EMTEKA: Jurnal Pendidikan Matematika
Volume 7, No. 1, 2026. 15-26
DOI: https://doi.org/10.24127/emteka.v6i1.8500

e-ISSN 2746-5594
p-ISSN 2746-5608

STRENGTHENING THE MATHEMATICAL LITERACY THROUGH PROBLEM POSING LEARNING WITH A WORD PROBLEM THEME

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Received December 05, 2026; Received in revised form February 07, 2026; Accepted March 02, 2026

ABSTRACT
Student mathematical literacy skills is depended teacher or prospective teacher skills to teach mathematical literacy. However, in reality, students' skills as prospective teachers in mathematical literacy are unable to do that. Therefore, a learning method is needed to facilitate the mathematical literacy skills of prospective teacher students. The aim of this research is to depict problem posing learning with a word problem theme that can strengthen the mathematical literacy skills of prospective teacher students. This qualitative research uses descriptive approach which conducted students on third and seventh grade of mathematics education study program for the 2023/2024 academic year. Validation sheet Observation sheets, response questionnaires, assignment sheet, and interview guide sheets are instrument for collecting data in this research. The results of the research show that the steps for learning problem posing with a word problem theme to strengthen students' mathematical literacy are consist of 2 steps. First; (1) choose a point, (2) List attribute to recall prior knowledge, (3) what -if-not-ing- to construct, (4) pose the problem, (5) analyze the problem, (6) communicate (7) emphasized by lecturer. Then second; (1) review, (2) project, (3) emphasized by lecturer. The second step is implemented for meeting after first step. The average validity percentage are 78% of the language content, 84% of mathematics content, and 80% of education content. The practicality of the design learning was 78,69%.
Keywords: mathematical literacy; problem posing; prospective teacher student; word problem.

ABSTRAK
Kemampuan literasi matematika siswa bergantung terhadap kemampuan literasi matematika guru atau calon guru dalam mengajarkan literasi matematika. Kenyataannya, kemampuan calon guru sekarang tidak dapat melakukannya. Oleh sebab itu, diperlukan sebuah metode untuk memfasilitasi kemampuan literasi matematika calon guru. Tujuan penelitian ini adalah mendeskripsikan pembelajaran problem posing bertema soal cerita yang dapat menguatkan kemampuan literasi matematika mahasiswa calon guru. Penelitian ini menggunakan pendekatan deskriptif yang diterapkan kepada mahasiswa semester 3 dan 7 program studi pendidikan matematika TA 2023/2024. Adapun instumen penelitian antara lain; lembar observasi, lembar tugas, lembar kuisionair, dan pedoman wawancara. Hasil dari penelitian ini adalah diperoleh langkah dalam pembelajaran problem posing bertema soal cerita yang dapat menguatkan literasi matematika mahasiswa calon guru sebagi berikut; (1) menentukan tema, (2) menuliskan informasi dari tema, (3) mendiskusikan perubahan infomasi dari tema , (4) menyusun masalah dari informasi yang telah ada, (5) menuliskan solusi dari masalah, (6) menyajdikan hasil, (7) dosen melakukan penekanan.
Kata kunci*: mahasiswa calon guru; literasi matematika; pengajuan soal; soal cerita.*

e-ISSN 2746-5594
p-ISSN 2746-5608

Introduction

In the 21st Century, the problems appear in daily life are increasingly complicated and need complex skill to encounter it. The demands skill based on some ealier studies are problem solving, critical thinking, creativity, innovation, collaboration, communication, adaptability, initiative, and information literacy (OECD, 2013; Stacey, 2011; Wijaya, 2016). Those skill have been integrated in matematical literacy (ML). ML become part of construct those skill in 21st century (Julie et al., 2017).

The integration of ML have more value not only mathematical knowledge as skill to calculate but also skill to solve problem in applicant of real-world contexts. This transformation become base of imperative of equipping students with skills beyond procedures, calculation, recognizing the need to prepare them for the complex challenges of the 21st Century (Schoenfeld, 2020). ML is the skill to identify information, tranform problem, initiative solution, formulate solution of problem, solve problems, and communicate mathematical concepts in applicant of various real-world contexts (Geiger et al., 2015; OECD, 2014; Stacey & Turner, 2015) Equipping students with ML skill when they learn at school. ML accentuate the learning to obtain of mathematical knowledge through a developmental process thinking, mainly within school contexts (Madison, 2015). The main facility of integration mathematical literacy is teachers or prospective teacher students (PTS). Because teachers or PTS have art to teach, educate, transfer knowledge and invite student to think in learning process, that's why role of teacher in student learning proccess is important (Tjernberg, 2023).

