



Developing AI-assisted learning worksheets to strengthen literacy and numeracy skills

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Submission: June 11st, 2024; Accepted: December 24th, 2024; Published: October 31th, 2024

DOI: <https://doi.org/10.31629/jg.v9i1.6932>

Abstract

According to research, PISA, and national exams, pupils' numeracy literacy is generally low; teachers frequently utilize less participatory and irrelevant real-life teaching methods. Learning can be made more engaging by integrating technology into it, one example being the application of artificial intelligence (AI). This study aims to examine the validity and usefulness of student worksheets created using artificial intelligence to improve numeracy literacy abilities in the area of linear inequality of one variable. This is a preliminary and formative evaluation study. Product preparation and design were completed at the preliminary stage. Furthermore, formative evaluation stages include expert review, one-on-one, small group, and field tests. The material used is linear inequality in one variable, and the questions are related to numeracy literacy metrics. Questionnaires and interviews were employed to obtain the data. The questionnaire consists of both validity and practicality questionnaires. Validity data is derived from expert comments and suggestions. Questionnaires and interviews are used to collect practical data. The validity and practicality of data were qualitatively assessed by changing the worksheets in response to the validator and student comments and suggestions. The study's findings revealed that worksheets using AI were deemed valid at the expert review stage and very practical based on the results of the practicality questionnaire and interviews at the one-on-one, small group, and field testing phases. AI-powered worksheets can be utilized more widely to promote learning in class and individually. Schools might include AI technology in their learning strategies to increase numeracy literacy.

Keywords: worksheets; artificial intelligence; numeracy literacy

How to cite: Agustiani, R., Putri, A. D., Zahra, A., Hartatiana., & Saputri, A. M. Developing AI-assisted learning worksheets to strengthen literacy and numeracy skills. *Jurnal Gantang*, 9(1), 39–48. <https://doi.org/10.31629/jg.v9i1.6932>

I. Introduction

The rapid development of applied science and technology in today's globalized era has resulted in the advancement of information and communication technology, including artificial intelligence (AI) technology. The ChatGPT

application is a user-friendly AI-based technology. (Khoiriah et al., 2023; Sharma et al., 2023; Tajik & tajik, 2024). Technology has improved and streamlined many aspects of human life, including education. In education, technology has evolved into a helpful tool for



instructors and students, particularly junior high school pupils, to impart ideas or concepts in a practical and timely manner. (Fauziyati, [2023](#); Haleem et al., [2022](#)).

One of the learning resources is the student worksheets that are developed. They must have references and follow the technological era because it cannot be denied that technology is developing very rapidly, even in the world of education. Facing these conditions, learning must, of course, be improved by utilizing technological developments and leaving traditional teaching patterns. (Mursyidah & Muhammad, [2023](#); Zaka, [2023](#)).

The application of artificial intelligence in education has become an increasingly relevant innovation in the digital age when technology plays an essential role in boosting learning quality. AI not only allows for personalized learning based on each student's needs, hence increasing the learning experience (Kanwal et al., [2023](#)), but it also assists teachers in more efficiently managing the teaching and learning process (EL Gamal, [2023](#); Suharmawan, [2023](#)). AI allows for evaluating individual student learning issues and providing individualized support to maximize student achievement in mathematics classrooms (Qiu et al., [2022](#)).

According to research results, PISA, and national exams, pupils' numeracy literacy is quite low (Lopez-Pedersen et al., [2023](#); Son et al., [2023](#)). Teachers frequently utilize less participatory teaching approaches unrelated to actual life (Kusdiyanti et al., [2020](#); Syahrul et al., [2022](#)). Technological integration can make learning more fascinating, one example being the usage of artificial intelligence (Hasni et al., [2023](#); Windiarti et al., [2023](#)). AI can be used to teach numeracy and literacy skills in an engaging manner. AI can generate data visualizations and simulations to assist students in understanding abstract topics in mathematics (Soesanto et al., [2022](#)). AI chat models, such as ChatGPT, can reply accurately to chat commands in problem-

solving, evidence, and explanation (Remoto, [2024](#))

Learning with technology-based learning media or AI is thought to be a factor that can influence the learning paradigm by increasing motivation and learning experiences through interactive and fun learning (Siregar et al., [2023](#); Maulana et al., [2023](#)) and improving students' digital literacy or numeracy skills.

