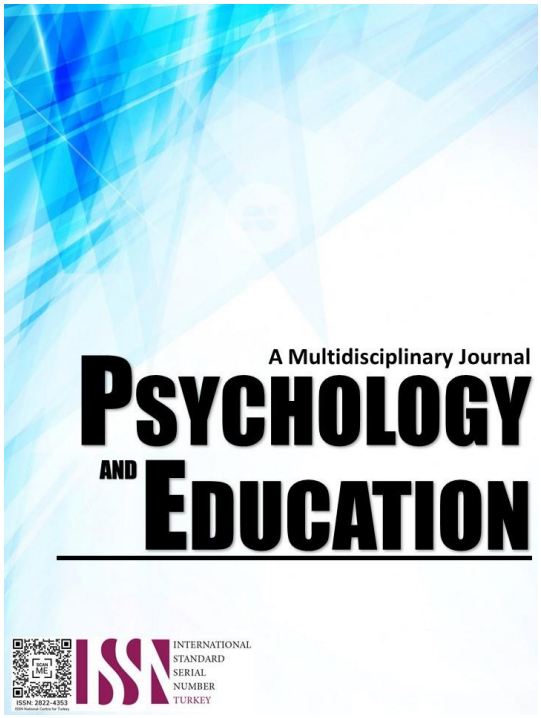
MATHEMATICAL THINKING SKILLS OF BSED- MATH STUDENTS: ITS RELATIONSHIP TO STUDY HABITS AND UTILIZATION OF SCHOOLOGY



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Research Article

Mathematical Thinking Skills of BSED-Math Students: Its Relationship to Study Habits and Utilization of Schoology

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Abstract

This study was conducted to determine the Mathematical Thinking of BSED -Math students: Contributory of Study Habits and Utilization of Schoology. This study made use of Descriptive Correlational research designs. The respondents were selected through Purposive Sampling method. Based on the findings, it reveals that majority of the respondents were typically young adults who were 20 years old and above and were mostly females. The respondents have high level of Mathematical Thinking in terms of connections, representation, communication, reasoning, and problem solving. In terms of Study Habits, respondents have good study habits in terms of time management, self-discipline, concentration, organization, and effort. The respondents have great extent of utilization of Schoology in terms of uploading and notifications, activities and submissions and monitoring and evaluation. The relationship between mathematical thinking skills and the study habits of the respondents indicates a moderate positive correlation. On the other hand, the relationship between mathematical thinking skills and the extent of utilization of schoology of the respondents indicates a weak positive correlation. The result shows that the mathematical thinking skills of BSED-Math 3 students are high. Their study habits are also good and the extent of utilization of schoology is great.

Keywords: *mathematical thinking skills, study habits, utilization of schoology*

Introduction

Thinking skills necessitate both critical and creative aspects of the mind. There are numerous reasoning works in mind during the thinking process. To construct a good thinking system, individuals must use Mathematical Thinking skills in an effective and meaningful manner during the thinking process (Ersoy & Basar, 2012).

Mathematical Thinking is an important goal of schooling. The ability to think mathematically and to use mathematical thinking to solve problems is a fundamental goal of education. Mathematical Thinking Skills are learnt, developed, and supported as they are utilized; these skills are used to establish sense or develop one another. The primary purpose of mathematics education is to foster mathematical thinking. It is desirable to acquire process skills such as creative problem-solving methods. In terms of the extent to which to be efficient in mathematical thinking, it is necessary to be proficient in mathematical techniques of questioning PISA (2016). In addition, in the 2018 tests, the Philippines ranked second to the last (Dominican Republic) in math and science.

With the recent crisis, there are changes that happened specifically to the system of education wherein higher education institutions, especially at the tertiary level, are adopting learning approaches such as using online learning platforms to continue enhancing the student habits of learning and improving student performance. As a respond to it, Notre Dame of Midsayap College introduces Schoology as an alternative way for students to continue learning and enhance their thinking skills. Students and teachers can access Schoology anytime and anywhere which is a great help for the students in Notre Dame of Midsayap College as it became the bridge of learning. According to Priyatno (2017), Schoology gives college students and teachers with a special social networking trip that encourages reflection, sharing, interaction and overall, supports satisfactory practices in pedagogy and cooperative cell gaining knowledge to improve mathematical thinking skills.

With the changes happened, this study focused on the relationship of study habits and utilization of Schoology to the Mathematical Thinking Skills of the respondents. The researchers investigated the relationship of the level of mathematical thinking skills and the study habits of the respondents. Similarly, the researchers also investigated the relationship of the level of mathematical thinking skills and the extent of utilization of Schoology by the respondents.

Research Questions

This study aimed to determine the Mathematical Thinking Skills of BSED-Math Students: Its Relationship to Study Habits and Utilization of Schoology. Specifically, this study sought to answer the following questions:

1. What are the demographic profiles of the respondents in terms of age and sex?
2. What is the level of Mathematical Thinking Skills of the respondents in terms of Connections, Representation, Communication, Reasoning, and Problem Solving?
3. What are the study habits of the respondents in terms of Time Management, Self-Discipline, Concentration, Organization, and Effort?
4. What is the extent of utilization of Schoology by the respondents in terms of Uploading and Notifications, Activities and Submissions, and Monitoring and Evaluation?
5. Is there a significant relationship between the level of Mathematical Thinking Skills and the study habits of the respondents?
6. Is there a significant relationship of the level of Mathematical Thinking Skills and the extent of utilization of Schoology by the respondents?

Literature Review

Mathematical Thinking Skills

The most important feature that distinguishes mathematical thinking which includes high level thinking skills from other forms of thinking is that an individual obtains a new knowledge or concept by using abstraction, estimation, generalization, hypothesis and testing, reasoning, proving, and describing using mathematical knowledge and concepts previously learned (Alkan and Güzel, 2005). Students with high-level thinking skills can recognize the reflections of the information they have learned in real-life situations and gain the ability to understand the problems they encounter and to solve them easily and effectively.

According to Mason, Burton, and Stacey (2010), Mathematical thinking is a dynamic process that helps us understand complex systems by merging our ideas. The five important assumptions are that a person has a mathematical mind, practice and reflection can help enhancing the mathematical thinking, contradiction, stress, and surprise are all stimuli for mathematical reasoning, it can thrive in an environment that encourages questioning, confronting, and pondering and lastly, Mathematical thinking can assist in better understanding yourself and the world around you.

Similarly, according to Arslan and İlkörücü (2018) found that the students who undertake math courses, mathematical thinking levels are high. This is because the students who took math courses have skills like doing various activities, such as dealing with a problem, reflecting on experiences, and studying a defined problem method, can help to enhance mathematical thinking skills.

According to Aljaberi (2014), if we can investigate students' mathematical thinking processes and skills in detail and discover their thinking habits, we can speed up the growth of existing habits toward higher-level thinking habits, and therefore improve their thinking processes and pre-service teachers' mathematical thinking improved as their grade levels increased.

Five Areas of Mathematical Thinking Skills

Mathematical Thinking Skills have different areas. The five key areas of Mathematical Thinking are Representation, Reasoning and Proof, Communication, Problem Solving, and Connections (NTCM, 2000).

