International Journal of Multidisciplinary Research and Growth Evaluation.

Electronic Gadgets in Relation to the Study Habits of Stem Students in Mathematics

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Article Info

ISSN (online): 2582-7138
Volume: 05
Issue: 06
November-December 2024
Received: 15-10-2024
Accepted: 19-11-2024
Page No: 1102-1110

Abstract
The aim of this study is to determine the relationship between the electronic gadgets and the study habits of Science, Technology, Engineering, and Mathematics (STEM) students in mathematics. This study utilizes quantitative research methodology, particularly adopting a descriptive-correlational research design. There are two hundred six (206) STEM students who have served as respondents. The study checked if there was an interrelationship between the time student-respondents spend using electronic gadgets to study mathematics and its impact on STEM students' study habits using ANOVA and Pearson R. The study found that the STEM students are predominantly male, aged 17, typically in grade 12, and frequently use mobile phones for studying, spending 1-2 hours per day to study mathematics. They have strongly agreed on the impacts of electronic gadgets on their study habits in mathematics, particularly in preparation for tests. There are no significant differences in students' gadget usage or its impact on their math study habits when categorized by demographic profile, time management, or note-taking skills. Lastly, there is a negligible correlation between the time students spend per day using electronic gadgets for studying and its impacts on their study habits in terms of preparation for tests, time management, and note-taking.

Keywords: Electronic Gadgets, Mathematics, Niote-taking, Study Habit, Time Management

Introduction

In recent years, the widely spreading influence of electronic gadgets has transformed various aspects of our lives. These devices have seamlessly integrated into our daily routines, altering how we communicate, work, entertain ourselves, and seek information. According to Kabanova & Vetrova (2019), their usage spans across demographics, transcending gender, age, education levels, ethnicity, and economic backgrounds. Among their multitude of benefits, quick access to information stands out as a pivotal advantage, cementing electronic gadgets as an indispensable part of modern education.

The evolution of electronic gadgets, particularly the multifunctionality of mobile phones, has made them indispensable tools for students. Balbaguio, Articulo, Bantillo, Megabolo, Borres, Capuslanan, Jabagat, Panes, Panes & Muyco assert that contemporary education heavily relies on technology, offering students flexibility and diverse learning avenues. However, while these gadgets are instrumental, their misuse poses significant challenges. Ganganahalli, Tondare, & Durgawale, (2014) [17] note a concerning trend: excessive reliance leading to gadget addiction among students. Othman (2020) [24] further underline this issue, correlating high gadget usage with low academic performance, attributing neglect of studies to gadget addiction. With these concerns in mind, the integration of electronic gadgets in mathematics learning may either offer advantageous support to students or potentially hinder their progress. Amidst this, the pivotal role of study habits in academic success comes to the fore. Sharma and Vyas (2016) [29] define study habits as the methodologies individuals employ in their learning processes, encapsulating routines and strategies that facilitate knowledge acquisition. Ebele and Olofu (2017) [14] stress their significance, highlighting how deliberate and systematic habits profoundly impact academic achievements. Study habit indicators employed in the study of Cerna, Reyes, & Pavliushch were; reading materials, class content and feedback on assignments, note-taking, study times and preparing for examinations. Among the aspects, the findings revealed that high performing students practice punctuality and regularity to classes, submit homework and assignment on time, take notes and read the notes, and allocation of time for their studies.

With the emphasis on indicators including preparing for examinations, study times/time management, and note-taking, this study intends to analyze the impact of using electronic gadgets to the students' study habits in mathematics.

In Senior High School, there are crucial elements of the curriculum that revolve around mathematics, particularly General Mathematics and Statistics and Probability. Moreover, within the academic track, Science Technology Engineering and Mathematics (STEM) stands out as a strand focused on equipping students with diverse concepts in Mathematics and Science. This track serves as preparation for students aiming for engineering and medical-related courses. This strand emphasizes specialized subjects related to mathematics such as Pre-Calculus, Basic Calculus, General Physics 1 and 2, General Biology 1 and 2, and General Chemistry 1 and 2. Impliedly, mathematics learning is an essential component for the success of STEM students (Barroso, 2020) [5]. Thus, STEM students will be used as respondents for the purpose of this study.

