International Journal of Educational Management and Development Studies
Volume 3 Issue 1 March 2022
DOI: https://doi.org/10.53378/352866

Effects of Reflective Learning Resource Material on Achievement of Mathematics Learning Outcome

[1]Herbert I. Aquino & [2]Delon A. Ching

Abstract

This study developed and used a Reflective Learning Resource Material in Grade 9 Mathematics in effort to improve the performance learning outcome. It aimed to determine the effect of the developed learning resource material to the learning outcome in terms of analysis, representation and problem-solving skills. The study used descriptive research design utilizing the pretest/ posttest assessments and survey questionnaire as the main instruments, with 35 Grade 9 students during the school year 2020-2021 as participants of the study. The results revealed that reflective learning resource material is highly effective in the achievement of the Mathematics learning outcome. Further data resulted to a significant difference and an increased Mathematics learning outcome assessment on analysis, representation, and problem-solving skills implying that the use of reflective learning resource material helped the students improve their Mathematics skills. From lower proficiency levels, learners were able to reach advanced and proficient levels, indicating mastery of the competencies. This demonstrates the use of RLRM has a good significant relationship with mathematical skills development. The results suggest that incorporating reflective learning resource material into students' learning activities can improve Mathematics learning outcome.

Keywords: *reflective learning resource material, mathematics learning outcome, analysis, representation, problem-solving skills*

Received: August 31, 2021 **Revised:** February 20, 2022 **Accepted:** March 3, 2022

Suggested Citation: Aquino, H.I. & Ching, D.A. (2022). Effects of Reflective Learning Resource Material on Achievement of Mathematics Learning Outcome. *International Journal of Educational Management and Development Studies*, Volume 3 Issue 1, pp. 114 - 130. DOI: https://doi.org/10.53378/352866

About the authors:

[1]Corresponding author. Secondary School Teacher II, Callejon National High School
[2] Research Advisor, Instructor I, Laguna State Polytechnic University- San Pablo City Campus

** This paper is a finalist in the IIARI Research Competition (IRC) – 2021 Category 3 – Graduate*

1. Introduction

Students' mathematics performance is directly affected by changes in the educational framework and implementation process (Moreno-Guerrero et al., 2020). As such, teachers should help students connect their mathematical awareness, talents, and understandings to other topics and the world around them by assisting them in discovering, sharing, and engaging with them (Victoria State Government, 2019). Because mathematics education is an active, complex, and ongoing process, classroom activities in particular aid students in improving their thinking skills, thinking logically, systematically, objectively, and thoroughly, and adopting an objective and open attitude when dealing with problems (Su et al., 2016). For example, problem-solving abilities enable pupils to think creatively and critically using progressive and exciting mental processes (Yuanita et al., 2018). However, this is not always the case. Students face challenges in the learning process resulting to poor achievement.

According to the 2018 Programme for International Student Assessment (PISA) results, the Philippines scored 353 points in math literacy, which is lower than the global average of 489 points with only 19% of students accomplished Level 2 or higher in Mathematics. This result demonstrated the "*urgency of resolving problems and inequalities in attaining quality basic education in the country*" (Dela Cruz, 2019). In the school level results, one national high school in the Quezon province in the Philippines has a Mathematics MPS of 54.87%, of which, Mathematics 9 got 53.97% as the lowest MPS in all subjects in the same grade level in school year 2018-2019. These data proved the MPS below the standard passing rate of 75% signifying learners' difficulties in understanding the lesson.

The poor performance in mathematics has been severely affected by the pandemic situation due to the implementation of the modular distance learning modality (Castroverde & Acala, 2021). Dangle and Sumaoang (2020) identified lack of funding in the design and delivery of modules, students' difficulties with self-study, and parents' lack of knowledge on how to aid their child/children academically as the three main barriers in the modular distance learning. Despite the present educational crises, teachers are still finding strategies to reach all types of learners. The role of the instructor is crucial in supporting pupils in overcoming learning challenges (Dayagbil et al., 2021).