Problem Solving. According to Costa and Kallick (2009), those who take risks are better at addressing challenges. Students who take what they call "responsible risks" are amenable to trying out novel strategies, and they approach testing novel hypotheses with the mindset. The basic objective of teaching students to solve mathematical problems is to help them acquire a general aptitude for applying mathematics to everyday settings and difficulties (Wilson, Fernandez & Hadaway, 2011). Mathematics is used to quantitatively and spatially characterize both natural and artificial events, according to Dendane (2009). It assists in problem-solving and has facilitated advancements in the social, economic, and technological spheres. The only constant in this life, as is often stated, is changing. (Cardetti, Nirattaya & Orgnero, 2012) say that making notes requires high-level skills. Note-taking can be useful when students re-learn the subject matter. (Cardetti, Nirattaya & Orgnero, 2012) confirmed that partial notes in mathematical assignments are related strongly to high academic performance. In addition, Bohay et al. (2011) say that it is believed that students'' notes which are written in class during the lesson or while reviewing a course material or comprehending a text are an essential tool for learning.

Reasoning. Solving problems entails more than simply listing or summarizing an answer. To

encourage students to think mathematically, they must be given opportunities to make conjectures, test them, and prove or justify their conclusions. This is the reasoning and proof process. It is what some other countries refer to as a mathematical investigation that promotes the understanding of mathematics. According to Wood (2001), understanding mathematics occurs best when children are expected to problem-solve, reason, and communicate their ideas and thinking to others. Additionally, a student with good reasoning can speculate, test ideas, and defend or argue them through contextualized problem-solving tasks (Diezmann, Watters & English, 2001).

Communication. Problem solving and sound mathematical reasoning are almost certainly two of the most critical characteristics of a successful mathematical thinker. Another that is almost certainly just as critical is mathematical communication. He or she lacks the ability to justify their actions with examples and does not value feedback. However, students who excel at mathematical communication seek clarification. It occurs as a result in Smieskova's (2017) research, which found that mathematical communication skills are effective tools for promoting students' creativity and motivation in mathematics. According to Wood, (2001), presentations, explanations, and arguments are fundamental mathematical communication approaches that motivate students to discuss, exchange, and reflect. Respondents' critical thinking skills are then tested when they reason with teachers. Additionally, Hasibuan, Saragih, and Amry (2019) reinforce this statement by stating the importance of mathematical communication ability in mathematics, but the facts encountered in the field show that the still low ability of students in mathematical communication. The low of students' mathematical communication ability is the importance of mathematical communication skill in mathematics, but the real encounter with the field shows that the low ability of ' mathematical communication students.

Representation. If a good explanation and representation of the solution are not provided, it can be difficult to get a clear picture of what a student is thinking. As Clarke, Goos, and Morony (2007) state, developing an appropriate visual representation of a problem's information is critical to successful problem solving. Exceptional mathematical thinking is characterized using this technique. Instead of relying on one-time opportunities to demonstrate what they know and how they arrived at a solution, students should be provided with multiple opportunities to practice this skill. According to (Duval, 2006), "without a representation action, no knowledge can be mobilized by an individual." Furthermore, representation is essential to the learning of mathematics since it enables students to visualize ideas using symbols, letters, diagrams, objects, pictures, and graphs.

Connections. Solving problems, proving your arguments, communicating your ideas clearly, and representing your ideas visually all lead to a deeper understanding of mathematical concepts and problems. He calls it "sense-making," Based on Siregar and Siagian, (2019) study by making connections, mathematical concepts that have been realized are not left as a separate part but are used as basic knowledge to understand new concepts. Through the teaching process that emphasizes the relationship between mathematical ideas, students will not only learn about mathematics, but about the usefulness of mathematics. Making higher-level connections, according to Costa and Kallick (2009), is what allows students to connect a mathematical event with new concepts or skills in a way that connects familiar ideas.

Study Habits. Study habits are another variable related to distance learning student performance. Learning habits reflect a learner's normal learning behaviour and serve to evoke and guide the learner's cognitive processes during learning. Learning habits include a variety of activities: time management, setting appropriate goals, choosing appropriate learning environments, using appropriate note-taking strategies, and choosing key ideas and structures (Proctor et al., 2006). More and more college courses are being offered online, especially through the use of synchronous technology, giving educators the opportunity to find the learning environment that best suits their students' learning habits. Depending on the technology used, the online setting can meet the learner's needs. Create virtual presentation media by sharing a variety of videos, images, animations, text, audio, and more. In this sense, Sharpe and Benfield (2005) reviewed e-learning experiences and learning practices in higher education to identify areas worthy of future investigation. They found several links between habits and performance and suggested looking more closely at the experiences, habits, and strategies of effective eLearners. Recent developments in DL techniques have therefore attracted the attention of researchers as to how pedagogical approaches need to work within this framework. Therefore, before incorporating new environments into online higher education courses, you need to gain insight into learner requirements, expectations, learning habits, and learning styles.

Role of Study Habits. According to Arieta, Gementiza and Saco (2017) emphasize the important role of study habits in students' lives. They concluded that each student's success or failure depends on their study habits. Moreover, their success depends on skill, intelligence and dedication. Singh, Muktesh, and Snehalata (2010) found that children's study habits improve with age and grade or grade level. Moreover, most study habits are already formed in higher education. According to Bashir and Mattoo (2012) and Mendezabal (2013), students already in tertiary education had better study habits and were more confident about their academic and educational performance. A student's study habits can play a central role in the learning process, which is reflected in a student's academic performance in mathematics.

Significance of Study Habits

Study habits are the techniques of investigative process you developed throughout your school years. Study habits can be beneficial or detrimental. He went on to say that, like many other habits, the sooner you start honing and developing good habits; the more likely you are to adhere with them. We've all heard that good study habits are fundamental for educational success. Fishman and Shu (n.d.), contend good study habits are an important part of any student's success. We can probably reduce academic dishonesty by promoting good study habits among students and informing them that good study habits are critical in college. Even procrastination could be resolve with effective study habits, and the core key to effectively learning is to strengthen your study habits. Good study techniques are an important asset to have in one's toolbox. If the components are met, effective study habits can be attained. Time management, self-discipline, concentration, organization, and effort are all components of good study habits.

Time Management. Previous research has found that time management has a positive effect. Time management abilities have been shown to improve student learning and outcomes. Multiple studies have found that time management has positive impact. According to Kearns & Gardiner, (2007), time management skills have been proven to have a positive impact on student learning and outcomes indicating that students' capability to effectively maintain their time is the basis for improving better study habits and success strategies. The ability to successfully manage one's time is the foundation for students developing good study habits and success strategies Krause and Coates (2008). Two of these variables were discovered by the researchers: time management and study habits. The provided time management factor contributes to excellent study habits, and study habits affect performance. It will also strengthen its critical thinking abilities.

Self-Discipline. According to Manandhar and Shrestha (2019), there is a moderately positive relationship between self-discipline and study habits, with the higher the self-discipline scores, the higher the study habits scores. Self-discipline is essential in all aspects of learning, including reading, problem solving, and thinking. Academic performance improves as an outcome of this. Develop effective study habits for all respondents, regardless of educational level, because it improves their ability to be self-disciplined, self-directed, and ultimately successful in their degree programs. Finally, the learning process requires the respondents to be self-disciplined in order to meet the expectations.

Concentration. Concentration is a neurocognitive method that entails the capacity to concentrate on the task at hand whereas the neglecting distractions. According to Igun (2007), efficiency in studying the subject matter would provide students with analytical abilities, develop deeper their potential for critical reasoning, boost self-reflection, augment conceptual grasp, and enhance their ability to learn alone.

