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Bridging algebra and sustainability: Examining the effectiveness of problem-based learning with Wizer.me in SDG 12-contextualized mathematics instruction

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Abstract

Persistent challenges in algebraic learning among Indonesian junior high school students, characterized by performance below minimum mastery criteria, necessitate innovative pedagogical interventions. This study examined the effectiveness of integrating Problem-Based Learning (PBL) with the wizer.me digital platform in enhancing Year 7 students' algebraic competence within the context of Sustainable Development Goal 12 (sustainable consumption and production). Employing a quantitative one-shot case study design, the research involved 24 randomly selected students from a junior high school in Banda Aceh during the 2024/2025 academic year. Data were collected through a validated post-test instrument comprising four essay questions contextualized within SDG 12 scenarios, assessing conceptual understanding, mathematical modeling, and problem-solving skills. Statistical analyses revealed significant learning outcomes, with students achieving a mean score of 76.33 (SD = 9.78), substantially exceeding minimum mastery criteria (t = 38.224, p < 0.001). Results demonstrate that the synergistic combination of PBL, interactive digital technology, and authentic sustainability contexts effectively facilitates algebraic mastery while cultivating global citizenship awareness. These findings suggest that educators should integrate technology-enhanced problem-based approaches and SDG frameworks into mathematics curriculum to enhance engagement, conceptual understanding, and real-world relevance. Future research should employ larger samples and experimental designs to establish robust causal evidence regarding the scalability and long-term impacts of such interventions.

1. Introduction

Education is a fundamental aspect of developing exceptional human resources to tackle the challenges of the 21st century. Information technology is crucial in educational reform by disseminating knowledge widely and effectively (Kalyani, 2024). Consequently, the education system must continuously innovate to cultivate a creative, innovative, and highly competitive generation capable of navigating complex global challenges.

In the Indonesian national education system, mathematics plays a strategic role in enhancing students' logical thinking, analytical abilities, and problem-solving skills (Mariamah, 2017). However, empirical evidence indicates that mathematics achievement among Indonesian students remains

relatively low, particularly in algebraic reasoning (Haniah & Senjayawati, 2023). This persistent challenge is concerning given that algebraic concepts form the foundational framework for understanding advanced mathematical topics and their applications across multiple disciplines. The limited mastery of algebra among students necessitates the development and implementation of more innovative and effective pedagogical approaches.

Algebra occupies a central position in the junior high school mathematics curriculum due to its broad applicability across various fields, including science, economics, and technology (Booker, 2009). Beyond its role in mathematical advancement, algebraic thinking is essential for analyzing and solving real-world problems, including those addressed by the United Nations' Sustainable Development Goals (SDGs) (Thakur et al., 2021). Among the 17 SDGs, Goal 12—focused on ensuring sustainable consumption and production patterns—presents particularly relevant opportunities for mathematical modeling. Algebraic concepts can be employed to model complex issues related to resource optimization, waste reduction, energy efficiency, and sustainable production systems, thereby bridging abstract mathematical learning with tangible global challenges.

The integration of SDG 12 into mathematics education is not merely a pedagogical innovation but a strategic response to urgent environmental imperatives. The 12th Sustainable Development Goal emphasizes responsible management of consumption and production to mitigate negative environmental impacts (Mensah, 2019). Within this framework, food waste emerges as a critical concern, contributing significantly to environmental pollution and biodiversity loss (Waluyo & Kharisma, 2023). Contemporary patterns of uncontrolled consumption and environmentally detrimental production practices exacerbate global challenges, including escalating waste generation, natural resource depletion, and energy crises (Dharmayanti & Aziz, 2024). In educational contexts, connecting mathematical content with authentic real-world problems has been shown to deepen students' understanding of how their daily economic and consumption behaviors affect broader ecological systems (Arora & Mishra, 2023). Therefore, contextualized algebra instruction not only facilitates mathematical concept mastery but also cultivates critical awareness of pressing global sustainability issues.

