
A Case Analysis of the Strategies of Students in Learning Mathematics amidst Academic Disruption

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ABSTRACT

This study was investigated and aimed to determine the strategies of students in learning Mathematics amidst the pandemic. This study was conducted at Bukidnon State University, Malaybalay City during the School Year 2021-2022. It employs a Qualitative Case Study Research Design, specifically Sharan Merriam's model which also follows the six-stage framework of thematic analysis outlined by Braun and Clarke (2006), which identifies patterns or themes within the qualitative data. This analysis includes familiarization, coding, generating themes, reviewing themes, defining and naming themes, and writing up. A total of 6 college students who specialized in Mathematics from the College of Education and College of Arts and Sciences. The results indicated that the students' learning mechanisms include self-paced learning, note-taking, and time-management learning techniques. These distinct learning strategies of the students suggest that different learning strategies that a student developed may also be useful and beneficial to some. From these results, a Constructivist Learning Theory by Piaget, Vygotsky, and Bruner is anchored. These learning mechanisms encourage students' academic standing to advance and improve. This study recommends that the curriculum should promote a self-paced learning strategy as it is more effective in the teaching of Mathematics at the college level during the pandemic and to face-to-face instruction in learning Mathematics, teachers should encourage students to do note-taking and create a to-do list as they review and study their lessons, the future researcher may highlight students' learning strategies across ages, groups, gender, cultures, and experiences, and teachers should promote math applications to the students with respect to the enhancement of the new curriculum.

KEYWORDS: *case analysis, learning strategies, Mathematics, academic disruption*

INTRODUCTION

In early January 2020, Coronavirus disease also known as COVID-19, a new infectious disease has since caused widespread disruptions in schools and universities. Schools have become the most vulnerable with their safety and security and the health of school personnel, students, parents, and other stakeholders are at stake, schools were temporarily closed to contain the virus's spread and reduce infections (UNESCO, 2020). Schools needed to make immediate decisions on how to facilitate the learning of the students amidst this pandemic.

Concerns were raised in mathematics education that learning mathematics outside of the classroom could impede inquiry-based methods of learning mathematics in numerous ways.

Sullivan et al. (2020) point out that explicit explanations followed by repeated practice are conducive to the use of video technology, particularly instructional videos that may be prepared ahead of time and shared via a web link. Inquiry-based approaches to learning mathematics, on the other hand, necessitate student-centered, mathematically rigorous discussions centered on students' experiences working on problems. Teachers might use post-task talks to draw attention to links between mathematical ideas that emerge (Stein, Engle, Smith, & Hughes, 2008).

According to Tupas and Laguda (2020), other countries attempted and failed to continue classes using various innovations to protect students from the spread of COVID-19. Protocols are some of the many nations' required guidelines to allow classes to continue this school year, ranging from putting plastic on the desk to serving as a shield to a limited number of students to health. The proposed start of classes would make use of technology such as cellphones, tablets, and desktop computers with internet connectivity, as well as modular and face-to-face instruction and other forms of instructional materials. Education has always been an important part of a country's growth and development. Flexible Learning System was implemented throughout the Philippines providing students the freedom in how, what, when, and where they learn; customizing their pace, place, and mode of learning.

In view of the aforementioned predicaments, this study explored the learning strategies of students at the tertiary level amidst academic disruption to foster academic resilience and flexibility.

FRAMEWORK

The concept of students' learning methods and effective learning strategies predominate over other types of learning. Students' learning strategies include self-paced learning, note-taking, and time management. These learning mechanisms encourage students' academic standing to advance and improve.

The theoretical underpinnings that guided the researchers on this case study were anchored on Lev Vygotsky's Social Constructivism (1968), Bruner's Constructivist Learning Theory (1967), Jean Piaget's Constructivism Theory. Constructivism learning theory is defined as the active construction of new knowledge based on a learner's prior experience wherein students actively create their own knowledge; their minds evaluate information received from the outside world to decide what they will learn. Learning is mental activity; it is not merely passive assimilation of information. The concepts primarily emphasized that a learner actively create their own knowledge and create effective ways rather than simply absorbing information passively so that they seek help from others for them to construct their own learning.

