

Development of a PBL-Based E-LKPD Assisted by the wizer.me Website on Buffer Solution Material for Phase F Senior High School Students

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Abstract: This study is a research and development (R&D) study aimed at producing an electronic student worksheet (E-LKPD) based on Problem-Based Learning (PBL) assisted by the Wizer.me website on the topic of buffer solutions. The development model employed was the 4-D model, comprising the define, design, develop, and disseminate stages; however, this study was limited to the develop stage. The research instruments included interview guidelines, validation sheets, teacher practicality questionnaires, and student response questionnaires. The research subjects consisted of three chemistry lecturers from FMIPA UNP, two chemistry teachers from SMA Pertiwi 1 Padang, and Phase F students of SMA Pertiwi 1 Padang in the 2025/2026 academic year. The data collected were primary data analysed through validity and practicality tests. The expert validity test yielded an average Aiken's V index of 0.91, categorised as valid. The practicality test results indicated mean scores of 96% from teachers and 90% from students, both categorised as very practical. Based on these findings, it can be concluded that the developed PBL-based E-LKPD assisted by Wizer.me is valid, highly practical, and feasible for use as a chemistry learning medium on buffer solution material.

Keywords: electronic student worksheet, Problem-Based Learning, Wizer.me, buffer solutions

Abstrak: Penelitian ini merupakan penelitian dan pengembangan (research and development) yang bertujuan menghasilkan E-LKPD berbasis Problem Based Learning (PBL) berbantuan website Wizer.me pada materi larutan penyangga. Model pengembangan yang digunakan adalah model 4-D yang meliputi tahap define, design, develop, dan disseminate, namun penelitian ini dibatasi sampai tahap develop. Instrumen penelitian yang digunakan meliputi lembar wawancara, lembar validasi, angket praktikalitas guru, dan angket respon murid. Subjek penelitian terdiri atas tiga dosen Kimia FMIPA UNP, dua guru kimia SMA Pertiwi 1 Padang, serta murid fase F SMA Pertiwi 1 Padang tahun ajaran 2025/2026. Data yang diperoleh merupakan data primer yang dianalisis melalui uji validitas dan uji praktikalitas. Hasil uji validitas oleh ahli menunjukkan nilai rata-rata Aiken's V sebesar 0,91 dengan kategori valid. Hasil uji praktikalitas menunjukkan nilai rata-rata 94% oleh guru dan 90% oleh murid, yang keduanya termasuk dalam kategori sangat praktis. Berdasarkan hasil tersebut, dapat disimpulkan bahwa E-LKPD berbasis PBL berbantuan Wizer.me yang dikembangkan valid, sangat praktis, dan layak digunakan sebagai media pembelajaran kimia pada materi larutan penyangga.

Kata Kunci: E-LKPD, PBL, Wizer.me, larutan penyangga

INTRODUCTION

Scientific knowledge develops continuously and serves as the foundation for ever-advancing technology. Technological innovations have evolved rapidly into a digital era characterised by the utilisation of technology across all sectors of life. This technological advancement cannot be separated from various sectors, including education. In learning, technology functions not only as an instructional aid but also as a medium that enables the learning process to take place in an interactive, adaptive manner suited to students' needs (Sobri et al., 2022,

as cited in Zulaiha Abas, 2025). The use of technology in learning allows teachers and students to interact more flexibly through digital media that support creativity and collaboration.

In line with this, the global challenges of the 21st century demand that education produce individuals who master knowledge, critical thinking skills, creativity, collaboration, and communication collectively referred to as the 4Cs (Indarini, 2024). Indonesia's education system therefore continues to innovate through the implementation of a curriculum oriented toward developing students' competencies and character. This curriculum focuses on student-centred learning activities and encourages the use of digital technology to create adaptive, contextual, and innovative learning (Kusumasari et al., 2024).

In the context of curriculum implementation, the teacher's role is crucial as both a facilitator and a guide in optimising student engagement in learning activities. According to Chotimah and Fathurrohman (2018:40), as cited in Ardianti et al. (2022), the learning process encompasses all activities designed by educators to support students in developing knowledge and skills, cultivating their potential and competencies, and forming character through learning experiences within a supportive environment.

The learning model recommended under the national curriculum and aligned with 21st-century skill development demands is Problem-Based Learning (PBL). In the PBL model, students are not only required to understand conceptual content but must also develop an understanding that enables them to apply these concepts to real-world problems (Ardianti et al., 2021). In practice, however, PBL implementation requires the support of relevant, interactive, and contextual learning media for the learning process to be effective. One teaching medium with great potential to support national curriculum implementation is the electronic student worksheet, or *E-LKPD*.