According to Hendriana (2017), innovative mathematical learning materials should provide students the mechanisms to explore their abilities. As the learning materials determines

students' success in understanding the lessons contained (Widodo & Jasmadi, 2008), it should provide evaluation and response to evaluation (Prastowo, 2012) and reflection of students on the learning process (Hendriana, 2019). Student reflection can be used to promote and assess the proficiencies as well as mathematical concepts (Attard, 2017). This allows students to become independent learners specially during the period of modular distance learning.

This study determines the effects of the reflective learning resource material on students' performance in mathematics 9. It also assessed the students' perception on the reflective learning resource material, experimented on the students' performance through pretest and posttest on analysis, representation, and problem-solving skills and tested significant difference on the pretest and posttest scores and significant relationship between the evaluation of the reflective learning material and performance in Mathematics.

2. Literature Review

2.1. Reflective Learning

Reflection process can be scaffold and encouraged to facilitate reflection, professional learning, and reflective practice (Hegarty, 2011). According to Mcleod (2017), reflective learning helps students to enable prior knowledge as well as build and rebuild their knowledge. In this process, the students learn from their own experiences, acquire metacognitive skills, take responsibility for their own learning, and increase their capacity to restructure and reframe information. On the teacher's perspectives, reflective learning enables teachers understand what areas must be improved and changed for better learning outcomes (Orias, 2019).

The most common method of reflective teaching includes journal writing and situational testing where students feed backs are assessed. According to Disilio (2019), reflective journals resulted in higher mean test scores, more complicated mathematical explanations, and more use of content-specific academic language. Similarly, Dionisio (2019) found that math journal helped the students' attitudes, increased their confidence and sharpened their Mathematical skills. Denton (2018) also found in a study that reflective learning journal helped students control negative feelings (such as anxiety and disappointment) that may occur when taking a difficult course.

According to Costa and Kallick (2020), reflection has several different aspects. It involves linking a current experience to previous learning (a process called scaffolding), gathering cognitive and emotional information from a variety of sensory inputs and applying

what have been learned to different situations. Previous studies showed the usefulness of journal writing as a reflection tool in face-to-face math courses. It was suggested to use online tools as well as several instructional strategies, to support reflective journaling in learning environments in Mathematics. This includes anything from open-ended and generic self-reflection exercises to more content-specific, forced-choice assessments (Choi et al., 2017).

2.2 Students' Performance in Mathematics

According to Villamis (2020), learning outcomes are instances of the fundamental experience, abilities, or mastery acquired by the student because of a learning action. These are quantifiable triumphs that students really need to understand after the learning is done. In terms of Mathematics, the required learning outcomes include analysis, representation, and problem solving skills.

Analysis. According to Indriati et al. (2020), analytical skills is a deduction capacity to help people in solving problems of Mathematics. Ariyanto (2020) adds analyzing as the process of breaking down a material into its fundamental bits and discovering how the parts interact with one another and with a broader structure or purpose, especially in the numerical sense. Students require the ability to think analytically because the objects studied in mathematics are abstract (Khusna, 2020). At the analyze level, students must not only be able to apply one theory, but also a number of related ideas. Differentiating, organizing, and characterizing are the three degrees of analysis (Ariyanto, 2020).

Representation. According to Minarni et al. (2016), mathematical representation can be divided into two types: visual and non-visual. Non-visual representations include numerical representations and mathematical equations or mathematical models, as well as graphs, tables, sketches/figures, and diagrams. When visual and numerical representations are used in ratio, proportion, and percent problems, the power of representation is clearly visible. In addition, Widakdo et al. (2017) affirms that representation is the most basic way for people to comprehend mathematical concepts particularly constructing abstract ideas into concrete ideas using logical thinking through configuration of signs, characters, or objects. For instance, Utami et al. (2019) asserted that mathematical representation is necessary in solving geometry problems.

