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Analyzing the Effects of Modern Distractions on Learning Mathematics Among Junior High School Students at MSU–Sulu Laboratory High School

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Index Terms:

modern distractions, learning mathematics, junior high school, critical thinking, problem-solving skills, working memory capacity

Abstract. This study examined the level of effects of modern distractions on learning Mathematics among junior high school students at Mindanao State University–Sulu Laboratory High School, focusing on critical thinking, problem-solving skills, and working memory capacity. Using a descriptive–correlational research design, data were collected from 120 students across Grades 7 to 10 through a validated survey questionnaire. Statistical tools such as descriptive statistics, t-tests, analysis of variance (ANOVA), and Pearson correlation were used for data analysis. Results revealed that modern distractions have a neutral and varied influence on students' Mathematics learning, as reflected by "Undecided" overall mean ratings across the three cognitive domains. Findings further indicated that students' perceptions of modern distractions do not significantly differ when grouped according to gender, age, parents' educational attainment, and parents' monthly income; however, significant differences were observed when grouped by grade level, suggesting the role of academic maturity. Correlational analysis showed strong to very high positive relationships among critical thinking, problem-solving skills, and working memory capacity, confirming that these cognitive processes are closely interconnected. Based on the findings, the study recommends that school administrators and teachers may implement instructional strategies that strengthen students' attention control and higher-order thinking skills, parents provide supportive and distraction-minimized learning environments, and students develop self-regulation skills in managing distractions. Future research may further explore intervention strategies to reduce the impact of modern distractions on Mathematics learning.

Introduction

In the 21st century, technology has become a cornerstone of modern education. Globally, digital platforms have expanded access to learning, enabling students to study flexibly and independently. According to UNESCO's 2023 Global Education Monitoring Report, technology has reshaped teaching and learning across Southeast Asia, with countries like the Philippines integrating digital tools into classrooms to improve educational outcomes. However, this digital shift has also introduced new challenges, particularly the rise of modern distractions. Studies show that digital distractions such as mobile notifications, social media, and multitasking can affect students' attention, memory, and academic performance. These effects are especially concerning mathematics, a subject that demands sustained cognitive effort, logical reasoning, and mental discipline.

In the Philippine context, the integration of technology into education has accelerated, especially during and after the COVID-19 pandemic. A case study by Espinosa et al. (2023) highlighted both the promise and pitfalls of digital learning in the country, noting that while access to devices and platforms has improved, students often struggle with focus and motivation. In regions such as BARMM and Region IX, also known as Zamboanga Peninsula, these challenges are compounded by limited internet connectivity, shared learning spaces, and varying levels of instructional support. Sulu, now officially part of Region IX, faces unique educational realities shaped by both geographic isolation and evolving administrative structures. At MSU–Sulu Laboratory High School, teachers report frequent interruptions caused by mobile phone use, background noise, and divided attention during math lessons. These factors make it difficult for students to think deeply about mathematical tasks and grow their cognitive skills—in areas such as critical thinking, problem solving, and working memory capacity.

Despite growing awareness of digital distraction, there was still an absence of localized research, particularly in underserved areas like Sulu. Most existing studies focus on urban or university settings, leaving junior high school learners in rural contexts underrepresented. For instance, Lucob et al. (2024) examined digital distraction among college students but did not explore its effect on younger learners or specific subjects such as mathematics. Similarly, Kuncoro et al. (2023), in their synthesis of literature on mathematics online learning, concluded that digital distractions affect students' engagement with mathematical tasks but did not address how these distractions affect cognitive processes such as working memory and problem-solving. This gap underscores the need for targeted investigation into how modern distractions influence mathematics learning in junior high school settings.

The purpose of this study is to examine how modern distractions affect junior high school students' ability to learn mathematics at MSU–Sulu Laboratory High School. Specifically, it aims to explore how distractions affect students' working memory capacity, problem-solving skills, and critical thinking during math instruction. These cognitive skills are essential not only for mathematics achievement but also for lifelong learning and decision-making. Understanding how distractions impair these abilities can help educators foster deeper learning and resilience in students. By focusing on learners in Sulu, the study responds to the research gap and seeks to provide insights that reflect the lived experiences of students in this unique educational context.

Research Questions

This research study aimed to analyze the effects of modern distractions on learning mathematics among junior high school students at MSU-Sulu Laboratory High School. Specifically, it sought to answer the following questions:

1. What is the socio-demographic profile of the student-respondents in terms of:
   1.1 Gender;
   1.2 Age;
   1.3 Grade Level;
   1.4 Parents' Educational Attainment; and
   1.5 Parents' Monthly Income?
2. What is the level of the effects of modern distractions on learning mathematics among the junior high school students at MSU-Sulu Laboratory High School in terms of:
   2.1 Critical Thinking;
   2.2 Problem-Solving Skills; and
   2.3 Working Memory Capacity?
3. Is there a significant difference in the level of the effects of modern distractions on learning mathematics among the junior high school students at MSU-Sulu Laboratory High School when data are grouped according to:
   3.1 Gender;
   3.2 Age;
   3.3 Grade Level;
   3.4 Parents' Educational Attainment; and
   3.5 Parents' Monthly Income?

Is there a significant correlation among the sub-categories subsumed under the level of the effects of modern distractions on learning mathematics?

Methodology

The following sections include methods to identify the effect of contemporary distractions on the junior high school students. The section is presented in nine sections: research design, research locale, respondents of the study, sampling design, data gathering procedure, research instrument, validity and reliability, statistical treatment of the data and ethical considerations.

Research Design

A descriptive-correlational methodology was used in this study, which aims to investigate the effects of modern distractions on learning mathematics among junior high school students. This study explores the effects of modern distractions in terms of critical thinking, problem-solving skill, and working memory capacity. These three cognitive domains are essential to how students engage with and understand mathematics. By focusing on them, the study can meaningfully capture how modern distractions interfere with the mental processes that support effective learning.