E-LKPDs enable the dynamic presentation of instructional material through the integration of multimedia elements, videos, interactive quizzes, and reflection features that can facilitate students' independent learning, making instruction more engaging and interactive (Faiza & Wardhani, 2024). This is consistent with research findings by Wahyuni and Wahyuni (2025), who affirm that the implementation of technology in learning particularly through the development of E-LKPD instructional media constitutes a form of innovation relevant to the educational needs of the 21st century.

For an E-LKPD to be developed and used optimally, a digital platform that provides interactive features and is readily accessible to students is required. One such platform is *Wizer.me*. On *Wizer.me*, teachers can compose and design interactive E-LKPDs featuring embedded videos, quizzes, and animations that can be accessed through digital devices. In senior high school chemistry, students frequently regard buffer solution material as a difficult topic, owing to its complex and abstract concepts, which require strong conceptual understanding and higher-order thinking skills such as analysis and evaluation (Mardiansyah et al., 2022).

The availability of learning media in schools for buffer solution material has not yet been supported by technology-enhanced resources in the form of problem-based E-LKPDs that promote students' active engagement in accordance with national curriculum principles. Yet, as recommended by Dewi et al. (2023), the appropriate learning model for this topic is PBL, as it focuses on developing critical thinking skills, problem-solving, and the ability to connect concepts with real-world contexts. The use of a digital platform such as *Wizer.me* represents an alternative solution for developing interactive learning media. Findings by Wahyuni and Wahyuni (2025) demonstrate that the use of the *Wizer.me* platform in the learning process is effective in increasing student motivation, deepening conceptual understanding, and improving overall learning outcomes. Based on the foregoing, the researchers are motivated to develop a PBL-based E-LKPD using the *Wizer.me* website for the buffer solution topic targeting Phase F senior high school students.

METHODS

This study is a research and development (R&D) study aimed at producing a final product in the form of a Problem-Based Learning (PBL)-based E-LKPD assisted by the *Wizer.me* website on

buffer solution material. The development model applied follows the 4-D model introduced by Thiagarajan (1974), which comprises four main stages: define, design, develop, and disseminate. However, this study was limited to the develop (development) stage.

The research instruments consisted of interview guidelines, validation sheets, teacher practicality questionnaires, and student response questionnaires. The research subjects comprised three chemistry lecturers from FMIPA UNP, two chemistry teachers from SMA Pertiwi 1 Padang, and Phase F students of SMA Pertiwi 1 Padang in the 2025/2026 academic year. The data collected were primary data analysed through validity and practicality tests.

Content validity was assessed by subject-matter experts using a rating scale based on a Likert scale of 1–5, measured using Aiken's *V* and the practicality test score was obtained using percentage.

RESULTS AND DISCUSSION

Validity Test Results

Based on the validity test results using validation instruments covering multiple aspects including content, language, and presentation instructional media that have been comprehensively validated demonstrate quality that is feasible for use in modern chemistry learning (Sari & Nasution, 2024). Validation was conducted by three chemistry lecturers from FMIPA UNP and two chemistry teachers from SMA Pertiwi 1 Padang, yielding an average Aiken's *V* index of 0.91, categorised as valid. These results indicate that the PBL-based E-LKPD assisted by the Wizer.me website for buffer solution material satisfies the validity criteria and is suitable for use as a learning medium in Phase F Grade XI senior high school chemistry. The overall E-LKPD validation results are presented in Table 1.

Table 1. Analysis Results by Validation Level Component

Assessed Component	Aiken's <i>V</i>	Category
Content Component	0.92	Valid
Language Component	0.89	Valid
Presentation Component	0.91	Valid
Overall Mean	0.91	Valid

In terms of the content component, a mean Aiken's *V* value of 0.92 was obtained, placing it in the valid category. This value indicates that the material presented in the E-LKPD is aligned with the Learning Outcomes (CP) and Learning Objectives (TP) in both breadth and depth of content. Furthermore, the use of scientific terminology, chemical symbols, and the presentation of images and videos were assessed as accurate and consistent. This finding is consistent with the view of Hariadi (2016), who argues that visual components in an e-LKPD such as the use of images can help students understand material more effectively than verbal explanation alone. This view is further supported by Khusnia and Susantini (2018), who state that the combination of text, colour, and images in teaching materials should be arranged proportionally and attractively to increase students' interest in and engagement with the content being studied. The E-LKPD was also assessed as capable of guiding students to construct conceptual understanding independently through problems relevant to real life and in accordance with the characteristics of the PBL model. This aligns with the view of Paudi and Ngaito (2026), who assert that instructional media that is content-valid must be capable of connecting scientific concepts with real-world contexts in order to improve students' conceptual understanding and critical thinking skills.

