of specialization and family's monthly income.

Table 6. Results of the Test of Significant Relationship between the Learning Styles and Academic Performance of the Students

Variable	Probability of X^2	Decision	Remarks
Auditory Learning Style	0.1707	Accept Ho	Not Significant
Kinesthetic Learning Style	0.3210	Accept Ho	Not Significant
Visual Learning Style	0.4114	Accept Ho	Not Significant
Multiple Learning Styles	0/5034	Accept Ho	Not Significant

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Learning Styles and Academic Performance of the Students	0.2730	Accept Ho	Not Significant

As to the significant relationship between the learning styles and academic performance of the students, no statistically significant relationship was found between learning styles and the academic performance of students Studies have found no statistically significant relationship between learning styles and academic performance of students. This is consistent with studies such as Azizollah Arbabisarjou, et al. (2016) and Noushin Kohan, et al. (2021). Wilkinson, et al. (2014) found that the overall academic performance of 276 students in first-year medicine and dentistry is not influenced by learning style. Villajuan, A. (2019) found that learning styles were significantly related to academic achievement.

CONCLUSIONS AND RECOMMENDATIONS

Findings: The following were the significant findings of the study:

1. Profile of the students

1.1. The male and female students enrolled in Mathematics in the Modern World during the First Semester School Year 2021-2022 are equal in number.

1.2. Also, in terms of their field of specialization, there are more BSCE students enrolled in Mathematics in the Modern World. Out of the 830 respondents, 194 or 23.40 percent of the respondents are enrolled in the Bachelor of Science in Civil Engineering.

1.3. As to the source of income of the mother or father of the students, the majority of the mothers which comprised of 344 or 41.40 percent are not employed and have no source of income.

1.4. On the other hand, with respect to the father's source of income of the respondents, out of 830 respondents, 338 or 32.70 percent of the students responded that the source of income of their father is Farming. Thus the majority of the fathers' monthly income relies on farming.

1.5. As to the family monthly income, the results show that most of the family monthly income of the respondents is P9, 520.00 and below which comprises 50.50 percent of the total respondents. This only shows that the students and their families live in modesty where basic needs are of greatest priority.

1.6. In terms of the available gadget at home used for educational purposes, out of 830 students, 757 or 91.20 percent of them used Cellular Phones or Mobile Phones during the conduct of their online classes. This, therefore, means that the majority of them prioritized using Cellular Phones or Mobile Phones when joining online classes since it's the most commonly used gadget by youngsters and it is the most available and most affordable gadgets to use for online classes.

2. Academic Performance in Mathematics in the Modern World

With respect to the academic performance of the students, the majority of the students enrolled in Mathematics in the Modern World, which is 177 or 21.30 percent, received a grade of 1.75 with a numerical value of 89–91 and have fairly satisfactory performance in Mathematics in the Modern World.

3. Academic Performance in Mathematics in the Modern World and Profile of Students

The academic performance of students is not affected by their father's source of income, but by their profile in terms of Field of Specialization, Sex, Mother's Source of Income, and Family's Monthly Income. This further implies that there is a significant difference in the Mathematics achievement of the male and female students since the mean grade of the female students is 2.084 while the mean grade of the male students is 2.122.

4. Learning Styles

The majority of the students have learning styles such as Auditory. This implies that they learned best through interactive listening and therefore, most learners prefer the auditory learning style in which they tend to listen to lectures, discussions, and explanations and follow oral directions.

5. Learning Styles and Profile of the Students

The results show that the learning style of students is not affected by Sex, Gadgets, or Mother's and Father's income, but differs when grouped according to the field of specialization and family's monthly income.

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6. Significant Relationship between the Learning Styles and the Academic Performance of the Students

As to the relationship between the learning styles of the students and their academic performance, no statistically significant relationship was found between learning styles and the academic performance of students.

7. Preferred Learning Modality of the Students

As to the students' Preferred Learning Modality, 394 or 47.40 percent of the students preferred Online. he overall findings of this study showed that most of the students preferred online learning to other modes of learning.

8. Relationship between the Students' Preferred Learning Modality and their Academic Performance in Mathematics With regard to the relationship between the students' Preferred Learning Modality and their Academic Performance, it was found that there is a significant relationship between the preferred learning modality and the academic performance of the students.