Recently, ML skill of PTS are not able to understand well (Basri et al., 2021; Riana & Zenizela, 2020). It consequences the ML skill of students which they are taught in class (Jaramillo, 2020). So if PTS have a good experience in studying, they will succeed to play in class and achieve their goals as teacher (Towers et al., 2017). One of solution to encounter it, by improving teaching method to PTS. Base on some earlier studies, problem posing effectively can improve ML skill or achievements in mathematics skill, it also happen to student (Dhewy & Ayuningtyas, 2019; Sangco et al., 2022).

Problem posing learning determine the independence of student to compose problem base on information or situation (Juano & Pardjono, 2016; Manan & Siswono, 2018). Problem posing is a student-centered learning, which has 2 cognitive step in learning proccess, encourage student to accept and challenge (Falach, 2016). Accepting situation is condition where PTS accept information given or accept situation determined by lecturer. Challenging situation is student challenge situation by composing the new problem base on the situation given. Earlier years, many studies collaborate with teacher, pre-service teacher, and student about problem posing. Pre-service teacher is prospective teacher student in the last grade have been pracatical. Ulusoy & Kepceoğlu, (2018) inverstigated pre-service teacher, that most of the pre-service teachers pose a problem base on all quantitative data given in task. Ünlü & Sarpkaya-aktaş, (2017)investigated the problems posed by pre-service teachers that they generally posed verbal problem and used daily language. To overcome difficulties in solving real-life problems, media that incorporates everyday contexts is needed (Sugiharti et al., 2025).

e-ISSN 2746-5594
p-ISSN 2746-5608

Theme in this problem posing learning is tipe or model of problem was composed by PTS. PTS not only pose the problem whatever they want, but pose the problem base on situation become a word problem. That is the point, students is invited to hard think to pose new problem in literacy tipe. Base on eludication above this research studies problem posing learning which can strengthen mathematical literacy. The aim is to depict design of problem posing learing to strengthen mathematical literacy of PTS with a word problem theme.

Research Methods

This study was kind of development, ecxactly, Research and Development. this study focused on development of design learning. The product developed was a Design Problem Posing Learning to Strengthen Mathematical Literacy of PTS With A Word Problem Theme. The mathematical material was abritary on Senior High School and Junior High School Level. And the kind of problem is multiple choice, short answer, essay, matchmaking, and complex multiple choice. Research and Development used Plomp Theory (Plomp & Nieveen, 2013), it consist of three steps, namely; (1) Preliminary Research, (2) Prototyping Phase, and (3) Assessment Phase. The procedure of this study was depicted in Figure 1.

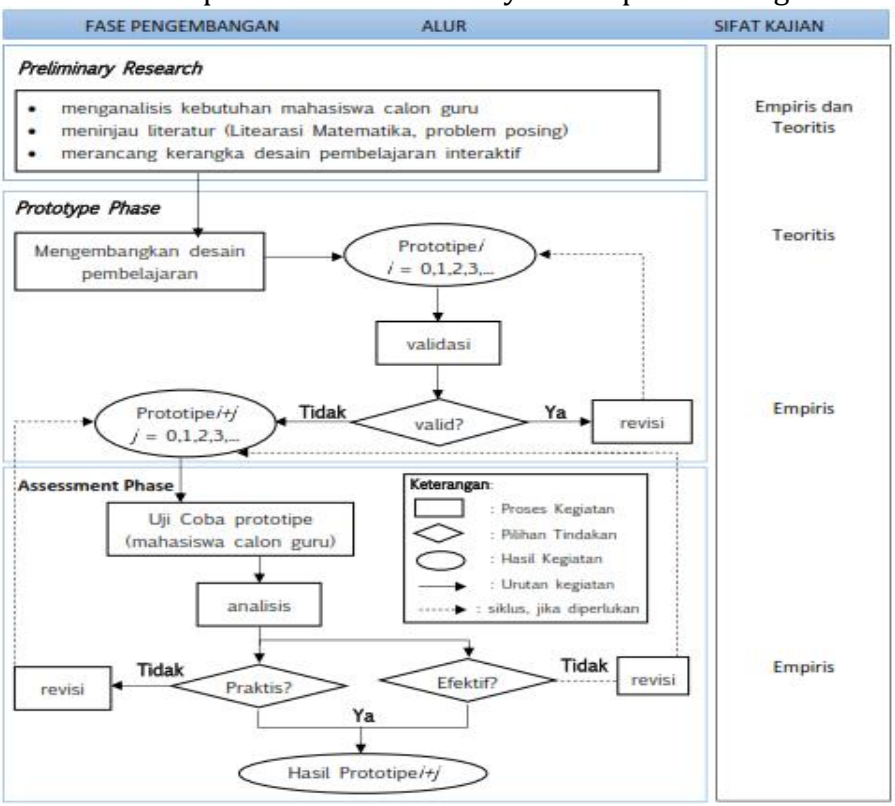

Figure 1. Flowchart Prosedure Research

Then the subject is PTS, consist of third grade and seventh grade of mathematics education study program for 2023/2024 academic year in Unipdu. Excactly, their number is 40 PTS. (1)Validation sheet, (2)observation sheets, (3)response questionnaires, and (4)test sheet were instruments for collecting data in this research.

