

*The Use of Mathematics Modules in Supporting Self-Regulation Among Junior High School Students in a Flexible Online Learning Environment*

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**Abstract**

Examining how students manage their learning through the mathematics modules in a flexible online learning setup can help educators plan and implement a curriculum in this environment. Hence, this study aims to assess the use of mathematics modules in supporting students' self-regulation in a flexible online learning environment. This study utilized an explanatory sequential mixed methods design. The Online Self-Regulated Learning Questionnaire (OSLQ) evaluated the students' self-regulation. After analyzing the results from the OSLQ, focus group discussions, and individual interviews were conducted. The results showed a significant difference between students in grades 7 and 10 in terms of self-regulation. The study discovered that JHS students "often" use environment structuring, goal setting, time management, and self-evaluation strategies. However, they rated themselves "sometimes" in using help-seeking and task strategies. Findings from the focus group discussion and interviews revealed that different features of the math modules, such as the module planner, pre-test, list of most essential competencies, module activities, answer key, and self-check activities, allowed the JHS students to engage in forethought, performance, and self-reflection phases of self-regulation. However, challenges in using the modules emerged, such as heavy workload, the irrelevance of activities, student attitudes, and teacher factors. Overall, the students and teachers have positive experiences using mathematics modules. The research findings could be used to improve schools' existing programs and establish best practices for using modules in a flexible online learning environment.

Keywords: Flexible Online Learning, Modular Learning, Self-Regulated Learning

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## **Introduction**

The emergence of the COVID-19 pandemic has brought both a challenge and an opportunity for the Philippine educational system to innovate. Different educational institutions were forced to close physically to protect the teachers, the students, and the other stakeholders from the virus. This situation has caused the Philippine educational system to adapt suddenly and meet the demands of the new normal. Of these demands, the foremost is the abrupt shift from traditional face-to-face learning to distance learning.

Before the pandemic even began, distance learning, now commonly called online learning, became the preferred instruction in the higher education sector (You, 2016). It provides flexible learning opportunities to learners, who learn synchronously, asynchronously, or both. However, this modality is still novel in Philippine Basic Education. Therefore, the Department of Education (DepEd) released the Basic Education Learning Continuity Plan (BE-LCP) under DepEd Order No. 012 s. 2020. To address the lack of gadgets and poor signal connections, self-learning modules or packets, which were made available online or offline, were also offered along with the different modalities mentioned.

While the current learning approach provides flexibility and freedom among the students, it also requires them to independently acquire the necessary knowledge, skills, and attitude. Students must have commitment and discipline in this learning modality (You, 2016; Kulusakli, 2021); since external regulation from the teacher might be limited in online learning, students need to become more self-regulated learners (Hutt et al., 2021).

The purpose of this study is to examine how Junior High School (JHS) students manage their learning in a flexible online learning environment and evaluate the use of mathematics modules in supporting their self-regulation based on teachers' and students' experiences and recommendations so that appropriate measures can be taken for future improvement of schools' existing programs and to establish best practices for the use of modules in a flexible online learning environment.

This study also aims to answer the following research questions:

1. What is the self-regulation profile of the JHS students who are using the mathematics modules in a flexible online learning environment?
2. What are the students' experiences in using mathematics modules in supporting their self-regulation in a flexible online learning environment?
3. What are the teachers' experiences in using mathematics modules to support students' self-regulation in a flexible online learning environment?

## **Research Methods**

This study implemented the explanatory sequential design. Here, the quantitative data are collected and analyzed first. Afterward, the qualitative data are collected and analyzed to support the quantitative results (Creswell, 2009).

The study's participants consisted of 932 enrolled regular JHS students, aged 12-17 years old, and 5 JHS Mathematics teachers, aged 23-35 years old. The researcher used stratified random sampling in determining the student participants for the survey questionnaire (OSLQ). The

target number of participants was 273 JHS students using Slovin's formula with a margin of error of 5%.

Meanwhile, convenience sampling was utilized in formulating the focus group. After the data in the quantitative phase were analyzed, the sample for focus group discussion was chosen from those students who agreed to be interviewed. The students were divided based on the result of the OSLQ. The two groups consisted of students whose OSLQ scores were above the mean, while the other two consisted of students whose scores were below the mean. Each group had representatives per grade level. Since many students consented to be interviewed, four groups were formed. This was also done to ensure that the possibility of neglected themes was lessened (Saunders et al., 2019).

On the other hand, all JHS math teachers were recruited to lessen the possibility of neglected themes (Saunders et al., 2019). The researcher, one of the JHS math teachers, was excluded to avoid bias. All JHS math teachers agreed to participate in the interview.

## **Results and Analysis**

### ***RQ1: What is the self-regulation profile of the JHS students who are using the mathematics modules in a flexible online learning environment?***

The questionnaire used here is adapted from the Online Self-Regulation Questionnaire (OSLQ) of Barnard et al. (2009). The questionnaire was revised to simplify the language and to incorporate mathematics modules in the questionnaire. Education experts validated it. It was revised, and then students who were not included in the study answered the OSLQ for pilot testing. The Cronbach Alpha coefficient is 0.903, which suggests high internal consistency. The revised questionnaire is a 5-point Likert scale format (never-often) consisting of 23 items assessing students' SRL in flexible online learning using the math modules.

The JHS students' self-regulation was identified using their responses to the Online Self-Regulated Learning Questionnaire (OSLQ). The mean and standard deviation were computed for every item.

<b>Grade 7</b>			
	<b>Mean</b>	<b>S. D</b>	<b>Verbal Interpretation</b>
1. I set learning objectives or learning targets for my activities in Math class.	3.49	1.05	Often
2. I set short-term (daily or weekly) goals and long-term goals (monthly or for the semester) to accomplish my math modules.	3.71	1.25	Often
3. I keep a high standard for my learning in math class.	4.06	0.90	Often
4. I do not compromise the quality of my work just because it is an online setup.	3.59	1.34	Often
5. I set goals to help me manage study time for my math modules.	3.65	1.15	Often
6. I work on my math modules at a time when there are no distractions at home.	3.51	1.41	Often
7. I know the venue where I can study most efficiently for math modules.	3.82	1.34	Often
8. I try to take more thorough notes in my math class because I use those notes to answer my math modules.	3.59	1.33	Often
9. I read aloud math modules posted online or offline as a way to fight against distractions.	2.63	1.40	Sometimes
10. I prepare my questions about the math modules before joining the synchronous class.	2.27	1.15	Rarely
11. I work on extra problems in my math modules in addition to the assigned ones to master the topic.	2.90	1.22	Sometimes
12. I allocate extra study time for my online class because I know that it is time demanding.	3.55	1.12	Often
13. I try to schedule a time to study the modules for my online class and regularly observe this schedule.	3.45	1.17	Often
14. Although we do not have to attend daily classes, I still try to distribute my study time evenly across days.	3.65	1.13	Often
15. I find someone knowledgeable in Math so that I can consult with him/her when I need help.	3.55	1.35	Often
16. I am persistent in getting help with the math module lesson from the instructor through e-mail (or chat).	2.88	1.38	Sometimes
17. I share my problems regarding Math modules with my classmates online, so we know what we are struggling with and how to solve our problems.	2.63	1.33	Sometimes
18. If needed, I try to connect with my classmates through video calls to ask and seek help regarding the math modules.	2.27	1.39	Rarely
19. I communicate with my classmates to find out how I am doing in my math module activities.	2.37	1.41	Rarely
20. I communicate with my classmates to find out if what I am learning is different from what they are learning from the module.	2.29	1.29	Rarely
21. I summarize my learning about the math modules to examine my understanding of what I have learned.	3.75	1.21	Often
22. I ask myself a lot of questions about the content of the math modules.	3.27	1.13	Sometimes
23. The Math modules helped me to control my learning in the online class.	3.94	0.95	Often
<b>TOTAL</b>	<b>3.25</b>	<b>1.36</b>	<b>Sometimes</b>

Table 1: Grade 7 (n=51) Students' OSLQ Result per Item

**\*Legend used in subsequent tables:**

4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

The overall result of Grade 7 students’ use of self-regulation strategies under the flexible online learning mode has an average of 3.25, which is verbally interpreted as “sometimes.” This suggests that Grade 7 students do not often use SRL strategies in their flexible online classes using math modules.

<b>Grade 8</b>			
	<b>Mean</b>	<b>S.D</b>	<b>Verbal Interpretation</b>
1. I set learning objectives or learning targets for my activities in Math class.	3.71	0.72	Often
2. I set short-term (daily or weekly) goals and long-term goals (monthly or for the semester) to accomplish my math modules.	3.63	0.99	Often
3. I keep a high standard for my learning in math class.	3.76	0.86	Often
4. I do not compromise the quality of my work just because it is an online setup.	3.41	1.18	Often
5. I set goals to help me manage study time for my math modules.	3.90	1.02	Often
6. I work on my math modules at a time when there are no distractions at home.	4.39	0.86	Always
7. I know the venue where I can study most efficiently for math modules.	4.02	1.15	Often
8. I try to take more thorough notes in my math class because I use those notes to answer my math modules.	3.71	1.19	Often
9. I read aloud math modules posted online or offline as a way to fight against distractions.	3.17	1.22	Sometimes
10. I prepare my questions about the math modules before joining the synchronous class.	2.29	0.87	Rarely
11. I work on extra problems in my math modules in addition to the assigned ones to master the topic.	3.00	1.02	Sometimes
12. I allocate extra study time for my online class because I know that it is time demanding.	3.71	0.93	Often
13. I try to schedule a time to study the modules for my online class and regularly observe this schedule.	3.46	0.92	Often
14. Although we do not have to attend daily classes, I still try to distribute my study time evenly across days.	3.39	1.00	Sometimes
15. I find someone knowledgeable in Math so that I can consult with him/her when I need help.	3.71	1.45	Often
16. I am persistent in getting help with the math module lesson from the instructor through e-mail (or chat).	2.90	1.02	Sometimes
17. I share my problems regarding Math modules with my classmates online, so we know what we are struggling with and how to solve our problems.	3.05	1.41	Sometimes
18. If needed, I try to connect with my classmates through video calls to ask and seek help regarding the math modules.	2.76	1.50	Sometimes
19. I communicate with my classmates to find out how I am doing in my math module activities.	2.85	1.33	Sometimes
20. I communicate with my classmates to find out if what I am learning is different from what they are learning from the module.	2.76	1.39	Sometimes
21. I summarize my learning about the math modules to examine my understanding of what I have learned.	3.78	0.91	Often
22. I ask myself a lot of questions about the content of the math modules.	3.68	1.04	Often
23. The Math modules helped me to control my learning in the online class.	3.90	1.00	Often
<b>TOTAL</b>	<b>3.43</b>	<b>1.20</b>	<b>Often</b>

Table 2: Grade 8 (n=41) Students’ OSLQ Result per Item

The overall result of Grade 8 students’ use of self-regulation strategies under the flexible online learning mode has an average of 3.43, which is verbally interpreted as “often.” This suggests that Grade 8 students frequently use SRL strategies in their flexible online classes using math modules.