Organization. Organization crosses all studies for higher education and all life situations. Directly teaching organizational skills aids students for their current task. Students who lack of organizational skills play a significant influence in selecting which students get the most out of their educational experience. Colleges report that freshmen with few study and organizational skills often fail post-secondary education (Gallagher, 2003).

Effort. Students sometimes think of effort as inversely related to ability (such that people with low ability must work harder than people with high ability) and other times think of effort as positively related to ability (such that hard work can lead people to develop high levels of ability). According to Meltzer, Katzir-Cohen, Miller, & Roditi, (2001) hard work, in combination with efficient strategy use, can lead to success in the classroom. In addition, improving study habits accompanies improving the effort in doing the tasks.

Schoology. Schoology is an Online Learning Management System (LMS) which enables educators to arrange curriculum, improve lesson plans, and assess students. Via public or private forums and

cross-application, the LMS platform enables peer collaboration and engagement. It is a web-based course management system that enables teachers to create and oversee academic courses for their students. It gives teachers a way to organize lessons, actively engage, and share content. Schoology provides a secure and safe, easy-to-use way for teachers, students, parents, and administrators to communicate and collaborate to enhance students' learning seamlessly and success (Carrollwood Day School (n.d.)). Ssekakubo, Suleman, and Marsden (2012) states that an institution will not achieve the benefits of learning process if LMS will not be used by the institutions.

According to Natalia (2016), development of e-learning with Schoology has exciting, easy-to-use, and effective qualities used as enrichment learning. And (Misbah, 2018) finds that the development of Schoology-based e-learning can train digital literacy and is suitable for use in learning.

Utilization of Schoology. Schoology helps teachers open broad communication opportunities for students to take part in discussions and teamwork. Besides that, Schoology is also supported by various forms of media such as video, audio and images that can attract students' interests. Schoology directs students to apply the use of technology in learning (Sicat, 2015).

The Schoology as a Learning Management System (LMS) has been applied by various institutions in many countries for online learning as well as blended learning. Byrd (2013) confirmed the benefits of Schoology including the easiness of use, the security for student's safety, and the efficient tools and resources for teachers. Catapano (n.d.) mentioned the benefits of Schoology for its features. There are, however, the challenges of Schoology cover the weakness of students to get troubled, the limited account that can be opened on one computer synchronously, and low moderation of student comments and discussions (Byrd, 2013). As Schoology is a closed system, any posts uploaded on Schoology would not be shared with people outside Schoology, and students are rather difficult to build their social media relationships because it is moderated by teachers (Catapano, n.d.)

One of the popular learning management systems gaining popularity nowadays in the field of blended or online learning is the Schoology. Within Schoology, students can access their grades, attendance list, and teacher feedback on electronically submitted assignments. Access to this information increases communication between lecturers and students and holds students more responsible for their academic assignments (Sicat, 2015). In addition, Wall (2014, as cited in Sicat, 2015) argued that "Schoology offers much more than just the Facebook factor. Students find that submitting assignments, taking tests, making comments, and asking questions are smooth and intuitive for them, and they retain access to resources in their courses after the semester ends".

Relationship of Mathematical Thinking Skills and Study Habits

According to Osa-Edoh and Alutu (2012), students that have good study habits, tend to get increase their mathematical thinking skills. With this, study habits are highly correlated to the mathematical thinking skills of the student at University of Melbourne taking up mathematics courses the degree of learning depends on the amount of time the child is actively engaged in learning. The time spent on studying helps students to retain the materials learnt, which will eventually boost the students' mathematical thinking skills. In addition, higher intrinsic motivation in mathematics and having an interest in mathematics also outside school are related to one another (Tossavainen's and Juvonen's, 2015).

Mathematical Thinking Skills and Extent of Utilization of Learning Management Systems (LMS)

Pendidikan Matematika Realistik Indonesia (PMRI) merupakanadaptasidari Realistic Mathematics Education (RME) are learning approach that encourages every student in the mathematics class to do mathematical contests in using mathematics to solve everyday problems or mathematical problems they face. This can improve the mathematician's student, which is an essential component of mathematical literacy so that it can automatically improve students' mathematical literacy.

According to Maulana, Wardono, Marwoto and Mariani (2019) stated that realistic e-schoology learning effectively improves mathematical literacy skills and HOTs. With realistic e-schoology learning, students always learn to solve contextual problems in everyday life with unlimited space and time (with e-schoology) to contribute to the components of mathematical literacy of HOTs, which they can improve. In addition, the researchers concluded that realistic learning and using of schoology can improve mathematical literacy skills in junior high school students. Using contextual problems (in practical learning) offers some potential to engage and motivate

students in learning mathematics.

Methodology

This study made use of the descriptive correlational research designs. It described the demographic profile of the respondents and determined the level of Mathematical Thinking Skills. Moreover, it described the study habits and the extent of utilization of Schoology. Finally, it determined whether there is significant relationship on the level of Mathematical Thinking Skills and the study habits of the respondents. On one hand, it determined the relationship of the level of Mathematical Thinking Skills and the extent of utilization of Schoology by the respondents.

Participants

Notre Dame of Midsayap College is the first Notre Dame School in Asia which was established in the year 1941. It is a private sector and one of the most well-known schools in Midsayap, Cotabato. This study was conducted in Notre Dame of Midsayap College, Poblacion 5, Midsayap, Cotabato. This takes placed during the second semester of the school year 2021-2022. The respondents are thirty (30) BSED Mathematics major students of Notre Dame of Midsayap College regardless of the year they are in.

Instruments of the Study

The study utilized a researchers' made questionnaire in gathering data. Part I of the questionnaire contains the demographic profile of the respondents in terms of age and gender. Part II determines the Level of Mathematical Thinking Skills of the respondents which were rated using the 5-point Likert scale of 1-5; where 5-Strongly agree, 4-Agree, 3-Moderately Agree, 2- Disagree, and 1- Strongly Disagree. Part III focuses on the Study Habits of the respondents which were rated using the 5-point Likert scale of 1-5; where 5-Always, 4-Often, 3-Sometimes, 2- Rarely and 1-Never. Part IV determines extent of Utilization of Schoology of the respondents which will be rated using the 5-point Likert scale of 1-5; where 5-Always, 4-Often, 3-Sometimes, 2- Rarely and 1-Never.

Procedure

The researcher asked the consent from their research Adviser and the research Instructor a letter noted by the Dean of the College of Education of Notre Dame of Midsayap College, where permission was secured to conduct a survey among the Bachelor of Secondary Education Major in Mathematics students of Notre Dame of Midsayap College. After seeking approval, the questionnaire was administered to the respondents through face to face and use of the Schoology platform. To ensure understanding and objectivity the researchers will explain first the content of the questionnaires and will allow the respondents to ask for clarifications along the way. They are given enough amount of time to answer to minimize pressure and feel relaxed. After the respondents answered the questionnaire, the researchers retrieved them. The data gathered were subjected to analysis using a statistical program.

Results

This section presents the results of the study. The data were presented in tabular form, which include the socio-demographic profiles of the respondents, level of mathematical thinking skills, study habits and extent of utilization of schoology of the respondents.