In addition, Vygotsky's social constructivism wherein the central topic was the Zone of Proximal Development (ZPD), uses social interaction with more knowledgeable others to move development forward. A concept that students are active participants in constructing their own knowledge which focuses on collaborative learning as students reach out to their peers/classmates/friends in regards to their lessons to improve their learning. A more capable person, such as a teacher or peer, provides assistance to the student; the student is able to complete the task with this assistance. Bruner (1967) created the concept of "discovery learning" and defined it as a constructivist, inquiry-based learning theory that contends that

students use prior knowledge and past experiences to find facts and correlations. As a result, it is believed that students are more likely to recall ideas and information they independently developed or learned. According to Jean Piaget's Constructive theory, "Reframing one's mental representation of the outside world to fit new experiences is the process of adaptation. When we behave in accordance with the belief that the world functions in a certain manner and our expectations are not met, we frequently fail. However, by adapting to this new experience and rethinking our model of how the world functions, we are able to learn from our own failures."

Cognitivism is a learning theory that focuses on how information is received, organized, stored, and retrieved by the mind. Computer-based learning environments (CBLEs) which is a cognitive tool that is defined as tools that are developed with the aim of enhancing the cognitive capabilities of learners during problem-solving, thinking, and learning (Derry and Lajoie, 1993, Jonassen and Reeves, 1996, Lajoie, 2000, Lajoie and Azevedo, 2006). Learners can access multiple representations, including audio, video, animation, text, and/or graphics, in a variety of sequences (Jonassen & Reeves, 1996). Piaget proposed the importance of cognitive structures, which he defined as the basic, interconnected psychological systems that enable people to process information by connecting it with prior knowledge and experience, finding patterns and relationships, identifying rules, and generating abstract principles relevant in different applications (Garner, 2008, p.32).

OBJECTIVE OF THE STUDY

The general objective of this study was to investigate and describe the strategies of students in learning mathematics amidst the pandemic. It has focused on Bukidnon State University (BukSU) – Bachelor of Secondary Education major in Mathematics (BSEd-Mathematics) and Bachelor of Science in Mathematics (BS-Mathematics), Malaybalay City specifically the first-year to third-year college students as the research participants. The study was conducted during the 2nd semester of the school year 2021-2022.

With the transition from face-to-face learning to the implementation of flexible learning, this study has aimed to answer the following questions:

1. What are the challenges encountered by the students in learning Mathematics amidst academic disruption?
2. What are the strategies developed by the students developed in the implementation of the new mode of instructional delivery?
3. How did the strategies influence the academic achievement of the students?

METHODS AND PROCEDURES

This study employs a Qualitative Case Study Research Design guided by Sharan Merriam's Model (1998). The model's particularistic, descriptive, and heuristic characteristics were observed. One of the model's highlights, the triangulation of data sources, is also integrated. Thematic analysis was utilized to analyze the cases. The researchers conducted a survey on first-year to third-year BSED- Mathematics students of Bukidnon State University—College of Education Department and BS- Mathematics of College of Arts and Sciences, Malaybalay City, who are enrolled in flexible learning modality at Bukidnon State University (BukSU).

The researchers used an interview guide to generate significant statements from the participants (Arikunto, 2010). The deliberate sampling technique was used to efficiently pick people for the interview, focus group discussion, and participant observation. Purposive sampling was the best sampling strategy to adopt because it provides a more in-depth look at the students' input. It also assists researchers in providing insights from the study's specific scenario, independent of the study's general population. The questionnaire was given in a face-to-face setting and conducted a focus group discussion with the selected participants. Ary (2010) stated that the most common research instruments used in qualitative research are observation, interview, and document analysis. Data has been transcribed, analyzed, and interpreted.

Following the six-stage framework of thematic analysis outlined by Braun and Clarke (2006), which identifies patterns or themes within the qualitative data. This analysis includes familiarization, coding, generating themes, reviewing themes, defining and naming themes, and writing up. By the use of thematic analysis, the researchers were able to construct themes that categorize the strategies students used in learning Mathematics amidst the pandemic.

RESULTS AND DISCUSSIONS

Students' Strategies in Learning Mathematics Amidst Pandemic: Case Analysis

Case 1. Research Participant 1 is 19 years of age, a female second-year student of Bachelor of Secondary Education Major in Mathematics. Her learning styles are reading, writing, and visual. She is a working student since high school for her family is of low-middle income status. She talked about her encountered challenges in learning Mathematics during the pandemic, such as the struggle in balancing her work and studies and lack of financial stability in sustaining her daily needs and school requirements. However, she looked for ways to balance and manage her time between her responsibilities at work and school.