Problem-Solving Skills. The major reason for teaching mathematics is to equip students to address challenges in everyday life (Phonapichat et al., 2014). Problem solving skills is the

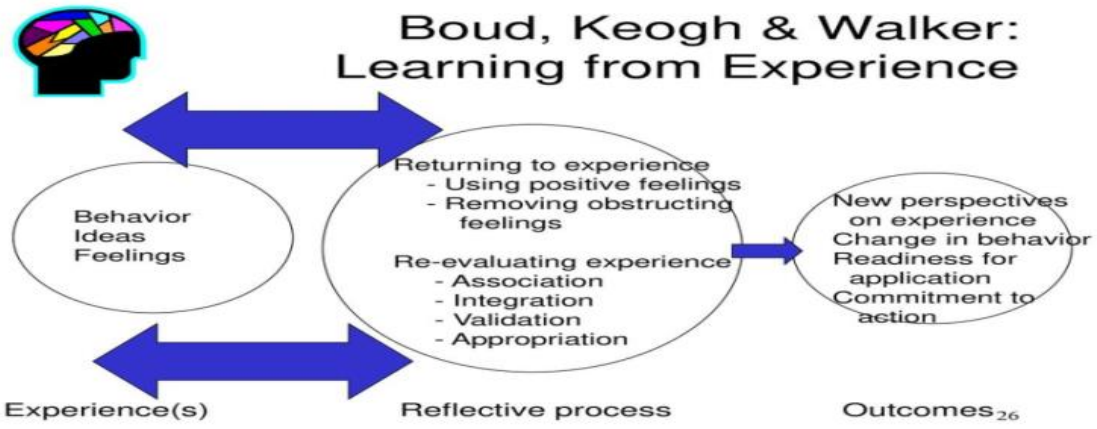
capacity or key ability of the students in comprehension, choosing approaches and adapting procedures to discover the arrangement of an issue (Surya et al., 2017). It is a vital fundamental ability that includes different cycles such as investigating, deciphering, thinking, anticipating, assessing, and reflecting (Anderson, 2009). Mathematical problem-solving skills are not only a goal in math education, but also something that is important in everyday life (Pinter, 2012). According to Simamora et al. (2019), it is normal that Mathematics teachers work with students learning materials.

2.2. Theoretical Framework

This study is guided by the theory model of Boud, Keogh, and Walker (1985) on learning from experience as shown in Figure 1.

Figure 1

The Learning from Experience Model



Source: Boud, Keogh & Walker (1985) entitled Learning from experience.

The three basic stages of the reflective process according to Boud et al. (1985) are depicted in the theoretical model. Returning to experience, reliving the underlying engagement in the student's mind, or communicating the experience's highlights to others are all examples of returning to experience. Using pleasant sensations and reducing blocking sentiments are the two aspects of attending to feelings. Focusing on pleasant sentiments regarding learning and the event under examination is what the usage of positive feelings implies. This might include intentionally recalling happy experiences, focusing on positive features of one's present environment, or anticipating the possible advantages of event processing. The removal of

blocking experience is a necessary precursor to an objective cognition of events. It entails doing everything possible to remove roadblocks to a full analysis of the event.

This leads to the third phase of re-evaluating experience, which is important but sometimes ignored if the prior two are skipped. Any sort of evaluation might have happened at any point during the process, and the learner may have accepted it as part of the experience. Re-evaluation entails re-evaluating experience in light of the student's goals, linking new data to previously collected data, and incorporating new knowledge into the student's reasonable context. It increases the student's allocation of this information to their behavior collection. This might involve a mental rehearsal in which the new information is put to the test to determine its validity, as well as the planning of following actions in which the knowledge is put to use in one's life. Even if these components and phases have separated from one another, they cannot be considered independent and unrelated. All in all, the technique will follow the means we have illustrated, however there might be a few cycles between stages, reiterations of key components, and waiting over particularly significant components (Boud et al., 1985).

3. Methodology

The study employed descriptive research method that attempted to describe and analyze the impact of reflective learning resource material on student’s performance in Mathematics 9. This research approach focuses on the effectiveness of reflective learning resource material.

This study utilized cluster sampling technique in choosing one class section as respondents out of the four sections of Grade 9 students in a national high school with a total population of 147. The chosen respondents were those who share characteristics that are indicative of the entire population. Since Grade 9 student population was too high to test the entire population in a short period of time with minimal financial resources, the study chose the Grade 9 section Cattleya consisted of 35 students as the samples. There were 27 girls and 18 boys who participated the study.

This study used researcher-developed instruments for data gathering. The three instruments used were reflective learning resource material, pretest/posttest, and survey questionnaire on experience reflection of the students.