According to McCurtney and White (2009), as cited by IvyPanda (2023), a descriptive-correlational research design is used to characterize a population's features and investigate correlations between variables without changing them. This design suits the present study, which aimed to explore how modern distractions affect learning mathematics.

Research Locale

The study was carried out in the Sulu Laboratory High School of Mindanao State University, which is situated on the Capitol Site in Jolo, Sulu, Philippines. The school operates under the Mindanao State University – Sulu Campus and serves as a secondary education institution offering Junior High School programs from Grade 7 to Grade 10.

The school was chosen as the research locale due to its strategic accessibility, well-established academic framework, and its alignment with the study's objectives. As a laboratory high school, it functions as a training ground for pre-service teachers and educational researchers, making it an ideal setting for academic inquiry.

Respondents of the Study

Out of the 510 students in the population, 120 students were chosen as the study's responses. These students were officially enrolled in the 2025–2026 academic year at Mindanao State University's Sulu Laboratory High School. The distribution of the responders by grade level is depicted in the figure below.

Grade Level	Number of Respondents	Population Size	Percentage
Grade 7	30	119	25.21%
Grade 8	30	132	22.73%
Grade 9	30	138	21.74%
Grade 10	30	121	24.79%
Total	**120**	**510**	**23.62%**

Table 1. Distribution of the Respondents according to Grade Level

Sampling Design

The respondents for this study were chosen by the researchers using non-proportionate stratified random sampling. Based on pertinent features, the target population is divided into discrete, homogeneous, and mutually exclusive strata using this method. Simple random sampling is then used to pick individuals within each stratum. The number of respondents selected from each stratum does not always correspond to their actual proportion in the whole population, in contrast to proportionate sampling. Ultimately, a single representative sample for analysis is created by combining the samples from all strata.

According to Frost (2024), one key advantage of this method is that it allows researchers to oversample smaller or critical subgroups to ensure adequate representation, which is especially useful when analyzing differences across strata. This approach enhances the precision of subgroup estimates and facilitates meaningful comparisons, even when some groups are underrepresented in the general population.

Data Gathering Procedure

To collect all the essential variables of interest, the researchers used a structured questionnaire that was adapted from previously validated studies. Authorization was sought before the administration of the survey from Dean of School of Graduate Studies Sulu State University. The agreement was also obtained from the Chancellor of Mindanao State University – Sulu and from the Principal of the Laboratory High School. Also worked with class advisers to schedule the survey sessions and ensure they were implemented smoothly.

To maintain ethical standards, consent forms were given to student participants as well as their parents or guardians. These forms described the goals of the study, assured confidentiality and informed that participation was voluntary.

Afterward, data collection was conducted at Mindanao State University – Sulu Laboratory High School, Capitol Site, Jolo, Sulu for two weeks in November of 2025. The questionnaires were personally administered by the researcher through class advisers during regular hours in the classroom. Students were told firmly, before the forms were passed out, that they were to respond honestly. Lastly, session completion took 30–40 minutes and the questionnaire was collected immediately to prevent delay/loss.

Once the responses were collected, the researcher reviewed them for completeness and encoded the data into a spreadsheet (for analysis). Frequency count, percentages, mean and correlation were used to analyze the results.

Research Instrument

A standardized questionnaire titled "Effects of Modern Distractions on Learning Mathematics among Junior High School Students at MSU–Sulu Laboratory High School" was utilized to gather relevant data from the respondents. The instrument was adapted, patterned, and modified from three different studies—*Assessing Critical Thinking in Higher Education: Current State and Directions for Next-Generation Assessment* by Liu et al. (2014), *Developing Students' Critical Thinking Skills in Mathematics Using Online-Process Oriented Guided Inquiry Learning (O-POGIL)* by Artuz and Roble (2021), and *The Influence of Technology on Academic Distraction: A Review* by Dontre (2021).

The questionnaire is divided into two main parts. Part I gathers the respondents' personal information, while Part II assesses three key cognitive domains relevant to learning mathematics: critical thinking, problem-solving skills, and working memory capacity. Responses in Part II are rated using a 5-point Likert scale, allowing participants to express varying degrees of agreement or frequency. To ensure content validity and clarity, the questionnaire will be reviewed and validated by research experts.

Rating Scale	Rating Interval	Verbal Description
1	1.00 – 1.49	Strongly Disagree
2	1.50 – 2.49	Disagree
3	2.50 – 3.49	Undecided
4	3.50 – 4.49	Agree
5	4.50 – 5.00	Strongly Agree

Table 2. Rating Scale and Intervals with the Verbal Description

Table 2 will be used to determine the level of the effects of modern distractions on learning mathematics among junior high school students in terms of critical thinking, problem-solving skills, and working memory capacity.

Validity and Reliability

The research instrument used in this study was adapted and revised based on established frameworks and findings from the works of Liu et al. (2014), Artuz and Roble (2021), and Dontre (2021). To ensure its relevance and suitability for the local educational context, the questionnaire was submitted for review by at least two faculty members from the Graduate Studies of Sulu State University, who evaluated its content and construct validity. Since the instrument was derived from previously published studies with established reliability, it was no longer subjected to a separate reliability test.

Statistical Treatment of Data

Descriptive (frequency, percentage, weighted mean and standard deviation) and inferential statistics (independent samples t-test, one-way analysis of variance-ANOVA and Pearson product-moment correlation) were used to analyze responses from the questionnaire.