“During face-to-face and online learning, I always woke up early in the morning due to my responsibilities as a working student. I do the house chores first before doing my school activities. I avoid slacking off in my vacant time and will eventually do needed and necessary things so that I can both do the housework and school requirements without a hassle.” (RP1)

She also added, *“When the teacher is discussing the lesson I also do note-taking, review the lesson, and try problem-solving as an application of the lesson I learned in the google classroom our teacher posted. I also opted in searching google, YouTube, and watching video lectures to better understand the lesson.” (RP1)*

According to her, the strategy she used is effective because it motivates her to study, thus, it helps her remember the lesson, though there are times that she took advantage of her notes she studies less at times.

Case 2. Research Participant 2 is 21 years of age, a female third-year student of Bachelor of Secondary Education Major in Mathematics. She is an audio-visual learner. An independent student since her family belongs to the low-income class but is not very poor. In a given situation, she has fewer resources at home to complete homework, study, or engage in any

school activities. In addition, she became a parent at a young age which is why it became her struggle to learn mathematics during the pandemic due to her family duties.

“One of the struggles that I have encountered, is engaging in online learning it’s because of the unstable internet we have in our place and I have to go up the mountain just so I could have a better connection. Next, is the technology I use, my phone doesn’t perform well, especially in viewing documents and online meetings such as google meet. And managing my time it’s because of family duties”. (RP2)

After she enumerated her different struggles, she talked about her strategies for how she dealt with the new normal way of learning and coping styles.

“The first learning strategy that I have developed is self-thought or learning on my effort. I do listen to my teacher online but if I have to understand well, I have to search, read, and watch videos online. Additionally, I plan everything out (to-do-list) so I could manage my time responsively”. (RP2)

She added, “Also, to interact with my classmate and teacher, I ask them for help especially if there’s something I don’t understand in the lesson. These strategies that I have developed are passages to get ought in the difficulties in learning mathematics in the new normal”. (RP2)

She believed that learning mathematics with these strategies gives her the advantage and satisfaction of getting high scores on tests and invites her to become more actively engaged in her learning.

“The advantage it gives is, it helps me have satisfied learning where I get high scores on the tests. It boosts my confidence and it is helpful for me as a future educator. And I learned that enough because of these strategies”. (RP2)

Thus, she recommends to other mathematics learners; do self-study, taking down of notes, read books, and learn to interact with other people. Because these strategies will help you learn mathematics more effectively.

Case 3. Research Participant 3 is a female fourth-year student of Bachelor of Secondary Education Major in Mathematics from Lantapan Bukidnon. She is 21 years of age. Her learning styles are visual, reading, and writing. She belongs to a family of middle-income class. One of her most problems is the internet connection. She struggled in learning mathematics during the pandemic given that their area has poor access to internet connectivity.

“Most of the time, I am unable to go online or join the virtual discussion due to our location’s bad internet access”. (RP3)

Given that hassle in her learning, she found ways to address her concerns. According to her, she can connect to her neighbor's WiFi connection. On the other hand, she shared her strategies, particularly in learning mathematics.

According to her, *"If the teacher discusses the topic, I'll take down notes, then search for it online to learn more about it"*. (RP3)

Some of her strategies are self-study in the sense that she cannot join online classes most of the time, watching YouTube tutorials, and other google sites that can help her learn the concepts of mathematics that were being discussed. Besides, she pointed out that she can learn mathematics better in face-to-face classes compared to virtual learning, with the reason that it was discussed continuously without interruptions due to disconnections.

"I believe that we can learn better in face-to-face classes than online classes or virtual learning. Because in the face to face classes, the discussion is continuous without disruptions unlike in online class, if the internet is poor or lost, the discussion is also stopped".(RP3)

Furthermore, she is convinced that her learning strategies are effective since she gets good grades. Thus, she sticks with her ways of learning mathematics during the pandemic and face-to-face classes. She takes it as her advantage to learn at her own pace with the help of self-studying, note-taking, google sites, and online tutorials.

Case 4. Research Participant 4 is a 19-year-old female who is currently a second-year student of Bachelor of Science in Mathematics with a learning style of Audio-visual and reading/writing. In line with her online classes, she stated that the internet connection and learning environment were the challenges that she had encountered in learning mathematics. With this, she developed learning strategies during the pandemic particularly waking up early and making a To-Do list to organize things that she has to prioritize. She also added that she made use of Google and YouTube for additional information regarding the lesson. In comparison between her learning strategies in the face-to-face classes and online classes during the pandemic, her learning strategies are not the same.