Reflective learning material. In the development of the reflective learning resource, the design step was anchored on the ICARE model as enumerated by Hidayat (2017). It has five key

elements of learning experience from children and adult that is introduction, connection, application, reflection and extension. It was intended only for the Quarter 2 lessons which include variations, integral and zero exponents, rational exponent and radical expressions, simplifying radical expressions, operations on radical and radical equations. It also includes the Most Essential Learning Competencies (MELC) and specific objectives of the lesson. Students' learning was aided by the Math journal templates that prompts children to coordinate, explain, and focus on their thinking in order to put their thoughts on paper. A variety of exercises were also provided so that learners could practice their skills from the most basic to the most complex. Every class session ended with a reflective learning activity that allowed students to reflect on their own learning and apply what they had learned in a real-world scenario.

Pretest and Posttest. The pretest and posttest are accompanied by table of specification dependent on the targets of the exercises. These two tests contain every topic for the quarter 2 in line with the curriculum's goal, MELC and the contents required by the DepEd's self-learning module. Equal weight and allocation were assigned to analysis, representation, and problem-solving skills in both the tests. The tests were content-validated by specialists including editorial manager for clarity, comprehensiveness, sentence structure and substance. Important adjustments were made such as reconstruction of stem of each test item and regrouping of test item based from specific Mathematics performance indicators, reasonable things held and a few things were altered and reexamined. The approved test was directed to Grade 9 students. The tests contain 40 items.

***Survey Questionnaire*.** The study also utilized researcher-made survey questionnaire to determine the extent of the impact of the reflective learning resource material. This contains six indicators with five statements each rated with 5-scale Likert style checklist.

The data gathering process involves the administration of the tests and survey on the evaluation of the learning material.

Administration of the pretest. The pretest was given to the students before the actual use of the developed reflective learning material. It was distributed to the students on the first day of second quarter of School Year 2020-2021. Since the learners are in modular modality, the pretest was disseminated during the first day of the module distribution schedule day. The pretest was returned after four days.

Administration of the posttest. The students used the learning resource material for six consecutive weeks as supplemental material in Mathematics. The posttest was administered on the 7th week and asked to return the exam with answers four days after.

Conduct of the survey. On the 8th week of the second quarter, the survey was conducted. The survey questionnaire was given to the students an explained to them the objectives.

The study utilized the following statistical techniques: mean and standard deviations, frequency count and percent distribution, paired t-test and Pearson-Product Moment Correlation.

4. Results and Discussion

Table 1 shows the overall evaluation of the students on their use of the reflective learning material as measured by positive feelings, obstructing feeling, association, integration, validation and appropriation.

Table 1

Students' Evaluation of the Reflective Learning Resource Material

Indicators	Mean	SD	VI
Positive Feelings	3.34	0.71	Agree
Obstructing Feelings	3.20	0.74	Agree
Association	3.27	0.64	Agree
Integration	3.33	0.67	Agree
Validation	3.35	0.68	Agree
Appropriation	3.37	0.67	Agree

Legend: 3.50-4.00- Strongly Agree, 2.50-3.49- Agree; 1.50-2.49 – Disagree; 1.00-1.49 – Strongly Disagree

Table 1 shows the evaluation of the students on the reflective learning resource material in terms of positive feelings, obstructing feelings, association, integration, validation and appropriation. Overall, the students' agreement on the indicators imply their positive appreciation of the material.

In terms of positive feelings, the students agreed with all the criteria indicating a general mean of 3.34. The agreement means the use of reflective learning resource material helped them achieve positive experiences through reflection writing and enabled them to use their positive emotions to better understand the lesson. This result agrees with the findings of Guce (2017) that providing opportunities for students to see how the process of writing can enrich their mathematical learning may lead to a positive feeling or fulfilment. Similarly, the students have common agreement in terms of obstructing feeling with an overall mean of 3.20. This also shows student-respondents had a great extent of experience in using the learning resource material. As

reflected, journal writing and journal prompts assisted students in overcoming negative feelings resulting to maintaining a positive attitude towards the topic. As a result, students have more chances to express themselves and generate new ideas enabling better understanding of the lessons.