Given these complexities, this research aimed to delve into the relationship between electronic gadget use and study habits in mathematics among Senior High School students in Science, Technology, Engineering, and Mathematics (STEM) strand at Zambales National High School of school year 2023-2024.

Methodology

This study employed a quantitative research methodology, particularly adopting a descriptive-correlational research design, and a survey questionnaire was the main instrument in gathering the required data developed based mainly on Study Habit Inventory (SHI) Form B. This study therefore would look into the relationship between electronic gadget use and study habits in mathematics among senior high school students (STEM). The study was conducted in Zambales National High School during the school year 2023-2024. The study used purposive sampling. There are two hundred six (206) STEM students who have served as respondents. The instruments were validated by research experts and treated through reliability testing. The research instrument was made up of three major components: (a) the demographic profile of the respondents; (b) the time student-respondents spend using electronic gadgets to study mathematics; and (c) the impacts of using electronic gadgets on the students' study habits in mathematics in terms of test preparation, time management, and note-taking. The study checked if there was an interrelationship between electronic gadget use and study habits in mathematics among senior high school students (STEM) using ANOVA and Pearson R.

Results and Discussion

1. Profile of the Respondents

1.1 Age

Table 1 shows the frequency and percentage distribution of the student-respondents according to age.

Table 1: Frequency and Percentage Distribution on the Age of the Respondents

Age	Frequency	Percent
16 and below	57	27.67
17	93	45.15
18	55	26.70
19 and above	1	0.49
Total	**206**	**100.00**
Mean Age: 17 years old		

In terms of age, it can be noted that majority of the respondents, with ninety-three (93) or 45.15%, belong to the age group 17 years of old; fifty-seven (57) or 26.67% belong to the age group of 16 years old and below; fifty-five (55) or 26.70% belong to the age group of 18 years old; and only one (1) or 0.49% belongs to age group of 19 years old and above. The mean age of STEM students is 17 years old.

This is similar to the study of Flavier (2018) [15] entitled "Challenges and Self- Efficacy of Senior High School Students In Lcc Silvercrest: Basis For Guidance Enrichment Program" where out of 277 student-respondents that participated, majority of them are 17 years old with 77.4%. This aligns with the high percentage of 17 years-old respondents observed in the provided table.

1.2 Sex

Table 2 shows the frequency and percentage distribution of the student-respondents according to sex.

Table 2: Frequency and Percentage Distribution on the Sex of the Respondents

Sex	Frequency	Percent
Male	105	50.97
Female	101	49.03
Total	**206**	**100.00**

Out of 206 student-respondents, 105 or 50.97% are male; while the remaining one hundred one (101) or 49.03% are female. This result shows that there were more males than females in the study, although there is a slight difference that can be observed in the frequency.

This result shows that majority of the student-respondents are male, similar to the findings of Calucag (2020) [7], where males had a higher frequency compared to females at the STEM senior high school, although the difference was slight.

1.3 Grade Level

Table 3 shows the frequency and percentage distribution of the student-respondents according to grade level.

In terms of grade level, one hundred ten (110) or 53.40% of the student- respondents are in grade 12; while the remaining ninety-six (96) or 46.50% are in grade 11.

Table 3: Frequency and Percentage Distribution on the Grade Level of the Respondents

Grade Level	Frequency	Percent
11	96	46.60
12	110	53.40
Total	**206**	**100.00**

Morados (2020) pointed out that one of the significant changes brought about by the K to 12 Curriculum in the

Philippine educational system is the inclusion of senior high school in its basic education. He also added, senior high school is referred to as the pinnacle of secondary education, it prepares students for their chosen career paths. This implies that the inclusion of senior high school, adding another 2 years in education curriculum, enhances the educational landscape by offering students more opportunities for personal and professional development.

1.4. Frequently Used Electronic Gadgets for Studying

Table 4 shows the frequency and percentage distribution of the student-respondents according to the frequently used electronic gadgets for studying.