Table 1. *Profile of the Respondents*

Variable		*Frequency*	*Percentage (%)*
Age			
18		2	6.67
19		5	16.67
20 and above		23	76.67
	Total	30	100.00
Sex			
Male		17	56.67
Female		13	43.33
	Total	30	100.00

Age of Respondents. Data show that more than half (76.67%) of the respondents are 20 years old and above; although a considerable number (16.67%) of them are younger (19 years old) and the remaining number (6.67%) are ages 18-year-old.

Sex of Respondents. Data show that most (56.67%) of the respondents are males, while a smaller (43.33%) number are females. These figures indicate the majority are male BSED-Math Major students over female BSED-Math Major students enrolled in the A.Y. 2021-2022 in terms of number.

Level of Mathematical Thinking Skills. The information pertaining to the respondents' level of mathematical thinking skills of the respondents in terms of Connections, Representation, Communication, Reasoning, and Problem Solving were consolidated in Table 2 and Table 2.1.

Table 2. *Level of Mathematical Thinking Skill*

Mathematical Thinking Skills	*Mean*	*SD*	*Description*	*Interpretation*
Connections				
1. I can easily connect familiar ideas to new concepts and skills.	3.70	0.60	Agree	High Level
2. I can visualize on how mathematical ideas are related.	3.80	0.48	Agree	High Level
3. I can visualize on how mathematical ideas or concepts are connected to other subjects and the real world.	3.80	0.61	Agree	High Level
4. I can connect new problems that I have encountered before.	4.00	0.69	Agree	High Level
5. I can connect mathematical ideas between mathematics and other subjects.	3.87	0.73	Agree	High Level
Total Mean& SD	3.83	0.62	Agree	High Level
Representation				
6. I can use representation to help others know, figured out, and how to problem was solved.	3.93	0.64	Agree	High Level
7. I know the right or appropriate representation to use and when to use it.	3.97	0.67	Agree	High Level
8. I can list ways to represent a problem and its solution.	3.83	0.53	Agree	High Level
9. I use range of representation in expressing my thinking.	3.77	0.50	Agree	High Level
10. I can use representation to help convey the mathematical focus of lessons.	3.83	0.53	Agree	High Level
Total Mean& SD	3.87	0.57	Agree	High Level
Communication				
11. I usually seek clarification.	4.23	0.68	Agree	High Level
12. I realize it is okay to struggle in math and make mistakes.	4.50	0.78	Strongly Agree	Very High Level
13. I can explain my thinking clearly and concisely.	3.77	0.63	Agree	High Level
14. I ask others to figure out and explain any new ideas they have.	4.40	0.67	Agree	High Level
15. I can explain the mathematical steps that I used.	4.03	0.67	Agree	High Level
Total Mean& SD	4.19	0.69	Agree	High Level
Reasoning				
16. I can use data to make, test, or argue a conjecture.	3.80	0.55	Agree	High Level
17. I can explain the reasons behind mathematical thinking.	3.63	0.61	Agree	High Level
18. I can use a variety of reasoning	3.70	0.79	Agree	High Level
Problem Solving				
21. I can show confidence in solving problems.	3.93	0.58	Agree	High Level
22. I can demonstrate persistence when encountering a difficult problem and does not give up.	4.00	0.64	Agree	High Level
23. I know what to do when the problem is not familiar and can switch strategies if one is not working.	3.90	0.61	Agree	High Level
24. I list problem solving strategies to call upon when solving problems.	3.77	0.82	Agree	High Level
25. Mathematical thinking helps in finding solutions to my everyday problems.	3.87	0.82	Agree	High Level
Total Mean& SD	3.89	0.69	Agree	High Level
Overall	3.93	0.65	Agree	High Level

Connections. Data in table 2 shows that the composite mean 3.83, described as Agree with an SD of 0.62. Item 4 yielded the highest mean value of 4.00, described as Agree with an SD of 0.69 by the respondents which states that *I can connect new problems that I have encountered before.* While item 1, *I can easily connect familiar ideas to new concepts and skills* obtained a low mean rating of 3.70 which is also described as Agree with an SD of 0.60.

Representation. Data in table 2 shows that the composite mean 3.87, described as Agree with an SD of 0.57. Item 7 yielded the highest mean value of 3.97, described as Agree with an SD of 0.67 by the respondents which state that *I know the right or appropriate representation to use and when to use it.* While item 9, *I use range of representation in expressing my thinking* obtained a low mean rating of 3.77 which is also described as Agree with an SD of 0.50.

Communication. Data in table 2 shows that the composite mean 4.19, described as Agree with an SD of 0.69. Item 12 yielded the highest mean value of 4.50, described as Strongly Agree with an SD of 0.78 by the respondents which state that *I realize it is okay to struggle in math and make mistakes*. While item 13, *I can explain my thinking clearly and concisely* obtained a low mean rating of 3.77 which is also described as Agree with an SD of 0.63.

Reasoning. Data in table 2 shows that the composite mean 3.85, described as Agree with an SD of 0.66. Item 19 yielded the highest mean value of 4.20, described as Agree with an SD of 0.66 by the respondents which state that *I listen to others mathematical thinking.* While item 17, *I can explain the reasons behind mathematical thinking* obtained a low mean rating of 3.63 which is also described as Agree with an SD of 0.61.

Problem Solving. Data in table 2 shows that the composite mean 3.89, described as Agree with an SD of 0.69. Item 22 yielded the highest mean value of 4.00, described as Agree with an SD of 0.64 by the respondents which state that *I can demonstrate persistence when encountering a difficult problem and does not give up.* While item 24, *I list problem solving strategies to call upon when solving problems* obtained a low mean rating of 3.77 which is also described as Agree with an SD of 0.82.

Table 2.1*Summary on the Level of Mathematical Thinking Skills of Respondents*

Mathematical Thinking Skills	*Mean*	*SD*	*Description*	*Interpretation*
Connections	3.83	0.62	Agree	High Level
Representation	3.87	0.57	Agree	High Level
Communication	4.19	0.69	Agree	High Level
Reasoning	3.85	0.66	Agree	High Level
Problem Solving	3.89	0.69	Agree	High Level
Overall Mean & SD	3.93	0.65	Agree	High Level

Table 2.1 shows that the highest clustered mean was under the Communication which yielded a mean value of 4.19, described as Agree with an SD of 0.69. While the lowest clustered mean is under the Connections which yielded a mean value of 3.83, described as Agree with an SD of 0.62. Furthermore, the overall mean is 3.93, described as Agree with an overall SD of 0.65.

Study Habits of the Respondents

The information pertaining to the study habits of the respondents in terms of Time Management, Self-Discipline, Concentration, Organization and Effort are consolidated in Table 3 and Table 3.1.