e-ISSN 2746-5594
p-ISSN 2746-5608

Validation sheets were used to validate product prototipe by validators based on three aspects; language, mathematics, and education (learning models). Observation sheets were used to capture activity learning proccess. Then response questionnaires were used to know the learning proccess from PTS view. Assignment sheets were used to analyze the quality of posing problem has been composed by PTS. The criteria of this research is valid, pratice and effective. Valid is based on validation sheet. Practice is based on observation sheet and response questionnaire. The effective is based on test sheet. There were formula to determine validity and praticity of the product. The following formula is;

$$I_i = \frac{\sum_{j=1}^{n} V_{ji}}{n}$$

I_i : the average of validation result by validators/respondens for each item.
V_{ji}: the validator's j-th value data for the i-th item.
n : the number of validators/respondents

Meanwhile, the percentage of validity for each indicator (Pi) and the percentage of assessment for all component/indicator aspects (Ri) are determined using the following formulas;

$$P_i = \frac{I_i}{k} \times 100\%$$

P_i : ercentage of validation results for each item.
I_i: average value of validation results from all validators for each item.
k : maximum score

The percentage of assessment for each aspect is determined by the following formula

$$R_i = \frac{\sum_{i=1}^{n} P_i}{m}$$

R_i : percentage of overall validation results for all item.
P_i : percentage of validation results for each item.
m : number of item

The catagrization of criteria is base on the table 1. It was used to analize the level of validity and practicality the product.

Table 1. Criteria of validation and pratical of reseach

Percentage of average validation/practically score	Valid Criteria	Note
$85 \leq P \leq 100$	Very valid /practical	No Revision
$70 \leq P < 85$	Valid / practical	No Revision
$55 \leq P < 70$	Valid/practical enough	Revision
$40 \leq P < 55$	Valid / practical less	Revision
$0 \leq P < 40$	No valid / practical	Revision

(Source: Widjajant et al., 2023)

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On the other hand, analyzing the effectiveness of the product used the test sheet. The product is catagorized as effective product if 75% of PTS in 3rd and 7th (grade/semester) can pose mathematics literacy problem from information in test sheets. And the point of this analyze such as; realistic, logic, contextual, solution, literacy type.

Results and Discussion

Result

The research objectives had been said that this study conducted to develop design problem posing learning to strengthen mathematics literacy of PTS with a word problem theme. The result of the development learning design were steps of problem posing learning. This design can be integrated with other learning tools, such as; worksheet PTS or learning media. This design focused of high education, because based on andragogy learning. Where, the PTS have to be active, be initiative, and assimilation in learning. And a part of this desain is project to train the mathematics literacy throgh posing word problem. The design of this problem posing learning consist of two main stage. The first one is implementation of problem posing learning, for first meet. Then the second one is project for second meet and after. Clearly, the stage of the design is illustrated in Figure 2.