Table 4: Frequency and Percentage Distribution on the Frequently Used Electronic Gadgets of the Respondents

Frequently Used Electronic Gadgets	Frequency	Percent
Mobile Phone	170	82.52
Laptop	31	15.05
Tablet	4	1.94
Computer	1	0.49
Total	**206**	**100.00**

In terms of the used electronic gadgets, majority of the student-respondents, with one hundred seventy (170) or 82.50% frequently use mobile phones; thirty-one (31) or 15.05% frequently use laptop; four (4) or 1.94% frequently use tablet; only one (1) or 0.49% frequently use computer.

According to Akpan (2016) [1], most phones offer computer-like functionality at a reasonable price, making them a popular device among students due to their affordability, portability, and convenience. Harnish (2022) [18] stated that students can easily access more information and services through apps on their mobile devices compared to desktop computers. He also added, computers are typically more expensive than other devices and need more maintenance and care.

2. Time Spent Per Day using Electronic Gadgets in Mathematics

Table 5 shows the frequency and percentage distribution of the student- respondents according to the amount of time spent per day using electronic gadgets in mathematics.

Out of 206 student-respondents, eighty-one (81) or 39.32% spent 1-2 hours per day using electronic gadgets in mathematics; seventy-eight (78) or 37.86% spent 3-4 hours per day; thirty (30) or 14.56% spent 5-6 hours per day; seventeen (17) or 8.25% spent 7 hours and above per day.

Overall, the average number of hours the student-respondents spent per day using electronic gadgets in mathematics is 3.29 hours. This aligns with the statistics on mobile phone usage reported by Howarth (2023), indicating that the average person spends over 3 hours and 15 minutes per day on their mobile phone. This exceeds the suggested screen time limit of two hours per day recommended by the American Heart Association, as mentioned in a blog from Reid Health (n.d.).

Table 5: Frequency and Percentage Distribution on the Time Spent Per Day using Electronic Gadgets in Mathematics of the Respondents

Times Spent Per Day using Electronic Gadgets in Mathematics	Frequency	Percent
1-2 hours	81	39.32
3-4 hours	78	37.86
5-6 hours	30	14.56
7 hours and above	17	8.25
Total	**206**	**100.00**
Average Number of Hours: 3.29 hours		

Muduli (2014) [23] stated that the positive impacts of tech gadgets and services are often short-lived, eventually leading to negative effects on individuals in the long run. He also stated that the more students use gadgets, the more they are crazy about it which may distract them from study. Moreover, according to Apprianti excessive use of gadgets can lead to lower academic scores, as it negatively impacts health, cognitive development, and behavior. He also stated that students may become dependent on gadgets, leading to forgetfulness, laziness, and a reluctance to study. He mentioned that this often involves spending excessive time on social media and gaming, which distracts from academic pursuits.

3. Effect of Electronic Gadgets in the Study Habits of the Respondents in Mathematics

3.1. Preparation for Tests

Table 6 shows the effects of electronic gadgets in the study habits of the respondents in Mathematics in terms of preparation for tests.

Table 6: Perception of the Respondents on the Impacts of Electronic Gadgets in the Study Habits in Mathematics of Respondents in terms of Preparation fror Test

A. Preparation for Test	Mean	Descriptive Equivalent	Rank
1. Using electronic gadgets improves my overall productivity when preparing for a test in mathematics subjects (Pre-Calculus, Basic Calculus, General Mathematics, Statistics & Probability, etc.).	3.33	Strongly Agree	4
2. Electronic gadgets make it much easier for me to review our mathematics lessons.	3.47	Strongly Agree	2
3. Using electronic gadgets has been really helpful in studying mathematical concepts before our test.	3.44	Strongly Agree	3
4. Using electronic gadgets improves my study efficiency in preparing for tests in mathematics subjects (Pre-Calculus, Basic Calculus, General Mathematics, Statistics & Probability, etc.).	3.27	Strongly Agree	5
5. Using electronic gadgets helps me to review my lessons anytime, anywhere.	3.55	Strongly Agree	1
Overall Weighted Mean	**3.41**	**Strongly Agree**	