<b>Grade 9</b>			
	<b>Mean</b>	<b>S.D</b>	<b>Verbal Interpretation</b>
1. I set learning objectives or learning targets for my activities in Math class.	3.48	1.07	Often
2. I set short-term (daily or weekly) goals and long-term goals (monthly or for the semester) to accomplish my math modules.	3.70	1.05	Often
3. I keep a high standard for my learning in math class.	3.84	1.02	Often
4. I do not compromise the quality of my work just because it is an online setup.	3.50	1.05	Often
5. I set goals to help me manage study time for my math modules.	3.80	1.18	Often
6. I work on my math modules at a time when there are no distractions at home.	3.98	1.10	Often
7. I know the venue where I can study most efficiently for math modules.	4.12	1.10	Often
8. I try to take more thorough notes in my math class because I use those notes to answer my math modules.	3.68	1.25	Often
9. I read aloud math modules posted online or offline as a way to fight against distractions.	2.54	1.15	Rarely
10. I prepare my questions about the math modules before joining the synchronous class.	2.06	1.04	Rarely
11. I work on extra problems in my math modules in addition to the assigned ones to master the topic.	2.68	1.08	Sometimes
12. I allocate extra study time for my online class because I know that it is time demanding.	3.56	1.03	Often
13. I try to schedule a time to study the modules for my online class and regularly observe this schedule.	3.42	1.14	Often
14. Although we do not have to attend daily classes, I still try to distribute my study time evenly across days.	3.66	1.06	Often
15. I find someone knowledgeable in Math so that I can consult with him/her when I need help.	3.90	1.20	Often
16. I am persistent in getting help with the math module lesson from the instructor through e-mail (or chat).	2.78	1.30	Sometimes
17. I share my problems regarding Math modules with my classmates online, so we know what we are struggling with and how to solve our problems.	3.52	1.49	Often
18. If needed, I try to connect with my classmates through video calls to ask and seek help regarding the math modules.	2.94	1.42	Sometimes
19. I communicate with my classmates to find out how I am doing in my math module activities.	2.90	1.46	Sometimes
20. I communicate with my classmates to find out if what I am learning is different from what they are learning from the module.	2.92	1.41	Sometimes
21. I summarize my learning about the math modules to examine my understanding of what I have learned.	3.40	1.12	Often
22. I ask myself a lot of questions about the content of the math modules.	3.54	1.11	Often
23. The Math modules helped me to control my learning in the online class.	3.66	0.89	Often
<b>TOTAL</b>	<b>3.37</b>	<b>0.89</b>	<b>Sometimes</b>

Table 3: Grade 9 (n=50) Students' OSLQ Result per Item

The overall result of Grade 9 students' use of self-regulation strategies under the flexible online learning mode has an average of 3.37, which is verbally interpreted as "sometimes." This suggests that Grade 9 students occasionally use SRL strategies in their flexible online classes using math modules.

<b>Grade 10</b>			
	<b>Mean</b>	<b>S.D</b>	<b>Verbal Interpretation</b>
1. I set learning objectives or learning targets for my activities in Math class.	3.61	1.03	Often
2. I set short-term (daily or weekly) goals and long-term goals (monthly or for the semester) to accomplish my math modules.	3.81	0.99	Often
3. I keep a high standard for my learning in math class.	3.92	0.90	Often
4. I do not compromise the quality of my work just because it is an online setup.	3.61	1.26	Often
5. I set goals to help me manage study time for my math modules.	3.88	1.06	Often
6. I work on my math modules at a time when there are no distractions at home.	4.00	1.11	Often
7. I know the venue where I can study most efficiently for math modules.	4.24	1.04	Always
8. I try to take more thorough notes in my math class because I use those notes to answer my math modules.	3.97	1.19	Often
9. I read aloud math modules posted online or offline as a way to fight against distractions.	2.73	1.46	Sometimes
10. I prepare my questions about the math modules before joining the synchronous class.	2.34	1.32	Rarely
11. I work on extra problems in my math modules in addition to the assigned ones to master the topic.	2.86	1.30	Sometimes
12. I allocate extra study time for my online class because I know that it is time demanding.	3.47	1.09	Often
13. I try to schedule a time to study the modules for my online class and regularly observe this schedule.	3.46	1.18	Often
14. Although we do not have to attend daily classes, I still try to distribute my study time evenly across days.	3.70	1.16	Often
15. I find someone knowledgeable in Math so that I can consult with him/her when I need help.	4.00	1.12	Often
16. I am persistent in getting help with the math module lesson from the instructor through e-mail (or chat).	2.81	1.32	Sometimes
17. I share my problems regarding Math modules with my classmates online, so we know what we are struggling with and how to solve our problems.	4.20	0.95	Always
18. If needed, I try to connect with my classmates through video calls to ask and seek help regarding the math modules.	3.66	1.38	Often
19. I communicate with my classmates to find out how I am doing in my math module activities.	3.82	1.26	Often
20. I communicate with my classmates to find out if what I am learning is different from what they are learning from the module.	3.99	1.15	Often
21. I summarize my learning about the math modules to examine my understanding of what I have learned.	3.73	0.98	Often
22. I ask myself a lot of questions about the content of the math modules.	3.59	1.06	Often
23. The Math modules helped me to control my learning in the online class.	3.73	1.10	Often
<b>TOTAL</b>	<b>3.62</b>	<b>1.25</b>	<b>Often</b>

Table 4: Grade 10 (n=74) Students' OSQ Result per Item

The overall result of Grade 10 students' use of self-regulation strategies in flexible online learning has an average of 3.62, which is verbally interpreted as often. This suggests that grade 10 students frequently use SRL strategies in the flexible online learning environment using math modules.

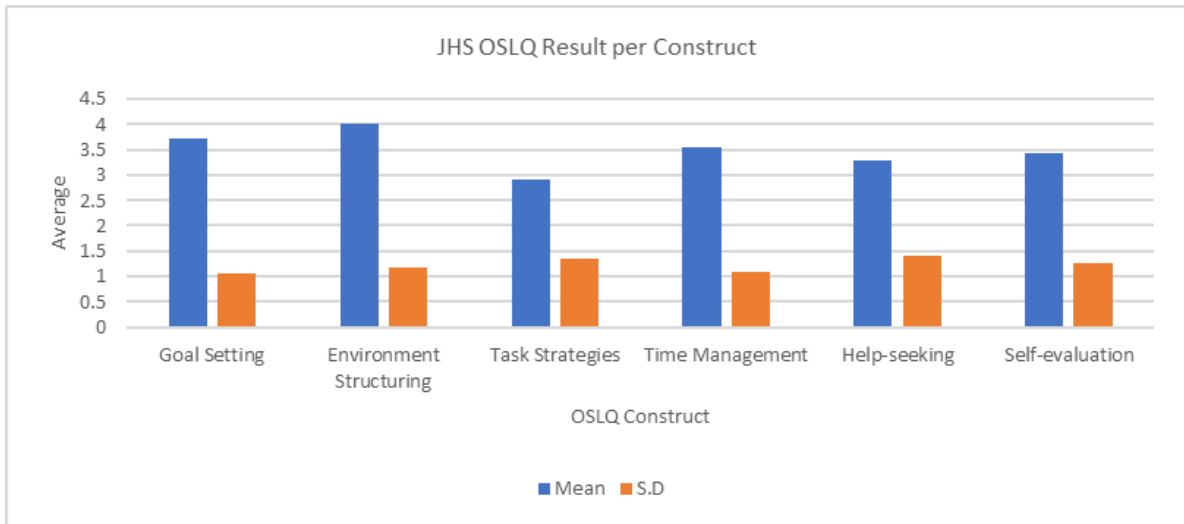


Figure 1: JHS Students' OSLQ Result

Figure 1 shows the OSLQ results of students per construct. Based on the results, one may say that the JHS students attained the highest score in environment structuring ( $M=4.01$ ,  $S.D.=1.16$ ). This implies that students are good at finding a venue with no distractions and that they can study their math modules most efficiently. Second in rank is goal setting ( $M=3.71$ ,  $S.D.=1.07$ ). This suggests that students perceived themselves to often set objectives to accomplish their math modules and kept a high standard for their learning in math class. Third in rank is time management ( $M=3.54$ ,  $S.D.=1.09$ ). This indicates that students often scheduled a time to study the modules for their math online class. Next is self-evaluation ( $M=3.43$ ,  $S.D.=1.26$ ). This shows that students often assess their understanding of the math modules.