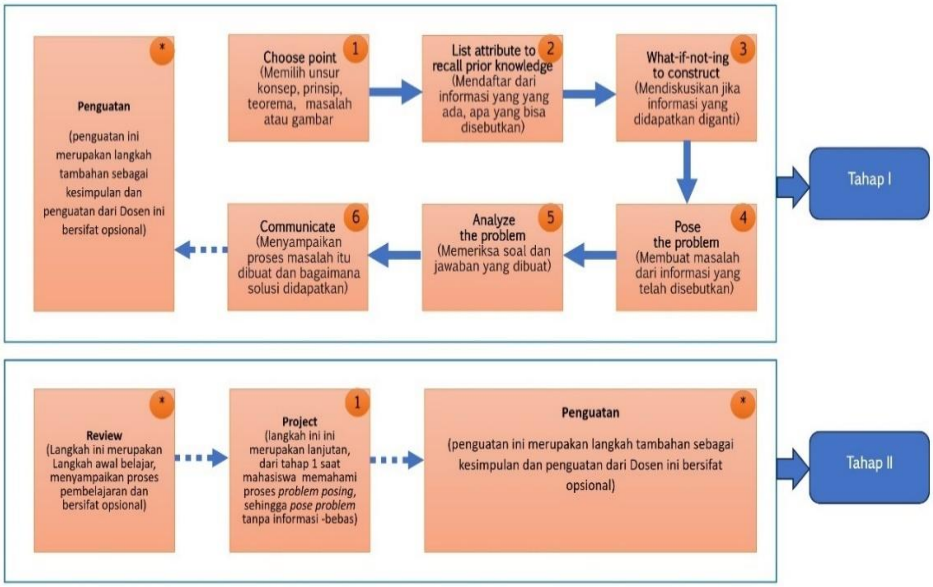


Figure 2. The Design Problem Posing to Strengthen Mathematical Literacy of PTS

Data was obtained from validity three aspects, consist of; language, mathematics, and education. The validity shown in table 2.

Table 2. Validity result of design learning in three aspects

No.	Aspect	Percentage of Validity	Criteria of Validity	Note
1.	Language content	78%	Valid	No revision
2.	Mathematics content	84%	Valid	No revision
3.	Education content	80%	Valid	No revision

e-ISSN 2746-5594
p-ISSN 2746-5608

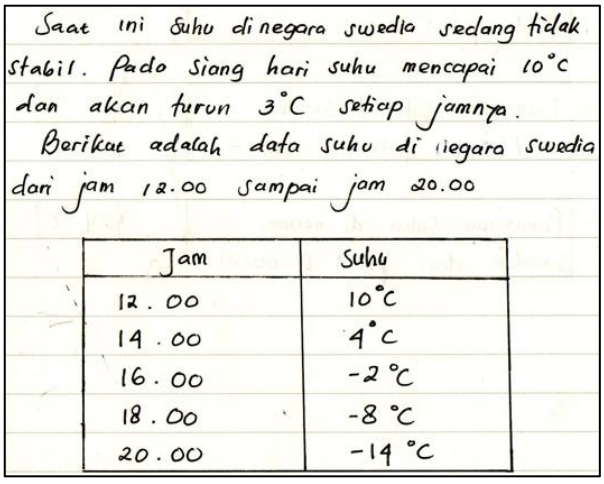
Table 2 above can be explained that the validity of this product based on three aspect. And the average of the validity result 80,7%, it means that the product in valid criteria.

Table 3. Practical result of learning process.

No.	Aspect	Percentage of Practical	Criteria of Practical	Note
1.	Punctuality between plan and process learning	70%	Practical	No revision
2.	Achievement of learning objectives	84%	Practical	No revision
3.	Activeness of student in learning	80%	Practical	No revision
3.	Implementation steps of Problem Posing			
	a. Choose point			
	b. List attribute of info	78%	Practical	No revision
	c. What if-not-inf to construct	75%	Practical	No revision
	d. Pose the problem	80%	Practical	No revision
	e. Analyze to problem	70%	Practical	No revision
	f. Communicate	72%	Practical	No revision
	g. Strengthening teacher	82%	Practical	No revision
		85%	Practical	No revision
4.	Interactive among students	82%	Practical	No revision
5.	Interactive between teacher and students	81%	Practical	No revision
6.	Creating interest of students	84%	Practical	No revision

The table 3 is result of observation sheet. And the average of that result is 78,69%. It still in pratical criteria base on table 2. Some note from observer are the material of information in step 'choose point', it is less varied. Because PTS need more varied information so can be creative pose the problem. Then 'commucate' step, PTS are still feel shy and afraid to be wrong of what they have done.

Then, the result of effectiveness of the product is analyzed qualitatively. Generally, the PTS can pose the problem from given information. The materials are also varied. But the from contextual aspect is still less. Because the country is too far and not all PTS can know that place. The number in the problem is logic for cool weather. It is illustrated in Figure 3.


Saat ini suhu di negara swedia sedang tidak stabil. Pada siang hari suhu mencapai 10°C dan akan turun 3°C setiap jamnya.
Berikut adalah data suhu di negara swedia dari jam 12.00 sampai jam 20.00

Jam	Suhu
12.00	10°C
14.00	4°C
16.00	-2°C
18.00	-8°C
20.00	-14°C

Figure 3. Result of worksheet PTS.

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Also from figure 3, there is a useless tabel, because information in table have explained in the narative text before. It reduce the literacy in narative text.

In other view, the variety of problem posed by PTS is more than one. Some of them are multiple choice, essay, matchmaking. They are shown in Figure 4.