In terms of experience as to association, the overall mean of 3.27 means students had a great extent of experience in relating ideas and feelings during initial experience to the present and previous knowledge and attitudes. Meanwhile, the other indicators were also rated "agree" including integration (M=3.33, SD = 0.67), validation (M=3.35, SD = 0.68) and appropriation (M=3.37, SD = 0.67). The reflective writing and activities provided in the learning resource material help students associate new learned concepts to its application in a real-life situation, finding solution and re-evaluating new experiences in a real-world setting.

Table 2

Pretest and Posttest Scores of the Students

Scores	Pretest		Posttest		Remarks
	F	%	F	%	
Analysis					
12-14	2	5.7	19	54.3	Advanced
9-11	6	17.1	6	17.1	Proficient
6-8	15	42.9	7	20	Approaching Proficiency
3-5	11	31.4	2	5.7	Developing
0-2	1	2.9	1	2.9	Beginning
Representation					
12-14	0	1	18	51.4	Advanced
9-11	3	8.6	11	31.4	Proficient
6-8	10	28.6	4	11.4	Approaching Proficiency
3-5	17	48.6	2	5.7	Developing
0-2	5	14.3	0	0	Beginning
Problem-Solving Skills					
12-14	1	2.9	8	22.9	Advanced
9-11	3	8.6	10	28.6	Proficient
6-8	11	31.4	13	37.1	Approaching Proficiency
3-5	18	51.4	4	11.4	Developing
0-2	2	5.7	0	0	Beginning

Table 2 shows the outcome of pretest and posttest of Grade 9 students. In terms of analysis, the majority of students' pre-test scores were 6-8 points, with the highest frequency of 15, 42.9% of the respondents are approaching proficiency. In the developing level, there is a frequency of 11, which represents 31.4% of the respondents. It signifies that, prior to the implementation of the reflective learning resource material, students have an average performance in scrutinizing and breaking down facts to obtain better understanding of the lesson.

After the implementation of the learning resource material, most of the students in the class got a score of 12-14, interpreted as ‘advanced’ and 7 students fall under approaching proficiency level. This result implies that after the utilization of the reflective learning resource material, majority of the students were able to utilize their own strategy to clearly analyze each question and arrive with the correct answer. It also inferred that the students' analytical skills were revealed through the posttest, with majority of students demonstrating mastery of the important concepts of the lesson in such a way that they were able to examine and analyze the provided question and provide proper answers in each question. Their knowledge and opinions about the subject enabled them to appropriately analyze conditions, leading to the correct answers to the given question.

In terms of representation, no one performs exceptionally during the pretest. Students’ representation skill involved the transformation of mathematical expressions into their equivalence form. The pre-test showed students within the approaching proficiency to developing level. This suggests that students had the bare minimum of knowledge, skills, and core understandings to rewrite mathematical concepts or expressions into their equivalent expressions. Moreover, the posttest showed that majority of the students are within proficient to advanced level. The use of the resource material exceeded the core requirements in terms of representing concepts in Mathematics.

In terms of problem-solving, majority of the students ranged from approaching proficiency to developing level during the pretest which means students were not able to visualize and examine the given information to solve the given problem. However, the posttest assessment result shows that majority of them were in proficient to approaching proficiency level. The learning material helped the students become more competitive in solving problems involving variation, integral exponents, and radical equations.

The results of the evaluation are congruent to the explanations of Guce (2017) that students enjoy sharing positive thoughts or emotions and eventually grasp the lessons more

easily, Hernick and Jaworska (2018) that students' enjoyment has a good impact on the learning process and Kuuk and Arslan (2020) that journal writing and journal prompts assisted students in overcoming negative feelings. Similarly, the positive evaluation of the students on the reflective learning resource leads to fruitful and enjoyable learning (McCoy, 2013), concern with the new knowledge (Williams, 2008), opportunity to correct tasks (Cowan, 2014), application to a real-world setting experience (Murillo-Llorente et al, 2021), finding solutions to a problem (Al-Rawahi & Al-Balushi, 2015), connections among concepts and experiences (Farrah, 2012), and group ideas according to level of understanding (Habibi et al., 2017).