1. Frequency and percentage distributions were performed to analyze respondents' demographic profile such as gender, age, grade level, parents' monthly income and educational attainment.
2. The weighted arithmetic mean and standard deviation were used to analyze the level of the effects of modern distractions on learning mathematics among junior high school students at MSU Sulu Laboratory High School considering critical thinking, problem solving skills, and working memory capacity.
3. Using independent samples t-test and one way analysis of variance (ANOVA), the significant difference in how modern distractions affect learning mathematics on junior high school students at MSU Sulu Laboratory High School when data are grouped according to gender, age, grade level, parents' monthly income, and educational attainment was determined.

4. Pearson Product Moment Correlation was used to analyze the significant correlation between the sub-categories hidden in terms of level effects of contemporary distractions learning mathematics.

Ethical Considerations

A study is considered reliable, valid, and ethical only if it adheres to all principles of ethics. All data collected for analysis and interpretation adhered strictly to recognized ethical standards. In particular, the researcher adhered to the following ethical protocols during the study:

1. Informed Consent – Subjects were provided with detailed information about the goals, methods, and limitations of the study. They voluntarily signed a consent form to participate and are free to withdraw at any time without penalty.
2. Privacy and Anonymity – Participants' names and their institutions were kept private. No identifying information was included in any report, presentation, or publication associated with this study.
3. Voluntary Participation — All participation in the study was voluntary. Participation had been obtained without the use of coercion, pressure or undue influence.
4. Integrity of Data — The researchers reported whether or not all data are gathered, recorded, analyzed, and reported honestly and accurately. We did not fabricate, falsify, or misrepresent any data.
5. Respect for Persons – The researchers maintained respect for the rights, dignity, and welfare of participants by ensuring their perspectives and experiences are valued throughout the research process.
6. Beneficence and Non-Maleficence – The study was performed with the purpose to increase benefit for participants, as well as the larger community, while ensuring that no harm will come to any participating individual.
7. Adherence to Institutional Guidelines – This research was conducted in accordance with the ethical policies and procedures of the School of Graduate Studies, Sulu State University (SSU), Philippines as well as national and international ethical guidelines for educational research.
8. Ethical Clearance – Before the survey questionnaire was administered, an official Ethical Clearance from the Research Ethics Committee or authorized body of Sulu State University (SSU) graduated institution was obtained by the researcher to ensure that the study complied with all ethical requirements concerning institutional and professional standards.

Results and Discussion

This section deals with presentation, thought and translation of results obtained from data collected for this study. Also tackles how modern distractions affect junior high school students in learning mathematics at Mindanao State University-Sulu Laboratory High School. It also describes the respondents' demographic profile based on their sex, age, year level, parent's educational attainment and monthly income; the degree of effect of modern distractions in learning mathematics as perceived by junior high school students; and whether or not there is a significant relationship and difference between the responses when categorized according to respondents' demographic profiles. Below are the presentations, analyses and interpretation of results based on proper scoring as well as statistical treatment of data gathered in this study that addresses each of the research questions:

1. *What is the socio-demographic profile of the student-respondents in terms of 1.1 Gender, 1.2 Age, 1.3 Grade Level, 1.4 Parent's educational Attainment and 1.5 Parent's monthly income?*

1.1 In terms of Gender

Table 3 presents the gender distribution of the student-respondents. As shown, out of the total 120 participants, 48 or 40.0% are male, while 72 or 60.0% are female. The data indicate that female students comprise more than half of the respondents in this study. This suggests that the majority of junior high school participants from MSU–Sulu Laboratory High School are predominantly female in terms of gender composition.

Gender	Number of respondents	Percent
Male	48	40.0%
Female	72	60.0%
Total	**120**	**100%**

Table 3. Demographic profile of student-respondents in terms of Gender

1.2 In terms of Age

Table 4 presents the age distribution of the student-respondents. The data show that out of 120 participants, 51 (42.5%) are aged 13 years old and below, 65 (54.2%) fall within the 14–15 age range, and 4 (3.3%) are between 16–17 years old, while none belong to the 18 years old and above category. These results indicate that the majority of respondents are within the 14–15 age group. This suggests that most of the participants belong to the middle age bracket as defined in this study.

Age	Number of respondents	Percent
13 years old and below	51	42.5%
14-15 years old	65	54.2%
16-17 years old	4	3.3%
18 years old and above	0	0.0%
Total	**120**	**100%**

Table 4. Demographic profile of student-respondents in terms of Age

1.3 In terms of Grade Level

Table 5 illustrates the distribution of student-respondents according to their grade level. The data indicate that each grade level—Grades 7, 8, 9, and 10—is equally represented, with 30 students or 25.0% from each group out of the total 120 respondents. This equal distribution suggests that the sample is balanced across all grade levels included in the study.

Grade Level	Number of respondents	Percent
Grade 7	30	25.0%
Grade 8	30	25.0%
Grade 9	30	25.0%
Grade 10	30	25.0%
Total	**120**	**100%**

Table 5. Demographic profile of student-respondents in terms of Grade Level

1.4 In terms of Parent's Educational Attainment

Table 6 presents the distribution of student-respondents based on their parents' educational attainment. The data indicate that none of the respondents have parents with no formal education. Meanwhile, 1 respondent (8.0%) has parents who completed elementary education, 11 (9.2%) have parents who are high school graduates, 71 (59.2%) have parents who attained a college degree, and 37 (30.8%) have parents with postgraduate qualifications. These findings show that more than half of the respondents come from families where parents have completed college education. This suggests that the majority of the respondents' parents possess at least a college-level educational background, indicating a generally moderate to high level of parental educational attainment.