According to her, *"No. Because in face-to-face classes there are no or fewer distractions during the discussions while in online classes, there are many distractions at home such as the noises coming from our neighbors, from the passing motorcycles, and even from the chickens which affect my focus and my study. So, there is a difference. I have to make an extra effort to wake up early so that I can study because I can study well when it is quiet."* (RP4)

Accordingly, these learning strategies were effective as she was able to pass her subjects, especially her specialization.

She also added, *"Through my strategies, I can still learn the lessons. I can self-learn especially in times when I could not attend an online class."* (RP4)

Moreover, she pointed out how her learning strategies contribute to her studies.

“Its advantage is that it works on me. I passed. Even though I self-taught some of the lessons especially those that do not have video lessons, I can still answer. But the disadvantage is that I find it tiring/hassle sometimes to wake up early to do school works, so sometimes I could not finish my activities on time. If I will not study, I will fail for sure.” (RP4)

Additionally, she recommended, *“Study in your preferred time in your preferred learning environment. Because studying is different when it is to your liking.” (RP4)*

As for her, *“Learning mathematics requires time. Studying is important.” (RP4)*

Case 5. Research Participant 5 is a 20-year-old male living in Bangcud, Malaybalay City. A third-year student of Bachelor of Science in Mathematics whose learning styles are visual, reading/writing, and audio. Although he is not a working student, he considers his family to have poor income status. He pointed out that the unstable connection to the internet, and financial, and family problems are the challenges that he mainly encountered in learning Mathematics amidst the pandemic, especially as someone who opted for an online class. With this, he emphasized that study time and study habit is crucial to cope with these challenges.

“Sparing some time is your peak time in which your mind is active to study. Just like me for example, I wake up early to have a fresh mind so that I can focus especially on major [subjects] because it is hard to understand it when your mind is in chaos and you’re already exhausted so it’s better to study in your peak time.” (RP5)

He further pointed out that this strategy he had since face-to-face classes, works on him effectively as his learning strategy in face-to-face classes and during the pandemic are the same.

“Although in face-to-face classes there is someone who will teach you, in terms of your strategy and on how you study, it is still the same. Since I cannot focus, for example, when our classes end late in the afternoon or evening when we go home, I feel tired and unable to study. So, I’ll sleep and just wake up early to study.” (RP5)

He also made it clear that it is how a person disciplines himself that matters. For what he does or does not, there is a gain or loss.

“If I don’t study, I will fail. If you study, it’s not that you will not fail but at least there is learning. Still, there is a chance to fail in exams or grades but you learned something and it’s different.” (RP5)

He even recommends it to have study habits and be goal-oriented.

“Have study habits, focus on your goal, and make objectives every day on what to do, on how will I survive. Is what I’m doing will help me in my major?” (RP5)

Case 6. Research Participant 6 is 22 years of age, a female 4th-year student of Bachelor of Science in Mathematics. Her learning styles are reading, writing, and audio-visual. She is a self-support student since high school for her family is of low-income status. She has multiple stresses of being a student such as family, school, and finances. She talked about her challenges in learning Mathematics during the pandemic, such as the struggle in balancing her part-time jobs and studies and her lack of financial support. On top of that, she was concerned about having fewer resources to complete her tasks at school, study, and/or engage in activities that require gadgets such as a laptop, computer, and faster internet. However, the given situation makes her inspired to continue her studies despite the difficulties which the pandemic affects her. She makes sure that she is still doing her responsibilities as a student and that she has ways to balance her studies and work. That she wants to continue her studies because she believed that it can help her and her family to get out of the poverty line.

Tungod sa kakulangan nako ana nga part, nangita kog pamaagi makatuon labi sa mathematics subjects' courses nako like mag adtu ko sa computer shop para mag watch ug online tutorials, then I take my time para mag take notes sa mga necessary information nga akong kinahanglan, after ana mag look ko for more examples nga naay answer daan but ako siya i-solve in my own dayun compare nalang kung nakuha ba nako ang saktu nga proseso, ug makabuhat sa akong responsibilities as a student". (RP6)