Despite the recognized importance of algebraic competence, substantial evidence indicates that many students struggle with conceptual understanding and the manipulation of algebraic expressions. An interview conducted with a mathematics teacher at a junior secondary school in Banda Aceh revealed that the majority of students fail to meet minimum mastery criteria in algebra. This finding aligns with broader research demonstrating that students frequently encounter difficulties in applying algebraic concepts to real-world contexts, particularly in understanding variables, constructing mathematical models, and translating problem scenarios into algebraic expressions (Dangkua et al., 2023; Jumiati & Zanthy, 2020). Moreover, conventional teaching methodologies often fail to engage students meaningfully, and accumulating evidence suggests that traditional approaches are inadequate for motivating active participation and sustained engagement (Yue, 2024). These converging challenges underscore the urgent need for pedagogical transformation in algebra instruction.

To address these multifaceted challenges, innovative learning approaches are essential for enhancing algebraic understanding and student engagement. Problem-Based Learning (PBL) has emerged as a particularly effective pedagogical model for improving student engagement and learning outcomes (Darmawan & Harjono, 2020). PBL emphasizes authentic, contextual problem-solving that requires students to engage in critical thinking, collaborative inquiry, and active solution-seeking (Hotimah, 2020). Numerous studies have demonstrated that PBL implementation can significantly enhance learning outcomes across diverse disciplines, including mathematics (Syakir, 2019). Through this approach, students can develop deeper comprehension of algebraic concepts within meaningful real-world contexts, such as addressing sustainable consumption and production challenges aligned with SDG 12.

Beyond pedagogical model selection, the strategic integration of technology into educational processes has become crucial for enhancing mathematics learning effectiveness. The Indonesian Minister of Education has emphasized the importance of technology integration to create more engaging and meaningful learning experiences (Laurens & Laamena, 2020). Among available digital platforms, wizer.me represents a particularly promising tool—an interactive online learning environment enabling teachers to create and assess student worksheets efficiently (https://app.wizer.me/). Recent research

demonstrates that wizer.me implementation can significantly increase student engagement and material comprehension (Nurfadila et al., 2024; Safitri, 2022). The synergistic combination of PBL with wizer.me technology is anticipated to transform students into active participants in their learning journey while deepening their understanding of algebraic concepts through application to everyday scenarios.

Existing research has explored relationships between PBL and mathematics learning outcomes with promising results. For instance, Ananda and Liana (2023) found that PBL implementation improved Year 7 students' mathematics learning outcomes on systems of linear equations in two variables (SPLTV). Similarly, Anidlah et al. (2021) concluded that students in PBL-based experimental groups achieved significantly higher learning outcomes compared to control groups taught through conventional methods, particularly in arithmetic operations involving algebraic forms. These findings suggest substantial potential for PBL in mathematics education.

However, a critical research gap persists: studies integrating Sustainable Development Goals—particularly SDG 12 focusing on sustainable consumption and production—into mathematics education remain notably scarce. This gap is particularly significant given the dual potential of such integration to enhance both mathematical understanding and sustainability awareness among young learners. Furthermore, while individual studies have examined PBL and technology integration separately, research examining their combined effects within an SDG-contextualized framework remains limited. This gap in the literature motivates the present study.

Therefore, this research addresses the following research question: Do students' learning outcomes on algebraic concepts, when contextualized with SDG 12 through the PBL model assisted by wizer.me, achieve the desired minimum criteria of mastery learning?

This study aims to contribute substantively to innovations in mathematics education by developing and evaluating more interactive, contextually grounded pedagogical methods. Beyond methodological contribution, it aspires to establish meaningful connections between abstract mathematical concepts and critical global issues, enabling students to achieve academic mastery while simultaneously fostering heightened awareness of sustainable development's relevance to their daily lives. Through this dual focus, the research seeks to demonstrate how mathematics education can serve both cognitive and socio-environmental educational objectives.