The student-respondents strongly agreed to statement 5 “Using electronic gadgets helps me to review my lessons anytime, anywhere” (3.55, Rank 1), statement 2 “Electronic gadgets make it much easier for me to review our mathematics lessons” (3.47, Rank 2), statement 3 “Using electronic gadgets has been really helpful in studying

mathematical concepts before our test" (3.44, Rank 3), statement 1 "Using electronic gadgets improves my overall productivity when preparing for a test in mathematics subjects (Pre-Calculus, Basic Calculus, General Mathematics, Statistics & Probability, etc.)" (3.33, Rank 4), statement 4 "Using electronic gadgets improves my study efficiency in preparing for tests in mathematics subjects (Pre-Calculus, Basic Calculus, General Mathematics, Statistics & Probability, etc.)" (3.27, Rank 5). The overall weighted mean for the impacts of electronic gadgets in the study habits in mathematics of the respondents in terms of preparation for tests is 3.41, interpreted as "Strongly Agree".

According to Britanico (2015) [6], using electronic gadgets positively influences students' preparation for tests and performance across various mathematics subjects such as Pre-Calculus, Basic Calculus, General Mathematics, Statistics, and Probability. These gadgets aid students in managing their time efficiently, maintaining focus during reviews, and improving information retention. This is attributed to the vast amount of easily accessible information available through the internet via electronic devices.

3.2. Time Management

Table 7 shows the Impacts of Electronic Gadgets in the study habits in Mathematics of Respondents in terms of Time Management.

Table 7: Perception of the Respondents on the Impacts of Electronic Gadgets in the Study Habits in Mathematics of Respondents in terms of Time Management

B. Time Management	Mean	Descriptive Equivalent	Rank
1. Electronic gadgets help me manage my study time in mathematics effectively.	2.80	Agree	2
2. Using electronic gadgets gives me a sense of control over my study time in mathematics subjects (Pre-Calculus, Basic Calculus, General Mathematics, Statistics & Probability, etc.).	2.74	Agree	3
3. Electronic gadgets help me to stick to my study schedule.	2.53	Agree	4
4. Managing the time I spend using electronic gadgets feels effortless for me.	2.51	Disagree	5
5. Electronic gadgets help me do my home works and assignments in mathematics subjects (Pre- Calculus, Basic Calculus, General Mathematics, Statistics & Probability, etc.) on time.	3.39	Strongly Agree	1
Overall Weighted Mean	**2.79**	**Agree**	

The student-respondents strongly agreed to statement 5 "Electronic gadgets help me do my home works and assignments in mathematics subjects (Pre-Calculus, Basic Calculus, General Mathematics, Statistics & Probability, etc.) on time" (3.39, Rank 1). While they agreed to statement 1 "Electronic gadgets help me manage my study time in mathematics effectively" (2.80, Rank 2); statement 2 "Using electronic gadgets gives me a sense of control over my study time in mathematics subjects (Pre-Calculus, Basic Calculus, General Mathematics, Statistics & Probability, etc.)" (2.74, Rank 3); and statement 3 "Electronic gadgets help me to stick to my study schedule" (2.53, Rank 4). However, they disagreed to statement 4 "Managing the time I spend using electronic gadgets feels effortless for me" (2.51, Rank 5). The overall weighted mean for the impacts of electronic gadgets in the study habits in mathematics of respondents in terms of time management is 2.79, indicated as "Agree".

According to Galindo-Domínguez and Bezanilla (2021) [16], technology is important for students to manage their time better. It can change how they study. This current generation easily recognize their usefulness, but at the same time, the great distracting factor and waste of time that they suppose (Saariketo, 2019) [28]. In the realm of digital applications, various mechanisms are strategically employed to sustain user engagement, often diverting individuals from their intended tasks.A factor why it doesn't seem to be effortless for them to manage their time. Notably, one prevalent tactic involves the incessant generation of notifications and updates, serving to continually captivate users with fresh content. According to Parviainen (2016) [25], this constant flow of info can make someone who isn't good at managing their time keep going back to the app and checking things over and over again.

3.3. Note-Taking

Table 8 shows the Impacts of Electronic Gadgets in the study habits in Mathematics of Respondents in terms of Time Management.