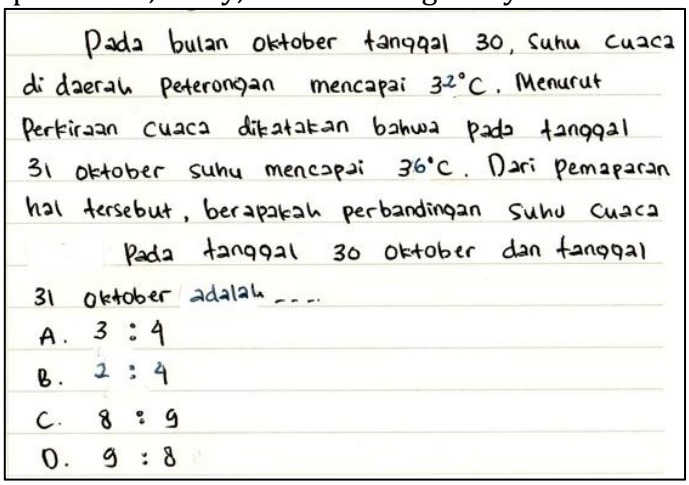

Figure 4. The type multiple choice problem

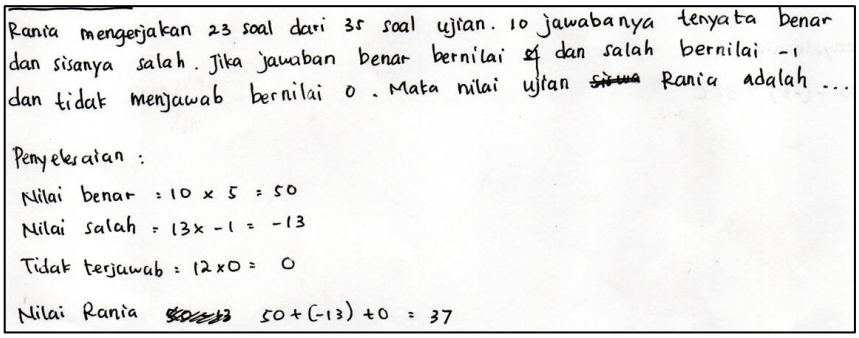

Figure 5. The type essay problem

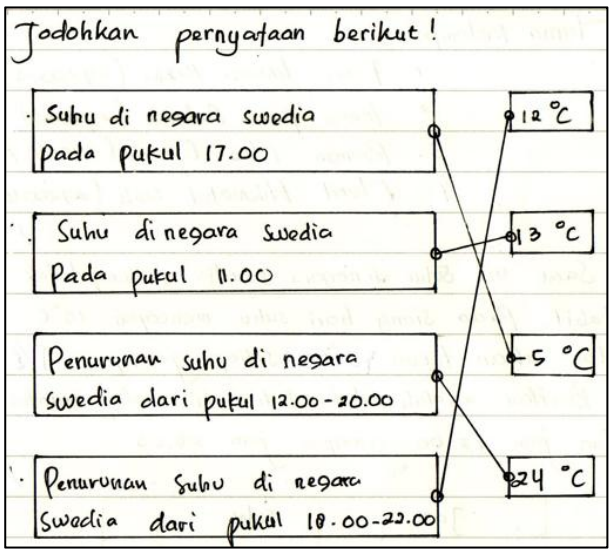

Figure 6. The type matchmaking problem

e-ISSN 2746-5594
p-ISSN 2746-5608

Discussion

The development design learning is for PTS in high education. So the stage used andragogy learning approch. Andragogy learning is often implemented for adult learners prefer in higher education (MacKeracher, 2004; Pratt, 1988). Where, PTS are invited to initiative posing problem based on their experience before. And the principles of PTS in high education as adult learning, for instance; learning-centered, interactive, constructive, and transformative dimensions of learning (Muneja, 2015).

Problem posing for learning process is student-centered approach. So Problem posing prefer implemented in high education. Problem posing can encourage student to be active in class; accepting and challenging (Falach, 2016). Accepting, PTS accepts the information to be understood and recall prior knowledge in it. Challenging, PTS arranges the information to be transformed be a problem which is new and unique.

Secondly, after given information (as Choose point) and PTS recall prior knowledge. PTS is invited to discuss the information, from that what can be transformed to be keyword or question. The discussion is an important technique to develop students' engagement (Ampatuan & Jose, 2016; Indriani, 2016; Robson, 2016). The discussion can motivate learners, they will learn from peers(Alfino et al., 2019; Tesfaye & Berhanu, 2015). Moreover, group discussion can improve learning and interaction among students, which it turns leads to better achievement.

Then pose the problem, this phase will persuade even force student to think loud to compose the new problem, in this case is mathematics problem. Posing a mathematical problem become a main activity of mathematical thinking (Lang, 1989). Posing a problem is a one of key indicator of mathematical creativity (Joklitschke et al., 2019; Van Harpen & Presmeg, 2013).