Table 3.*Study Habits of the Respondents*

Study Habits	*Mean*	*SD*	*Description*	*Interpretation*
Time Management				
1. I set aside time each day for studying.	3.73	0.78	Often	Good
2. I allot a reasonable amount of time to each subject.	3.63	0.72	Often	Good
3. I spend less time with my friends during school days to concentrate more on my studies.	3.73	0.74	Often	Good
Total Mean& SD	3.70	0.75	Often	Good
Self – Discipline				
4. I never missed a single homework every day.	4.10	0.71	Often	Good
5. I study in the same place.	3.73	0.87	Often	Good
6. I review my notes in regular basis.	3.57	0.82	Often	Good
Total Mean& SD	3.80	0.80	Often	Good
Concentration				
7. I set my mind to study and stick to it.	3.93	0.78	Often	Good
8. I write down important things that my teachers say.	4.13	0.78	Often	Good
9. I pay attention to important things that teachers say.	4.37	0.85	Often	Good
Total Mean& SD	4.14	0.80	Often	Good
Organization				
10. I keep all my study materials in one convenient location.	4.10	0.92	Often	Good
11. I make a list of topics that I am going to study.	3.87	0.97	Often	Good
12. I place my lessons in a notebook or file folder.	4.20	0.96	Often	Good
Total Mean& SD	4.06	0.95	Often	Good
Effort				
13. I recite out important keywords when I study.	4.00	0.91	Often	Good
14. I give myself a practice test about what I have just studied.	3.70	0.84	Often	Good
15. I define terms that are not familiar to me.	3.73	0.83	Often	Good
Total Mean& SD	3.81	0.86	Often	Good
Overall	3.90	0.83	Often	Good

Time Management. Data in table 3 shows that the composite mean 3.70, described as Often with an SD of 0.75. Item 1 and item 3 yielded the highest mean value of 3.73, described as Often with an SD of 0.78 and 0.74 by the respondents which state that *I set aside time each day for studying* and *I spend less time with my friends during school days to concentrate more on my studies*. While item 2, *I allot a reasonable amount of time to each subject* obtained a low mean rating of 3.63 which is also described as Often with an SD of 0.72.

Self-Discipline. Data in table 3 shows that the composite mean 3.80, described as Often with an SD of 0.80. Item 4 yielded the highest mean value of 4.10, described as Often with an SD of 0.71 by the respondent which states that *I never missed a single homework every day*. While item 6, *I review my notes in regular basis* obtained a low mean rating of 3.57 which is also described as Often with an SD of 0.82.

Concentration. Data in table 3 shows that the composite mean 4.14, described as Often with an SD of 0.80. Item 9 yielded the highest mean value of 4.37, described as Often with an SD of 0.85 by the respondents which states that *I pay attention to important things that teachers say.* While item 7, *I set my mind to study and stick to it* obtained a low mean rating of 3.93 which is also described as Often with an SD of 0.78.

Organization. Data in table 3 shows that the composite mean 4.06, described as Often with an SD of 0.95. Item 12 yielded the highest mean value of 4.20, described as Often with an SD of 0.96 by the respondents which states that *I place my lessons in a notebook or file folder.* While item 11, *I make a list of*

topics that I am going to study obtained low mean rating of 3.87 which is also described as Often with an SD of 0.97.

Effort. Data in table 3 shows that the composite mean 3.81, described as Often with an SD of 0.86. Item 13 yielded the highest mean value of 4.00, described as Often with an SD of 0.91 by the respondents which states that *I recite out important keywords when I study.* While item 14,*I give myself a practice test about what I have just studied* obtained low mean rating of 3.70 which is also described as Often with an SD of 0.84.

Table 3.1. *Summary on the Study Habits of Respondents*

Study Habits	*Mean*	*SD*	*Description*	*Interpretation*
Time Management	3.70	0.75	Often	Good
Self-Discipline	3.80	0.80	Often	Good
Concentration	4.14	0.80	Often	Good
Organization	4.06	0.95	Often	Good
Effort	3.81	0.86	Often	Good
Overall Mean & SD	3.90	0.83	Often	Good

Table 3.1 shows that the highest clustered mean was under the Concentration which yielded a mean value of 4.14, described as Often with an SD of 0.80. While the lowest clustered mean is under the Time Management which yielded a mean value of 3.70, described as Often with an SD of 0.75.Furthermore, the overall mean is 3.90, described as Often with an overall SD of 0.83.

Utilization of Schoology. The information pertaining to the extent of utilization of schoology of the respondents in terms of Uploading and Notifications, Activities and Submissions and Monitoring and Evaluation are consolidated in Table 4 and Table 4.1.

Uploading and Notifications. Data in table 4 shows that the composite mean 4.38, described as Often with an SD of 0.62. Item 2 yielded the highest mean value of 4.67, described as Always with an SD of 0.55 by the respondents which state that *I check the deadlines in the upcoming section.* While item 3, *I go back to the past lessons posted by my teachers* obtained a low mean rating of 3.77 which is also described as Often with an SD of 0.68.

Activities and Submissions. Data in table 4 shows that the composite mean 3.96, described as Often with an SD of 0.80. Item 7 and 11 yielded the highest mean value of 4.13, described as Often with an SD of 0.73 and 0.92 by the respondents which state that, *I always participate in class discussions,* and *I post comments/reactions in comments section.* While item 12, *I send messages to the teachers for queries* obtained low mean rating of 3.75 which is also described as Often with an SD of 0.92.

Table 4. *Utilization of Schoology of the Respondents*

Utilization of Schoology	*Mean*	*SD*	*Description*	*Interpretation*
Uploading and Notifications				
1. I check the reminders posted by my teachers.	4.40	0.72	Often	Great Extent
2. I check the deadlines in the upcoming sections.	4.67	0.55	Always	Very Great Extent
3. I go back to the past lessons posted by my teachers	3.77	0.68	Often	Great Extent
4. I opened the folders that contain learning materials.	4.53	0.57	Often	Great Extent
5. I always see announcements posted by the school administrators	4.50	0.57	Always	Very Great Extent
6. I am notified of newly uploaded learning materials.	4.43	0.63	Often	Great Extent
Total Mean& SD	4.38	0.62	Often	Great Extent
Activities and Submissions				
7. I always participate in class discussions.	4.13	0.73	Often	Great Extent
8. I collaborate/interact with my classmates	3.90	0.71	Often	Great Extent
9. I perform my tasks anywhere and anytime.	3.93	0.69	Often	Great Extent
10. I accomplished my tasks or assignments on time.	3.90	0.90	Often	Great Extent
11. I post comments/reactions in comments section.	4.13	0.92	Often	Great Extent
12. I send messages to the teachers for queries.	3.75	0.92	Often	Great Extent
13. I receive responses from the teachers about the queries.	3.90	0.76	Often	Great Extent
Total Mean& SD	3.95	0.80	Often	Great Extent
Monitoring and Evaluation				
14. I regularly keep track of my grades and performances.	4.23	0.57	Often	Great Extent
15. I am updated of the results of my quizzes, assignments, and examinations.	4.33	0.71	Often	Great Extent
Total Mean& SD	4.28	0.64	Often	Great Extent
Overall	4.20	0.68	Often	Great Extent

Monitoring and Evaluations. Data in table 4 shows that the composite mean 4.28, described as Often with an SD of 0.64. Item 15 yielded the highest mean value of 4.33, described as Often with an SD of 0.71 by the respondents which states that *I am updated of the results of my quizzes, assignments, and examinations.* While item 14,*I regularly keep track of my grades and performances* obtained low mean rating of 4.23 which is also described as Often with an SD of 0.57.

Table 4.1. Summary on the Extent of Utilization of Schoology of the Respondents

Utilization of Schoology	*Mean*	*SD*	*Description*	*Interpretation*
Uploading and Notifications	4.38	0.62	Often	Great Extent
Activities and Submissions	3.95	0.80	Often	Great Extent
Monitoring and Evaluation	4.28	0.67	Often	Great Extent
Overall Mean & SD	4.20	0.68	Often	Great Extent

Table 4.1 shows that the highest composite mean is under the Uploading and Notifications which yielded a

mean value of 4.38, described as Often with an SD of 0.62. While the lowest composite mean is under the Activities and Submissions which yielded a mean value of 3.95, described as Often with an SD of 0.80.Furthermore, the overall mean is 4.20, described as Often with an overall SD of 0.68.