On the other hand, the JHS students obtained the lowest mean score for help-seeking ( $M=3.28$ ,  $S.D.=1.42$ ) and task strategies ( $M=2.90$ ,  $S.D.=1.34$ ). This indicates that students were not frequently persistent in getting help in answering the math module from their math teacher, and they did not usually connect with their classmates through video calls to ask and seek help regarding their math modules. Furthermore, for task strategies, students seldom prepared questions about the math modules before joining their SLA class. Also, they did not usually work on extra problems in the math modules, and they did not usually read aloud math to fight distractions.

To determine whether there is a significant difference between the self-regulation of Grades 7, 8, 9, and 10, students' scores in the OSLQ were totaled first. After this, descriptive statistics of each grade level were obtained.

Grade Level	N	Mean	Standard Deviation	Coefficient of Variation	Minimum	Maximum
Grade 7	51	74.82	17.364	23.20%	43	106
Grade 8	41	78.95	15.377	19.48%	31	100
Grade 9	50	77.58	14.723	18.98%	42	115
Grade 10	74	83.15	13.462	16.19%	52	115
Total	216	79.10	15.348	19.40%	31	115

Table 5: Descriptive Statistics of JHS Students' OSLQ Scores



Table 5 shows the descriptive statistics of the OSLQ scores of the JHS students. Grade 10 students have the highest mean, followed by grade 8, grade 9, and grade 7 students, respectively. All coefficients of variation are less than 100% which means that the standard deviations are low in relation to the means.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2262.099	3	754.033	3.304	.021
Within Groups	48384.859	212	228.230		
Total	50646.958	215			

Table 6: Analysis of Variance

A one-way ANOVA was performed to compare students' self-regulation total scores per grade level. Before conducting the one-way ANOVA, the researcher checked if the assumptions of normality, equal variances, and independence were met. Using Shapiro-Wilk and Kolmogorov-Smirnov, Levene's test, and since participants are from different grade levels, then all the assumptions were met. The one-way ANOVA revealed a statistically significant difference in grade level between at least two groups ( $F(3, 212) = 3.304, p = 0.021$ ).

GRADE		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
7	8	-4.128	3.169	.562	-12.33	4.08
	9	-2.756	3.007	.796	-10.54	5.03
	10	-8.325*	2.749	.015	-15.44	-1.21
8	7	4.128	3.169	.562	-4.08	12.33
	9	1.371	3.183	.973	-6.87	9.61
	10	-4.197	2.941	.484	-11.81	3.42
9	7	2.756	3.007	.796	-5.03	10.54
	8	-1.371	3.183	.973	-9.61	6.87
	10	-5.569	2.766	.186	-12.73	1.59
10	7	8.325*	2.749	.015	1.21	15.44
	8	4.197	2.941	.484	-3.42	11.81
	9	5.569	2.766	.186	-1.59	12.73

Table 7: Paired Comparisons using Tukey HSD

To determine the levels that have a significant difference, Tukey's HSD Test for Multiple Comparisons was used. It was found that the mean value of grade level was significantly different between Grade 7 and Grade 10 ( $p = .015, 95\% \text{ C.I.} = [-15.44, -1.21]$ ). On the contrary, there was no statistically significant difference between Grade 7 and Grade 8

( $p=.562$ ), Grade 7 and Grade 9 ( $p=.796$ ), Grade 8 and Grade 9 ( $p=.973$ ), Grade 8 and Grade 10 ( $p=.484$ ), and Grade 9 and Grade 10 ( $p=.186$ ).

	Grade 7			Grade 8			Grade 9			Grade 10		
	M	S.D	V.I	M	S.D	V.I	M	S.D	V.I	M	S. D	V.I
Goal Setting	3.70	1.16	Often	<b>3.68</b>	<b>0.97</b>	Often	3.66	1.08	Often	3.76	1.06	Often
Environment Structuring	3.67	1.37	Often	<b>4.21</b>	<b>1.07</b>	Always	4.05	1.10	Often	4.12	1.08	Often
Task Strategies	2.85	1.34	Sometimes	<b>3.04</b>	<b>1.19</b>	Sometimes	2.74	1.27	Sometimes	2.98	1.44	Sometimes
Time Management	3.55	1.14	Often	<b>3.52</b>	<b>0.95</b>	Often	3.55	1.08	Often	3.55	1.14	Often
Help-seeking	2.83	1.43	Sometimes	<b>3.10</b>	<b>1.40</b>	Sometimes	3.29	1.42	Sometimes	3.67	1.31	Often
Self-evaluation	3.13	1.38	Sometimes	<b>3.40</b>	<b>1.21</b>	Sometimes	3.28	1.25	Sometimes	3.77	1.11	Often

Table 8: OSLQ Result per Construct per Grade Level

Table 8 shows that all grade levels often used strategies for goal setting, environment structuring, and time management. On the other hand, task strategies were infrequently used. Furthermore, grade 10 students often used help-seeking and self-evaluation strategies, unlike in Grades 7, 8, and 9, who only used them sometimes. This suggests that grade 10 students seek help more and evaluate themselves better than grades 7 to 9. Overall, JHS students often use goal setting, environment structuring, time management, and self-evaluation strategies.

***RQ2. What are the students' experiences in using mathematics modules to support their self-regulation in a flexible online learning environment?***

The researcher followed Braun and Clarke's six phases of analysis (2006) as a guide in doing the thematic analysis for focus group discussion. The findings underwent member checking, also known as respondent or participant validation, to check their accuracy. This process increased the reliability of the findings (Birt et al., 2016). The emerging themes did not vary between groups. The four themes produced were shown in Figure 2.

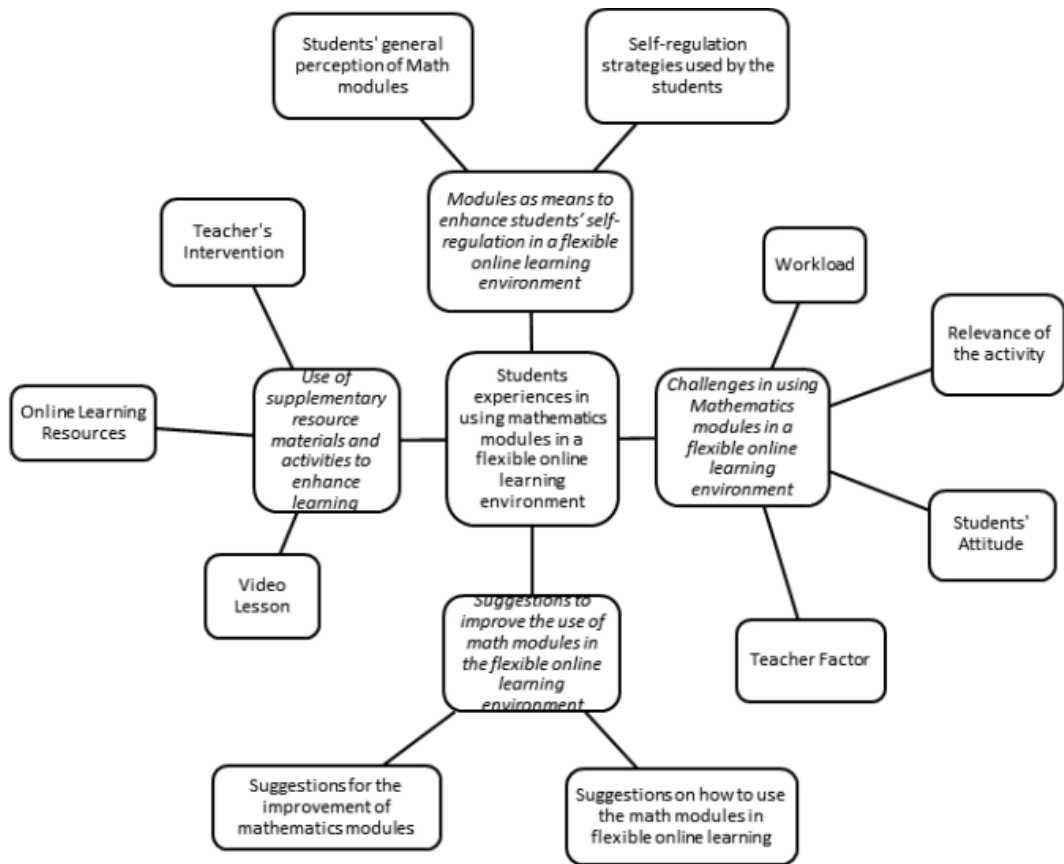


Figure 2: Thematic Map for Focus Group Discussion

**Theme 1:** *Mathematics modules as a means to support students' self-regulation in a flexible online learning environment.*

Most of the participants across groups gave a positive assessment of the use of mathematics modules. They stated that modules served as their guide and helped them learn in a flexible online learning setup. Students shared how the modules helped them in their online mathematics classes. They emphasized that they used mathematics modules in studying their math lessons. Participants said that mathematics modules assisted in studying in advance for their lessons and in deepening their understanding of the topic, especially whenever they missed a lesson.

**G8-34:**

*Yes, because it also helps me beforehand, before SLA class starts, it helps me advance study in [a] certain lesson.*

**G9-40:**

*But whenever I look across those, I think they are important, especially since they are not exactly required. They are, I believe, to help encourage the students in learning and to understand the topic better. Whenever you missed a lesson, they give you an opportunity to enhance or deepen your understanding of a topic or a lesson.*

Furthermore, mathematics modules helped students perform well in math as these complemented the SLA discussions.

### **G7-14:**

*For me po, it helps me perform well in my Math online class because the information in the module makes me generate more questions in my mind. Which I then put into a list form to ask during SLA sessions.*

Also, the students shared their experiences in using different features of the modules. The students expressed how they used these features in their planning, goal setting, environment structuring, task strategies, time management, help-seeking, and self-evaluation, as shown in the following quotes.