"The pandemic challenges me as a student and as a part-timer, it gives me a lot of stress due to my problems between family, school, and finances. It gives me a hard time continuing my studies given that I did not have enough resources that I needed at that time such as an android phone with sufficient storage, a laptop, and faster internet. But, learning mathematics without these resources that I needed challenges me to look for ways to learn mathematics such as visiting a computer shop to watch online tutorials, then I take my time to take down notes for the necessary information that I needed, and after that, I look for more examples and solve it in my own and just check it if I got it right and if I did follow the right process, and do my responsibilities as a student." (RP6)

Moreover, Case RP6 has stated the differences between her strategies in learning mathematics in face-to-face classes and during the pandemic. In which the challenges she faced in learning mathematics during face-to-face classes and the pandemic were determined. Accordingly, self-learning during face-to-face interaction is not that applied because she can easily seek immediate learning interventions from her instructors. However, self-paced learning along with math applications, online tutorials, and google sites was explored well given her adjustments and difficulties due to the sudden shift to an online learning platform, it is because of her interest to learn the subject. She emphasized that she became more responsible for her learning during the pandemic.

"During our face-to-face classes, it is easy to ask our mathematics instructors for help especially if there are things that I need to clarify so I think self-studying is not that applied because I already learned what is being taught in the classroom. However, the sudden shift from face-to-face instruction to online learning makes self-paced learning for me a habit. And since I cannot immediately ask for help from my mathematics instructors or cannot talk to them in person, I explored different types of learning sites such as google, online tutorials, and some math applications". (RP6)

She further pointed out that her strategies give her the advantage to balance her studies and work and get higher grades at the same time. Thus, she recommends it to other individual learners because it is more effective, especially in learning mathematics.

Students' Strategies in Learning Mathematics Amidst Pandemic: Themes Across Cases

The thematic analysis of this study aimed to investigate the major themes and sub-themes that describe the first-year to third-year BSED- Mathematics students of Bukidnon State University—College of Education Department and BS- Mathematics of College of Arts and Sciences, Malaybalay City, who are enrolled in flexible learning modality. The final stage in this exploration intended to examine and analyze the themes across all cases. The preliminary data from 6 students, along with data gathered through observation of interactions with the research participants, reveal four (4) major themes derived from five (5) sub-themes. The following themes and sub-themes contribute to a deeper appreciation of the research phenomenon.

Themes	Sub-themes
Students' Strategies for Learning Mathematics Amidst the Pandemic include:	
Theme 1: Self-paced Learning	<ol style="list-style-type: none"> 1. Google Searching 2. Math Application 3. Video Tutorials or Lessons
Theme 2: Note Taking	<ol style="list-style-type: none"> 1. Reviewing of lesson
Theme 3: Time Management	<ol style="list-style-type: none"> 1. Active study habit

Theme 1: Self-Paced Learning

A major theme common to all participants from different year levels and colleges was that they tend to overcome this challenge of flexible learning by learning at their own pace. Studies showed that the nature of flexible learning is more individual and independent; therefore, motivation is a key to efficient learning (Tang et al.). Self-paced learning is a discipline that develops based on the learners' aptitude and reactions to pedagogical and instructional interventions (Luzano, 2020). It is meant to enable learners to advance to the following academic level from one subject to the next (Dick et al., 2014). A self-paced learning module may be printed or in digital format. For instance, online searches and the digital modules or lessons provided by a school's Learning Management System (Cooper & Maile, 2018).

In this study, the research participants enumerated and described the different learning strategies they have used in coping with the challenges brought on by the pandemic. Out of many strategies available and effective for learning, a blog written by Lambda Solutions described self-paced learning as a potent learning strategy that enables students to tailor their education to their particular requirements (Lambda Solutions Blog, 2018). That is why the students who have been greatly affected by the transition from face-to-face to flexible learning modalities addressed their way of learning Mathematics by learning independently

and at their own pace with the help of google searching, math applications, and YouTube video tutorials or lessons.

Sub-theme 1.1: Students applied google searching to better learn the lesson in Mathematics. Students at Bukidnon State University College of Education and Arts and Sciences who specialize in mathematics often conduct google searches on the subject matter related to their particular field. All of the research participants concurred that using Google searches, which is one of the most practical ways to keep up with the courses, helps students overcome obstacles during the implementation of flexible learning modalities.