2. Method

2.1 Research Design

This study employed a quantitative approach utilizing a one-shot case study design, wherein a single group of participants received an intervention followed by post-test assessment. According to Creswell (1994), quantitative research is a systematic method used to test specific theories by examining relationships between variables through numerical data analysis. This design was selected due to its appropriateness for evaluating the immediate effects of a pedagogical intervention on student learning outcomes without requiring a control group comparison. The one-shot case study design allowed for focused examination of whether the integrated PBL-wizer.me approach with SDG 12 contextualization enabled students to achieve minimum mastery criteria.

The study was conducted at a junior high school in Banda Aceh, Indonesia, during the odd semester of the 2024/2025 academic year. The intervention consisted of algebra instruction delivered through the Problem-Based Learning (PBL) model, supported by the wizer.me digital platform, with all learning activities contextualized within the framework of SDG 12 (Sustainable Consumption and Production). The learning process culminated in a post-test administered to assess student mastery of algebraic concepts.

2.2 Participants

The study population comprised all Year 7 students enrolled at the participating junior high school in Banda Aceh, totaling five classes. From this population, a sample of 24 students was selected through random sampling procedures. Random sampling was employed to ensure that each student in the population had an equal probability of selection, thereby minimizing selection bias and enhancing the generalizability of findings to the broader Year 7 student population at the school. The sample size of 24 students was deemed appropriate for this exploratory study examining the effectiveness of the integrated PBL-wizer.me approach. All participants were enrolled in the regular mathematics curriculum and had no prior experience with SDG-contextualized mathematics instruction or the

wizer.me platform. Participation in the study was voluntary, and informed consent was obtained from both students and their parents or guardians in accordance with ethical research protocols.

2.3 Data Collection

Data on student learning outcomes were collected through a post-test administered at the conclusion of the instructional intervention. The post-test served to provide conclusive evidence of student performance following exposure to the PBL approach assisted by wizer.me and contextualized within SDG 12 themes. The assessment instrument consisted of a learning outcome test specifically designed to measure students' mastery of algebraic concepts within the context of sustainable consumption and production. The post-test instrument underwent rigorous validation procedures to ensure content validity and reliability. Validation was conducted by two expert reviewers: a mathematics education lecturer with expertise in curriculum development and assessment, and an experienced junior high school mathematics teacher. Both validators independently evaluated the instrument for alignment with learning objectives, appropriateness of difficulty level, clarity of language, and relevance to SDG 12 themes. Following the validation process, necessary revisions were implemented based on expert feedback to ensure the instrument's quality and appropriateness.

The validated assessment instrument comprised four essay questions requiring extended written responses. These questions were adapted from established sources, including the 2022 Indonesian mathematics textbook for junior high school Year 7 students and the algebra textbook by Yoshiwara and Yoshiwara (2006). All questions were contextualized within real-world scenarios related to SDG 12, requiring students to apply algebraic reasoning to problems involving sustainable consumption patterns, resource management, and production optimization. Each essay question presented students with authentic problem situations involving algebraic expressions embedded within sustainability contexts. The questions were designed to assess multiple dimensions of algebraic competence, including conceptual understanding of algebraic principles, ability to construct mathematical models from verbal descriptions, proficiency in manipulating algebraic expressions, and capacity to interpret solutions within real-world contexts. Students were required to show complete problem-solving processes, including problem interpretation, mathematical modeling, algebraic manipulation, solution derivation, and contextual interpretation of results.

2.4 Data Analysis

Student responses to the post-test were analyzed using a criterion-referenced assessment approach. Each response was evaluated against a predetermined scoring rubric aligned with the learning objectives and the school's minimum mastery criteria. The scoring rubric assessed both procedural accuracy and conceptual understanding, awarding points for correct problem interpretation, appropriate mathematical modeling, accurate algebraic manipulation, valid solutions, and meaningful contextual interpretation. The primary analytical objective was to determine whether individual student scores and the overall class performance met or exceeded the minimum criteria for mastery learning (MCML) established by the school. The MCML represents the threshold score indicating adequate mastery of the learning objectives. Individual student performance was classified as "mastery achieved" if the student's score met or exceeded the MCML, or "mastery not achieved" if the score fell below this threshold.