Planning	<p><b>G9-33:</b> <i>Dun po sa first part ng module, meron pong module planner and naka-help po dun yung pagpa-plan kasi meron po yung target date and such. And dun ko po madalas binibase yung pagsasagot ko ng Math modules. Maybe around 1-2 module activities po per day.</i></p> <p>English Translation: In the first part of the module, there is a module planner, and it helps me with planning my schedule because there is a target date and such. And that's where I often base when to answer my math modules. Maybe around 1-2 module activities per day.</p>
Goal setting	<p><b>G9-19:</b> <i>And yung list of most essential competencies po is going to give you ng parang goal or objectives po that you need to attain when accomplishing the module.</i></p> <p>English Translation: And the list of most essential competencies is going to give you a goal or objectives that you need to attain when accomplishing the module.</p>
Environment Structuring	<p><b>G10-29:</b> <i>In accomplishing the module activities, I do it with my friends. We started doing it from the first quarter until the fourth quarter po. I think it's really fun to accomplish it with friends since hindi lang ikaw yung nahihirapan pati sila nahihirapan din.</i></p> <p>English Translation: In accomplishing the module activities, I do it with my friends. We started doing it from the first quarter until the fourth quarter. I think it's really fun to accomplish it with friends since it's not just you struggling. They are also struggling.</p>
Task-strategies	<p><b>G7-51:</b> <i>The strategy that I used is just to go lesson by lesson and do the activities right after the teacher discussed the lessons during the SLA lessons.</i></p>
Time-management	<p><b>G9-40:</b> <i>As for the module planner itself, is quite essential because it helps you organize what you are going to do and what can you do. It shows you what you have and haven't accomplished, and personally, for me, who is someone who quite struggles to make a reliable schedule with the task I do, it is quite a lot of help.</i></p>
Help-seeking	<p><b>G7-5:</b> <i>Yes po. Sometimes po when I get confused, I either asked help from people or look on the internet.</i></p>
Self-evaluation	<p><b>G9-21:</b> <i>For the list of most essential competencies and module planner, it helped me assess myself po in answering the following module activities.</i></p>

Table 9: Excerpt from FGD (Verbatim)

These responses illustrate that the features of the math modules, such as the pre-test, list of most essential competencies, module planner, and self-check activity encouraged them to use self-regulation strategies. On the other hand, module activities and answer keys allowed the students to perform well in their classes as they helped them gain the necessary math skills.

**G7-39:**

*They help me to perform well po because the math modules po are the only things I used upon reviewing po for something po or for refreshing before answering an activity po.*

**G10-32:**

*The answer key, it will help you enhance your skill po. Kasi sometimes, yun nga, may mistake yung answer key. So, with that, you have to take to your teacher and ipaglalaman mo na mali yung nasa answer key at tama yung sagot mo. You have to persuade him or her (teacher) na tama yung process mo.*

English Translation:

The answer key will help you enhance your skill. Sometimes, answer keys contain mistakes. From there, you can discuss with your teacher that the answer key is wrong, and your answer is correct. You must persuade your teacher that your solution is correct.

Students also talked about some of the task strategies they used for their mathematics class. For example, one student shared that she took notes during SLA and compared it to the math module for better understanding.

**G10-24:**

*For me po, nagonotes lang din po ako from the SLA session tapos chinicheck ko lang po uli sa module kung ano yung pinakameaning ng lesson na iyon or formulas.*

English Translation:

For me, I just took notes from the SLA discussion, and then I studied the modules to understand better the lesson or the given formulas during SLA.

**Theme 2:** *Use of supplementary resource materials and activities to enhance learning.*

It is also revealed that students used help-seeking strategies not mentioned in the OSLQ. They shared that whenever they find the topic in the math module hard to understand, aside from asking for help from other people, they use supplementary materials. The links to some of these materials can be found in the mathematics modules. Here are some quotes about students' use of video lessons.

**G8-30:**

*Here is my response to the YouTube links embedded in the modules. Some students find it necessary because the videos contain step-by-step instructions for those who haven't fully grasped the lessons.*

**G7-14:**

*I think these links are very important po because they further explain the topic to the students aside from the given examples of the teacher in the SLA and in the module, nagbibigay din po ng examples yung mga YouTube links and Khan Academy.*

English Translation:

I think these links are very important because they further explain the topic to the students aside from the given examples of the teacher in the SLA and in the module. YouTube [videos] and Khan Academy also give examples.

While these are some of the statements about their use of online learning resources.

**G8-29:**

*Pero yung ibang website links po tulad ng desmos and other stuff, I think medyo importante po iyun kasi kapag mahirap po talaga yung topics and need na po ng help, I think dun na po papasok yung help ng mga websites na iyun.*

English Translation:

But the other website links like Desmos [calculator] and other stuff, I think that's quite important because when the topics are difficult, and you need help, I think that's where the help from those websites comes in.

**G10-24:**

*Tapos I seek help, minsan lang po. And usually po, I tried to do it myself po. I try to search in google po.*

English Translation:

I seek help sometimes. Usually, I try to do it myself. I try to search on Google.

Moreover, students preferred to listen to their teachers during SLA discussions before working on their modules. One student expressed that SLA discussions are better than modules alone since their learning styles are addressed.

**G9-40:**

*I have to agree that when it comes to comparing these two ways of taking information [module and synchronous meeting], I believe that when it comes to – let's say – the teacher is presenting the module and discussing the topic with the teacher, it is more effective because, like the other participant has said, each and every student is different from the other students. Each one has [their] own way of learning, either auditory, visual, tactile, etc. And also, I would like to bring up that you can ask the teacher and have discussions, which are more interactive [than answering modules]. You can discuss this in real-time. Connection is being made. And when you compare it with just reading the module by yourself, there isn't much variety to it. It is just you reading whatever is on the module, and there is not much auditory or much discussion between you and the module itself.*

**Theme 3: Challenges in using mathematics modules in a flexible online learning environment.**

It is revealed that students also experienced challenges in using the mathematics modules in flexible online learning. Due to the number of activities, not only in the math modules but also in other subjects, students expressed that they felt overwhelmed.

**Workload**

**G10-70:**

*But to be honest, sometimes, it is quite tedious working on these activities because there are other activities that we need to do in other subjects. And sometimes it is hard to do these extra activities.*

**G9-38:**

*It's overwhelming po because of the number of activities in it.*

Some students also find it unnecessary to answer some module activities because they need to see the relevance of these to real-life scenarios. One student explained that the activity was unnecessary if it was not in line with the topic, and he could not see how it relates to real-life situations.

## **Relevance of the Activity**

### **G9-31:**

*And also, yung essential questions and Bedan talk po, I just answer it when it's required po but actually it is unnecessary na po for me. And this year po, parang wala naman na akong masyadong na encounter na essential questions and just the Bedan talk. But for me po, I don't think na it is not in line with the topic po talaga. So parang naging reckless lang po yung naging sagot ko because I really don't know how it is related to real-life situations and the Benedictine Hallmarks.*

English Translation:

And, regarding the essential questions and Bedan talk, I just [answered] them when required but actually, it is unnecessary for me. And this year, it seems that there [were] fewer essential questions and Bedan talks. But for me, I [didn't] think that they [were] in line with the topic. So, it is like, I [answered] them carelessly because I [didn't] know how they [were] related to real-life situations.

Furthermore, the participants also clarified that the reasons for not frequently asking for help from their teachers were that they were shy, and they felt intimidated by their teachers since they seem not approachable.

## **Student Attitude toward Learning and Teacher Factor**

### **G9-21:**

*And in seeking help po, I usually don't seek help because I have fewer friends po in the class. And somehow, I find the teacher intimidating. I am afraid to get asked po if I am really listening to the discussion.*

### **G10-29:**

*I try not to [ask for help] so that I can be more independent. And my math teacher is not really approachable po.*

**Theme 4:** *Suggestions to improve the use of mathematics modules in the online learning environment.*

Through these challenges, they gave the following suggestions. For the content of the module, they suggested lessening module activities, providing detailed examples of the different math problems, considering the learning styles of the students, and providing vocabulary or review activities and more difficult word problem samples. Moreover, they suggested that students may allot time to accomplish the module activities, and teachers may offer options on how to accomplish the module activities. Here are some of their statements:

**G8-26:**

*But I think it is important to be given a chance to think freely outside of the given formulas and given answers. Otherwise, I find it a bit hard since it helps me change my trend of thought after I was just thinking about formulas.*

**G9-21:**

*I think the modules are quite wordy po that somehow confuses the other students. Instead of creating a whole paragraph po, I think it would be better we have a page po for the different terminologies.*

**G9-40:**

*Each one has [their] own way of learning, either auditory, visual, tactile, etc. And also, I would like to bring up that you can ask the teacher and have discussions, which are more interactive. You can discuss this in real-time. Connection is being made. And when you compare it with just reading the module by yourself, there isn't much variety to it. It is just you reading whatever is on the module, and there is not much auditory [stimulation] or much discussion between you and the module itself.*

**RQ3. What are the teachers' experiences in using mathematics modules to support students' self-regulation in a flexible online learning environment?**

The researcher interviewed individually the math teachers from different grade levels to gather their observations regarding students' SRL in the classroom. The researcher also followed the six phases of analysis of Braun and Clarke (2006) as a guide in doing the thematic analysis. The findings also underwent member checking, also known as respondent or participant validation, to check their accuracy and to increase the reliability of the findings (Birt et al., 2016). The four themes produced were shown in Figure 3.