Table 8: Perception of the Respondents on the Impacts of Electronic Gadgets in the Study Habits in Mathematics of Respondents in terms of Note-Taking

C. Note-Taking	Mean	Descriptive Equivalent	Rank
1. Electronic gadgets provide fast access to various mathematical learning resources that can be used for note-taking.	3.52	Strongly Agree	2
2. Electronic gadgets make it easier for me to organize and categorize my notes.	3.24	Agree	3
3. Electronic gadgets allow me to take notes more quickly and efficiently.	3.20	Agree	4
4. I manage to stay focused on taking math notes without getting distracted by other apps or notifications on my electronic gadgets.	2.31	Disagree	5
5. Electronic gadgets allow me to browse information and concepts to be added on my notes.	3.63	Strongly Agree	1
Overall Weighted Mean	**3.18**	**Agree**	

The student-respondents strongly agreed to statement 5 "Electronic gadgets allow me to browse information and concepts to be added on my notes" (3.63, Rank 1); and statement 2 "Electronic gadgets provide fast access to various mathematical learning resources that can be used for note-taking" (3.52, Rank 2). They agreed to statement 2 "Electronic gadgets make it easier for me to organize and categorize my notes" (3.24, Rank 3); and statement 3

"Electronic gadgets allow me to take notes more quickly and efficiently" (3.20, Rank 4). However, they disagreed to statement 4 "I manage to stay focused on taking math notes without getting distracted by other apps or notifications on my electronic gadgets" (2.31, Rank 5). The overall weighted mean for the impacts of electronic gadgets in the study habits in mathematics of respondents in terms of note- taking is 3.18.

As Redeña pointed out, electronic gadgets offer additional avenues for learners to visualize and engage with mathematical concepts. The internet enables students to quickly access information pertaining to mathematical lessons, which they can visually observe, read, and hear. According to Cousins (2024) [11], digital note-taking means using electronic gadgets like laptops, tablets, or smartphones to write down and organize your notes and information. He also pointed out the cons of digital note-taking such as distractions. He also mentioned that electronic gadgets often have many distractions, like notifications and apps, which can make it difficult for users to stay focused on taking notes.

3.4 Summary of the Perception of the Respondents on the Impacts of Electronic Gadgets in the Study Habits in Mathematics of Respondents

Table 9 shows the summary of the perception of the respondents on the impacts of electronic gadgets in the study habits in mathematics of respondents.

Table 9: Summary Table on the Perception on the Impacts of Electronic Gadgets in the Study Habits in Mathematics of Respondents

Impacts of Electronic Gadgets in the study habits in Mathematics	Mean	Descriptive Equivalent	Rank
Preparation for Test	3.41	Strongly Agree	1
Time Management	2.79	Agree	3
Note-Taking	3.18	Agree	2

Preparation for test obtained the highest mean of 3.41, rank 1, interpreted as "Strongly Agree"; while Note-taking and time management obtained the mean of 3.18 and 2.79, rank 2 and 3, respectively, interpreted as "Agree".

This suggests that students perceived the impacts of electronic gadgets in their study habit in mathematics to be positive. According to Burden, Aubusson, & Schuck, digital devices, when used appropriately, can enhance student engagement, collaboration, and access to educational resources, leading to improved study habits and learning outcomes. The study of Sivarajah, Curci, Johnson, Lam, Lee, & Richardson (2019) [30] found that the use of digital devices and online resources for test preparation improved student engagement and academic performance, particularly for students who were initially struggling. In addition, the study of Demir & Akpınar (2018) [13] found that the use of mobile apps for time management and organization positively impacted students' academic performance and time management skills. Sun & Li (2019) [31] also found that the students who recorded notes digitally scored significantly higher than those who recorded notes conventionally. These suggest that electronic gadgets have positive impacts on the students' study habits in terms of preparation for tests, time management, and note-taking.

4. Significant Difference in the Time Student-Respondents Spend using Electronic Gadgets to Study in Mathematics When Grouped According to the Respondents' Demographic Profile

Table 10 shows the test of significant difference on the time spent per day using electronic gadgets in mathematics when grouped according to profile variables.

Results show that the significant values of age (0.160); sex (0.252); grade level (0.300); and electronic gadgets (0.831) are greater than the 0.05 Alpha Level of Significance. As a result, the null hypothesis is accepted, indicating that there is no significant difference on the time spent per day using electronic gadgets in mathematics when grouped according to profile variables.