Parent's Educational Attainment	Number of respondents	Percent
No Formal Education	0	0.0%
Elementary Graduate	1	8.0%
High School Graduate	11	9.2%
College Graduate	71	59.2%
Postgraduate Degree	37	30.8%
Total	**120**	**100%**

Table 6. Demographic profile of student-respondents in terms of Parent's Educational Attainment

1.5 In terms of Parent's Monthly Income

Table 7 presents the distribution of student-respondents according to their parents' monthly income. The data show that out of 120 respondents, 28 (23.3%) have a monthly family income of ₱10,000 and below, 1 (0.8%) falls within the ₱10,001–₱20,000 range, 32 (26.7%) are within ₱20,001–₱35,000, 47 (39.2%) belong to the ₱35,001–₱50,000 bracket, and 12 (10.0%) have an income of ₱50,001 and above. The findings indicate that nearly two-fifths of the respondents come from households earning between ₱35,001 and ₱50,000 monthly. This suggests that a considerable portion of students at MSU–Sulu Laboratory High School belong to families with moderately high income levels based on the categories used in this study.

Parent's Monthly Income	Number of respondents	Percent

10,000 and below	28	23.3.0%
10,001 – 20,000	1	0.8%
20,001 – 35,000	32	26.7%
35,001 – 50,000	47	39.2%
50,001 and above	12	10.0%
Total	**120**	**100%**

Table 7. Demographic profile of student-respondents in terms of Parent's Monthly Income

2. *What is the level of effects of modern distractions on learning mathematics among junior high school students at MSU-Sulu Laboratory High School in terms of 2.1 Critical thinking, 2.2 Problem-Solving skills, and 2.3 Working Memory Capacity?*

2.1 In the context of Critical Thinking
Table 8 presents the level of the effects of modern distractions on students' learning of mathematics in terms of critical thinking among junior high school students at MSU–Sulu Laboratory High School. The results show a total weighted mean of 3.40 with a standard deviation of 0.69473, which is interpreted as "Undecided." This suggests that the respondents generally hold neutral or varied perceptions regarding how modern distractions influence their critical thinking skills in mathematics. It further indicates that the impact of such distractions is not consistent across all learners.

In particular, several statements were also rated as "Undecided" by the respondents. These include difficulties in analyzing mathematical problems from different perspectives when interrupted by calls or conversations, challenges in evaluating the logic of solutions due to pop-up notifications, struggles in justifying mathematical reasoning when disrupted by digital reminders, and the tendency to skip important steps in the thinking process as a result of divided attention caused by switching between applications or responding to messages.

	Statements	Mean	SD	Rating
1	I find it harder to evaluate math problems critically when I'm distracted by social media notifications.	3.60	1.103	Agree
2	I struggle to question assumptions in math tasks when multitasking between messaging apps and online videos.	3.57	1.019	Agree
3	I lose the ability to analyze math problems from multiple angles when interrupted by incoming calls or peer conversations.	3.39	1.071	Undecided
4	I fail to reflect on the logic of my math solutions when distracted by pop-up notifications.	3.18	1.034	Undecided
5	I overlook errors in my reasoning when exposed to digital distractions like chat messages, app alerts, or scrolling behavior.	3.67	.947	Agree
6	I rely on shortcuts instead of deep thinking when I'm multitasking.	3.46	1.243	Undecided
7	I avoid challenging math tasks when I'm distracted by technology such as streaming videos or group chats.	2.98	1.195	Undecided
8	I find it difficult to justify my mathematical reasoning when I'm interrupted by digital reminders.	3.25	.972	Undecided
9	I skip steps in my thinking process due to fragmented attention caused by switching between apps or responding to messages.	3.19	1.197	Undecided
10	I struggle to connect mathematical ideas when my attention is divided.	3.78	1.022	Agree
	Total Weighted Mean	**3.40**	**.69473**	**Undecided**

Legend: (5) 4.50-5.00=Strongly Agree; (4) 3.50-4.49= Agree; (3) 2.50- 3.49= Undecided; (2) 1.50- 2.49=Disagree; (1) 1.00- 1.49= Strongly Disagree

Table 8. Level of the effects of modern distractions on learning mathematics in the context of Critical thinking

2.2 In the context of Problem-Solving skills

Table 9 presents the level of the effects of modern distractions on students' learning of mathematics in terms of problem-solving skills among junior high school students at MSU–Sulu Laboratory High School. The results reveal a total weighted mean of 3.19 with a standard deviation of 0.75131, interpreted as "Undecided." This indicates that the respondents generally demonstrate neutral or varied perceptions regarding the impact of modern distractions on their ability to solve mathematical problems. The findings suggest that while some students perceive distractions as detrimental to their problem-solving processes, others do not consider them to have a substantial effect.

Moreover, several statements were rated as "Undecided" by the respondents. These include difficulties in following problem-solving procedures when interrupted by smartphone notifications, losing concentration during multi-step problems due to calls or messages, challenges in applying mathematical strategies while multitasking across devices or applications, and experiencing difficulty in organizing thoughts during problem-solving when exposed to background music.

	Statements	Mean	SD	Rating
1	I struggle to follow problem-solving steps when distracted by smartphone notifications.	3.27	1.207	Undecided
2	I make more errors in math problem-solving when multitasking between messaging apps, browser tabs, or music streams.	3.28	1.124	Undecided
3	I lose focus during multi-step math problems due to digital interruptions like incoming calls or chat messages.	3.38	1.101	Undecided
4	I fail to identify key information in math problems when distracted by background media or social media alerts.	3.23	1.098	Undecided
5	I abandon math problems more quickly when I'm exposed to digital media such as online videos or group chats.	3.08	1.267	Undecided
6	I find it harder to apply math strategies when multitasking across devices or apps.	3.31	.986	Undecided
7	I skip important steps in problem-solving when I'm distracted by notifications.	2.50	1.167	Undecided
8	I find less confident solving math problems when I'm interrupted by digital reminders.	3.14	1.190	Undecided
9	I struggle to organize my thoughts during math problem-solving when distracted by background music.	3.02	1.322	Undecided
10	I take longer to solve math problems when I'm exposed to digital distractions like scrolling behavior.	3.66	1.226	Agree
	Total Weighted Mean	**3.19**	**.75131**	**Undecided**