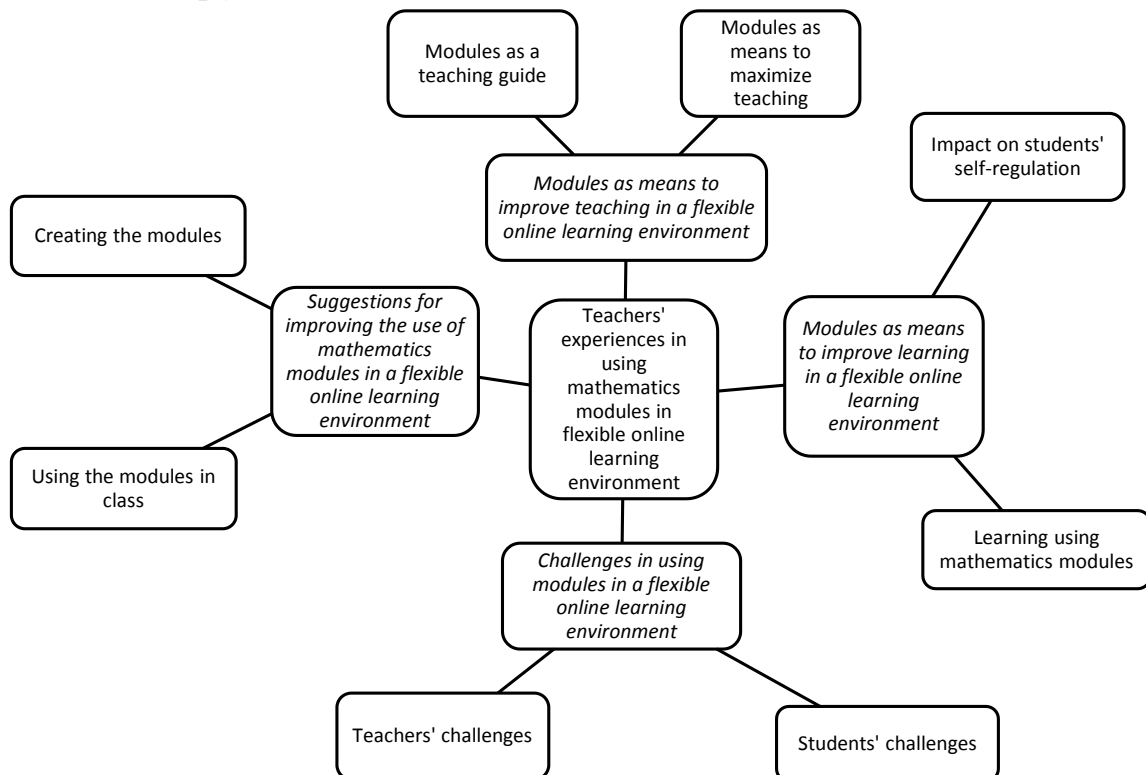


Figure 3: Thematic Map for Individual Interviews



**Theme 1:** Mathematics modules as means to improve teaching in a flexible online learning environment.

The teachers emphasized that the modules served as their guide during discussion. Also, modules helped teachers maximize their time in the flexible online learning setup. Teacher A shared that in the current setup, many learning activities can be given to the students using modules, unlike in the face-to-face setup where modules were not utilized.

**Teacher E:**

*In my class po kasi, I used the modules as my guide during the discussion. For example, I want my students to try the content or topic that we discuss during SLA, I'm going to ask my students to answer specific activity in the module po. So that's one, that's one way I used the module.*

**Teacher A:**

*Actually, ito yung napansin ko. Compare dun sa face-to-face na set-up natin, yung module natin, marami siyang activities. Mas marami yung activities na naibibigay natin sa students because of the module compare nung andoon tayo sa face-to-face set-up.*

English Translation:

Actually, this is what I noticed. Compared to our face-to-face setup, our module has many activities. There are more activities that we can give to students because of the module compared to when we were in the face-to-face set-up.

Teachers also viewed the answer key as an immediate way of giving feedback to students that allowed them to monitor their own performance in answering the mathematics module activities.

**Teacher A:**

*Beneficial, first, yung answer key. Kasi parang feedbacking na rin iyon eh. Makikita nila agad kapag nagsolve sila, kung tama yung sagot nila o hindi.*

English Translation:

The answer key is, first, beneficial. Because that's like giving feedback too; they will see immediately when they solve if their answer is correct or not.

One teacher also shared that, through the modules, he can encourage his students to study in advance about the lessons to be discussed during SLA.

**Teacher E:**

*The other one is if I want them to do the advanced reading. So, before the SLA session, I'll ask my students to do the advanced readings, which is the module nga po. So those are the two things na ginagamit ko yung module in my class.*

Math modules also helped math teachers teach under the flexible online learning mode. One teacher shared that the math module served as his guide in class as it helped him with the activities to be assigned in class. He also emphasized that the answer keys made it easier for him to check students' outputs.

**Teacher E:**

*Para sa akin naman, as a teacher, mas madali magturo since meron ng prepared activities included sa modules. So I don't have to think of another activities na kailangan nilang gawin during ALA. That's one. Second is yung sa answer key nga, mas madali na para sa akin magcheck since nacheckan na nila and I just have to double check their work. Ayun so, I think that's it.*

English Translation:

Teacher E: For me, as a teacher, it is easier to teach since there are prepared activities included in the modules. So, I don't have to think of another [set of] activities they have to do during ALA. That's one. Second is the answer key; it's easier for me to check since they have already checked their work, and I just have to double-check their work. So, I think that's it.

**Theme 2:** *Mathematics modules as means to improve learning in a flexible online learning environment.*

It was revealed that different features of the mathematics modules allowed the students to engage in different self-regulation strategies were also supported by the analysis of teachers' individual interviews.

Goal Setting	<p><b>Teacher A:</b>  <i>Maganda 'yung module planner actually. Kasi, una pa lang, pwede 'yung, let's say ALA, pwede nilang i-list 'yung [activities] and then ma-answer nila. Guide kasi nila 'yun para ma-accomplish 'yung module.</i>  English Translation:  The module planner is good. Because it's possible that, let's say, it's their ALA. They can list the activities, and then they can answer them. Because that is their guide to accomplishing the module.</p>
Task Strategies	<p><b>Teacher B:</b>  <i>Magtatanong ako bago mag-start kasi instruction ko rin 'yun sa kanila na read ahead of time; parang [babasahin nila] or study na the module para during SLA meetings, example na lang [kami]. May mga nakakasagot na agad. Talagang alam na nila yung lesson namin.</i>  English Translation:  I will ask questions at the start of the discussion because I also instructed them to read ahead of time, like they should read or study the module. So that, during SLA meetings, we will focus on examples. There are students who can answer immediately. They know our lesson.</p>
Time management	<p><b>Teacher A:</b>  <i>'Yung parang – I don't know. Siguro kasi gano'n yung thinking nila. Siguro kung ako din yung student, gano'n din yung iisipin ko – na instead [of] wasting the time of the class for my question, I'll just listen first and then, kung meron akong tanong, during ALA na lang. Kaming dalawa na lang ni teacher. Parang gano'n.</i>  English Translation:  It's like – I don't know. Maybe because that's how they think. Maybe if I were the student, I would think the same thing; instead of wasting time in class on my question, I'll just listen first, and then, if I have a question, I will ask it during ALA. So it's just the two of us: the teacher and me. Something like that.</p>
Help-seeking	<p><b>Teacher B:</b>  <i>Nakatulong din yung SLA recordings kaya nabawasan yung mga nagtatanong na bata. Kasi nare-replay nila. At sabi ko naman sa kanila na they may rewatch the SLA recordings kung may mga concern [sila], bago [nila] itanong talaga sa akin ['yung mga tanong nila]. Sinusunod naman nila yun.</i>  English Translation:  The SLA recordings also helped in minimizing the number of students who asked me questions. [It's] because students can replay them. I also told them that they could rewatch the SLA recordings if they had any concerns before they ask me questions. They do just that.</p>
Self-evaluation	<p><b>Teacher A:</b>  <i>So, I think, it's a good point of the module na meron siyang answer key kasi nave-verify nila agad kung yung answer nila ay tama.</i>  English Translation:  So, I think, it's a good point of the module that it has an answer key because they can immediately verify if their answer is correct.</p>

Table 10: Excerpt from Interviews (Verbatim)

Teachers also observed that students learn through the mathematics modules. Teachers explained the different learning processes that students went through using the modules. Also, one teacher noticed that students could answer during the discussion since they have read the module.

**Teacher B:**

*Sa modules, since may book rin naman sila, siyempre, kumukuha ako ng resources na iba. I mean parallel with the book pero may ibang approach. May discussion and after that may activity agad. Discussion-activity, discussion-activity. May mga Explore [activity] na pwede nilang ma-watch, tapos a-answeran nila 'yung mga guide [question]. O [kung] may mga problem, doon sa Explore [activity] pa lang may problem na agad para malaman natin kung paano iso-solve [mga] 'yun nang hindi pa naituturo sa kanila 'yung problems. Or baka alam na nila i-solve. And then sa module natin may apat na part e: Explore, Firm-Up, Deepen, and Transfer. So, sa Deepen [part], more on problem-solving. Sa Transfer [part], mga PT, mini-tasks. Gano 'n, miss.*

English Translation:

In the modules, since they also have a book, of course, I use different resources, I mean those that are parallel with the book but with a different approach. After the discussion, there is always an activity. So, it's like discussion-activity, discussion-activity. There are also Explore activities that they can watch, then they will be able to answer the guide questions. Or there are problems in the Explore activity so that we can know how they will solve them even though I have not taught to them. And then, in our module, there are four parts: Explore, Firm-Up, Deepen, and Transfer. So, in the Deepen part, that section is more on problem-solving. In the Transfer part, it's more on PTs [performance tasks], and mini tasks,

**Teacher C:**

*Also, sometimes, ayun nga 'yung answers nila doon na nanggagaling. So kapag ako naman ang nag-ask ng questions, 'yung answer nila ay based on what they have read [on the module].*

English Translation:

Also, sometimes, that's where their answers come from. So, when I ask questions, their answer is based on what they have read [on the module].

Furthermore, teachers clarified that students do not often ask for help because they were oriented on what to do if they find the lesson in the mathematics module difficult to understand.

**Teacher C:**

*Kasi, it has been discussed na rin with the students na before the consultation would be done, they have to look at the procedures muna, which is 'yun nga, reviewing muna of the recordings, then the modules; pero, kung hindi talaga na maintindihan, that's the time that we will schedule for a consultation.*

English Translation:

It has been discussed with the students that, before a consultation period is done, they must look at the procedures first, which is, as I said, reviewing the recordings first and then the modules. If they cannot understand them, that's the time to schedule a consultation period.