II. Method

This study employs the research and development (R&D) technique. The study's findings will be used to develop a new product, which will be evaluated with students until it is appropriate for use in the teaching and learning process. The cycle for generating research and development products in education is: 1) potential and difficulties; 2) collecting information; 3) product design; 4) design validation; 5) design validation; 6) product trials; 7) product testing; 8) use trials; 9) product revision; and 10) mass production of products (Jumiarti, [2022](#)).

The scientific research method includes rational, empirical, and systematic elements (Sugiyono, [2015](#)). There are five stages of classical formative evaluations, with the following stages: self-evaluation, expert review, one-on-one, small group, and field test (Tessmer, [2013](#)). This study is a research flow in the development of student worksheets. Formative evaluation is carried out to find out how to make instructions more efficient and interesting so that students are motivated and can be accepted in the products being developed (Tessmer, [2013](#)). Development research is divided into preliminary and prototyping, which use formative evaluation. The graphic below depicts the implementation flow that will be followed.

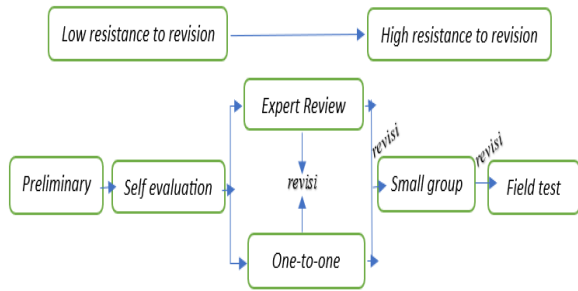


Figure 1. Formative evaluation design flow (Tessmer, 2013)

Validity and practicality data were analyzed qualitatively. Researchers made revisions to the student worksheet based on comments and suggestions from the validator at the expert review stage and students at the one-to-one, small group, and field test stages.

III. Results and Discussion

Based on the research procedure, the researcher created a student worksheet product using AI on the topic of linear inequality of one variable to improve numeracy literacy skills. This study followed the formative assessment stage, preceded by product analysis and design activities. At the analysis stage, it was determined that interactive teaching resources, such as student worksheets created using AI, were required to assist students in understanding the subject presented. At the product design stage, a study was conducted on the material and AI appropriate for learning activities. The table below was created based on the study's results.

Table 1. AI activities and applications

No.	Activity	AI	Outcome
1.	Students can listen to the video and view images of AI-Khawarizmi	Canva, Tts.prosa.ai, Capcut	Students are provided with information about Muslim mathematicians
2.	Students read and watch comic strips about inequality	Comical.ai, Canva	Students identify elements of inequality in their daily lives and can draw judgments about what inequality is
3.	Students are presented with advanced quiz questions	Quizizz	It makes it easy for teachers to administer quizzes by merely presenting an outline of the lecture, and student grades are directly translated into a ranking
4.	Students are given questions that are solved using AI.	Gemini.ai	AI is useful for students' study buddies who do not have a set time restriction to find knowledge.

The specified learning activities are then implemented as a comprehensive list of questions, supplemented by extra videos, images, and AI application support. After all of the materials, in the form of questions and video, have been effectively generated, the student worksheet is compiled by paying attention to the components. The assembled student worksheet includes a barcode that students can use to facilitate learning activities with AI. The following is an example of how the student worksheet is shown.



Figure 2. View design results

After the worksheet product is created, five stages of formative evaluation activities are carried out. Here are the details about the research stages:

Self-evaluation

At this stage, the research team discusses the flaws and mistakes in the product being developed. This stage produced the following revision points:

1. The researcher's concept map remains relatively simple, with no connections.
2. The learning objective flow developed by the researcher does not yet include an indicator of learning objective achievement.
3. The material given by the researcher merely instructs students to read.
4. Use the offered images following the needs of the situation.
5. The researcher's instructions on the questions can lead to confusion among students regarding the claims and their solutions.

Expert Review & One to one

The expert review and one-on-one stages were completed simultaneously. During the expert review stage, the worksheet product was validated by experts, and comments and ideas were used as revision material after being modified to the results of the one-on-one questionnaire. Validators were chosen based on their respective expertise, fields, and experiences with the research topic, and each validator evaluated all parts of the media, materials, and context. The following is a summary of the expert comments regarding the worksheet.