The language validity results show that the E-LKPD obtained a mean Aiken's *V* value of 0.89. This value indicates that the delivery of instructions and content in the E-LKPD employs standard Indonesian, is effective, and does not give rise to ambiguity. The language and readability aspects are important components in the validation of teaching materials, as they encompass the accuracy of sentence structure and the use of effective sentences that can facilitate students' understanding of the learning material. This aspect therefore requires careful attention so that teaching materials are not only correct in content but also comprehensible in terms of language

(Galuh et al., 2022). Furthermore, the word choices used were assessed as appropriate and free of potential misconception-inducing language. The material is also presented in a coherent sequence, and sentence writing adheres to the General Guidelines for Indonesian Spelling (PUEBI). The Aiken's V value of 0.89 for the language aspect therefore indicates that the E-LKPD satisfies good language standards with respect to word choice, sentence structure, and the use of standard Indonesian enabling students to understand the instructions and content of the E-LKPD without confusion arising from ambiguous or inappropriate language. The clarity of language and visual appeal work synergistically to reduce students' cognitive load when studying complex material.

In the presentation component, a mean Aiken's V value of 0.91 was achieved, in the valid category. These results indicate that the E-LKPD has been systematically structured and follows the learning steps of the PBL model. The layout of the E-LKPD including the arrangement of text, images, and videos, as well as the smooth functioning of features on the Wizer.me website was assessed as capable of supporting the effective implementation of learning.

Overall, the validity analysis results indicate that the mean Aiken's V index across all assessment components reached 0.91. Based on the assessment criteria using a five-point scale with five validators, an Aiken's V value exceeding 0.80 falls within the valid category. The subsequent test conducted was the practicality test.

Practicality Test Results

Practicality test results were obtained through the distribution of practicality questionnaires to chemistry teachers and students. Four assessment aspects were evaluated: appeal, ease of use, time efficiency of learning, and the benefit of the developed E-LKPD (Hidayati & Zainul, 2025).

Table 2. Teacher Practicality Data Analysis Results

Assessed Aspect	NP (%)	Category
Appeal	100%	Very Practical
Ease of Use	98%	Very Practical
Time Efficiency	90%	Very Practical
Benefit of E-LKPD	94%	Very Practical
Overall Mean	96%	Very Practical

Table 3. Student Practicality Data Analysis Results

Assessed Aspect	NP (%)	Category
Appeal	88%	Very Practical
Ease of Use	91%	Very Practical
Time Efficiency	90%	Very Practical
Benefit of E-LKPD	91%	Very Practical
Overall Mean	90%	Very Practical

Based on the practicality data analysis results from questionnaires distributed to chemistry teachers, all four evaluated aspects fall into the very practical category. The appeal aspect received the highest score of 100%, indicating that the appearance and presentation of the E-LKPD were assessed as highly attractive. Learning media with an appealing appearance can increase teachers' motivation to use them sustainably a finding also observed in other studies showing that attractive interactive learning media tend to be rated very practical by both teachers and students (Riska et al., 2025). The ease of use aspect received a score of 98%, indicating that the E-LKPD is easy to operate without significant technical obstacles.

The time efficiency aspect received a score of 90%, indicating that the E-LKPD helps teachers manage instructional time more effectively. The E-LKPD benefit aspect received a score of 94%, indicating that the E-LKPD makes a positive contribution to supporting content delivery and learning implementation.

Regarding the student practicality results, the appeal aspect received a score of 88%, the ease of use aspect 91%, time efficiency 90%, and the E-LKPD benefit aspect 91%. These scores indicate that students perceive tangible benefits from using the E-LKPD in learning. The E-LKPD was assessed as helping students understand the concept of buffer solutions, increasing engagement in learning, and supporting the process of independent learning.

Based on the practicality data analysis from teachers, a mean score of 96% was obtained in the very practical category, while the student practicality mean score was 90%, also in the very practical category. Based on the overall practicality test results from both teachers and students, it can be concluded that the developed E-LKPD falls within the very practical category and is feasible for use as a chemistry learning medium on buffer solution material.

CONCLUSION

Based on testing of the PBL-based E-LKPD assisted by the Wizer.me website on buffer solution material for Phase F senior high school students, the overall E-LKPD validity analysis results indicate that the mean Aiken's V index across all assessment components reached 0.91, categorised as valid. The practicality test yielded a mean score of 96% from teachers and 90% from students, both categorised as very practical. Based on the overall practicality test results from teachers and students, it can be concluded that the developed E-LKPD is valid, highly practical, and feasible for use as a chemistry learning medium on buffer solution material.

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