Teachers also noticed that most students preferred to listen first in the SLA discussion before they answered the module activities or instead of asking questions about the module activities. One teacher explained that the possible reason for this is for them to maximize their time in accomplishing their tasks.

**Teacher A:**

*'Yung parang, I don't know, siguro kasi gano'n yung thinking nila. Siguro kung ako din yung student, gano'n din yung iisipin ko na "Instead [of] wasting the time of the class for my question, I'll just listen first and then, kung meron akong tanong, during ALA na lang – kaming dalawa na lang ni teacher." Parang gano'n.*

English Translation:

Teacher A: It's like, I don't know, maybe because that's how they think. Maybe if I were the student, I would think the same thing: "Instead of wasting time in class for my question, I'll just listen first, and then, if I have a question, I'll ask it during ALA. It's just me and the teacher." Something like that.

Furthermore, one teacher observed that students had developed the initiative to accomplish their tasks during ALA without teachers' instruction.

**Teacher C:**

*In accomplishing their tasks, I noticed na yung students na mismo yung naghahanap [ng activities]...sometimes, there are times kasi in a quarter, especially kapag alam natin na sabay-sabay na talaga 'yung activities nila, na binabawasan na natin yung pinapagawa natin sa kanila. So, there was a time na hindi ko na binigay yung certain activity for ALA; meron na akong hindi inassign, or meron na akong binawas; but then, the students themselves are asking me na "Miss, should we answer this po?" Kasi it has become a routine for them already. So ayun yung napansin ko – na they were able to build up a routine na alam nila na, kapag ALA time, "Itong part ng module 'yung kailangan kong i-answer." Then, [merong] proficiency task after.*

English Translation:

In accomplishing their tasks, I noticed that the students themselves were searching [for the activities]. There are times in a quarter, especially when we know that there are activities in different subjects that are given at the same time, we reduce the activities that we ask them to do. So, there was a time when I didn't give a certain activity for ALA, I didn't assign something, or I deducted something; but then, the students themselves asked me, "Miss, should we answer this?" [It's] because it has become a routine for them already. So that's what I noticed that they were able to build up a routine that they know that when it's ALA time, "This part of the module is what I must answer." Then, [there is a] proficiency task after.

**Theme 3: Challenges in using mathematics modules in a flexible online learning environment.**

The findings from the interview revealed that teachers also experienced challenges in using the math modules in flexible online learning. These challenges include training, limited resources, and time, minimizing the activities, student's motivation, and learning styles.

Due to the sudden shift from face-to-face to online learning, there was not enough training for the teachers on how to write the mathematics modules, as mentioned by the teachers.

## **Training**

### **Teacher A:**

*Trainings? Parang wala yata. For webinars? Webinars in creating a module? I can't remember e. Siguro, di siya workshop e, so baka webinar nga lang siya.*

English Translation:

Training? I think there were none. For webinars? Webinars in creating a module? I can't remember. Maybe, it's not a workshop, so maybe it's just a webinar.

### **Teacher E:**

*Actually, since this is my first year po and I only created modules for one quarter only; unfortunately, wala akong training. So binase ko yung module du'n sa mga previous modules na pinasa lang rin sa akin. And then I tried to improve [them] lang.*

English Translation:

Since this is my first year, and I only created modules for one quarter only; unfortunately, I have no training. So, I based that module on the previous modules that were also passed on to me. And then I just tried to improve [them].

They also shared that there were limited resources and time for the teachers to create the mathematics modules.

## **Limited Resources and Time**

### **Teacher A:**

*Actually, I don't rely more on modules. Kung ano yung mga difficulties na na-encounter ko sa modules, siguro yung paggawa ng module. Ayun, siguro yun 'yung pinaka-challenging para sa akin. Kasi, I think I have a limited access, 'yung mga [source], sa paggawa ng module. 'Yung, doon, kulang ako. So kulang ako ng mga [resource]. Kasi nga, di ba, 'andito lang tayo sa bahay. Kulang tayo sa access sa mga [reference] na pwede nating ilagay doon sa module.*

English Translation:

I don't rely more on modules. One of the difficulties that I encounter is, maybe, preparing the module. Well, maybe that's the most challenging [thing] for me. Because I think I have limited access to the sources in making the module. So, I lacked resources because we were just here at home. We lacked access to references that we can include in the module.

### **Teacher D:**

*Kasi medyo mabilis nga, like what we have mentioned in the synchronous class; kasi, before, in the F2F class, 5 times natin sila nami-meet every week, a total of 5 hours. Unlike now, twice lang or 2 hours per week, and then sa hapon for ALA na iyon.*

English Translation:

Because it is quite fast, like what we have mentioned in the synchronous class; because, before, compared to the F2F class, we met them 5 times every week, a total of 5 hours. Unlike now, only twice or 2 hours per week, and then in the afternoon we hold ALAs.

Also, teachers find it difficult to lessen the module activities due to numerous competencies.

## **Minimizing the Activities**

### ***Teacher A:***

*And also, yung sa paggawa ng module, isa sa mga difficulty na na-encounter ay kung paano siya gagawing brief, pero 'andun lahat. Kasi parang gusto mo na 'yung module pa lang can stand alone, that the student can learn from the module itself. 'Yung module lang, meron na silang matututunan; pero, parang napakahirap kasi kailangan siya na i-summarize mo. Tapos kaunti lang 'yung activities kasi you cannot expect them to finish din. Kasi nga ang dami din nilang modules [sa ibang subjects]. So ayun yung pinaka-challenge doon – 'yung paggawa ng modules.*

English Translation:

And also, when making the module, one of the difficulties I encountered was how to make it brief but complete. Because we want the module to be a stand-alone that the students can learn from; even though they have modules only, they will learn. But it seems very difficult because you need to summarize a lesson, then only a few activities must be included because you cannot expect them to finish either. They also have many modules [in other subjects]. So, that's the most challenging thing there – the creation of modules.

### ***Teacher D:***

*So sa [cons], hindi na siguro magiging [beneficial] ang module kapag it is very long. There is a tendency kasi na the students will not read it anymore. So as much as possible, we try to make a creative module, 'yung talagang kaunti lang.*

English Translation:

So, for [cons], maybe the module will not be beneficial anymore when it is very long. There is a tendency that the students will not read it anymore. So as much as possible, we try to do a creative module that is short.

Lastly, teachers find it challenging if there are students who are not motivated to attend an online class. They noticed that there were a few students who were not attending the SLA meeting and who could not submit their module activities. Also, they observed that not all learning styles are catered to in the modules.

## Students' Motivation and Learning Styles

### **Teacher D:**

*'Yung mga batang hindi ganoon ka-motivated to attend the online class, sila rin yung students na nagkakaroon ng difficulties during the ALA period or in submitting their deliverables. Kasi, we can check through their class notebook, kung nakapag-submit ba talaga sila. And as early as first quarter, nagbibigay na kami ng guidelines kung paano ang gagawin since the answer key is provided.*

English Translation:

Those children who are not that motivated to attend the online class, they are also the students who have difficulties during the ALA period or in submitting their deliverables. Because we can check through their class notebook if they really submitted it. And as early as the first quarter, we are already giving guidelines on how to do it since the answer key is provided.

### **Teacher A:**

*And then for "not beneficial" naman: 'yung module natin ay hindi naka-cater [sa] lahat ng learning styles. Para sa akin, ha? Hindi naka-cater lahat ng learning styles. Naka-print e o kaya PDF e. Although, may mga YouTube video naman, pero would they try to open [them]? Baka 'yung iba, [papanoorin] na lang 'yung recorded meeting. So, I think na hindi...ganoon ka-wide yung nasasakop niya na learning styles ng students. Hindi siya applicable for all.*

English Translation:

And then for "not beneficial": our module does not cater to all learning styles. For me, not all learning styles are catered for. The modules are either printed or in PDF format. Although there are YouTube videos, would they try to open them? Maybe others will just watch the recorded meeting. So, I think that modules do not cover the learning styles of students. It is not applicable to all.

For the students' part, teachers agreed that the number of activities hindered students from studying in advance for their math class.

## Heavy Workload

### **Teacher E:**

*Actually, I ask some students kung bakit nga gano'n, and one of their concerns is that there are lots of assessments that they need to accomplish during the ALA period. That's why they don't have the time [for] advance reading. Parang [sa] ALA nila, actually, nag-aaral nga rin sila tuwing gabi. Kinakaya na lang kasi nagsasagot nga sila ng mga [assessment] or ng activities ng previous topic pa. So kahit i-assign mo nang advance, kahit 'yung mga magagaling nag-struggle din lalo na kapag nag-assign ka ng advance reading tapos sinabay mo pa sa mga [assessment].*

English Translation:

I ask some students why, and one of their concerns is that there are lots of assessments that they need to accomplish during the ALA period. That's why they don't have the time to do advanced reading. Aside from their ALA period, they also study at night. They also answer the assessments or the activities of the previous topic. So even if you assign a reading in advance, even the model students struggle, especially when you assign advanced reading together with the assessments.

**Theme 4:** *Suggestions for improving the use of mathematics modules in flexible online learning.*

Teachers also gave suggestions to improve the math modules based on their experiences. In creating the math modules, they suggested lessening the module activities, adding a section for vocabulary words, indicating the duration of each activity, providing a link for a real-time record sheet, and giving more sample problems. They also suggested establishing routines for



using the math modules in class and using them in peer learning and flipped learning. These are the sample quotes from teachers.

**Add vocabulary** *Teacher A:*

**Words** *So maybe suggestion na lang is we can put vocabulary words, maybe, definition of terms; pero, may gano 'n naman tayo sa ibang part.*

English Translation:

So maybe my suggestion is we can put vocabulary words, maybe, definitions of terms, although we have that already in other parts.