1. Technical Enhancements
 - a. Improve the print quality of the worksheet cover, particularly the color.
 - b. Video Display: Remove watermarks, lengthen videos, and add interesting animations.
 - c. Writing: Correct mistakes, clarify orders and queries, and provide verb-writing variations (e.g., color, font).
 - d. Barcode: Ensure that the barcode is functioning properly.
2. Content and construction of worksheet
 - a. Indicator compliance: Verify that the modules, questions, and worksheets are consistent with the established indicators.
 - b. Student motivation: The worksheet's contents must stimulate pupils to learn.
 - c. Problem structure: The issues provided are adequate, but the processes for answering them could be expanded or improved.
 - d. Learning objective Achievement Indicators: Posttest indicators should take the form of story questions.
 - e. Command title: Each command in the spreadsheet should have a clear title.
 - f. Learning steps: Improve the worksheet's steps so students can correctly complete the learning objectives.

The researcher instructed students to explore the worksheet on their smartphones during the one-on-one stage. When students encountered challenges, the researcher acted as a

facilitator and companion. The researcher conducted two hours of teaching. After students had finished exploring the worksheet, they were handed a questionnaire sheet comprising statements about the effectiveness of the previously evaluated worksheet. The questionnaire results include the following points:

1. The advantages of worksheet
 - a. Attractive design: The worksheet design is appealing and encourages students to learn.
 - b. Relevance: Because the content and example questions offered apply to everyday life, they are simple to understand.
 - c. Usability: The worksheet is straightforward to use and navigate, especially with the help of AI.
 - d. Clear language: The worksheet's wording is straightforward for kids to understand.
 - e. In accordance with student abilities: The material's difficulty level is appropriate for the student's skills.
2. The disadvantages of worksheets
 - a. Systematic errors: The spreadsheet has several typos and other systemic problems that degrade its accuracy.
 - b. Barcode problems: Some barcodes do not work properly.
 - c. Some illustrations are not clear enough and may be improved
 - d. Boredom: As children learn to use AI-powered worksheets, they may become bored.
 - e. Mathematical mistakes: There are errors in the math material, particularly in the section on one-variable linear equations.

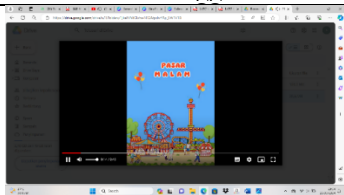
Small group

This stage focuses on measuring the learning efficacy of media users and the ease with which students use learning media. During the small group stage, students are divided into two groups and instructed to discuss individually with group members. After researching the worksheet, students are asked to complete a questionnaire, and researchers conduct interviews with them to confirm the questionnaire and students'

understanding of how to use the worksheet with artificial intelligence. The following is Table 2 of the revision points based on student suggestions.

Table 2. Results of the small group stage revision

Comments and suggestions

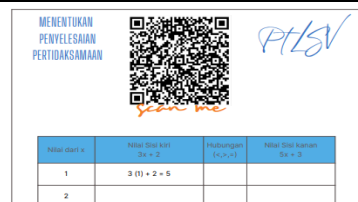


The worksheet includes two videos, one of which is 2-3 minutes lengthy and can take up a significant amount of students' time.

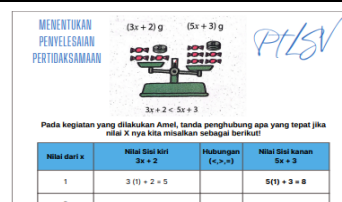
Revision decision



The discourse video substitutes it with a comic so that students can read it at their own pace.



- The instructions on when to use the barcode are confusing; some barcodes are still incorrect or cannot be used.
- Due to the nature of the inquiry, students must first request that any blank boxes be completed.



- There was too much AI use, and the guidelines were unclear; the researcher replaced it with an experimental image made by Amel, and the barcode used didn't work, making it ineffective.
- The researcher inserted completed questions and modified the font color to improve visibility.

Field test

In the Tessmer development paradigm, the field test stage marks the end of the formative assessment loop. Students' activities include observing worksheets and accessing AI. During the field test, researchers act as teachers, observing students as they answer questions on the worksheet presented.