Relationship between Mathematical Thinking Skills and Study Habits

The information about the relationship of the variable mathematical thinking skills to the study habits of the respondents are contained in Table 5 and visualized in Figure 2.

Table 5. *Relationship between Mathematical Thinking Skills and Study Habits of the Respondents*

Variables	*r-values*	*Indication*	*p-value*	*Decision*	*Indication*
Mathematical Thinking Skills Study Habits	0.57	*Moderate Positive Correlation	0.0009	Reject Ho1 Hypothesis	*Significant Relationship

*Significant at p-value ≤0.05

Entries in Table 5 shows that computed r-value for the variable mathematical thinking skills in relation to the variable study habits is 0.57. This figure indicates that there is moderately positive correlation between the two variables. Moreover, the computed p-value with respect to the relationship between the said variables is 0.0009 which is lower than the set p-value of 0.05. This figure indicates that the correlation between the two variables mathematical thinking skills and study habits is significant. The null hypothesis, "There is no significant relationship between the level of mathematical thinking skills and study habits" is rejected.

Figure 1. *Scattered Plot and Correlation Curve for Mathematical Thinking Skills and Study Habits Where r-value0.57.*

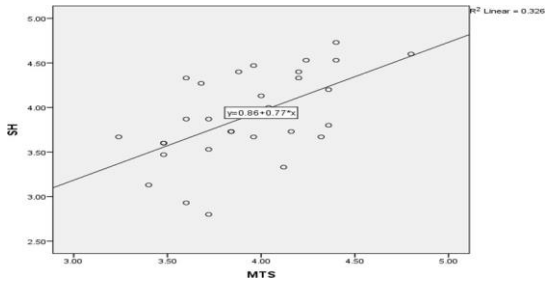

Figure 1 shows that the correlation curve gradually slopes upward from left to right. This means that as the values in x-axis (Mathematical Thinking Skills) increase, the values in y-axis (Study Habits) also gradually increase; and as the values in the x-axis decrease, the values in y-axis also gradually decrease.

Relationship between Mathematical Thinking Skills and Utilization of Schoology

The information about the relationship of the variable mathematical thinking skills to the extent of utilization of schoology of the respondents is contained in Table 6 and visualized in Figure 3.

Table 6**.** *Relationship between Mathematical Thinking Skills and Utilization of Schoology of the Respondents*

Variables	*r-values*	*Indication*	*p-value*	*Decision*	*Indication*
Mathematical Thinking Skills Utilization of Schoology	0.34	Weak Positive Correlation	0.0675	Accept Ho2 Hypothesis	Relationship is not Significant

*Significant at p-value ≤0.05

Entries in Table 6 shows that computed r-value for the variable mathematical thinking skills in relation to the variable utilization of schoology is 0.34. This figure indicates that there is no correlation between the two variables. Moreover, the computed p-value with respect to the relationship between the said variables is 0.0675 which is higher than the set p-value of 0.05. This figure indicates that the correlation between two variables mathematical thinking skills and utilization of schoology is not significant. The null hypothesis, "There is no significant relationship between the level of mathematical thinking skills and the extent of utilization of schoology" is accepted.

Figure 2.*Scattered Plot and Correlation Curve for Mathematical Thinking Skills and Utilization of Schoology Where r-value is 0.34*

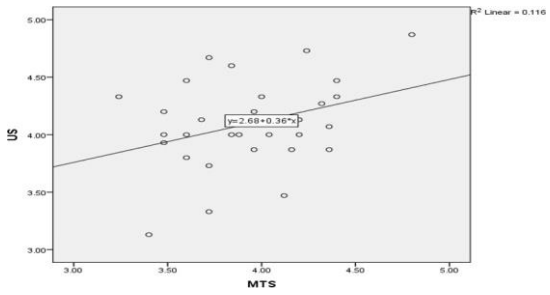

Figure 2 shows that the correlation curve slightly

slopes upward from right to left. This means that as the values in x-axis (Mathematical Thinking Skills) increase, the values in y-axis (Utilization of Schoology) slightly increase; and as the values in the x-axis decrease, the values in y-axis slightly decrease.

Discussion

This section discusses and explains the meanings and implications of the results of the study relative to the Personal Profile of the Respondents, Mathematical Thinking Skills, Study Habits, Utilization of Schoology, the Correlation Between their Mathematical Thinking Skills and Study Habits and the Correlation Between their Mathematical Thinking Skills and Utilization of Schoology. It also contains an overview of the study summary of findings, conclusion, and recommendation.

Profile of the Respondents

Age of the Respondents. Result shows that most of the respondents are 20 years old and above, a considerable number are younger (19 years old), and the remaining number is ages 18-year-old. According to the survey of the Philippine Statistics Authority (2021), the educational attainment of the population in the Philippines has improved and specified that most of the students who are ages 19 and above are already in tertiary levels

Sex of the Respondents. Results show that most of the respondents are males, which implies that the population of male Mathematics Education students is higher, and most Mathematics Education Students are male. Open (July 2, 2015), says that men outnumbered women in teaching mathematics in Washington State University not because the former are better skilled, but they *believe* that they are well equipped to do the complicated mathematics associated with these disciplines which this agrees with the result of this study.

Level of Mathematical Thinking Skills

In terms of Connections. Result show that the Level of mathematical thinking skills in terms of connections is high. *I can connect new problems that I have encountered before* has the highest value. This implies that respondents have a wider range of knowledge and connects it to new one. This finding supports the study of Siregar and Siagian (2019), which stated that in Mathematics, lessons are interconnected, wherein what you have learned in a specific math subject will be applied in another math subject. Moreover, by making connections, mathematical concepts that have been realized are not left as a separate part but are used as basic knowledge to understand new concepts.

However, *I can easily connect familiar ideas to new concepts and skills* garnered the low mean rating. Through the teaching process that emphasizes the relationship between mathematical ideas, students will not only learn about mathematics, but about the usefulness of mathematics. It shows that the respondents can show confidence that they have mathematical skill but have low recall and connecting ability. The finding is supported by the study of Costa and Kallick (2009) that those students who engage in what they refer to as "responsible risk taking" are open to experimenting with new approaches and techniques, and they approach testing new hypotheses with the mindset. In addition, the main goal in teaching mathematical problem-solving is for the students to develop a generic ability to solve real-life problems and to apply mathematics in real life situations.

In terms of Representation. In the level of mathematical thinking skills in terms of representation, data shows it was high. This implies that the respondents signify a high level of mathematical thinking regarding representation. *I know the right or appropriate representation to use and when to use it* represents the highest mean. This implies that respondents are confident on what are the proper usage and applications of representation. The result is parallel to the study of Clarke, Goos, and Morony (2007) that developing an appropriate visual representation of a problem's information is critical to successful problem solving. Exceptional mathematical thinking is characterized by the use of this technique. (Duval, 2006) also added that, "without a representation action, no knowledge can be mobilized by an individual." As a result, the level of mathematical thinking associated with the art of representation of the respondents was improved. It aids respondents in visualizing and thinking about abstract and logical topics.