**Lessen module activities** *Teacher B:*

*Recommended pero siguro modify [yung modules]. Especially 'yung mga [activity]. May mga [activity] kasi nga di naman na ginagamit. So kung di naman na useful, huwag nating ilagay. Kasi last year, may Activity 1 tapos may 1.1, 1.2, and 1.3 pa. So siguro [isang activity] na lang.*

English Translation:

Recommended but maybe let's modify the modules, especially the activities that are no longer used. So, if it's not useful, don't put it. Because, last year, there was Activity 1; then, it was followed by Activity 1.1, 1.2, and 1.3, and so on. So maybe just put one [activity] only.

**Add real-time record sheet** *Teacher C:*

*Siguro, we could have the scores kung saan nilalagay, or maybe...real-time na monitoring...for example, you [can] give the students...flexible time kung kailan nila ia-answer. Pero siyempre dapat may deadline pa rin. Yes, they are free to do it during their available time pero dapat meron pa ring certain time kung kailan dapat tapos na sila sa task na iyon. For example, lesson number, bibigyan lang si student ng a week. Maybe a week will do naman for him/her to do or finish 3 activities especially if 5 points or 5 items lang na activity iyan.*

English Translation:

Maybe, we could have the scores where they are supposed to be placed, or maybe real-time monitoring...for example, you [can] give the students... flexible time when they will answer. But of course, there should still be a deadline. Yes, they are free to do it during their available time, but there must still be a certain time when they must be done with that task. For example, in a lesson number, the student will only be given a week. Maybe a week will do for him/her to do or finish 3 activities, especially if that activity is only worth 5 points or 5 items.

**Include time duration for each activity**

*Teacher C:*

Of course, as teachers, we know naman that they [students] can accomplish it, an hour would do. Pero yun nga, with a problem of students being not able to answer yung certain activity, siguro kahit module activities yan, dapat meron pa ring deadline na nakalagay. So if in the module kung may idadagdag man ako, siguro nga yun ay yung deadline, para din dun sa summative assessments masanay din sila na mayroong deadline na kailangan sundin. So not really a specific deadline naman na kunwari yung specific date ay ilalagay, but maybe in the activities, lalagyan ng time duration kung gaano katagal nila ianswer. Para masanay sila na may time monitoring din dapat sila on their own para kapag nagtake na sila ng summative assessments, sanay na sila. And together, nadedevelop na rin yung speed nila as they do those formative assessments.

English Translation:

Of course, as teachers, we know that they [students] can accomplish it, an hour would do. However, with the problem of students not being able to answer a certain activity, maybe even if it's just a module activity, there should still be a deadline. So, in the module, if I must add something, maybe that is the deadline for every activity so that in the summative assessments, they can also get used to having a deadline that needs to be followed. So not really a specific deadline as if the specific date will be set, but maybe in the activities, time duration will be set for how long they will answer. For them to get used to having time monitoring so that when they take summative assessments, they are used to it. And together, their speed is also developed as they do those formative assessments.

**Provide more sample problems**

*Teacher E:*

Actually, maganda kasi yung module na naprepare ng school. Complete siya, meron siyang objectives, essential questions, lahat. So I think, walang pangit na feature yung module natin. But if you'll ask me if what are the things we need to improve in those modules is that yun nga, yung examples. Pili lang yung content na may mga examples. Lesser activities, wherein yung activities ay covered niya na karamihan ng competencies, hindi lang isang chunk or yung isang part. So lesser activities pero maraming competencies [na kasama].

English Translation:

Actually, the module prepared by the school is good. It is complete, it has objectives, essential questions, and everything. So, I think, our module has no unlikeable features. But if you'll ask me what to improve in those modules is the examples. Only selected contents have examples. Lesser activities, in which the activities covered most of the competencies, not just a chunk or a part. So lesser activities but many competencies [included].

Table 11: Excerpt from Interview (Verbatim)

## Discussion

The first aim of this study is to gain an understanding of how students manage their learning in a flexible online learning environment. The results showed that students attained the highest score in environment structuring. This result is aligned with the study of Nitcher (2021) and Kulusakli (2021) since students also obtained the highest mean score in environment structuring. It was also revealed that students often set goals, next to environment structuring, for their class, and they rarely used help-seeking and task strategies. This result is supported by the study of Martinez-Lopez et al. (2017) and Jurisevic et al. (2021). Since the transition from face-to-face to online learning was abrupt, students might have felt the need to focus first on environment structuring, and goal-setting strategies as these might have helped them in dealing with the situation effectively (Jurisevic et al., 2021). Also, students might have difficulty getting help from other people, such as their teachers and classmates, as they felt embarrassed (Kulusakli, 2021).

Based on the mean scores of each grade level per construct, grade 10 students often used help-seeking and self-evaluation strategies more than grades 7, 8, and 9 students. It was found that the mean value of grade level was significantly different between grades 7 and 10. The grade 10 students have higher mean scores than Grade 7 students. This result is in accordance with the results of the study of Kirkic & Demir (2022) and Babayigit and Guven (2020), wherein there was a significant difference between students' self-regulation and their age or grade level. A possible reason why grade 10 students' OSLQ mean score is higher than the grade 7 students' OSLQ mean score might be that adults and teenagers exercise greater control or agency through goal setting, deliberate learning strategies, and self-evaluation compared to young children (Moyer, 2018). Meanwhile, there was no significant difference between grades 7 and 8, grades 7 and 9, grades 8 and 9, grades 8 and 10, and grades 9 and 10.

The use of the mathematics modules in flexible online learning was assessed using qualitative data. The findings of the focus group discussion and interview revealed that different features of the mathematics modules, such as the pre-test, list of most essential competencies, module planner, practice exercise, answer key, and self-check activities, helped the students to use SRL strategies. These features were based on the three phases of Zimmerman's Cyclical Model of Self-Regulated Learning. A potential explanation for this is that the features of the mathematics modules contained prompts that allowed the students to engage in the different phases of self-regulation (Russo et al., 2020; Wong et al., 2019). However, van Alten et al. (2020) investigated the effect of video-embedded SRL support, which includes explicit instruction and prompts, on eighth-grade students' SRL in flipped learning. It was found that the video-embedded self-regulation support enhanced secondary education students' learning outcomes, but no significant difference was found between the SRL skills of the control and experimental group. According to the students' comments in this study, they generally disapproved of this type of SRL assistance. A possible reason for this is that students find it difficult to use SRL strategies since it requires effort (van Alten et al., 2020).

The qualitative data also revealed that mathematics modules were used as means to enhance the teaching-learning process in the flexible online learning environment. This finding is supported by the study of Dangle & Sumaoang (2020), where it was revealed in the result that modules helped students acquire better learning skills. Laureano et al. (2015) stated that utilizing materials in teaching is a supporting component that enhances the educational and instructional environment, promotes effectiveness, and encourages learning persistence. It is

also important to take note that, through individual interviews, it was found that by using mathematics modules, the class discussion time can be maximized. There is a possibility that the modular approach increases the chance that students will engage in class and do the given tasks right away (Ambayon, 2020).

The quantitative data revealed that students used the least help-seeking strategies, such as asking for help from teachers and classmates. However, findings from the qualitative data revealed that students do not ask for help from other people since they use different supplementary materials as a form of help-seeking. This is an example of strategic help-seeking wherein a learner seeks assistance to build his capacity to overcome challenges on his own in the future and, as a result, become an independent learner (Algharaibeh, 2020). Also, teachers mentioned that students were taught what to do if they found the lessons in the modules difficult. Explaining to students the process of employing self-regulation strategies and their importance is another kind of self-regulation support that could be beneficial among the students (van Alten et al., 2020).

Despite the advantages, students still face challenges in using mathematics modules. One of these is the heavy workload. This is in accordance with the study by Dangle & Sumaoang (2020). There is a possibility that students felt that they must learn everything in the mathematics module alone. Also, online learning involves a substantially greater mental workload than traditional face-to-face learning (Widyanti et al., 2020). In addition, the irrelevance of the activities might also be a reason for students not to use self-regulation strategies such as task strategy. Students have a high possibility to use self-regulation strategies only if they believe that the tasks in online learning are valuable (Lee et al., 2020).

Another challenge mentioned is about teachers, specifically teachers' approachability. Aside from the use of modules, the teacher still has an influence on students' self-regulation (Guo et al., 2019; Jayawardana et al., 2017; Zee & de Bree, 2017). They are still effective agents who can promote and support students' self-regulation (Alvi & Gillies, 2020). On the other hand, student motivation is one of the teachers' challenges in supporting students' self-regulation through mathematics modules. Moreover, it was mentioned by the teachers and students that not all learning styles are catered to in the mathematics modules. According to Keshavarz & Hulus (2019), a possible reason why students are not motivated is that their learning styles are not addressed.

One of the recommendations of the teachers in using mathematics modules is to establish routines. These routines include the location of their modules, and the way students pass their module activities. This might be because routines are important in reducing students' cognitive load (Russo et al., 2020).

Overall, the findings of the study revealed that modules, through their different features, encouraged the students to experience the forethought, performance, and reflection phases of Zimmerman's Cyclical Model of Self-Regulation. The use of mathematics modules allowed students to use different strategies that helped them manage their learning in the flexible online learning modality.

## **Conclusions**

The mathematics modules presented in this study are meant to provide students with learning materials to support them in using SRL strategies in the flexible online learning environment.

Overall, the students and teachers shared their positive experiences with the use of mathematics modules. Integrating features in the modules based on Zimmerman's Cyclical Model helped the students to self-regulate. Students were reported to have used different self-regulation strategies with the support of mathematics modules. Yet, according to the answers of the participants, the mathematics modules need improvement in some ways.