The analyze problem is phase to investigate the problem and solve it. One of enhancing learner to understand mathematical content by solving a problem. In problem solving, students understand of the problem and start generating hypotheses about possible solutions (Molnár & Greiff, 2013). Student have to analyze the problem, then formulate the solution by investigating the given information or problem (Hmelo-Silver, 2004).

And then, communicate, phase students communicate or present the process how to pose the problem. This phase students explain the begin of list attributes till solutions of new problem have posed. A researcher said that communication become tools of thinking and auxiliary to mathematical knowledge or thougt(Sfard & Kieran, 2001). Prof. Stella Christie as Deputy Minister of Higher Education, Science and Technology ever said that the way to construct strong memories is elaboration. Elaboration is rewrite or explain to others, because communication will strengthen our connection memories (Oktarina, 2025). Further more, communication skill are ranked as the highest priority skills to compete in order to be ready for workforce in 2030 (OECD, 2019).

Strengthen, is the final phase in the first step. In this phase is the teachers' turn. Teachers explain again the process what student done of posing problem. And the emphasizes that other students have not understood.

e-ISSN 2746-5594
p-ISSN 2746-5608

Second step of this learning are project and strengthening. Because the object of learning are students in higher education. They are taught by andragogy learning style. And the second step or after of 16 meeting, project is a first phase. Project in learning create meaningful learning experience, even it helped related skills to to be develop during learning process (Hsbollah & Hassan, 2022). Project in learning refers to an inquiry-based instructional method that engages learners in knowledge construction by having them accomplish meaningful projects and develop real-world products (Brundiers & A., 2013; J.S. & Shin, 2014). In this phase students are given an information to solve the project and then they explain the process to the others. Last phase is strengthening by teacher base on project have been explained by student.

Conclusion and Suggestion

Based on the analysis, criteria of the developed design was in category valid and practical. The average validity percentage of the language content was 78%, the average validity percentage of the mathematics content was 84%, and the average validity percentage of the education content was 80%. The practicality of the design learning was 78,69%. Therefore, Design Problem Posing Learning to strengthen mathematical literacy tih a word problem theme is recommended because it is very suitable for use in learning in student higher education. The advantages of this design on strengthening the matematical literacy, in this case problem posing learning create meaningfull learning by project have been done by student. In addition, this design learning proritize literacy so the theme is a word problem. Word problem help student on mathematics literacy.

This research has limitations, including the fact that the design learning is only used on students of mathematics education. Therefore, future research can be developed the not only for students of mathematics education, or implemented in school with different learning style. In addition, future researchers can examine the effectiveness with quatitative data have been transform from qualitative data.

Reference

Alfino, B. Y., Rochsantiningsih, D., & Sulistyawati, H. (2019). Improving Students' Class Participation By Optimizing The Use Of Think- Pair-Share Technique. *Jurnal Penelitian Pendidikan*, *22*(2), 136–147. https://doi.org/10.20961/paedagogia.v22i2

Ampatuan, R. A., & Jose, A. E. S. (2016). Role Play As An Approach In Developing Students Communicative Competence. *International Journal for Innovation Education and Research*, *4*(1), 18–24. https://doi.org/10.31686/ijier.vol4.iss1.503

Basri, H., Kurnadi, B., Syarifuddin, Tafriliyanto, C. F., & Nugroho, P. B. (2021). Investigasi kemampuan numerasi mahasiswa calon guru matematika. *Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika*, *4*(2), 72–79. https://doi.org/10.30605/proximal.v4i2.1318

Brundiers, K., & A., W. (2013). Do we teach what we preach? An international comparison of problem- and project-based learning courses in sustainability. *Sustainability*, *5*(4), 1725–1746. https://doi.org/10.3390/su5041725

Dhewy, R. C., & Ayuningtyas, N. (2019). Implementasi Pendekatan Problem Posing Soal Matematika PISA Likes terhadap Kemampuan Literasi Matematis.