Table 3

Test of Difference Between the Pretest and Posttest on the Dependent Variable

Mathematics Learning Outcome	Pretest		Posttest		T	Df	Sig.
	Mean	SD	Mean	SD			
Analysis	6.46	2.66	10.54	3.19	-7.591	34	.000
Representation	4.97	2.36	10.94	2.79	-11.289	34	.000
Problem Solving Skills	5.69	2.23	8.69	2.71	-6.493	34	.000

Based from table 3, there is a significant difference between the pretest and posttest scores performances of the student respondents before and after the utilization of the reflective learning resource material with significance value of 0.000 in all Mathematics learning outcomes. There is a significant improvement in the performance of the students from developing and approaching proficiency levels to advanced level in analysis and representation. Meanwhile, student-respondents were able to reach approaching proficiency and proficient levels in problem-solving skills.

The statistical analysis proves that the learning material helped the learners improve their skills and eventually achieve the mathematics learning outcomes. Thus, this study concur with the findings of Guce (2017), Hernick and Jaworska (2018), Kuuk and Arslan (2020), McCoy (2013), Williams (2008), Cowan (2014), Murillo-Llorente et al. (2021), Al-Rawahi and Al-Balushi (2015), Farrah (2012) and Habibi et al. (2017) that the reflective learning material helps improve the students' performance in mathematics.

Table 4
Test of Significant Relationship Between the Evaluation of the Learning Resource Material and the Students' Mathematics Performance

Reflective Learning Resource Material	Mathematical Learning Outcomes		
	Analysis	Representation	Problem Solving Skills
Reflection through Experience			
Returning to Experience			
Using Positive Feelings	.421*	.306	.416*
Removing Obstructing Feelings	.031	.086	.109
Re-evaluate to Experience			
Association	.157	-.068	.073
Integration	.194	.048	.155
Validation	.278	.217	.386*
Appropriation	.257	.180	.187

***. Correlation is significant at the 0.01 level (2-tailed).*
**. Correlation is significant at the 0.05 level (2-tailed).*

Table 4 notes a significant relationship between the students' evaluation of the reflective learning material and their test performance results. The relationship exists from the use of positive feeling and analysis as a mathematical learning outcome with r-value of 0.421. Moreover, significant relationship exists from the use of positive feeling in answering the reflective learning resource material and the problem-solving skills as a mathematical learning outcome with r-value of 0.416. There is also significant relationship between the validation in re-evaluating the experience and the problem-solving skills as mathematical learning outcome with r-value of 0.386. These findings are congruent to the study of Viterbo (2019) that the utilization of more usable material like module is significantly related to the level of skills attainment of the leaner in problem solving particularly in applying concepts. Similarly, the study of McCornick et al. (2012) asserts that writing self-reflection makes students more engaged in their schoolwork and achieve higher levels of academic proficiency.

5. Conclusion

This study assessed the effects of the reflective learning resource material on the achievement of the Mathematics 9 learning outcomes using descriptive and experimental research methods. It examined the extent to which student-respondents engaged in the use of the learning material. The students' performance was assessed through the pretest and posttest scores in analysis, representation, and problem-solving skills.

The results of the evaluation showed that students perceived positively the use of the reflective learning material in their study of mathematics. This implicates that the use of the reflective learning resource material aided them to highly engage in learning. Furthermore, the students reached proficient to advanced level in terms of analysis and representation and proficient to approaching proficiency in terms of problem-solving skills after employing the reflective learning resource material.

It is highly evident that the use of reflective learning resource material in Mathematics 9 increases the students' proficiency of the Mathematics learning outcomes. Thus, the teachers could use the reflective learning resource material in the learning process. Furthermore, the incorporation of reflective learning resource material into students' learning activities is suggested to improve their achievement of the math learning outcomes in terms of analysis, representation, and problem solving.

References

Al-Rawahi, N. M., & Al-Balushi, S. M. (2015). The Effect of Reflective Science Journal Writing on Students' Self-Regulated Learning Strategies. *International Journal of Environmental and Science Education*, *10*(3), 367-379.

Amirkhanova, K. M., Ageeva, A. V., & Fakhretdinov, R. M. (2016). Enhancing students' learning motivation through reflective journal writing. *The European Proceedings of Social and Behavioural Sciences Ep-SBS*.