Legend: (5) 4.50-5.00=Strongly Agree; (4) 3.50-4.49= Agree; (3) 2.50- 3.49= Undecided; (2) 1.50- 2.49=Disagree; (1) 1.00- 1.49= Strongly Disagree

Table 9. Level of the effects of modern distractions on learning mathematics in the context of Problem-Solving skills

2.3 In the context of Working Memory Capacity

Table 10 presents the level of the effects of modern distractions on students' learning of mathematics in terms of working memory capacity among junior high school students at MSU–Sulu Laboratory High School. The findings indicate a total weighted mean of 3.20 with a standard deviation of 0.80015, which is interpreted as "Undecided." This suggests that the respondents generally exhibit neutral perceptions regarding how modern distractions affect their working memory during mathematics learning. The results imply that while some students experience difficulty in retaining and processing mathematical information due to distractions, others do not perceive a significant impact. The relatively high standard deviation further reflects variability in responses, indicating differences in students' attention control and levels of exposure to modern distractions.

In addition, several statements were rated as "Undecided" by the respondents. These include difficulties in remembering mathematical instructions when interrupted by smartphone notifications or social media alerts, challenges in holding multiple pieces of information when disrupted by incoming calls, confusion in following procedures due to digital interruptions such as pop-up notifications or multitasking, and difficulty retaining mathematical formulas when exposed to digital reminders or environmental noise.

	Statements	Mean	SD	Rating
1	I forget math instructions easily when I'm distracted by smartphone notifications or social media alerts.	3.28	1.330	Undecided
2	I lose track of numbers or steps in math problems when multitasking between apps, messages, or browser tabs.	3.30	1.082	Undecided
3	I struggle to hold multiple pieces of math information in mind when interrupted by incoming calls.	3.22	1.047	Undecided
4	I feel mentally overloaded when switching between math tasks and digital content like videos or chat threads.	3.30	1.001	Undecided
5	I can't recall previous math concepts when I'm distracted by background media or device alerts.	3.07	1.193	Undecided
6	I mix up math procedures when exposed to digital distractions such as pop-up notifications or multitasking demands.	3.12	1.030	Undecided
7	I feel mentally fatigued during math tasks when multitasking across devices or frequently switching between apps and digital content.	3.22	1.078	Undecided
8	I lose my place in multi-step math problems due to distractions like checking my phone or responding to messages.	3.26	1.156	Undecided
9	I struggle to retain math formulas when I'm interrupted by digital reminders or environmental noise.	3.31	1.262	Undecided
10	I forget what I was solving in math when I check my device mid-task.	2.89	1.340	Undecided
	Total Weighted Mean	**3.20**	**.80015**	**Undecided**

Legend: (5) 4.50-5.00=Strongly Agree; (4) 3.50-4.49= Agree; (3) 2.50- 3.49= Undecided; (2) 1.50- 2.49=Disagree; (1) 1.00-1.49= Strongly Disagree

Table 10. Level of the effects of modern distractions on learning mathematics in the context of Working Memory Capacity

3. Is there a significant difference in the level of the effects of modern distractions on learning mathematics among the junior high school students at MSU-Sulu Laboratory High School when data are grouped according to 3.1 Gender, 3.2 Age, 3.3 Grade level, 3.4 parent's educational attainment and 3.5 parent's monthly income?

3.1 According to Gender

Table 11 shows the differences in the level of the effects of modern distractions on learning mathematics among junior high school students at MSU–Sulu Laboratory High School when grouped according to gender. The results indicate that all computed t-values and corresponding probability values are not significant at the 0.05 level of significance. This suggests that there is no statistically significant difference between male and female respondents in their perceptions of how modern distractions affect their learning of mathematics across the identified subcategories.

Furthermore, the findings imply that gender does not influence how students perceive the impact of modern distractions on their mathematical learning. In other words, being male or female does not make a student more or less sensitive to these effects.

Therefore, it can be concluded that gender does not significantly affect students' perceptions of the influence of modern distractions on learning mathematics at MSU–Sulu Laboratory High School. Consequently, the null hypothesis stating that "there is no significant difference in the level of the effects of modern distractions on learning mathematics among junior high school students when grouped according to gender" is accepted.

Variables	Grouping	Mean	SD	Mean Difference	t	Sig.	Description
Critical Thinking	Male Female	3.4021 3.4097	.75131 .65974	-.00764	-.057	.954	Not Significant
Problem-Solving Skills	Male Female	3.2458 3.1486	.74889 .75563	.09722	.694	.489	Not Significant
Working Memory Capacity	Male Female	3.2042 3.1903	.83308 .78330	.01389	.092	.927	Not Significant

** Significant at alpha 0.05*

Table 11. Difference in the level of effects of modern distractions on learning mathematics when data are grouped according to gender

3.2 According to Age

Table 12 presents the differences in the level of the effects of modern distractions on learning mathematics among junior high school students at MSU–Sulu Laboratory High School when grouped according to age. The results show that, except for working memory capacity, all computed F-values and corresponding probability values are not significant at the 0.05 level. This indicates that, despite differences in age, the respondents generally share similar perceptions regarding the impact of modern distractions on their mathematics learning across most dimensions.

The findings further suggest that belonging to a particular age group does not significantly influence how students perceive the effects of modern distractions. In other words, older students (including those aged 18 and above) are not necessarily more or less aware of these effects compared to younger students within the categories used in this study.