Sub-theme 1.2: Students used math applications to seek immediate learning interventions. The participants from the College of Education and College of Arts and Sciences prefer to use math applications as an alternative to support their learning. According to a study, using math applications in general education classrooms to enhance struggling kids' learning may be a successful strategy. Comparing the average and struggling students, the latter has more room for development. Furthermore, struggling children may benefit even more from the features that math apps provide, such as self-pacing, rapid feedback, and reducing complicated processes down into manageable parts. It may be possible to use well-made math apps to assist underachieving children in meeting the Common Core State Standards for Mathematics (Zhang et al., 2015). Hence, utilizing math applications in learning Mathematics assists students in better understanding the problem.

Sub-theme 1.3: The students find watching YouTube video tutorials or lessons whenever the topic is difficult useful. YouTube works well in getting students of all ages interested in what they are learning. Many people find that a secondary instructor can more effectively convey something than they can on their own. YouTube is a free educational resource that can support good learning, but it is not intended to take the position of teachers (Lynch, M., 2020). Indeed, watching movies to learn more effectively aids in understanding the subject. Occasionally, students could take advantage of the chance to study through YouTube tutorial videos rather than listen to the teacher's discussion. However, YouTube videos are a major aid during the pandemic to meet the pupils' demand to learn in academic situations when it comes to mathematics.

Theme 2: Note Taking

Note-taking is one of the most fundamental tasks that students perform to learn. Simply said, taking notes helps students remember information that would otherwise be forgotten (GoodNotes Blog, 2018). Effective note-taking involves more than just writing down every word you hear; instead, it entails summarizing fundamental ideas as precisely as you can in your own words, making connections between ideas both within and between lectures, and writing down any questions that come to mind for deeper understanding and clarity (GoodNotes Blog, 2018). It is acknowledged that note-taking is a crucial action that improves learning in academic contexts. These learning strategies help the students to be able to review their lessons after the proper class discussion.

According to Ward and Tatsukawa (2003), note-taking includes two aspects. First, the notes written are useful for reviewing. Second, the process of note-taking itself helps students in understanding the material. This is typically discussed in terms of encoding: the purpose is to integrate the information that the student's mind gets from the instructor, both verbally and in writing on the whiteboard. The theory is that while taking notes requires the student to re-

express his or her thoughts, doing so enables the concepts to be cognitively rehearsed and incorporated at a deeper level, or even re-encoded in a way that is simpler for the student to understand, utilize, and remember. Through this, students prefer taking thorough notes so they may reread and review the mathematics concepts that have been taught to them at the same time to master mathematics from the eLearning type of instruction during the pandemic.

Sub-theme 2.1: To study and acquire mathematics concepts and knowledge, students frequently reviewing of the lesson from their notes. Students at Bukidnon State University College of Education and College of Arts and Sciences who specialize in mathematics used to review the lessons from the notes that they've taken so they can remember the information they've been taught or the ideas they've been reading. Additionally, it serves as a reminder of what they have learned and creates a solid foundation for their learning. As a result, it helps them in retaining that learning and encouraged them to transfer new information and acquired abilities from their memory.

Theme 3: Time Management

Time is a crucial component of how human life is organized, sustained, and modernized. Time management practices are actions that are intended to achieve effective utilization of time while carrying out certain goal-directed tasks (Mumford, 2015). Simply said, the basic goal of time management is to allocate time wisely, which entails spending as little time as possible on irrelevant things and as much time as possible on important tasks. Time management is comprised of multiple tools that serve the purposes of setting, prioritizing, planning, monitoring, and organizing. For college students, managing their time is a major problem in both their academic and social lives.

Students who can effectively manage their time can work more efficiently and have less stress, whereas students who manage their time poorly experience both stress and poor academic performance. Gupta (2018) and Amin (2017). Students should be aware of their working rhythms and learn to anticipate their activities and any other elements that may affect how well they function (Indreica, 2011). A crucial component of time management is motivation (Wolters, 2017).

Sub-theme 3.1: Students who want to be more productive between their jobs and studies tend to manage their time by practicing active study habits. College students from the first year to the third year at Bukidnon State University College of Education and College of Arts and Sciences who specialize in mathematics believed that having active study habits such as waking up early, making To-Do lists, and time commitment result in a productive day of learning. Students see that getting up early is a very preferable time to study and complete their chores at home because it simultaneously helps them feel at peace and less distracted at the same time. Additionally, by creating a To-Do list and having a time commitment, they can finish their responsibilities while maintaining a positive mindset that serves as a reminder of what has to be done. According to Haneklau (2019), having an active study habit can improve your self-confidence and self-esteem. It aids in lowering anxieties and stress related to deadlines and other school assignments. This may be one of the reasons why some students follow this routine; they think that by doing so, they would be more successful in their classes, have more time to focus on their assignments, have time to unwind, and have a more productive day overall. Thus, one study explicated that self-efficacy beliefs contribute to

students' success and become more productive in areas that they find more difficult (Retutas & Rubio, 2021).