The result and findings of the study have led the researcher to conclude that modules are advantageous for students' self-regulation but must be properly designed to prevent students' dissatisfaction which might negate its benefits. There are many different factors to be considered in designing the modules to support students' self-regulation. The grade level and self-regulation of the learners may be taken into consideration in designing a module. Since the result of the study showed that there is a significant difference in the OSLQ mean scores of grades 7 and 10 students, and the mean score of grade 10 students is higher than the mean score of grade 7 students, more SRL support must be given explicitly among the grade 7 students. Also, a heavy workload hinders students from using self-regulation strategies. Hence, the relevance and number of activities per module need to be considered.

The study explored how the students managed their learning using the mathematics modules and assessed the use of mathematics modules in supporting JHS students' self-regulation. The researcher used an explanatory sequential design. For the quantitative data, the researcher used Online Self-Regulated Learning adapted from Barnard et al. (2009) to describe students' self-regulation using mathematics modules in a flexible online learning environment. It does not quantitatively measure the impact of mathematics modules on students' self-regulation. Hence, for future studies, researchers can use experimental design and use the modules as an intervention to improve students' self-regulation. Also, they may use an additional qualitative approach, such as observation, to get a deeper understanding of the data.

It is also important to note that the current study focuses only on the mathematics modules. Future studies on using modules may be extended to other subject areas across different grade levels. Furthermore, this study focuses on using mathematics modules for a flexible online learning environment. Similar research may be done in face-to-face learning. Students' self-regulation strategies in an online class utilizing modules may be compared with students' self-regulation strategies in face-to-face learning. Several follow-up studies may be considered, such as integrating modules into different teaching and learning methods, such as differentiated instruction and collaborative learning. It is also recommended that future studies may focus on how students may improve on task strategies and help-seeking strategies which are the least used self-regulation strategies in a flexible online learning environment.

This study revealed that different features of the mathematics modules allowed the students to use different self-regulation strategies. Thus, the following recommendations are hereby presented. Curriculum and instructional developers may use the study's findings in creating or improving learning materials, such as textbooks, modules, and online learning packages for the students. They may also use the findings to plan for education in emergencies. This can be a good beginning point for analyzing the quality of education in emergency situations. Moreover, training for pre-and in-service teachers on how to create and use modules in the class may also be conducted. Similarly, students may also be trained on how to use self-regulation strategies using their modules.

Modules may be used to redesign educational experiences. Since the modules helped to maximize class time, they may still be used in face-to-face learning, and the number of school days may be lessened so that students may be given more flexibility regarding their schedule and environment. Based on the findings, the module may be modified while considering the ideas of the students and teachers. Also, to assist faculty members in delivering lessons using the modules, a teacher manual may be created.

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## References

- Ambayon, C. M. (2020). Modular-based approach and students' achievement in literature. *International Journal of Education & Literacy Studies*, 8(3), 32-36. <http://dx.doi.org/10.7575/aiac.ijels.v.8n.3p.32>
- Barnard, L., Lan, W., To, Y. M., & Paton, V. L.-L. (2009). Measuring self-regulation in online and blended learning environments. *The Internet and Higher Education*, 12(1), 1-6. <http://dx.doi.org/10.1016/j.iheduc.2008.10.005>
- Birt, L., Scott, S., Cavers, D., & Campbell, C. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, 26(13), 1802-1811. <https://dx.doi.org/10.1177/1049732316654870>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. (*Muller 2018*), 77-101. <http://dx.doi.org/10.1191/1478088706qp063oa>
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd Edition ed.). United States of America: Sage Publications Ltd.
- Dangle, Y. R., & Sumaoang, J. D. (2020). The implementation of modular distance learning in the philippine secondary public schools. *3rd International Conference on Advanced Research in Teaching and Education*, (pp. 100-108). Dublin, Republic of Ireland.
- DepEd prepares Self-Learning Modules for education's new normal.* (2020, July 1). <https://www.deped.gov.ph/2020/07/02/deped-prepares-self-learning-modules-for-educations-new-normal/>
- Guo, W., Lau, K. L., & Wei, J. (2019). Teacher feedback and students' self-regulated learning in mathematics: A comparison between a high-achieving and a low-achieving secondary schools. *Studies in Educational Evaluation*, 48-58. Retrieved from <https://doi.org/10.1016/j.stueduc.2019.07.001>
- Hutt, S., Ocumpaugh, J., Andres, J. M., Bosch, N., Paquette, L., Biswas, G., & Baker, R. S. (2021). Investigating SMART models of self-regulation and their impact on learning. *The 14th International Conference on Educational Data* (pp. 580-587). Paris: International Educational Data Mining Society. <https://educationaldatamining.org/edm2021/>
- Jansen, R., van Leeuwen, A., Janssen, J., Conjin, R., & Kester, L. (2020). Supporting learners' self-regulated learning in Massive Open Online Courses. *Computers & Education*, 1-17. <https://doi.org/10.1016/j.compedu.2019.103771>
- Jayawardena, P., Kraayenoord, C., & Carroll, A. (2017). Promoting self-regulated learning in science: A case study of a Sri Lankan secondary school science teacher. *International Journal of Information and Education Technology*, 7(3), 195-198. <https://dx.doi.org/10.18178/ijiet.2017.7.3.865>

- Jurisevic, M., Lavrih, L., Lisic, A., Podlogar, N., & Zerak, U. (2021). Higher education students' experience of emergency remote teaching during the covid-19 pandemic in remote teaching during the covid-19 pandemic in relation to self-regulation and positivity. *CEPS Journal*, 241-262. <https://dx.doi.org/10.26529/cepsj.1147>
- Karademir, A., & Akman, B. (2019). Effect of inquiry-based mathematics activities on preschoolers' math skills. *International Journal of Progressive Education*, 15(5), 198-2015.
- Keshavarz, M. H., & Hulus, A. (2019). The effect of students' personality and learning styles on their motivation for using blended learning. *Advances in Language and Literary Studies*, 10(6), 78-88. <http://dx.doi.org/10.7575/aiac.all.v.10n.6p.78>
- Kırkıç, K. A., & Demir, B. (2020). Examination of pre-school students' self-regulation skills. *Problems of Education in the 21st Century*, 78(6), 967-981. <https://doi.org/10.33225/pec/20.78.967>
- Kulusakli, E. (2021). Exploring self regulated online learning skills of efl learners in distance education. *Turkish Online Journal of Distance Education*, 23(1), 86-96.
- Laureano, R. A., Espinosa, A. A., & Avilla, R. A. (2015). Effects of grade 9 science learner's material on students' self-regulation and achievement in chemistry. *Electronic Journal of Science Education*, 19(8), 28-58.
- Lee, D., Watson, S. L., & Watson, W. R. (2020). The relationships between self-efficacy, task value, and self-regulated learning strategies in Massive Open Online Courses. *International Review of Research in Open and Distributed Learning*, 21(1), 23-39.
- Martinez-Lopez, R., Yot, C., Tuovila, I., & Perera-Rodríguez, V.-H. (2017). Online self-regulated learning questionnaire in a Russian MOOC. *Computers in Human Behavior*, 966-974. <http://dx.doi.org/10.1016/j.chb.2017.06.015>
- Moyer, A. (2018). An advantage for age? Self-concept and self-regulation as teachable foundations in second language accent. *The CATESOL Journal*, 30(1), 95-112.
- Muller, C., Stahl, M., Alder, M., & Muller, M. (2018). Learning effectiveness and students' perceptions in a flexible learning course. *European Journal of Open, Distance and e-Learning*, 21(2), 44-53.
- Nitcher, S. (2021). Does mode of access make a difference? Mobile learning and online student engagement. *Online Learning*, 25(3), 5-17. <https://dx.doi.org/10.24059/olj.v25i3.2848>
- Russo, J., Minas, M., Hewish, T., & McCosh, J. (2020). Using prompts to empower learners: Exploring primary students' attitudes towards enabling prompts when learning mathematics through problem solving. *Mathematics Teacher Education and Development*, 22(1), 48-67.

- Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Jinks, C. (2017). Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quant*, 1893-1907. <https://doi.org/10.1007/s11135-017-0574-8>
- van Alten, D., Phielix, C., Janssen, J., & Kester, L. (2020). Self-regulated learning support in flipped learning videos enhances learning outcomes. *Computers & Education*, 1-16. <https://doi.org/10.1016/j.compedu.2020.104000>
- Widyanti, A., Hasudungan, S., & Park, J. (2020). e-Learning readiness and perceived learning workload among students in an Indonesian university. *Knowledge Management & E-Learning: An International Journal*, 12(1), 18-29. <https://doi.org/10.34105/j.kmel.2020.12.002>
- Wong, J., Khalil, M., Baars, M., & de Koning, B. (2019). Exploring sequences of learner activities in relation to self-regulated learning in a massive open online course. *Computers and Education*, 1-14.
- You, J. W. (2016). Identifying significant indicators using LMS data to predict course achievement in online learning. *Internet and Higher Education*, 23-30.
- Zee, M., & de Bree, E. d. (2017). Students' self-regulation and achievement in basic reading and math skills: The role of student-teacher relationships in middle childhood. *European Journal of Developmental Psychology*, 2017, 14(3), 265-280. <http://dx.doi.org/10.1080/17405629.2016.1196587>
- Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, 81(3), 329-339.
- Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal*, 166-183. <https://doi.org/10.3102/0002831207312909>
- Zimmerman, B., & Campillo, M. (2003). Motivating self-regulated problem solvers. *The Psychology of Problem Solving*, 233-262. <https://doi.org/10.1017/CBO9780511615771.009>
- Zimmerman, B. J., & Martines-Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal*, 614-628. <https://doi.org/10.3102/00028312023004614>
- Zimmerman, B. J., & Moylan, A. (2009). Self-regulation: where metacognition and motivation intersect. In D. Hacker, J. Dunlosky, & A. G. (Eds.), *Handbook of metaocgnition in education* (pp. 299-316). Routledge.
- Zimmerman, B. J., & Schunk, D. H. (2011). *Self-Regulated Learning and Performance: An Introduction and Overview*. New York: Routledge.



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