Therefore, it can be concluded that age does not significantly affect students' perceptions of the impact of modern distractions on learning mathematics, with the exception of working memory capacity. Overall, the null hypothesis stating that "there is no significant difference in the level of the effects of modern distractions on learning mathematics among junior high school students when grouped according to age" is accepted.

Sources of Variation		Sum of squares	df	Mean Square	F	Sig.	Description
Critical Thinking	Between Groups	.252	2	.126	.258	.773	Not Significant
	Within Groups	57.182	117	.489			
	Total	57.435	119				
Problem-Solving Skills	Between Groups	3.177	2	1.589	2.904	.059	Not Significant
	Within Groups	63.994	117	.547			
	Total	67.171	119				
Working Memory Capacity	Between Groups	4.142	2	2.071	3.363	.038*	Significant
	Within Groups	72.046	117	.616			
	Total	76.188	119				

** Significant at alpha 0.05*

Table 12 Difference in the level of effects of modern distractions on learning mathematics when data are grouped according to age.

3.3 According to Grade Level

Table 13 presents the difference in the level of effects of modern distractions on mathematics learning among junior high school students of MSU-Sulu Laboratory High School when grouped according to grade level. As shown in the table, all F-values and their corresponding probability values for the subcategories are significant at α = 0.05. This indicates that although the respondents differ in grade level, they significantly differ in their perceptions of the effects of modern distractions on mathematics learning.

This further suggests that students in Grade 10 may have different perceptions compared to those in Grades 7, 8, and 9, and vice versa. Overall, grade level appears to influence how students perceive the impact of modern distractions on their mathematics learning experiences.

Hence, it can be concluded that grade level has a significant effect on the perceptions of junior high school students at MSU-Sulu Laboratory High School, Division of Sulu, regarding modern distractions in mathematics learning. Therefore, the null hypothesis stating that "There is no significant difference in the level of effects of modern distractions on learning mathematics among junior high school students when grouped according to grade level" is rejected.

Sources of Variation		Sum of squares	df	Mean Square	F	Sig.	Description
Critical Thinking	Between Groups	6.201	3	2.067	4.680	.004*	Significant
	Within Groups	51.234	116	.442			
	Total	57.435	119				
Problem-Solving Skills	Between Groups	9.791	3	3.264	6.598	.000*	Significant
	Within Groups	57.380	116	.495			
	Total	67.171	119				
Working Memory Capacity	Between Groups	5.906	3	1.969	3.249	.024*	Significant
	Within Groups	70.282	116	.606			
	Total	76.188	119				

** Significant at alpha 0.05*

Table 13. Difference in the level of effects of modern distractions on learning mathematics when data are grouped according to Grade Level

A post hoc analysis using the Tukey test was conducted to determine which groups differed significantly in their mean levels of Critical Thinking, Problem-Solving Skills, and Working Memory Capacity when data were grouped according to the respondents' grade level.

On Critical Thinking: The results revealed a significant difference in perceptions between Grade 8 students and Grade 7 students, with a mean difference of -0.51333*, a standard error of 0.12185, and a p-value of 0.018. Likewise, a significant difference was also found between Grade 8 and Grade 9 students, with a mean difference of -0.46333*, a standard error of 0.17159, and a p-value of 0.039. Both comparisons are significant at α = 0.05. These findings indicate that Grade 8 students significantly differ in their perceptions of the effects of modern distractions on critical thinking compared to their counterparts in Grades 7 and 9. The negative mean differences further suggest that Grade 8 learners tend to report lower levels of critical thinking in relation to modern distractions, which may be influenced by grade-specific academic demands, cognitive development, or learning experiences.

On Problem-Solving Skills: The analysis showed a significant difference between Grade 7 and Grade 8 students, with a mean difference of 0.51441, a standard error of 0.16906, and a p-value of 0.016. A further significant difference was also observed between Grade 7 and Grade 9 students, with a mean difference of 0.73333*, a standard error of 0.18160, and a p-value of 0.001. Both results are significant at α = 0.05. This implies that Grade 7 students significantly differ in their perceptions of the effects of modern distractions on problem-solving skills compared to students in higher grade levels. The positive mean differences indicate that Grade 7 learners tend to perceive a higher level of impact of modern distractions on their problem-solving abilities than those in Grades 8 and 9.

Dependent Variable	(I) Grouping by Parent's educational attainment	(J) Grouping by Parent's educational attainment	Mean Difference (I-J)	Std. Error	Sig.
Critical Thinking	Grade 8	Grade 7	-.51333*	.17159	.018
		Grade 10	-.46333*	.17159	.039
Problem-Solving Skills	Grade 7	Grade 8	.64000*	.18160	.003
		Grade 9	.73333*	.18160	.001
Working Memory Capacity	Grade 7	Grade 9	.59000*	.20098	.021

Table 13.1. Post Hoc Analysis of the difference in the level of effects of modern distractions on learning when data are grouped according to Grade Level

3.4 According to Parent's Educational Attainment

Table 14 presents the difference in the level of effects of modern distractions on mathematics learning among junior high school students of MSU-Sulu Laboratory High School when grouped according to their parents' educational attainment. As shown in the table, all F-values and their corresponding probability values across the subcategories are not significant at α = 0.05. This indicates that although the respondents vary in their parents' educational attainment, they do not significantly differ in their perceptions of the effects of modern distractions on mathematics learning.

This implies that students whose parents have postgraduate degrees do not differ in perception compared to those whose parents have attained a college degree or lower levels of education. Overall, parents' educational attainment does not appear to influence how students perceive the effects of modern distractions on their mathematics learning experiences. Hence, it can be concluded that parents' educational attainment has no significant effect on the perceptions of junior high school students at MSU-Sulu Laboratory High School, Division of Sulu, regarding modern distractions in mathematics learning. Therefore, the null hypothesis stating that "There is no significant difference in the level of effects of modern distractions on learning mathematics among junior high school students when grouped according to parents' educational attainment" is accepted.