SUMMARY OF FINDINGS

This analysis captured and formulated five themes describing the students' strategies for learning Mathematics amid the pandemic. Instinctively, the items include self-paced learning, note-taking, time management, and goal-oriented learning techniques. These themes indicate that students utilized various learning strategies developed amid the crisis. These distinct learning strategies of the students suggest that different learning strategies that a student developed may also be beneficial to some. Furthermore, if the students face another challenge may it be academic or a crisis worldwide, they will eventually add up coping learning strategies to better adapt to the situations they are in with confidence and will achieve academic success.

From these results, Constructivist Learning Theory developed as one meta-theme. According to the concept of students' learning methods, effective learning strategies predominate over other types of learning. Students' learning strategies include self-paced learning, note-taking, time management, and goal-oriented. These learning mechanisms encourage students' academic standing to advance and improve.

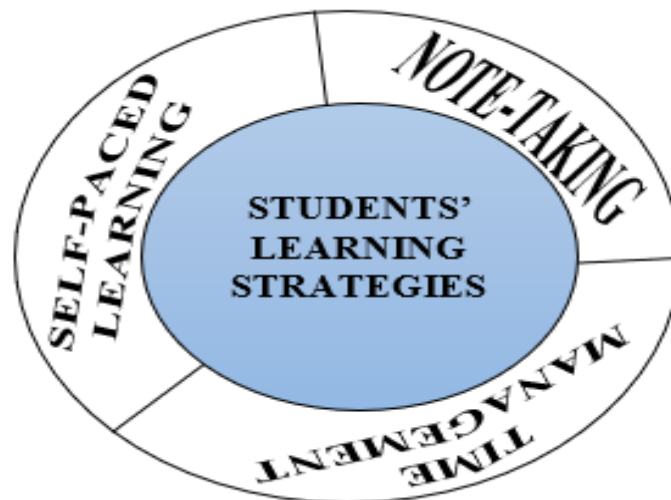


Figure 1. Model of students' learning strategies showing the themes and their meta-theme

According to several research, students used a variety of learning strategies to overcome the difficulties caused by the COVID-19 epidemic. Theoretically, a person uses a variety of coping mechanisms or learning techniques. The challenges that students face and experience have an impact on their learning mechanisms. In this study, case analysis was used to examine how learning strategies related to problems appeared in 6 cases involving college students at Bukidnon State University. Additionally, the learning mechanisms mentioned in this study may vary depending on an individual's age, gender, culture, and experiences, particularly in academic situations. The findings of the current study imply that it is important

to investigate how children learn in various contexts and circumstances that may have an impact on the generalizability of Filipino students.

CONCLUSIONS AND RECOMMENDATIONS

This study provides information on the strategies of students in learning mathematics amidst the COVID-19 pandemic. Students' learning mechanisms include self-paced learning, note-taking, and time-management learning techniques. These distinct learning strategies of the students suggest that different learning strategies that a student developed may also be beneficial to some. From these results, a Constructivist Learning Theory by Piaget, Vygotsky, and Bruner is anchored. These learning mechanisms encourage students' academic standing to advance and improve.

Based on the findings and conclusions of the study, the following are the recommendations:

- a. The curriculum should promote a Self-paced learning strategy as it is more effective in the teaching of Mathematics at the college level during the pandemic and in face-to-face instruction in learning Mathematics;
- b. Teachers should encourage students to do note-taking and create a To-Do list as they review and study their lessons;
- c. The future researcher may highlight students' learning strategies across ages, groups, gender, cultures, and experiences; and
- d. Teachers should promote math applications to the students concerning the enhancement of the new curriculum.