While *I use range of representation in expressing my thinking* garnered a lowest mean under representation. This implies that respondents have only limited range of representation. They express their opinions and learning in some ways that they are comfortable but not the proper representation. The result is parallel to the study of (Duval, 2006), where he says in learning mathematics, representation is crucial because it allows students to visualize concepts using signs,

letters, diagrams, objects, pictures, and graphs. In contrast, Clarke, Goos, and Morony (2007), says a good mathematician always has a wide range of representation strategies at his or her disposal.

In terms of Communication. Results show that in terms of communication, the level of mathematical thinking of the respondents is high. *I realize it is okay to struggle in math and make mistakes* garnered a highest mean out of all items. This shows that respondents are resilient in learning mathematics. They struggle and able to survive in learning mathematics, thus they are learning on their mistakes. As a result, the findings are supported by the study of Smieskova's (2017), which found that mathematical communication skills are effective tools for promoting students' creativity and motivation in mathematics. The students convey that being motivated and creativity leads to the expanding their mathematical thinking skills. In this setting, students can also engage in dialogues with other students to better grasp their views and points of view. In addition (Wood, 2001) says that), presentations, explanations, and arguments are fundamental mathematical communication approaches that motivate students to discuss, exchange, and reflect.

However, *I can explain my thinking clearly and concisely* have the lowest mean under Communication. It means that respondents have low skills on communicating their ideas and answer. Furthermore, Hasibuan, Saragih and Amry (2019) also reinforces this statement by stating that once the importance of mathematical communication ability in mathematics, but the facts encountered with the field shows that the still low ability of students ' mathematical communication. The low of students' mathematical communication ability is an importance of mathematical communication skill in mathematics, but the real encountered with the field shows that the low ability of ' mathematical communication students.

In terms of Reasoning. In terms of reasoning results show that the respondents have high mathematical thinking. *I listen to others mathematical thinking* has the highest mean value among statements presented. This shows that respondents agree that they can investigate and learn a new understanding from others and relating to personal thinking. This is anchored to the study of two Wood (2001), that it says understanding mathematics occurs best when children are expected to problem solve, reason, and communicate their ideas and thinking to others. Additionally, it is believed that situations of confusion and clash of ideas in which students are allowed to struggle for resolution are precisely the settings that promote understanding learning. While *I can explain the reasons behind mathematical thinking* has the lowest mean value under reasoning. This implies that respondent's lack of communication skill in reasoning their ideas and learning. This finding is supported by the study of (Diezmann, Watters and English, 2001), that a student with good reasoning can speculate, test ideas and defend or argue them through contextualized problem solving tasks.

In terms of Problem Solving. Results show that the respondents have high level of mathematical thinking in problem solving. *I can demonstrate persistence when encountering a difficult problem and does not give up* have the highest mean value in problem solving. They show confidence in doing the math, finding the answer, and choosing the appropriate strategy in mathematics. The result is also anchored to (Wilson, Fernandez and Hadaway, 2009), wherein the basic objective of teaching students to solve mathematical problems is to help them acquire a general aptitude for applying mathematics to everyday settings and difficulties With this, the respondents see mathematics in their daily lives that they can apply and create solutions to the present real-world problems. Also (Dendane, 2009) states that, Mathematics is used to quantitatively and spatially characterize both natural and artificial events. It is used to solve problems, and it has helped make social, economic, and technological advances. Respondents possess this kind of ability, but they need to hone it to reach the highest level of mathematical thinking skill.

Meanwhile, *I list problem solving strategies to call upon when solving problems* garnered a lowest mean in terms of reasoning. This means that respondent's only relying to what they learn and on what they have remembered. This finding confirms that note-taking strategies help respondents problem solving becomes higher. (Cardetti, Nirattaya and Orgnero, 2012) says that making notes requires high-level skills. Note-taking can be useful when students re-learn the subject matter. (Cardetti, Nirattaya and Orgnero, 2012) confirmed that partial notes in mathematical assignments are related strongly to high academic performance. In addition, (Bohay et al., 2011) says that it is believed that students'' notes which are written in class during the lesson or while reviewing a course material or comprehending a text are essential tool for learning. Good note-taking practices can lead to efficient study practices, better course outcomes, and improve retention of content beyond a course's conclusion.

Overall Results on the Mathematical Thinking Skills. The findings of study reveal that the respondents fairly agreed on Mathematical Thinking Skills in terms of connections, representation, communication, reasoning, and problem solving. This finding implies that the students have a high level of mathematical thinking, considering the full scale. They also had high levels in the five key areas of mathematical thinking skills. Arslan and İlkörücü (2018) found that the students who undertake math courses, mathematical thinking levels are high. Students with high-level thinking skills can recognize the reflections of the information they have learned in real-life situations and gain the ability to understand the problems they encounter and to solve them easily and effectively (Alkan and Güzel, 2005). Aljaberi (2014) also concluded that pre-service teachers' mathematical thinking improved as their grade levels increased.

Study Habits of the Respondents

In terms of Time Management. The results show that all the respondents answered "often" to all the statements. This means that the study habits of respondents in terms of Time Management is good. Moreover, they signified higher agreement to the items *I set aside time each day for studying* and *I spend less time with my friends during school days to concentrate more on my studies*. This further implies that the respondents are using their time properly for studying and concentrate on their studies. Researchers such as Krause and Coates (2008), report that the capacity to successfully manage their time is the foundation of students developing good study habits and strategies for success. Two of these variables were discovered by the researchers: time management and study habits. The provided time management factor contributes to excellent study habits, and study habits affect performance. It will also strengthen its critical thinking abilities. This also support the findings of (Kearns & Gardiner, 2007) that time management skills have a positive impact on student learning and student outcomes which indicate that the ability for successfully managing their time is the benchmark of students in developing better study habits as well as strategies for success.

In terms of Self-Discipline. The finding shows high self-discipline in their study habits. They all responded as often to the statements presented, which indicates that the study habits of respondents in terms of Self Discipline is good. Moreover, they signified higher agreement on the item *I never missed a single homework every day*. This further implies that still; self-discipline is a factor to in successful and progressive study habits. The findings are in line with the findings of (Manandhar and Shrestha, 2019) that states that a moderate positive relationship was found between self-discipline and study habits. The higher the scores in self-discipline, the higher the scores in study habits. Self-discipline is essential in all aspects of learning, including reading, problem solving, and thinking. Academic performance improves as an outcome of this. Develop effective study habits for all respondents, regardless of educational level, because it improves their ability to be self-disciplined, self-directed, and ultimately successful in their degree programs. Finally, the learning process requires the respondents to be self-disciplined in order to meet the expectations.

In terms of Concentration. The finding shows that concentration has the highest mean among other areas of study habits. Moreover, they signified higher agreement on the item *I pay attention to important things that teachers say.* This further indicates that the respondents' concentration is good. Igun (2007), in his paper, held that efficiency in studying the subject matter would equip the students with analytical skills, deepen their capacity for critical reasoning, increase self-reflection, augment conceptual grasp, and enhance their ability to learn alone. The study is anchored on the findings of concentration, which plays a significant role in a progressive study habit. It improves respondents' performance as it improves their concentration.