Sources of Variation		Sum of squares	df	Mean Square	F	Sig.	Description
Critical Thinking	Between Groups	2.260	3	.753	1.584	.197	Not Significant
	Within Groups	55.175	116	.476			
	Total	57.435	119				
Problem-Solving Skills	Between Groups	1.835	3	.612	1.086	.358	Not Significant
	Within Groups	65.336	116	.563			
	Total	67.171	119				
Working Memory Capacity	Between Groups	1.880	3	.627	.978	.406	Not Significant
	Within Groups	74.308	116	.641			
	Total	76.188	119				

** Significant at alpha 0.05*

Table 14. Difference in the level of effects of modern distractions on learning mathematics when data are grouped according to Parent's educational attainment

3.5 According to Parent's Monthly Income

Table 15 presents the difference in the level of effects of modern distractions on mathematics learning among junior high school students of MSU-Sulu Laboratory High School when grouped according to parents' monthly income. As reflected in the table, all F-values and their corresponding probability values across the subcategories are not significant at α = 0.05. This indicates that although the respondents differ in their parents' monthly income, they do not significantly differ in their perceptions of the effects of modern distractions on mathematics learning. This suggests that students whose parents belong to the highest income bracket (50,001 and above) do not significantly differ in perception compared to those from lower income groups included in the study. Overall, parents' monthly income does not appear to influence how students perceive the effects of modern distractions on their mathematics learning experiences. Hence, it can be concluded that parents' monthly income has no significant effect on the perceptions of junior high school students at MSU-Sulu Laboratory High School, Division of Sulu, regarding modern distractions in mathematics learning. Therefore, the null hypothesis stating that "There is no significant difference in the level of effects of modern distractions on learning mathematics among junior high school students when grouped according to parents' monthly income" is accepted.

Sources of Variation		Sum of squares	df	Mean Square	F	Sig.	Description
Critical Thinking	Between Groups	.700	4	.175	.355	.840	Not Significant
	Within Groups	56.734	115	.493			
	Total	57.435	119				
Problem-Solving Skills	Between Groups	1.352	4	.338	.591	.670	Not Significant
	Within Groups	65.819	115	.572			
	Total	67.171	119				
Working Memory Capacity	Between Groups	2.299	4	.575	.895	.470	Not Significant
		73.889	115	.643			

	Within Groups Total	76.188	119

** Significant at alpha 0.05*

Table 15. Difference in the level of effects of modern distractions on learning mathematics when data are grouped according to Parent's monthly income

4. Is there a significant correlation among the sub-categories subsumed under the level of the effects of modern distractions on learning mathematics?

Table 16 presents the correlation among the subcategories under the level of effects of modern distractions on mathematics learning among junior high school students of MSU-Sulu Laboratory High School. As shown in the table, all computed Pearson correlation coefficients (Pearson r) among the variables are significant at α = 0.05.

1. In terms of the degree of correlation, a very high positive relationship was observed between Critical Thinking and Problem-Solving Skills (r = .804, p = .000), and between Problem-Solving Skills and Working Memory Capacity (r = .817, p = .000). These results indicate strong and significant interrelationships among the cognitive domains involved in mathematics learning. This suggests that students who demonstrate higher levels of critical thinking also tend to exhibit stronger problem-solving skills, while those with greater working memory capacity are better able to process and apply information in solving mathematical problems. These findings further imply that modern distractions that impair working memory may significantly affect students' problem-solving abilities and, in turn, their critical thinking performance.

2. A high positive correlation was also found between Critical Thinking and Working Memory Capacity (r = .699, p = .000), indicating that students with better working memory capacity are more likely to engage in higher levels of analysis, evaluation, and logical reasoning in mathematics. This highlights the importance of working memory in supporting the development of critical thinking skills, particularly in learning environments influenced by modern distractions.

Overall, the results show that the subcategories under the level of effects of modern distractions on mathematics learning are highly interrelated among the junior high school students of MSU-Sulu Laboratory High School. Therefore, the null hypothesis stating that there is no significant correlation among the subcategories is rejected.

Variables		Pearson *r*	Sig.	N	Description
Dependent	Independent				
Critical Thinking	Problem-Solving Skills	.804**	.000	120	Very High
	Working Memory Capacity	.699**	.000	120	High
Problem-Solving Skills	Working Memory Capacity	.817**	.000	120	Very High

**Correlation coefficient is significant at alpha .01*

Table 16. Correlation among the sub-categories subsumed under the level of the effects of modern distractions on learning mathematics

Summary of Findings

The following are findings for this study:

1) *On the demographic profile of the student-respondents:*

The demographic profile of the student-respondents shows that most are aged 14–15 years (54.2%), with a relatively balanced distribution across grade levels. In terms of gender, the majority are female (60.0%). A large proportion of the respondents come from families with moderately high monthly income, particularly within the ₱35,001–₱50,000 range. Furthermore, most of the student-respondents have parents who attained college-level education, indicating a generally favorable educational background among families.

2) *On the level of effects of modern distractions on learning mathematics among junior high school students at MSU-Sulu Laboratory High School:*

The findings indicate that modern distractions exert a neutral and varied influence on junior high school students' learning of Mathematics at MSU–Sulu Laboratory High School across the domains of critical thinking, problem-solving skills, and working memory capacity, as reflected in "undecided" ratings. This suggests that students differ in how distractions affect their cognitive processes, where some experience interference while others are able to maintain focus and regulate attention.