The findings suggest that regardless of demographic differences such as age, sex, or grade level, students generally spend a comparable amount of time utilizing electronic gadgets for mathematics-related tasks. This aligns with the article of Howe (2024) [20] discussing the Social Media Statistics in the Philippines updated in 2024 which shows no significant difference in overall digital media use based on the demographic profile of the sample. This is evident from the data collected in the Philippines, where the average daily internet usage across all devices is 8 hours and 52 minutes, with 5 hours and 20 minutes spent on mobile phones and 3 hours and 32 minutes on other devices. This consistent usage pattern is not significantly influenced by demographic factors such as age, and sex. This is similar to the study of Cavanagh (2022) [8] which did not find significant differences in digital device use based on profiles of high school students. He suggested that the use of digital devices is consistent across different demographic groups, with no significant variations in usage patterns based on their profile. This implies that factors such as age, which might influence technological proficiency, or sex and grade level, which could affect academic workload, and the type of electronic gadgets they frequently use, do not significantly impact the time allocated to using electronic devices for mathematical activities.

Table 10: Test of Significant Difference on the Time Spent Per Day using Electronic Gadgets in Mathematics when grouped according to Profile Variables

Time Spent Per Day using Electronic Gadgets in Mathematics		Sum of Squares	df	Mean Square	F	Sig.	Interpretation
Age	Between Groups	4.478	3	1.493	1.742	0.160	Accept Ho Not Significant
	Within Groups	173.119	202	0.857			
	Total	177.597	205				
Sex	Between Groups	1.141	1	1.141	1.319	0.252	Accept Ho Not Significant
	Within Groups	176.456	204	0.865			
	Total	177.597	205				
Grade Level	Between Groups	0.935	1	0.935	1.079	0.300	Accept Ho Not Significant
	Within Groups	176.662	204	0.866			
	Total	177.597	205				
Frequently Used Electronic	Between Groups	0.766	3	0.255	0.292	0.831	Accept Ho Not Significant

Gadgets	Within Groups	176.831	202	0.875			
	Total	177.597	205				

5. Significant Difference in the Impacts of Electronic Gadgets in the STEM Students' Study Habits in Mathematics When Grouped According to the Respondents' Demographic Profile

5.1 Preparation for Tests

Table 11 shows the analysis on variance on the impacts of electronic gadgets in the study habits in mathematics in terms of preparation for test when grouped according to the respondents' demographic profile.

Results show that the significant values of age (0.653); sex (0.053); and electronic gadgets (0.399) are greater than 0.05 Alpha Level of Significance. As a result, the null hypothesis is accepted, indicating that there is no significant difference on the impacts of electronic gadgets in the study habits in mathematics in terms of preparation for test when grouped according to age, sex, and electronic gadgets. This is similar to the study of Chu (2014) examined studies on using tablets/computers for math learning and found no significant differences in effects between male and female students. The study of Tamim, Borokhovski, Pickup, & Bernard (2015) [33] also found similar moderate positive effects on math achievement when using desktops, laptops or tablets, suggesting the device type may not be a significant factor. These suggest that the impacts of electronic gadgets to the study habits in mathematics are not limited to a specific age group, sex, and the type of electronic gadgets they frequently use.

In contrast, the significant value of grade level (0.006) which is lower than the

0.05 Alpha Level of Significance. Thus, the null hypothesis is accepted, indicating that there is a significant difference on the impacts of electronic gadgets in the study habits in mathematics in terms of preparation for test when grouped according to the grade level of the respondents. Sung, Chang, & Liu (2016) [32] found that the effectiveness of mobile learning (using electronic devices) on academic achievement tended to be higher for students in higher grade levels compared to lower grades. Delgado, Wardlow, McKnight, & O'Malley (2015) [12] also highlighted that the effects of technology integration could vary based on factors such as student grade level. This implies that the impacts of electronic gadgets to the study habits in mathematics significantly influenced by the grade level of the students.