Ariyanto, R. O. (2020, February). Characteristics of mathematics high order thinking skill problems levels. In *Journal of physics: Conference series* (Vol. 1470, No. 1, p. 012012). IOP Publishing.

Attard, C. (2017). *Promoting Student Reflection to Improve Mathematics Learning*. Engaging Maths.

Bashan, B., & Holsblat, R. (2017). Reflective journals as a research tool: The case of student teachers' development of teamwork. *Cogent Education*, *4*(1), 1374234.

Boud, D., Keogh, R., & Walker, D. (2013). *Reflection: Turning experience into learning*. Routledge.

Castroverde, F., & Acala, M. (2021). Modular distance learning modality: Challenges of teachers in teaching amid the Covid-19 pandemic. *International Journal of Research Studies in Education*, *10*(8), 7-15.

Choi, J., Walters, A., & Hoge, P. (2017). Self-reflection and math performance in an online learning environment. *Online Learning Journal*, *21*(4).

Costa, A. L., & Kallick, B. (Eds.). (2008). *Learning and leading with habits of mind: 16 essential characteristics for success*. ASCD.

Cowan, J. (2014). Noteworthy matters for attention in reflective journal writing. *Active Learning in Higher Education*, *15*(1), 53-64.

Dangle, Y. R. P., & Sumaoang, J. D. (2020, November). The implementation of modular distance learning in the Philippine secondary public schools. In *3rd International Conference on Advanced Research in Teaching and Education* (Vol. 100, p. 108).

Dayagbil, F. T., Palompon, D. R., Garcia, L. L., & Olvido, M. M. J. (2021). Teaching and learning continuity amid and beyond the pandemic. In *Frontiers in Education* (p. 269). Frontiers.

Dela Cruz, R. (2019). DepEd to Improve Education Quality After Ph's Poor PISA Ranking. Philippines News Agency. Retrieved from: https://www.pna.gov.ph/articles/1087967

Denton, A. W. (2018). The use of a reflective learning journal in an introductory statistics course. *Psychology Learning & Teaching*, *17*(1), 84-93.

Disilio, V. (2019). Reflective Learning Approach and Its Impact on Students' Mathematics Performance and Self-Efficacy. Laguna State Polytechnic Universities, San Pablo City Campus.

Farrah, M. (2012). Reflective journal writing as an effective technique in the writing process.

Guce, I. K. (2017). Investigating College Students' Views on Mathematics Learning through Reflective Journal Writing. *International Journal of Evaluation and Research in Education*, *6*(1), 38-44.

Habibi, F., Eviyuliwati, I., & Kartowisastro, S. (2017, October). The effect of reflective journal writing on students' writing ability of narrative text. In *International Conference on Education in Muslim Society (ICEMS 2017)* (pp. 16-20). Atlantis Press.

Hegarty, B. (2011). Is reflective writing an enigma? Can preparing evidence for an electronic portfolio develop skills for reflective practice. *Changing demands, changing directions proceedings ascilite*, 580-593.

Hendriana, H. (2017). Teachers' Hard and Soft Skills in Innovative Teaching of Mathematics. *World Transactions on Engineering and Technology Education*, 15(2), 145-150.

Hendriana, H., Putra, H. & Hidayat, W. (2019). How to Design Teaching Materials to Improve the Ability of Mathematical Reflective Thinking of Senior High School Students in Indonesia? *EURASIA Journal of Mathematics, Science and Technology Education*, 15(12), https://doi.org/10.29333/ejmste/112033

Hernik, J., & Jaworska, E. (2018, March). The effect of enjoyment on learning. In *Proceedings of INTED2018 Conference* (pp. 0508-0514).

Hidayat, H. (2017, December). Implementation of ICARE learning model using visualization animation on biotechnology course. In *AIP Conference Proceedings* (Vol. 1911, No. 1, p. 020027). AIP Publishing LLC.

Junsay, M., & Gerada, E. P. (2016). *The effect of reflective journal writing to students' critical thinking and mathematical communication skills*. Central Philippine University.

Khusna, A. H. (2020). Analytical thinking process of student in proving mathematical argument. *International Journal of Scientific and Technology Research*, *9*(1), 1248-1251.