Descriptive statistical analyses were conducted to summarize the data, including calculation of mean scores, standard deviation, minimum and maximum scores, and the percentage of students achieving mastery. Additionally, the distribution of scores was examined to identify patterns in student performance and areas of strength or difficulty in algebraic understanding. These analyses provided comprehensive evidence regarding the effectiveness of the PBL-wizer.me approach in facilitating student achievement of learning objectives within the SDG 12 context. To ensure scoring reliability, two independent raters evaluated a subset of student responses using the scoring rubric. Inter-rater reliability was calculated to confirm consistency in scoring procedures. Any discrepancies between raters were resolved through discussion and consensus, ensuring that all student work was evaluated fairly and consistently according to established criteria.

3. Results and Discussion

3.1 Results

Learning occurred over three sessions using the wizer.me E-worksheet, followed by a post-test in the fourth meeting. Before starting the lessons, the researcher provided tutorials and guidance to help students use wizer.me effectively while working on the E- worksheet. This introduction aimed to ensure

students understood how to use the platform and could utilize it optimally during the learning process. The session clarified that the platform would answer questions about algebraic forms associated with the 12th SDG: Responsible Consumption and Production. Additionally, students were educated about the purpose and significance of the SDGs to highlight the connection between their learning materials and relevant global issues.

After grasping the platform's usage and the fundamental concepts, students were grouped to discuss and explore the problems presented in the E-worksheet with the assistance of wizer.me. They began to take the initiative by researching information, exchanging ideas, and sharing their findings with their group members. This discussion process fostered the development of their critical thinking skills and more systematic problem-solving abilities, aligning with the stages of the PBL model. As noted by Sanjaya (2006), the problem-solving process enables students to acquire new knowledge, becoming active, independent, and motivated learners who can evaluate both the results and the learning process independently. Although some interruptions were due to students engaging with other groups outside the discussion topics, the teacher managed these disruptions by guiding to ensure the learning continued smoothly. After completing three sessions of PBL learning supported by wizer.me, students were given a post-test. The algebraic form problem associated with context 12 is illustrated in Figure 1.

Figure 1

Example of an Algebraic Form Problem with an SDG 12 context

> Dina is highly environmentally conscious. She decided to reduce her use of single-use plastic by bringing her shopping bags. To support this effort, Dina purchased several types of eco-friendly shopping bags. The price of one cloth shopping bag is Rp18,000.00. One woven shopping bag is four times more expensive than a cloth bag, while one paper shopping bag is three times less expensive than a cloth bag.
> a. Let variables represent the number of each type of shopping bag purchased by Dina. Define appropriate variables.
> b. Determine the actual price of one woven bag and one paper bag.
> c. Calculate the total amount of money Dina needs to pay if she purchases 3 cloth shopping bags, 2 woven shopping bags, and 1 paper shopping bag.

This post-test data will be analyzed to determine whether student scores improve when the PBL model, supported by wizer.me, is applied to algebraic form material. A normality test was previously conducted using the Kolmogorov-Smirnov test, and the results are presented in Table 1.

Tabel 1

Kolmogorov-Smirnov test results

		Data Post Test
N		24
Normal Parameters	Mean	76.33
	Std. Deviation	9.783
Most Extreme Differences	Absolute	0.237
	Positive	0.105
	Negative	-0.237
Kolmogorov-Smirnov Z		1.163
Asymp. Sig. (2-tailed)		0.133

The results of the Kolmogorov-Smirnov test indicate that student outcomes in algebraic form material, contextualized with SDG 12 and taught through the PBL model using wizer.me, follow a

normal distribution (p = 0.133). Therefore, data analysis can use parametric statistical tests, including the one-sample t-test, to address the hypothesis. The results of the t-test are presented in Tables 2 and 3.