After completing the worksheet tasks, students are asked to complete a practicality questionnaire. This assesses the feasibility of user approval, implementation power, and organizational acceptance. At the field test stage, researchers analyzed the comments and ideas from the student response questionnaire.

The process was then repeated with interviews to check the students' responses. According to the findings of student interviews, worksheets with AI aid are engaging learning tools that students may use on their own. Researchers interviewed three kids with low, medium, and high abilities. Based on the findings

of the interviews, the worksheets created are effective, and students may utilize them to comprehend the topic better. The following is an excerpt from a researcher-led interview with MFR students.

Researcher: Can worksheets help students learn linear inequalities of one variable?

Student: Yes, because technology facilitates and simplifies teaching and learning processes.

Researcher: Does the AI on the worksheet help students solve questions?

Student: Yes, because the AI instructions are understandable.

Researcher: Does using AI-powered worksheets help students learn the content better?

Student: Yes, because it makes students more engaged.

According to the evaluation results from the field test stage, the typical student receives a high criterion score. The evaluation questions are then used to calculate the potential effect measured using the students' numeracy literacy

skills, which is 84.842, where the value is acquired by dividing the overall value by the number of students. As a consequence of the assessment question analysis, the prospective effect on students' numeracy literacy skills falls into the medium category. The following image depicts the percentage findings of an analysis of students' numeracy literacy skills:

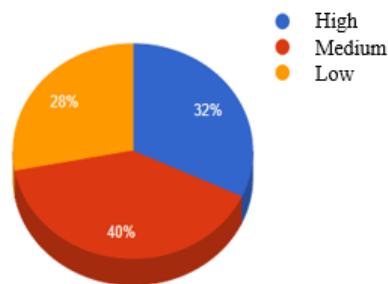


Figure 3. Percentage graph of students' numeracy literacy skills

The following is a detailed examination of the product's validity and practicality, referring in the learning device (Alhakim, Mustami, Damayanti, 2021). According to Nurul et al. (2024), appealing learning media can boost students' willingness and aptitude to learn. Meanwhile, the interview findings were positive regarding content, language, and structures that were certified legitimate and fit for usage, with adjustments based on the comments provided.

2. The practicality of worksheets with the help of AI

The product's practicality under development is evaluated regarding clarity, attractiveness, implementation power, effectiveness or efficiency, user acceptance, and organization (Tessmer, 2013).

The use of artificial intelligence to generate different questions can be a form of acceptance for students to learn and grasp linear inequality of one variable content based on what transpired throughout the investigation. This view is supported by research, which states that practicality focuses on how quickly users can utilize the generated product in accordance with

to the findings from these stages.

1. Validity of worksheets with AI assistance

Based on the researcher's investigation of the validity elements and indications, the worksheet was judged to meet the validity requirements. This is evident in the attractive design, various colors, and clear visuals with illustrations suited to the context; the language used is appropriate to the student's level, and the worksheet is operated with the assistance of AI, making it easier for students. There are animated films to help provide knowledge and colorful comics that make AI an intriguing and enjoyable learning partner. This occurred in agreement with Dewi's prior studies (Idrus, 2023).

The validation sheet assessment results determined that the worksheet prepared with AI aid for linear inequality material was feasible to use with adjustments. The learning device is legitimate if the expert assessment demonstrates that the device's development has internal consistency between each aspect studied, specifically the interaction between component the techniques supplied and learning objectives (Fadli et al., 2024; Teng et al., 2022).

This is consistent with a study that states that the ease of use of a learning media influences students' desire to use it. As a result, the worksheet created using artificial intelligence is practical (Teng et al., 2022).

IV. Conclusion

Worksheets that use artificial intelligence (AI) on one-variable linear inequality content to improve numeracy literacy skills are legitimate. This validity is proved by the results of data analysis on validated features, including media and material aspects, as well as the findings of validation sheets completed by the three validators during the expert review stage. Worksheets made using AI on one-variable linear inequality content to improve numeracy literacy skills are useful. The worksheet's practicality can be demonstrated during the one-on-one, small group, and field test stages, which are based on

qualitative data analysis results and provide items that fall into the practical category. Context, intelligibility, and the attraction of real errors were the variables assessed at the one-to-one stage. Then, from the aspects examined, particularly the effectiveness at the small group level. As indicated by data analysis findings in the areas of user approval and organizational acceptance throughout the field test stage. Using student comments and suggestions that the AI-created worksheet is very engaging, simple to use, and enhances learning motivation, it is also included in the practical outcomes.