Vygotsky, *1*(2), 87–98. https://jurnalpendidikan.unisla.ac.id/index.php/VoJ/article/download/136/136

Falach, H. N. (2016). Perbandingan Keefektifan Pendekatan Problem Solving dan Problem Posing dalam Pembelajaran Matematika pada Siswa SMP. *PYTHAGORAS: Jurnal Program Studi Pendidikan Matematika*, *11*(3), 136–148. https://doi.org/10.21831/pg.v11i2.10635

Geiger, V., Goos, M., & Forgasz, H. (2015). A rich interpretation of numeracy for the 21st century: A survey of the state of the field. *ZDM - Mathematics Education*, *47*, 531–548. https://doi.org/10.1007/s11858-015-0708-1

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, *16*, 235–266. https://doi.org/10.1023/B: EDPR.0000034022.16470.f3

Hsbollah, H. M., & Hassan, H. (2022). Creating Meaningful Learning Experiences With Active, Fun, And Technology Elements In The Problem-Based Learning Approach And Its Implications. *Malaysian Journal of Learning & Instruction*, *19*(1), 147–181. https://doi.org/https://doi.org/10.32890/mjli2022.19.1.6

Indriani, S. (2016). Fostering Student Participation Through Interactive Teaching in Basic English Class. *Scholaria : Jurnal Pendidikan Dan Kebudayaan*, *6*(2), 92–99. https://doi.org/10.24246/j.scholaria.2016.v6.i2.p92-99

J.S., K., & Shin, N. (2014). Project-Based Learning. In *The Cambridge Handbook of the Learning Sciences.* (pp. 275–297). Cambridge University Press. https://doi.org/10.1017/CBO9781139519526.018

Jaramillo, M. G. . (2020). *Mathematical Literacy: A Case Study Of Pre-Service Teachers* [Southern Illinois University]. https://opensiuc.lib.siu.edu/dissertations/1798/

Joklitschke, J., Baumanns, L., & Rott, B. (2019). The intersection of problem posing and creativity: a review. In M. Nolte (Ed.), Including the Highly Gifted and Creative Students – Current Ideas and Future Directions. *Proceedings of the 11th International Conference on Mathematical Creativity and Giftedness (MCG 11)*, 59–67. https://mathedidaktik.uni-koeln.de/fileadmin/home/baumanns/MCG2019_Joklitschke-Baumanns-Rott.pdf

Juano, A., & Pardjono, P. (2016). Pengaruh Pembelajaran Problem Posing Terhadap Kemampuan Berpikir Kritis dan Komunikasi Matematis Siswa Kelas V SD. *Jurnal Prima Edukasia*, *4*(1), 46–53. https://doi.org/10.21831/jpe.v4i1.7801

Julie, H., Sanjaya, F., & Anggoro, Y. (2017). The Students' Ability in Mathematical Literacy for Uncertainty Problems on the PISA Adaptation Test. *AIP Conference Proceedings*, 050026–1–050026–10. https://doi.org/10.1063/1.4995153

Lang, S. (1989). *Faszination Mathematik – Ein Wissenschaftler stellt sich der Offentlichkeit*. Vieweg+Teubner Verlag.

MacKeracher, D. (2004). *Making sense of adult learning (2nd ed.)*. University of Toronto Press.

Madison, B. (2015). Quantitative literacy and the Common Core State Standards in mathematics. *Numeracy*, *8*(1), 1–13. https://doi.org/10.5038/1936-4660.8.1.11

Manan, M. H., & Siswono, T. Y. E. (2018). Student's Mathematics Conceptual Understanding: The Effect of Problem Posing Learning Assisted Visual Studio Applications. *MATHEdunesa*, *7*(3), 659–662. https://ejournal.unesa.ac.id/index.php/mathedunesa/article/view/25951/23783

Molnár, G., & Greiff, S. (2013). Understanding transitions in complex problem-solving: Why we succeed and where we fail. *Thinking Skills and Creativity*, *50*. https://doi.org/10.1016/j.tsc.2023.101408

Muneja, M. S. (2015). A Theoretical Basis for Adult Learning Facilitation: Review of Selected Articles. *Journal of Education and Practice*, *6*(31), 54–61. https://files.eric.ed.gov/fulltext/EJ1083398.pdf

OECD. (2013). *PISA 2012 Results: What Students Know and Can Do – Student Performance in Mathematics, Reading and Science (Volume I)*. OECD Publishing. https://doi.org/10.1787/9789264201118-en

OECD. (2014). *PISA 2012 results: What students know and can do – Student performance in mathematics, reading and science (Volume I, Revised ed.).* OECD Publishing. https://doi.org/10.1787/9789264208780-en

OECD. (2019). *Future of Education and Skills 2030: A Series of Concept Notes. OECD Learning Compass*. OECD Publishing. https://www.oecd.org/education/2030-project/teaching-and-learning/learning/learning-compass-

Oktarina, D. (2025). *Rahasia Mengingat Cepat dan Lama ala Prof. Stella Christie*. RRI. https://rri.co.id/lain-lain/1236015/rahasia-mengingat-cepat-dan-lama-ala-prof-stella-christie

Plomp, T., & Nieveen, N. (2013). *An Introduction to Educational Design Research*. https://ris.utwente.nl/ws/portalfiles/portal/14472302/Introduction_20to_20education_20design_20research.pdf