Kuuk, Ö., & Arslan, A. (2020). Cooperative Learning in Developing Positive Attitudes and Reflective Thinking Skills of High School Students' in English Course. *International Journal of Psycho-Educational Sciences*, *9*(1), 83-96.

McCormick, C. et al. (2012). Metacognition, Learning and Instruction. Wiley Online Library. Volume 7. Educational Psychology. Retrieved from: https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118133880.hop207004

McCoy, B. (2013). Active and reflective learning to engage all students. *Universal Journal of Educational Research*, *1*(3), 146-153.

McLeod, S. (2017). Kolb's learning styles and experiential learning cycle. *Simply psychology*, *5*.

Minarni, A., Napitupulu, E., & Husein, R. (2016). Mathematical understanding and representation ability of public junior high school in North Sumatra. *Journal on Mathematics Education*, *7*(1), 43-56.

Moreno-Guerrero, A. J., Aznar-Díaz, I., Cáceres-Reche, P., & Alonso-García, S. (2020). E-learning in the teaching of mathematics: An educational experience in adult high school. *Mathematics*, *8*(5), 840.

Murillo-Llorente, M. T., Navarro-Martínez, O., Valle, V. I. D., & Pérez-Bermejo, M. (2021). Using the Reflective Journal to Improve Practical Skills Integrating Affective and Self-

Critical Aspects in Impoverished International Environments. A Pilot Test. *International Journal of Environmental Research and Public Health*, *18*(16), 8876.

Qolfathiriyus, A., Sujadi, I., & Indriati, D. (2019, February). Characteristic profile of analytical thinking in mathematics problem solving. In *Journal of Physics: Conference Series* (Vol. 1157, No. 3, p. 032123). IOP Publishing.

Peteros, E., Gamboa, A., Etcuban, J. O., Dinauanao, A., Sitoy, R., & Arcadio, R. (2019). Factors affecting mathematics performance of junior high school students. *International Electronic Journal of Mathematics Education*, *15*(1), em0556.

Phonapichat, P., Wongwanich, S., & Sujiva, S. (2014). An analysis of elementary school students' difficulties in mathematical problem solving. *Procedia-Social and Behavioral Sciences*, *116*, 3169-3174.

Pintér, K., & Kosztolányi, J. (2012). On teaching mathematical problem-solving and problem posing. *Unpublished PhD thesis, University of Szeged, Hungary*.

Prastowo, A. (2012). Panduan Kreatif Membuat Bahan Ajar Inovatif. Yogyakarta: Diva Press.

Simamora, R. E., & Saragih, S. (2019). Improving Students' Mathematical Problem Solving Ability and Self-Efficacy through Guided Discovery Learning in Local Culture Context. *International Electronic Journal of Mathematics Education*, *14*(1), 61-72.

Su, H. F. H., Ricci, F. A., & Mnatsakanian, M. (2016). Mathematical teaching strategies: Pathways to critical thinking and metacognition. *International Journal of Research in Education and Science*, *2*(1), 190-200.

Surya, E., & Putri, F. A. (2017). Improving mathematical problem-solving ability and self-confidence of high school students through contextual learning model. *Journal on Mathematics Education*, *8*(1), 85-94.

Utami, C. T. P. (2019, March). Profile of students' mathematical representation ability in solving geometry problems. In *IOP Conference Series: Earth and Environmental Science* (Vol. 243, No. 1, p. 012123). IOP Publishing.

Victoria State Government, (2019). Retrieved from https://www.education.vic.gov.au/about/department/Pages/coronavirus.aspx?Redirect=1

Viterbo, N. (2019). Designed an Interactive Learning Module for Mathematics Review Program: Basis for Improved Numeracy Skills of Grade 7 Students. Laguna State Polytechnic Universities, San Pablo City Campus

Widakdo, W. A. (2017, September). Mathematical representation ability by using project based learning on the topic of statistics. In *Journal of Physics: Conference Series* (Vol. 895, No. 1, p. 012055). IOP Publishing.

Williams, N. (2008). Reflective journal writing as an alternative assessment.

Widodo, C., & Jasmadi. (2008). Buku Panduan Menyusun Bahan Ajar. Jakarta: Elex Media Komputindo.