In terms of Organization. The result shows respondents responded as often to all statements presented. This implies that the respondents study habits in terms of organization is good. Moreover, they signified higher agreement on the item *I place my lessons in a notebook or file folder.* This further implies that placing lessons on folder is a way to organize the studying skills. Respondents with strong study and organization skills can break class and homework assignments into subtasks and use time efficiently to complete those assignments, save and store graded papers and handouts for later retrieval, regularly review class notes and course readings, and practice effective study techniques. This shows respondents do organize everything in their tasks. According to (Gallagher, 2003), it says that students' lack of organizational skills plays a significant influence in selecting which students get the most out of their educational experience. Colleges report that freshmen with few study and organizational skills

often fail post-secondary education. With this, organizational skill contributes to respondent's study habits.

In terms of Effort. The result shows that the respondents study habits are good in terms of effort as data shows they responded as often to all the statements. They imply that the respondents signified their higher agreement to item *I recite out important keywords when I study.* This means that effort is important in studying. The study by (Meltzer, Katzir-Cohen, Miller, & Roditi, 2001) indicated that hard work, in combination with efficient strategy use, can lead to success in the classroom. Improving study habits accompanies improving the effort in doing the tasks as the study says that study habits are a mediator of effort and academic performance of the respondents.

Overall Clustered results on the Study Habits of Respondents. The findings of study reveal that the respondents are often doing the study habits in terms of time managements, self-discipline, concentration, organization and effort. This finding implies that the students have a good study habit, considering the full scale. The findings of Singh, Muktesh and Sinehalata (2010) that study habits improve with age and class or grade levels in children. However, most study habits are already formed when students are already in tertiary level. The findings are consistent with more previous studies of Bashir & Mattoo, 2012 and Mendezabal, 2013 that students already in tertiary education had better study habits and were more confident about their academic and educational performance. A student's study habits can play a central role in the learning process, which is reflected in a student's academic performance in mathematics.

Utilization of Schoology of Respondents

In terms of Uploading and Notifications. Results show that respondents have great extent of utilization of Schoology that they frequently check the notifications and uploading of materials. This implies that the respondents signified higher mean to *I check the deadlines in the upcoming sections.* This means that the feature of Schoology utilized can help them be notified of the deadlines of every task posted, such as quizzes, discussions etc. Furthermore, this implies that in uploading and notification, students can access files without any difficulty.

In terms of Activities and Submissions. Results reveal that respondents have great extent of utilization of Schoology that they frequently perform the activities and submitting it. This implies that the respondents signified higher mean to the items, *I always participate in class discussions,* and *I post comments/reactions in comments section.* This finding supports the study of Low (2017), Schoology increased student's motivation and developed student's positive attitudes toward learning outside the classroom, increased interaction between teachers and students, increased student's engagement in learning.

In terms of Monitoring and Evaluation. Results shows that respondents have great extent of utilization of Schoology that they frequently checked, monitor, and evaluate their scores, performance etc. This implies that the respondents signified higher mean to the item, *I am updated of the results of my quizzes, assignments, and examinations.* This means that utilizing of Schoology can help informed students immediately about their scores, such as short and long quizzes and significant exams. Additionally, students can check their grades and performances at any time. Schoology can deliver academic information to students, and students can access their grades, attendance list, and teacher feedback on electronically submitted assignments (Sicat, 2015).

Overall Clustered results on the Extent of Utilization of Schoology of Respondents. The findings of study reveal that the respondents are often performing the activities, tasks etc. given in Schoology. This finding implies that the students have a great extent of Utilization of Schoology, considering the full scale. This was evident from a study conducted by Ssekakubo, Suleman, and Marsden (2012) that an institution will not achieve the benefits of learning process if LMS would not use by the institutions.

Also, the results are anchored to the study of Natalia (2017), she produces findings that the development of e-learning with Schoology has exciting, easy-to-use, and effective qualities used as enrichment learning. And (Misbah, 2017) finds that the development of Schoology-based e-learning can train digital literacy and is suitable for use in learning. This proves that it is because the reasons stated above results to great extent in the utilization of NDMC BSED-Math students of Schoology. Then 21st century learners are much more advanced and willing to used web-based technology.

Relationship between Mathematical Thinking Skills and Study Habits of the Respondents

Results reveal that there exists a moderate positive correlation between the variable mathematical thinking

skills and study habits. This illustrates that the respondents who have higher level of mathematical thinking on connections, representation, communication, reasoning, and problem solving tend to have higher chance of making the study habits; and those who have lower level of mathematical thinking tend to have lower possibility of making study habits. Moreover, the relationship between the two variables is significant. This implies that the BSED-Math students who have higher level of mathematical thinking are likely to have higher chance of performing their study habits.

This suggests that the study habits of the respondents contribute to their mathematical thinking of the respondents. If students have good study habits, they will have higher mathematical thinking skills. The findings of this study are supported by the study Osa-Edoh and Alutu (2012) which found that study habits are highly correlated with the mathematical thinking skills of the secondary students. Tossavainen's and Juvonen's (2015) study shows that higher intrinsic mathematical thinking and an interest in studying in school are related. The null hypothesis, therefore, is rejected.

Relationship between Mathematical Thinking Skills and Extent Utilization of Schoology of the Respondents

Results reveal a weak positive correlation between the variable mathematical thinking skills and utilization of schoology. This illustrates that the respondents who have higher level of mathematical thinking on connections, representation, communication, reasoning, and problem solving tend to utilize the schoology slightly. Those with low level mathematical thinking tend to have a somewhat low chance of using the schoology. Moreover, the relationship between the two variables has a weak positive correlations, this implies that the BSED-Math students who have higher level of mathematical thinking tend to have lower chance of utilizing the Schoology.

The finding of the study contradicts Maulana, Wardono, Marwoto and Mariani (2019) study, which tells that realistic e-schoology learning effectively improves mathematical literacy skills and HOTs. With realistic e-schoology learning, students always learn to solve contextual problems in everyday life with unlimited space and time (with e-schoology) to contribute to the components of mathematical literacy of HOTs, which they can improve. This is consistent with the results of the study of Marwoto and Mariani (2019), realistic learning assistance schoology can improve mathematical literacy skills in junior high school students. The same author has researched that RME / PMRI is a learning approach that encourages every student in the mathematics class to do mathematical contests in using mathematics to solve everyday problems or mathematical problems they face. This can improve the mathematician's student, which is an essential component of mathematical literacy so that it can automatically improve students' mathematical literacy. This also contradicts the results of research from Wardono and Mariani and Wardono et.al (2019) that the use contextual problems (in practical learning) offer some potential to engage and motivate students in learning mathematics. Still, it also presents some challenges for students in classrooms. So, from the results of the implementation of learning tools and realistic innovative learning models a scientific blended learning e-schoology approach containing character building at SMP N 9 Semarang can effectively improve mathematical literacy and HOTs based on PISA. The null hypothesis, therefore, is accepted.

Conclusion

Based on the results and analysis of the study, the researchers concluded the following: (1) Most of the BSED-Math students are females and some are males, typically they are younger adults and majority are under the age of 20 and above. (2) The BSED-Math students of NDMC have high level of Mathematical Thinking Skills in terms of connections, representation, communication, reasoning, and problem solving. (3) The BSED-Math students have good study habits in terms of time management, self-discipline, concentration, organization, and efforts of the respondents.(4)The BSED-Math students have great extent of utilization of Schoology in terms uploading and notifications, activities and submissions, and monitoring and evaluation. (5) There is a significant relationship between mathematical thinking skills and the study habits of the respondents. (6) There is no significant relationship between mathematical thinking skills and extent of utilization of schoology.

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