REFERENCES

- i. Amin, G. (2019). Academic Procrastination of college students. *Jurnal Muara Ilmu Ekonomi dan Bisnis*. Vol 3(2), pages 431 – 442
- ii. Bruner, J. (1967). *Constructivist Theory*
- iii. Cooper, M. &Maile, C. (2018). *The CIMC Guide to Developing a Self –Paced Learning Module*. Curriculum and Instructional Materials Center
- iv. Dick et al. , (2014). Development and validation of self-paced learning digital module in Mathematics 10.Polaris Global Journal of Scholarly Research and Trends,1(1),
- v. Eison et al. (1981). Goal Orientation and Its Impact on University Students' Academic Achievement During the COVID-19 Pandemic
- vi. Flack, C. B., Walker, L., Bickerstaff, A., Earle, H., & Margetts, C. (2020). Learning Mathematics From Home During COVID-19: Insights From Two Inquiry-Focused Primary Schools. <https://doi.org/10.29333/ejmste/10830>
- vii. Garner, B.K. (2008). When students seem stalled: The missing link for too many kids who don't "get it?" cognitive structures. *Educational Leadership* 65(6), 32.

-
- viii. GoodNotes Blog. (2018, May). The best note-taking methods for college students. Retrieved from <https://medium.goodnotes.com/the-best-note-taking-methods-for-college-students-451f412e264e>
- ix. Gupta, D. &. (2018). Effect of time management on academic performance of management students.
- x. Hamilton, L. S., Kaufman, J. H., & Diliberti, M. (2020). Teaching and leading through a pandemic: key findings from the American Educator Panels Spring 2020 COVID-19 Surveys. Rand Corporation. <https://doi.org/10.7249/RRA168-2>
- xi. Indreica, E. S. (2011). Effects of learning styles and time management on academic achievement.
- xii. Jonassen, D. H. (1992). Evaluating constructivistic learning. *Constructivism and the technology of instruction: A conversation* (pp. 137-148).
- xiii. Lewis, R. and Spencer, D. 1986. *What is Open Learning?*, Open Learning Guide 4–10. London: Council for Educational Technology.
- xiv. Luzano, J. F. (2020). Development and Validation of Strategic Intervention Materials (SIMs) of the Selected Topics in Trigonometry of Precalculus Discipline in Senior High School. *Journal of Mathematics and Statistics Studies*, 1(2), 26–37. Retrieved from <https://al-kindipublisher.com/index.php/jmss/article/view/752>
- xv. Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education*. Revised and Expanded from “Case Study Research in Education.”. Jossey-Bass Publishers, 350 Sansome St, San Francisco, CA 94104. <https://bit.ly/32K2bz5>
- xvi. Mumford, M. D. (2015). Students' time management during online class
- xvii. Peper, R., & Mayer, R. (1978). Note taking as a generative activity. *Journal of Educational Psychology*, 70(4), 514-522. doi: 10.1037/0022-0663.70.4.514
- xviii. Piaget, J. (1964). Part I: Cognitive development in children: Piaget development and learning. *Journal Research in Science Teaching*, 2(3), 176–186. doi:10.1002/tea.3660020306
- xix. Retutas, M. J., & Rubio, M. T. (2021). Multivariate analysis on performance in statistics, self-efficacy and attitudes of senior high school students. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, 6(4), 352-367. <https://doi.org/10.23917/jramathedu.v6i4.14368>
- xx. Serhat K. (2021). Constructivist Learning Theory.
- xxi. Shurville et al. (2008). Flexible Learning as New Learning Design In Classroom Process To Promote Quality Education
- xxii. Stein, M. K., Engle, R. A., Smith, M. S., & Hughes, E. K. (2008). Orchestrating productive mathematical discussions: Five practices for helping teachers move beyond show and tell. *Mathematical thinking and learning*, 10(4), 313-340. <https://doi.org/10.1080/10986060802229675>

-
- xxiii. Tang et al. (2021). Comparative analysis of Student's live online learning readiness during the coronavirus (COVID-19) pandemic in the higher education sector. *Comput. Educ.* , 168, 104211.
- xxiv. Tupas, F. P., Laguda, M. L. (2020). Blended Learning – An Approach in Philippine Basic Education Curriculum in New Normal: A Review of Current Literature. *Universal Journal of Educational Research* 8(11): 5505-5512, 2020 <http://www.hrpub.org> DOI: 10.13189/ujer.2020.081154
- xxv. Vygotsky, L. (1968). *Social Constructivism*
- xxvi. Ward, N., & Tatsukawa, H. (2003). *Note-taking Strategies and Academic Achievement*
- xxvii. Wolters, C. A. (2017). Examining the relations of time management and procrastination within a model of self-regulated learning. *Metacognition and learning*, 12(3), 381-399.