Table 2

Descriptive Statistics of Post-Test Data

	N	Mean	Std. Deviation	Std. Error Mean
Data Post Test	24	76.33	9.783	1.997

Descriptive statistical analysis of the post-test data (Table 2) revealed that the 24 participating students achieved a mean score of 76.33 (SD = 9.78), indicating generally strong performance following the PBL-wizer.me intervention contextualized within SDG 12. The standard deviation of 9.78 suggests moderate variability in student performance, reflecting diverse levels of algebraic mastery within the sample. The relatively small standard error of the mean (SEM = 1.997) indicates reasonable precision in estimating the population mean, suggesting that the sample mean provides a reliable representation of the broader Year 7 student population's potential performance under similar instructional conditions. The mean score of 76.33 demonstrates that, on average, students performed above the typical passing threshold, suggesting that the integrated approach effectively facilitated algebraic understanding and problem-solving skills within sustainability contexts. However, the presence of performance variability, as indicated by the standard deviation, underscores the need for differentiated instructional support to address individual learning needs and ensure comprehensive mastery across all students.

Tabel 3

One-Sample t-Test Test Results for Post-Test Data

					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Data Post Test	38.224	23	0.000	76.333	72.20	80.46

The one-sample t-test results (Table 3) provide compelling statistical evidence regarding student achievement following the PBL-wizer.me intervention. The analysis yielded a t-value of 38.224 with 23 degrees of freedom, producing a significance level of $p < 0.001$ (two-tailed), which substantially exceeds conventional thresholds for statistical significance ($\alpha = 0.05$). This highly significant result indicates that the observed mean post-test score of 76.33 differs significantly from the hypothesized population value, demonstrating that the intervention produced measurable effects on student learning outcomes. The mean difference of 76.33 points represents the average performance level achieved by students, while the 95% confidence interval ranging from 72.20 to 80.46 provides a range of plausible values for the true population mean. The narrow width of this confidence interval (8.26 points) reflects the precision of the estimate and suggests consistent performance across the sample. Importantly, the entire confidence interval falls well above typical minimum mastery thresholds (commonly 65-70 in Indonesian educational contexts), providing robust evidence that the intervention effectively enabled students to achieve satisfactory learning outcomes in algebraic reasoning within SDG 12 contexts.

The statistical findings carry significant pedagogical implications for mathematics education practice. The substantially significant t-test result ($p < 0.001$) provides strong evidence supporting the effectiveness of integrating Problem-Based Learning with digital technology (wizer.me) and authentic sustainability contexts (SDG 12) in facilitating algebraic concept mastery among Year 7 students. The lower bound of the confidence interval (72.20) indicates that even in the most conservative estimate, average student performance remains well above minimum competency standards, suggesting the intervention's reliability in promoting learning success. This statistical robustness is particularly noteworthy given the complexity of algebra for junior high school students and the dual demands of mathematical reasoning and sustainability awareness embedded in the learning activities. The highly significant results demonstrate that contextualizing abstract algebraic concepts within meaningful real-world problems related to sustainable consumption and production can enhance student engagement and comprehension. These findings align with contemporary educational reform emphasizing authentic, technology-enhanced, and globally-relevant learning experiences, while providing empirical support for curriculum innovations that bridge mathematical learning with critical sustainability competencies essential for 21st-century citizenship.

3.2 Discussion

The results indicated that the implementation of the PBL model, assisted by wizer.me, on algebraic expressions within the context of the Sustainable Development Goals (SDGs), successfully achieved the predetermined minimum criteria for mastery learning of 75%. The average student score was 76.33, with 79.17% of students meeting the minimum criteria for mastery learning requirement. Meanwhile, 20.83% of students did not achieve the minimum criteria of mastery learning.

This shows that the application of the PBL model is supported by wizer.me, allowed student learning outcomes in mathematics to meet the established minimum criteria for mastery learning in this junior high school. The five students who did not achieve mininum criteria of mastery learning likely struggled with answering the post-test questions accurately; some provided answers without carefully considering their correctness. Additionally, distractions during the exam, such as conversations that diverted their focus, affected their performance. Some students also lacked motivation to tackle the questions, which hindered their ability to achieve optimal results. Nevertheless, these students made an effort to respond to the questions presented to them.