Table 11: Test of Significant Difference on the Impacts of Electronic Gadgets in the Study Habits in Mathematics in terms of Preparation for Test When Grouped According to the Respondents' Demographic Profile

Preparation for Test		Sum of Squares	df	Mean Square	F	Sig.	Interpretation
Age	Between Groups	0.358	3	0.119	0.544	0.653	Accept Ho Not Significant
	Within Groups	44.369	202	0.220			
	Total	44.727	205				
Sex	Between Groups	0.814	1	0.814	3.783	0.053	Accept Ho Not Significant
	Within Groups	43.913	204	0.215			
	Total	44.727	205				
Grade Level	Between Groups	1.647	1	1.647	7.799	0.006	Reject Ho Significant
	Within Groups	43.080	204	0.211			
	Total	44.727	205				
Frequently Used Electronic Gadgets	Between Groups	0.647	3	0.216	0.989	0.399	Accept Ho Not Significant
	Within Groups	44.080	202	0.218			
	Total	44.727	205				

Table 12 shows the mean difference of the impacts of electronic gadgets in the study habits in mathematics in terms of preparation for tests according to the students' grade level.

Table 12: Mean Difference of the Impacts of Electronic Gadgets in the Study Habits in Mathematics in terms of Preparation for Tests according to the Students' Grade Level

Grade Level	Mean	N	Std. Deviation
11	3.5083	96	0.45967
12	3.3291	110	0.45943
Total	**3.4126**	**206**	**0.46710**

It shows that the mean of the impacts of electronic gadgets in the study habits in mathematics in terms of preparation for tests of grade 11 is 3.5087 or 3.5, while grade 12 is 3.3291 or 3.3. Therefore, grade 11 perceived the impacts of electronic gadgets in the study habits in mathematics in terms of preparation for tests more positive than grade 12. This suggest an inconsistency in the influence of electronic gadgets to the study habits of STEM students.

This finding aligns with the study of Balbaguio (n.d.) which explored the impacts of electronic gadgets among senior high school students. He found that there is a significant difference in the effects of electronic gadgets on the academic performance of the students when were classified to grade level. Grade 11 was described as "very effective" and grade 12 as "extremely effective". In addition, he also examined their study habits which both also has different results as grade 11 was indicated as "good" while grade 12 was "very good". This implies that there are inconsistencies between the impacts of electronic gadgets on the study habits of grade 11 students and grade 12 students that require attention and further research.

5.2 Time Management

Table 13 shows the test of signicant difference on the impacts of electronic gadgets in the study habits in mathematics in terms of time management when grouped according to the respondents' demographic profile.

Table 13: Test of Significant Difference on the Impacts of Electronic Gadgets in the Study Habits in Mathematics in terms of Time Management When Grouped According to the Respondents' Demographic Profile

Time Management		Sum of Squares	df	Mean Square	F	Sig.	Interpretation
Age	Between Groups	0.539	3	0.180	0.606	0.612	Accept Ho Not Significant
	Within Groups	59.934	202	0.297			
	Total	60.473	205				
Sex	Between Groups	0.413	1	0.413	1.403	0.238	Accept Ho Not Significant
	Within Groups	60.060	204	0.294			
	Total	60.473	205				
Grade Level	Between Groups	0.136	1	0.136	0.460	0.498	Accept Ho Not Significant
	Within Groups	60.337	204	0.296			
	Total	60.473	205				
Frequently Used Electronic Gadgets	Between Groups	0.078	3	0.026	0.087	0.967	Accept Ho Not Significant
	Within Groups	60.395	202	0.299			
	Total	60.473	205				

Results show that the significant values of age (0.612); sex (0.238); grade level (0.498); and electronic gadgets (0.967) are greater than the 0.05 Alpha Level of Significance, hence the null hypothesis is accepted. Thus, there is no significant difference on the impacts of electronic gadgets in the study habits in mathematics in terms of time management when grouped according to the respondents' demographic profile.

This is related to the study of Razali, Rusiman, Gan, & Arbin (2018) [26] which found that there is no significant difference between that students time management behaviors to their sex. This suggests that regardless of age, sex, grade level, or frequency of electronic gadget usage, students' time management habits in mathematics do not vary significantly. The study of Chukwu, Aroh, Ozor, Ugwoezuonu, & Ezema (2022) [10] also found that there is no significant differences of students demographics on time management among others. It implies that factors such as age-related technological proficiency, gender differences, academic workload across grade levels, or the type of electronic gadget they frequently use, do not notably affect how students manage their time when studying mathematics.