Reference

- EL Gamal, H. (2023). ChatGPT language model and its application in the field of libraries and information: an exploratory study. *International Journal of Library and Information Sciences*, 0(0). <https://doi.org/10.21608/ijlis.2023.203270.1190>
- Fadli, R., Surjono, H. D., Sari, R. C., Wagiran, Sardi, J., Eliza, F., Habibullah, Suhardiman, S., Ridho Dedy, A. B., Ramadhani, W., Hakiki, M., & Hidayah, Y. (2024). Practicality of Mobile-Based Learning with Project-Based Learning Approach in Electric Motor Installation to Increase Student Learning Motivation. *International Journal of Information and Education Technology*, 14(8), 1127–1135. <https://doi.org/10.18178/ijiet.2024.14.8.2141>
- Fauziyati, W. R. (2023). Dampak Penggunaan Artificial Intelligence (AI) dalam Pembelajaran Pendidikan Agama Islam. *Jurnal Review Pendidikan Dan Pengajaran*, 6(2).
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3. <https://doi.org/10.1016/j.susoc.2022.05.004>
- Hasni, H., Bangalangi, R. J., & Tumba, M. (2023). Penerapan AI (artificial intelligence) sebagai asisten pembelajaran dalam meningkatkan hasil belajar mahasiswa teknologi pendidikan universitas kristen indonesia toraja. *Seminar Nasional Teknologi Pendidikan UKI Toraja*.
- Idrus, (2023). Pembelajaran Berbasis Kognitif Multimedia Pada Kalbu Perspektif Al-Qur'an. *Jurnal Al Ashriyyah*, 9(2).
- Jumiarti, S. (2022). Pengembangan Media Permainan Corong Berhitung Untuk Meningkatkan Kecerdasaan Logika Matematika Anak Usia 5-6 Tahun Di Tk Islam Integral Darul Fikri Kota Bengkulu. *Skripsi*, 8.5.2017.
- Kanwal, A., Hassan, S. K., & Iqbal, I. (2023). An Investigation Into How University-Level Teachers Perceive Chat-Gpt Impact Upon Student Learning. *Gomal University Journal of Research*, 39(02). <https://doi.org/10.51380/gujr-39-03-01>
- Khoiriah, S. U., Lubis, L. K. L. U., & Anas, D. K. N. (2023). Analisis Perkembangan Sistem Manajemen Pendidikan di Era Society 5.0. *JISPENDIORA: Jurnal Ilmu Sosial, Pendidikan Dan Humaniora*, 2(2).
- Kusdiyanti, H., Nurruddin Zanky, M., & Prasetyo Wati, A. (2020). Blended Learning for Augmented Reality to Increase Student Competitiveness the Filling Subject Toward Making Indonesia 4.0. *KnE Social Sciences*. <https://doi.org/10.18502/kss.v4i7.6845>
- Lopez-Pedersen, A., Mononen, R., Aunio, P., Scherer, R., & Melby-Lervåg, M. (2023). Improving Numeracy Skills in First Graders with Low Performance in Early Numeracy: A Randomized Controlled Trial. *Remedial and Special Education*, 44(2). <https://doi.org/10.1177/07419325221102537>
- Maulana, S.M., Nurmalasari, Rheno Widiyanto, S., Dewi Ayu Safitri, S., & Maulana, R. (2023). Pelatihan Chat Gpt Sebagai Alat Pembelajaran Berbasis Artificial Intelligence Di Kelas. *Jurnal Penelitian Dan Pengabdian Masyarakat Jotika*, 3(1). <https://doi.org/10.56445/jppmj.v3i1.103>