CONCLUSIONS

The freshman students have fairly satisfactory performance in Mathematics in the Modern World. Data revealed that the academic performance of the students differ significantly in terms of field of specialization, mother's source of income, sex, and family monthly income. The identified learning style of the students is the Auditory Learning Style which means that students learned most effectively through interactive listening. In addition, the students differ significantly in their learning styles in terms of their field of specialization. However, the academic performance of the students is not significantly related to their learning styles, thus, regardless of their learning styles, the academic performance of the students is not affected. Based also on the result, students preferred blended learning as their learning modality which significantly affects their academic performance in Mathematics in the Modern World.

RECOMMENDATIONS

In response to the call for quality education by concerned sectors of Isabela State University-City of Ilagan Campus and in consideration of the identified space for improvement on the part of the Mathematics instructors, the following points are hereby recommended:

1. **Assess individual learning styles:** Students have different learning preferences, such as visual, auditory, kinesthetic, or a combination of these. It is essential to identify students' learning styles to tailor instruction accordingly. Teachers can use various assessments, such as learning style inventories or observations, to understand their students' preferences.

2. **Incorporate a range of instructional strategies:** After identifying students' learning preferences, teachers should employ a variety of teaching modalities to meet the needs of all students. For instance, diagrams, charts, or films may be helpful to visual learners while lectures or debates may be more appealing to auditory learners. The use of manipulative or hands-on activities may be beneficial for kinesthetic learners.

3. **Use technology and multimedia:** Integrating technology and multimedia resources can enhance learning experiences for students. Online platforms, educational apps, interactive simulations, and virtual manipulatives can provide opportunities for active engagement and individualized learning.

4. **Provide differentiated instruction:** Adjust instruction based on students' learning styles and abilities. Offer alternative explanations, supplementary materials, or additional support to address individual needs. Differentiation allows students to access content in a way that aligns with their preferred learning modalities.

5. **Encourage active learning:** Engage students in active learning strategies that involve problem-solving, critical thinking, and application of mathematical concepts. This can include group work, hands-on activities, projects, and real-world examples to promote deeper understanding.

6. **Promote self-awareness and metacognition:** Help students become aware of their own learning styles and preferences. Teach them strategies to effectively manage their learning, such as setting goals, planning study time, monitoring progress, and seeking help when needed.

7. **Provide professional development opportunities:** Allocate resources and time for teachers to attend training sessions, seminars, workshops, and conferences that focus on effective teaching strategies, instructional technology, differentiated instruction, assessment methods, and addressing diverse learning needs. These opportunities can enhance teachers' competencies and keep them updated with the latest research and best practices in education.

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REFERENCES

A. Journals & Articles

1) Alavi, S. & Toozandehjani, H. (2017). The Relationship between Learning Styles and Students' Identity Styles Open Journal of Psychiatry. 07(02):90-102 DOI: 10.4236/ojpsych.2017.72009

2) Ababisarjou, A., et al. (2016). The Survey of the Relationship between the Learning Style and Academic Performance in Students of Medical Sciences (2016). International Journal of Medical Research & Health Sciences ISSN: 2319-5886

3) Cabual, Reynaldo A., Learning Styles and Preferred Learning Modalities in the New Normal, Volume 8, e7305, ISSN Online: 2333-9721, ISSN Print: 2333-9705

4) Caraballe, Ma. Rosa S., (2015) The Relationship between Students' Learning Styles and Teachers' Teaching Styles to Students' Achievement

5) Carpio, Claire O. & Indama, Abegaol C. (2021). Onsite Learning and Flexible Learning Modalities: A Comparative Analysis of Students' Academic Performance. International Journal for Multidisciplinary Research and Publication. ISSN (0nline): 2581-6187

6) Dahie, A. M., et. al, (2016), Mohamed, Mahamed Omar and Moalim, Abdullahi Aden, Socioeconomic Status and Academic Achievement at Secondary Schools in Mogadishu-Somalia

7) Dalmolin, Ana Cludia, et al., (2018) Learning Styles Preferences and E-learning Experience of Undergraduate Dental Students https://www.scielo.br/j/rounesp/a/mpxwLBZcXkzSQyyh9GZTp6w/?lang=en

8) Dayon, C. A., (2018). Learning Styles and Acadedmic Performance of Students in English 3. International Peer Review Journal. PRINT ISSN: 261984-8428. Vol. 2. November 2018

9) Entwistle, N. and Ramsden, P. (2015) Understanding Student Learning (Routledge Revivals) - Noel Entwistle, Paul Ramsden - Google Books, Groom Helm.