5.3 Note-Taking

Table 14 shows the test of significance on the impacts of electronic gadgets in the study habits in mathematics in terms of note-taking when grouped according to the respondents' demographic profile.

Results show that the significant values of age (0.845); sex (0.117); grade level (0.679); and electronic gadgets (0.325) are greater than the 0.05 Alpha Level of Significance, hence the null hypothesis is accepted. Therefore, there is no significant difference on the impacts of electronic gadgets in the study habits in mathematics in terms of note-taking when grouped according to the respondents' demographic profile.

Table 14: Test of Significant Difference on the Impacts of Electronic Gadgets in the Study Habits in Mathematics in terms of Note-Taking When Grouped According to the Respondents' Demographic Profile

Note-Taking		Sum of Squares	df	Mean Square	F	Sig.	Interpretation
Age	Between Groups	0.173	3	0.058	0.273	0.845	Accept Ho Not Significant
	Within Groups	42.661	202	0.211			
	Total	42.834	205				
Sex	Between Groups	0.513	1	0.513	2.475	0.117	Accept Ho Not Significant
	Within Groups	42.321	204	0.207			
	Total	42.834	205				
Grade Level	Between Groups	0.036	1	0.036	0.171	0.679	Accept Ho Not Significant
	Within Groups	42.798	204	0.210			
	Total	42.834	205				
Frequently Used Electronic Gadgets	Between Groups	0.728	3	0.243	1.164	0.325	Accept Ho Not Significant
	Within Groups	42.106	202	0.208			
	Total	42.834	205				

This is related to the results of the study of Antigo, & de Guzman (2021) [2] which found that there is no significant difference on the effects of the use of electronic gadgets in terms of study habits including note-taking when attributed to the student's age, sex, and grade level. This implies that factors such as age-related familiarity with technology, gender disparities, academic workload across different grades, or the type of electronic gadget they frequently use, do not significantly influence how students take notes when studying mathematics.

6. Significant Relationship Between the Time Student-Respodents Spent using Electronic Gadgets to Study Mathematics and its Impact to STEM Students' Study Habits

Table 15 shows the Pearson r on the relationship between the time student-respondents spent using electronic gadgets to study mathematics and its impact to STEM students' study habits.

Table 15: Pearson R on the Relationship between the Time Student-Respondents Spent using Electronic Gadgets to Study Mathematics and its Impact to STEM Students' Study Habits

Time Spent Per Day using Electronic Gadgets in Mathematics			Interpretation
Preparation for Tests	Pearson Correlation	0.13	Negligible Relationship
	N	206	
Time Management	Pearson Correlation	0.06	Negligible Relationship
	N	206	
Note-Taking	Pearson Correlation	0.18	Negligible Relationship
	N	206	

The computed Pearson r in terms of preparation for tests (0.13), time management (0.06), and note-taking (0.18) signify negligible relationships between the time student-respondents spent using electronic gadgets to study mathematics and its impact to stem students' study habits. Therefore, the null hypothesis is accepted.

Moreover, Redeña suggested that although there is no statistical significance between the variables, students who use gadgets in their math class are more likely to achieve higher mathematical performance. This is attributed to their enjoyment of using gadgets in the learning process, which also serves as a motivator for them. Gadgets allow students to explore more and engage with different applications, further enhancing their learning experience. Additionally, students find electronic gadgets more convenient and easier to use.

Conclusion

1. STEM students are predominantly male aged 17, typically in grade 12, and frequently use mobile phones for studying.
2. STEM students typically spend 1-2 hours per day to study mathematics using electronic gadgets.
3. The STEM students have strongly agreed on the impacts of electronic gadgets on their study habits in mathematics, particularly in preparation for tests. Additionally, they have shown agreement regarding time manangement and note-taking.
4. There are no significant difference in the time students spend per day using electronic gadgets when grouped according to their demographic profile.
5. There are no significant differences in the impact of electronic gadgets on students' study habits in mathematics when grouped according to their profile in terms of time manangement and note-taking. However, there is a significant difference in terms of preparation for tests, specifically limited to the grade level of the respondents.
6. There is a negligible correlation between the time students spend per day using electronic gadgets for studying and its impacts on their study habits in terms of preparation for tests, time management, and note-taking.

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