Pratt, D. D. (1988). Andragogy as a relational construct. *Adult Education Quarterly*, *38*(3), 160–172. https://doi.org/10.1177/0001848188038003004

Riana, D., & Zenizela, Z. (2020). Kemampuan literasi matematis mahasiswa calon guru sekolah dasar. Konstruktivisme. *Jurnal Pendidikan Dan Pembelajaran*, *12*(1), 39–48. https://doi.org/10.35457/konstruk.v12i1.844

Robson, M. (2016). Action research: principles and practice. *Taylor & Francis Journals*, *13*(3), 283–285. https://doi.org/10.1080/14767333.2016.1220174

Sangco, A. P., Elpidang, M. E., & Sangco, R. M. R. (2022). The Impact of Problem Posing Strategies on Mathematical Performance, Ability, and Anxiety in Grade 7 Students: A Quasi-Experimental Study. *Malikussaleh Journal of Mathematics Learning (MJML)*, *5*(1), 14–18. https://doi.org/10.29103/mjml.v5i1.7423

Schoenfeld, A. H. (2020). Mathematical practices, in theory and practice. *ZDM Mathematics Education*, *52*, 1163–1175. https://doi.org/10.1007/s11858-020-01162-w

Sfard, A., & Kieran, C. (2001). Cognition as Communication: Rethinking Learning-by-Talking Through Multi-Faceted Analysis of Students' Mathematical Interactions. *MIND, CULTURE, AND ACTIVITY*, *8*(1), 42–76. https://doi.org/10.1017/CBO9780511499944

Stacey, K. (2011). The PISA view of mathematical literacy in Indonesia. *Journal on Mathematics Education*, *2*(2), 95–126. https://doi.org/10.22342/jme.2.2.746.95-126

e-ISSN 2746-5594
p-ISSN 2746-5608

Stacey, K., & Turner, R. (2015). *Assessing mathematical literacy: The PISA experience*. Springer International Publishing. https://doi.org/10.1007/978-3-319-10121-7

Sugiharti, A., Vahlia, I., & Rahmawati, D. (2025). Pengembangan Aplikasi Android Berbasis Problem Based Learning Berorientasi Kebudayaan Lokal Materi Baris Dan Deret Aritmatika. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 14(2), 409-423. http://dx.doi.org/10.24127/ajpm.v14i2.10963

Tesfaye, S., & Berhanu, K. (2015). Improving students ' participation in active learning methods : Group discussions , presentations and demonstrations : A case of Madda Walabu University Second Year Tourism Management Students of 2014. *Journal of Education and Practice*, *6*(22), 29–33. https://files.eric.ed.gov/fulltext/EJ1079478.pdf

Tjernberg, C. C. (2023). *Key factors for teaching and learning - Teachers' experiences and reflections on literacy teaching*. Research Square. https://doi.org/10.21203/rs.3.rs-2212915/v2

Towers, J., Andrews, H., Hall, J., Rapke, T., & Martin, L. C. (2017). Autobiographical Accounts of Students' Experiences Learning Mathematics. *Can. J. Sci. Math. Techn. Educ*, *17*, 152–164. https://doi.org/10.1080/14926156.2016.1241453

Ulusoy, F., & Kepceoğlu, İ. (2018). The contextual and cognitive structure of prospective middle school mathematics teachers' problems in semi-structured problem-posing context. *Journal of Kırşehir Education Faculty*, *19*(3), 1937–1963. https://doi.org/10.29299/kefad.2018.19.03.004

Ünlü, M., & Sarpkaya-aktaş, G. (2017). Examination of pre-service elementary mathematics teachers' problems posed about algebraic expressions and equations. *Turkish Journal of Computer and Mathematics Education*, *8*(1), 161–187. https://doi.org/10.16949/turkbilmat.303966

Van Harpen, X. Y., & Presmeg, N. C. (2013). An investigation of relationships between students' mathematical problem-posing abilities and their mathematical content knowledge. *Educational Studies in Mathematics*, *83*(1), 117–132. https://doi.org/10.1007/s10649-012-9456-0

Widjajant, K., Sarosa, M., & Selviana, V. (2023). Development of an E-Module on Derivative Applications for Vocational High School Students. *JTAM (Jurnal Teori Dan Aplikasi Matematika)*, *7*(3), 793–804. https://doi.org/10.31764/jtam.v7i4.15033

Wijaya, A. (2016). Students' Information Literacy: A Perspective from Mathematical Literacy. *Journal on Mathematics Education*, *7*(2), 73–82. https://doi.org/10.22342/jme.7.2.3532.73-82