10) Hamidah and Kusuma, J.W., (2020) Analysis of Student Learning Styles and Geometry Thinking Skills: During the COVID-19 Pandemic

11) Lathan, Joseph L., 2023. Complete Guide to Student-Centered vs. Teacher Centered Learning https://onlinedegrees.sandiego.edu/teacher-centered-vs-student-centered-learning/

12) Machebe, Chioma Henrietta, Ezegbe, Bernedeth N. and Onuoha, Joseph, The Impact of Parental Level of Income on Students' Academic Performance in High School in Japan

13) Magulod, Gilbert Jr. C., (2019) Learning Styles, Study Habits and Academic Performance of Filipino University Students in Applied Science Courses: Implications for Instructions, ISSN: 2014-6374, 2019.

14) Martin, M.J., (2015). It is Never Too Late to Go back to School. VIVIDCOMM Advanced technology in Action https://vividcomm.com/2015/02/26/it-is-never-too-late-to-go-back-to-school/

15) Musimenta, F., et al., (2020). Gender and Performance Disparity in Mathematics: A study of South Western Uganda

16) Noushin, K., et al. (2021. Relationship between Learning Styles and Academic Performance among Virtual

17) Nursing Students: A Cross-Sectional Study. Education Research International https://doi.org/10.1155/2021/8543052

18) Nuankaew, P., Nuankaew, W., Phanniphong, K., Imwut, S., & Bussaman, S. (2019). Students model in different learning styles of academic achievement at the University of Phayao, Thailand. *International Journal of Emerging Technologies in Learning (iJET).*, *14*, 133. https://doi.org/10.3991/ijet.v14i12.10352.

19) Nzesei, M. M. (2015). A Correlation Study between Learning Styles and Academic Achievement among Secondary School Students in Kenya. University of Nairobi.

20) Pashler, H., et al., (2009). Learning Styles: Concepts and Evidence. Sage Journals. https://doi.org/10.111/j.15396053.2009.01038 Volume 9, Issue 3

21) Richards, Sabrina, 2020. Like snowflakes, no two cells are alike. Fred Hutch Cancer Center. https://www.fredhutch.org/en/news/center-news/2020/01/Brent-non-genetic-source-variation.html

22) Rahman, A., et al., (2017). Relationship between Learning Styles and Learning Achievement in Mathematics Based on Genders

23) Singh, V. (2017). Exploring the relationship between cognitive style and learning style with academic achievement of elementary school learners. Educational Quest-An International Journal of Education and Applied Social Sciences, 8(spl), 413–419.

24) Truong, H. (2016). Integrating learning styles and adaptive e-learning system: current developments, problems, and opportunities. *Computers in Human Behavior, 55*(2016), 1185–1193. https://doi.org/10.1016/j.chb.2015.02.014.

25) Valdez, D. B. (2016). Investigative Approach in Teaching System of Linear Equation and Inequalities to Grade 8 Students of Los Banos National High School – Batong Malake, Los Banos, Laguna.

26) Verde, A, & Valero, J. M., (2021). Teaching and Learning Modalities in Higher Education During the Pandemic: Responses to Coronavirus Disease 2019 From Spain, Frontiers in Psychology

27) Villajuan, Ana-Mary Lorenzo, (2019). Relationship between Learning Styles & Academic Schievement in Mathematics of Grade 8 Students, ISSN: 2456-7620

28) Vizeshar, F. & Torabizadeh, C., (2018). The effect of teaching based on dominant learning style on nursing students' academic achievement. Nurse Education in Practice Volume 28, January 2018, Pages 103-108

29) Wilkinson, T., et al. (2014). Does Learning Style Influence Academic Performance in Different Forms of Assessment? Journal of Anatomy. DOI: 10.111/joa.12126

30) Williams, B., Brown, T., & Etherington, J. (2013). Learning style preferences of undergraduate pharmacy students. Currents in Pharmacy Teaching and Learning, 5, 110-119. https://doi.org/10.1016/j.cptl.2012.09.003

B. Websites/Links

1) https://chedro3.ched.gov.ph/wp-content/uploads/2020/10/CMO-No.-4-s.-2020-Guidelines-on-theImplementation-of-Flexible-Learning.pdf

2) https://newschoolarch.edu/blog/what-are-the-benefits-of-hands-on-learning/

3) https://psa.gov.ph/content/highlights-preliminary-results-2021-family-income-and-expenditure-survey-fies-visit1

4) https://phdessay.com/the-effect-of-parent-socio-economic-status-on-the-academic-performance-of-primaryschool-pupils/

5) https://sphero.com/blogs/news/learning-styles-for-kids