During the learning process, students demonstrated enthusiasm for solving problems using the interactive features provided by wizer.me. According to Erawati et al., (2023), interactive features can help students apply their knowledge more structured, leading to increased engagement in learning. Observations indicated that in the post-test results, most students experienced a significant increase in their scores, although some still had lower results. This suggests that innovative learning approaches can enhance outcomes, especially when connected to real-world contexts relevant to students.

In addition to deepening their understanding of algebraic concepts, this approach also raises students' awareness of the importance of responsible consumption and production. By linking algebraic material to the context of the 12th SDGs, students learn mathematical concepts and how to use mathematical models to analyze consumption patterns, efficiently use resources, and reduce waste in their everyday lives. Therefore, PBL improves academic understanding and fosters a critical mindset toward environmental and sustainability issues.

The PBL learning model also allows students time to think independently, engage in discussions, and collaborate to solve problems. This facilitates group understanding of the material. This aligns with the findings of Syamsidah and Hamidah (2018), who state that PBL is an approach to learning where students are presented with problems and encouraged to solve them using their knowledge and skills. This process cultivates critical thinking and enhances problem-solving abilities individually and in groups. Evidence of this can be seen when students collaborate and discuss solutions during the learning process. Utilizing wizer.me in the classroom sparks students' interest in understanding and addressing the problems presented to them. Designed to support the learning process, wizer.me effectively increases student engagement, enabling them to participate enthusiastically (Basrina et al., 2023).

During the research, we encountered issues with the free trial period on wizer.me, which had expired. Consequently, some previously available features became inaccessible without a premium account. As a result, researchers could only utilize certain features, such as matching questions with the correct answers, as illustrated in Figure 2. Despite the limitations in using the E-Worksheet features, students demonstrated a high level of engagement while answering questions through the wizer.me platform.

Figure 2
Learning with wizer.me

According to the research conducted by Zulfatunisa et al. (2024), the percentage of student learning completion was categorized as excellent, indicating that Problem-Based Learning (PBL) is effectively utilized in algebra material. Furthermore, the study by Setyawardani and Edy (2024) concludes that the PBL model, combined with E-Worksheet wizer.me enhances the quality of students' mathematical literacy skills.

4. Conclusion

This study provides empirical evidence supporting the effectiveness of integrating Problem-Based Learning (PBL) with the wizer.me digital platform in enhancing Year 7 students' mastery of algebraic concepts contextualized within Sustainable Development Goal 12. Statistical analyses revealed that students at the participating junior high school in Banda Aceh achieved significant learning outcomes, with a mean post-test score of 76.33 (SD = 9.78) and highly significant results (t = 38.224, p < 0.001), demonstrating that the majority met minimum mastery criteria. These findings indicate that combining problem-based pedagogy with interactive technology and authentic sustainability contexts effectively facilitates deeper conceptual understanding of algebraic principles while cultivating awareness of global sustainability challenges related to responsible consumption and production.

However, several limitations warrant consideration. The one-shot case study design without a control group limits causal inference, while the small sample of 24 students from a single class restricts generalizability. Additionally, limited access to premium wizer.me features constrained the diversity of interactive learning activities. These methodological constraints suggest findings should be interpreted as preliminary evidence requiring validation through more rigorous designs with larger, diverse samples and longitudinal follow-up to assess retention and transfer of learning.

The study carries important implications for educational practice and research. Mathematics educators should consider integrating SDG frameworks into curriculum design to enhance engagement and demonstrate real-world applicability of mathematical concepts. Schools should invest in digital platforms and teacher training to effectively implement technology-enhanced problem-based instruction. Future research should employ quasi-experimental designs with control groups, larger samples across multiple contexts, and longitudinal assessments to establish robust causal evidence and explore scalability of SDG-integrated mathematics education interventions.

Limitations

During the research, some free features on wizer.me were no longer available, so the researcher could only use features that were still accessible for free. Therefore, it is recommended for future research to utilise paid features to enhance the variety of learning materials, particularly in creating E-worksheet questions. This limitation provides additional challenges in the implementation of learning, although it can be overcome with the guidance and appreciation given by researchers during the process.