- Mursyidah, N., & Muhammad, M. (2023). Arah Baru Pembelajaran Pada Mahasiswa Di Era Society 5.0. *Jurnal Pembelajaran Dan Matematika Sigma (JPMS)*, 9(1). <https://doi.org/10.36987/jpms.v9i1.3829>
- Nurul, A. Y., Hermansah, B., Ratih Ayu, I., PGRI Palembang, U., Jend Yani Lorong Gotong Royong, J. A., Seberang Ulu, K. I., Palembang, K., & Selatan, S. (2024). Pengembangan Media Digital Storytelling pada Pembelajaran IPS SD untuk Membangkitkan Minat Belajar Generasi Millenial. *Journal on Education*, 06(02).
- Qiu, Y., Pan, J., & Ishak, N. A. (2022). Effectiveness of Artificial Intelligence (AI) in Improving Pupils' Deep Learning in Primary School Mathematics Teaching in Fujian Province. *Computational Intelligence and Neuroscience*, 2022. <https://doi.org/10.1155/2022/1362996>
- Remoto, J. P. (2024). ChatGPT and other AIs: Personal relief and limitations among mathematics-oriented learners. *Environment and Social Psychology*, 9(1). <https://doi.org/10.54517/esp.v9i1.1911>
- Sharma, -Sudhansh, Sharma, S., & Yadav, R. (2023). Chat GPT – A Technological Remedy or Challenge for Education System. *Global Journal of Enterprise Information System*, 14(4).
- Siregar, H. F., Hasmayni, B., & Lubis, A. H. (2023). The Analysis of Chat GPT Usage Impact on Learning Motivation among Scout Students. *International Journal of Research and Review*, 10(7). <https://doi.org/10.52403/ijrr.20230774>
- Soesanto, R. H., Dirgantoro, K. P. S., & Priyanti, N. (2022). Indonesian students' perceptions towards AI-based learning in mathematics. *Journal on Mathematics Education*, 13(3). <https://doi.org/10.22342/jme.v13i3.pp531-548>
- Son, A. L., Talan, M. R., Mone, F., & Jelahu, R. A. (2023). Profil Kemampuan Literasi Dan Numerasi Siswa Sekolah Menengah Pertama. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 12(1). <https://doi.org/10.24127/ajpm.v12i1.6569>
- Sugiyono. (2015). Sugiyono, Metode Penelitian dan Pengembangan Pendekatan Kualitatif, Kuantitatif, dan R&D , (Bandung: Alfabeta, 2015), 407 1. *Metode Penelitian Dan Pengembangan Pendekatan Kualitatif, Kuantitatif, Dan R&D*, 2015.
- Suharmawan, W. (2023). Pemanfaatan Chat GPT Dalam Dunia Pendidikan. *Education Journal : Journal Educational Research and Development*, 7(2). <https://doi.org/10.31537/ej.v7i2.1248>
- Syahrul, A., Syarli, S., & Sari, C. R. (2022). Penerapan Teknologi Augmented Reality Pada Media Pembelajaran Berbasis Android. *Journal Pegguruang: Conference Series*, 4(1). <https://doi.org/10.35329/jp.v4i1.2828>
- Tajik, E., & Tajik, Fatemeh. (2024). A Comprehensive Examination of the Potential Application of Chat GPT in Higher Education Institutions. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4699304>
- Teguh Iman Alhakim, M., Khalifah Mustami, M., & Damayanti, E. (2021). AI-Ahya: Jurnal Pendidikan Biologi Kevalidan Media Pembelajaran Berbasis Logo Board Games Materi Sistem Reproduksi Kelas XI MIA. *Jurnal Pendidikan Biologi*, 3(2), 37–47. <http://journal.uinalauddin.ac.id/index.php/ahya/index>
- Teng, Z., Cai, Y., Gao, Y., Zhang, X., & Li, X. (2022). Factors Affecting Learners' Adoption of an Educational Metaverse Platform: An Empirical Study Based on an Extended UTAUT Model. *Mobile Information Systems*, 2022. <https://doi.org/10.1155/2022/5479215>
- Tessmer, M. (2013). Planning and Conducting Formative Evaluations. In *Planning and Conducting Formative Evaluations*. <https://doi.org/10.4324/9780203061978>
- Windiarti, I. S., Bahri, S., & Prabowo, A. (2023). Melangkah Maju dengan Teknologi Generative AI: Peningkatan Kompetensi Kepala Sekolah SMP di Kota Palangkaraya. *Parta: Jurnal Pengabdian Kepada Masyarakat*, 4(1). <https://doi.org/10.38043/parta.v4i1.4344>

Zaka, P. (2023). Meaningful learning with technology. *Journal of Open, Flexible and Distance Learning*, 16(2).
<https://doi.org/10.61468/jofd.v16i2.190>