These results are supported by Uncapher et al. (2020), who found that digital distractions do not uniformly impair higher-order thinking and are largely dependent on individual differences in attentional control. Similarly, Risko and Gilbert (2019) reported that technology-related distractions may increase cognitive load for some learners but have minimal impact on others with stronger executive functioning. From a theoretical standpoint, Cognitive Load Theory by Sweller et al. (2019) explains that distractions may overload working memory in some learners while leaving others relatively unaffected. Recent studies further emphasize the role of self-regulation and working memory capacity in managing distractions during learning tasks (Alloway & Alloway, 2020; Zhang et al., 2021). Overall, these findings suggest that the impact of modern distractions on Mathematics learning is not uniform but is shaped by individual differences in cognitive capacity, attention regulation, and self-control.

3) *On differences in the level of effects of modern distractions on learning mathematics among junior high school students at MSU-Sulu Laboratory High School:*

The findings indicate that differences in the level of effects of modern distractions on Mathematics learning among junior high school students at MSU–Sulu Laboratory High School are generally not influenced by gender, age, parents' monthly income, or parents' educational attainment, as students across these groups exhibit similar perceptions. This supports recent studies suggesting that susceptibility to digital distractions is not strongly associated with demographic factors but is more closely linked to individual cognitive control and self-regulation (Uncapher & Wagner, 2019; Rosen et al., 2020).

However, grade level shows a significant difference, indicating that students at different academic stages vary in their awareness and perception of how modern distractions affect Mathematics learning. This finding aligns with research suggesting that older students tend to demonstrate higher metacognitive awareness and are better able to evaluate the impact of distractions on their learning processes (Zhang et al., 2021). Overall, the results imply that academic maturity, rather than demographic characteristics, plays a more critical role in shaping students' perceptions of modern distractions.

4) *On the correlation among the subcategories subsumed under the level of effects of modern distractions on learning mathematics among junior high school students at MSU-Sulu Laboratory High School:*

The findings reveal a significant and strong correlation among the subcategories under the level of effects of modern distractions on Mathematics learning among junior high school students at MSU–Sulu Laboratory High School. All Pearson correlation coefficients were significant at $\alpha = 0.05$, with very high positive correlations observed between critical thinking and problem-solving skills ($r = .804$), and between problem-solving skills and working memory capacity ($r = .817$). A high positive correlation was also found between critical thinking and working memory capacity ($r = .699$).

These results indicate that impairments in working memory due to modern distractions may directly affect students' problem-solving abilities and critical thinking performance. This finding is consistent with Uncapher and Wagner (2019) and Sweller et al. (2019), who emphasized that distractions increase cognitive load and weaken working memory, thereby negatively affecting higher-order thinking skills. Moreover, the strong interrelationships among these cognitive domains confirm that the effects of modern distractions on Mathematics learning are interconnected and mutually reinforcing.

Conclusion and Recommendations

The study concludes the following:

1. The study concludes that junior high school students at MSU–Sulu Laboratory High School are mostly 14–15 years old, predominantly female, with generally favorable family income and parental educational backgrounds. Despite these demographic advantages, empirical studies indicate that students' learning outcomes remain highly susceptible to environmental and technological influences, suggesting that demographic factors alone do not ensure effective learning (OECD, 2020).

2. Findings further conclude that modern distractions exert a neutral and varied effect on students' critical thinking, problem-solving skills, and working memory capacity, as reflected by the "Undecided" ratings. Empirical evidence supports that digital distractions do not uniformly impair learning; rather, their effects depend on individual differences in attention regulation and executive functioning (Risko & Gilbert, 2019; Uncapher et al., 2020).

3. The study also concludes that gender, age, parents' income, and parents' educational attainment do not significantly influence students' perceptions of modern distractions, while grade level does. This aligns with empirical findings that academic maturity and metacognitive development increase students' awareness of distraction effects (Zhang et al., 2021), whereas susceptibility to distractions cuts across gender and socioeconomic groups (Rosen et al., 2020).

Finally, the study concludes that critical thinking, problem-solving skills, and working memory capacity are strongly interrelated, confirming that the effects of modern distractions on Mathematics learning are interconnected. Empirical research shows that distractions increase cognitive load and weaken working memory, which in turn impairs higher-order thinking and problem-solving performance (Sweller et al., 2019; Uncapher & Wagner, 2019).

Recommendations

This study recommends the following:

1) Mindanao State University-Sulu Administration may develop and strengthen institutional policies that promote focused and distraction-aware learning environments, particularly in Mathematics classes.

2) Mindanao State University-Sulu Laboratory High School Faculty Members may integrate instructional strategies that strengthen critical thinking, problem-solving skills, and working memory capacity, such as problem-based learning, scaffolded instruction, and structured classroom routines.

3) Parents and guardians are encouraged to support their children by providing a conducive home learning environment with minimal distractions; monitoring students' use of digital devices and reinforcing good study habits. Active parental involvement in guiding students' screen time and encouraging focus during study hours may help mitigate the negative effects of modern distractions on Mathematics learning.

4) Students are encouraged to develop self-regulation and time-management skills by becoming more aware of how modern distractions affect their learning.

5) Moreso, future researchers in the field of Mathematics Education are encouraged to explore the specific types of modern distractions and their differential effects on various cognitive domains in Mathematics learning. Further studies may also investigate intervention programs that strengthen students' attention control, working memory, and self-regulation across different grade levels and educational contexts.

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Competing Interests Statement

The authors affirm that there are no financial or personal relationships that could have inappropriately influenced the findings or interpretations presented in this paper.

Data Availability Statement

Data sharing is not applicable to this study, as it did not involve the generation or analysis of new data. All information utilized was derived from existing published sources, which are properly cited in the reference section.

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Appendices

No appendices are attached to this study.