Author Contribution

Author 1: Conceptualization, writing - original draft;

Author 2: Reviewing;

Author 3: Writing & proofreading.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this manuscript. In addition, the authors have completed the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies.

5. References

Ananda, S. D., & Liana, E. (2023). Improving student mathematics learning outcomes through the implementation of pbl models for students of class VII H SMPN 23 Pekanbaru. *Journal of Research on Mathematics Instruction (JRMI)*, *4*(1), 53–62. https://doi.org/10.33578/jrmi.v4i1.76

Anidlah, I. S., Molle, J. S., & Ayal, C. S. (2021). Perbedaan hasil belajar siswa yang diajarkan dengan model pembelajaran problem based learning dan model pembelajaran konvensional pada materi operasi hitung bentuk aljabar. *Jurnal Pendidikan Matematika Unpatti*, *2*(1), 1–5. https://doi.org/10.30598/jpmunpatti.v2.i1.p1-5

Arora, N. K., & Mishra, I. (2023). Responsible consumption and production: A roadmap to sustainable development. *Environmental Sustainability*, *6*(1), 1–6. https://doi.org/10.1007/s42398-023-00266-9

Basrina, Y., Afryansih, N., & Febriani, T. (2023). Pengembangan aplikasi evaluasi pembelajaran wizer.me pada mata pelajaran IPS di MTs Darussalam Aryojeding. *JPIG (Jurnal Pendidikan dan Ilmu Geografi)*, *8*(1), 31–38. https://doi.org/10.21067/jpig.v8i1.7361

Booker, G. (2009). Algebraic thinking: Generalizing number and geometry to express patterns and properties succinctly. *Griffith University, Brisbane.* http://hdl.handle.net/10072/30846

Creswell, J. W. (1994). *Research design: Qualitative and quantitative approaches*. SAGE Publications.

Dangkua, S. R., Resmawan, R., & Zakiyah, S. (2023). Model course review horay: Upaya meningkatkan hasil belajar matematika bentuk aljabar. *Euler : Jurnal Ilmiah Matematika, Sains dan Teknologi*, *11*(2), 228–236. https://doi.org/10.37905/euler.v11i2.22448

Darmawan, W., & Harjono, N. (2020). Efektivitas problem based learning dan two stay two stray dalam pencapaian hasil belajar. *Jurnal Basicedu*, *4*(2), 402–411. https://doi.org/10.31004/basicedu.v4i2.364

Dharmayanti, D., & Aziz, A. (2024). Transaction halal supply chain management (HSCMT) in the digital economy era an opportunity and a challenge In Indonesia. *Migration Letters*, *21*(4), 1410–1419. https://migrationletters.com/index.php/ml/article/view/8086

Erawati, N. K., Purwati, N. K. R., Putri, N. W. S., & Wardika, I. W. G. (2023). Pelatihan pemanfaatan wizer.me sebagai media pembelajaran digital. *Puan Indonesia*, *4*(2), 125–134. https://doi.org/10.37296/jpi.v4i2.133

Haniah, L., & Senjayawati, E. (2023). Studi analisis kesulitan siswa dalam menyelesaikan soal cerita aljabar ditinjau dari level kemampuan siswa. *Jurnal Pembelajaran Matematika Inovatif*, *6*(4), 1409–1420. https://doi.org/DOI 10.22460/jpmi.v6i4.17550

Hotimah, H. (2020). Penerapan metode pembelajaran problem based learning dalam meningkatkan kemampuan bercerita pada siswa sekolah dasar. *Jurnal Edukasi*, *7*(3), 5. https://doi.org/10.19184/jukasi.v7i3.21599

Jumiati, Y., & Zanthy, L. S. (2020). Analisis kesalahan siswa dalam menyelesaikan soal cerita persamaan dan pertidaksamaan linear satu variabel. *Jurnal Pembelajaran Matematika Inovatif*, *3*(1), 11–18. https://doi.org/10.22460/jpmi.v3i1.p11-18

Kalyani, L. K. (2024). The role of technology in education: Enhancing learning outcomes and 21st century skills. *International Journal of Scientific Research in Modern Science and Technology*, *3*(4), 05–10. https://doi.org/10.59828/ijsrmst.v3i4.199

Laurens, T., & Laamena, Ch. M. (2020). Development of mathematical learning devices based on multimedia on circle materials of grade eighth of junior high school. *Journal of Physics: Conference Series*, *1470*(1), 1–7. https://doi.org/10.1088/1742-6596/1470/1/012088

Mariamah. (2017). Efektivitas pendekatan pembelajaran matematika realistik (PMR) terhadap penguasaan materi siswa SMP Negeri 8 Kota Bima. *Jurnal Pendidikan MIPA*, *7*(2), 138–145. https://ejournal.tsb.ac.id/index.php/jpm/article/view/11

Mensah, J. (2019). Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review. *Cogent Social Sciences*, *5*(1), 2–21. https://doi.org/10.1080/23311886.2019.1653531

Nurfadila, Adnan, & Nurgowa. (2024). Peningkatan hasil belajar peserta didik menggunakan model Discovery Learning berbantuan E-LKPD wizer Me pada materi sistem tata surya kelas VII UPT

SPF SMPN 24 Makassar. *Jurnal Pemikiran dan Pengembangan Pembelajaran*, *6*(2), Article 2. https://doi.org/10.31970/pendidikan.v6i2.1035

Safitri, O. N. (2022). *Pengembangan media bahan ajar E-LKPD interaktif menggunakan website Wizer.me pada pembelajaran IPS materi berbagai pekerjaan tema 4 kelas IV SDN Tanah Kalikedinding II*. *10*(1), 86–97. https://ejournal.unesa.ac.id/index.php/jurnal-penelitian-pgsd/article/view/44432

Sanjaya, W. (2006). *Strategi pembelajaran berbasis standar proses pendidikan*. Jakarta: Kencana Prenada Media.

Setyawardani, I. F., & Edy, S. (2024). Effect of problem-based learning Assisted by E-LKPD wizer.me on students mathematical literacy skills. *Mathline : Jurnal Matematika Dan Pendidikan Matematika*, *9*(2), 433–446. https://doi.org/10.31943/mathline.v9i2.611

Syakir, S. (2019). Peningkatan hasil belajar matematika pada pokok bahasan aljabar dengan pendekatan saintifik model pembelajaran problem based learning (PBL). *YUME : Journal of Management*, *2*(1), Article 1. https://doi.org/10.37531/yum.v2i1.387

Syamsidah, & Hamidah, S. (2018). *Buku problem based learning (PBL)*. Deepublish.

Thakur, P., Dutt, S., & Chauhan, A. (2021). Problem based learning in education– its need for sustainable development. *Journal of Engineering Education Transformations*, *34*(4), 58–66. https://doi.org/10.16920/jeet/2021/v34i4/152993

Waluyo, & Kharisma, D. B. (2023). Circular economy and food waste problems in Indonesia: Lessons from the policies of leading Countries. *Cogent Social Sciences*, *9*(1), 2202938. https://doi.org/10.1080/23311886.2023.2202938

Yoshiwara, K., & Yoshiwara, B. (2006). *Modeling, Functions, and Graphs: Algebra for College Students*. Thomson/Brooks/Cole.

Yue, S. (2024). The evolution of pedagogical theory: From traditional to modern approaches and their impact on student engagement and success. *Journal of Education and Educational Research*, *7*(3), 226–230. https://doi.org/10.54097/j4agx439

Zulfatunisa, Z., Sirait, S., & Manurung, R. F. (2024). Implementation of problem based learning (PBL) learning model to improve learning outcomes of class VII students of SMP Negeri 7 Kisaran. *Holistic Science*, *4*(3), 380–383. https://doi.org/10.56495/hs.v4i3.730