Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Development of E-LKPD Assisted by Wizer.Me and Artificial Intelligence on Biological Technology Innovation Material for Class X SMA

Gena Naila Antoni*, Zulfarina , Darmawati
Biology Education Study Program, Universitas Riau, Pekanbaru 28293, Indonesia

ARTICLE INFO

Article history:

Received: 21 Nov 2025
Accepted: 29 June 2026
Available Online: 05 July 2026

Keywords:

Artificial Intelligence,
Biological Technology Innovation,
E-LKPD,
Wizer.Me

** Corresponding author:*

E-mail: gena.naila1333@student.unri.ac.id

Article Doi:

https://doi.org/10.31258/jes.10.7.p.328-342

This is an open access article under the CC BY-SA license.

A B S T R A C T

Teaching and learning the Biological Technology Innovation topic in several senior high schools in Pekanbaru still face various constraints. Students experience difficulties in understanding concepts due to the abstract nature of the material, while the student worksheets (LKPD) used are not yet optimal in terms of content, appearance, and technological integration. As a result, students' learning motivation and achievement tend to be lower than in other biology topics. This study aimed to develop a high-quality electronic student worksheet (E-LKPD) assisted by Wizer.Me and Artificial Intelligence (AI) for tenth-grade students. The study employed the Research and Development (R&D) method using the ADDIE model up to the development stage. The product was validated by four validators consisting of two Biology Education lecturers and two high school Biology teachers. Limited Trial I involved 10 Biology Education students, while Limited Trial II involved 20 tenth grade high school students. The validation result obtained an average score of 3.79 (highly valid). Limited Trial I and II achieved average scores of 3.81 and 3.82, respectively, both categorized as excellent. The overall quality score was 3.80, indicating that the developed E-LKPD is highly valid, excellent, and feasible for biology learning.

1. Introduction

Twenty first century education has given rise to a generation of digital natives who are inseparable from technology. This characteristic enables students to adapt more easily to technology-based learning and demonstrates their strong enthusiasm for digital activities. Consequently, educators are required to integrate technology into the learning process. According to Khusnunnisa' & Andriani, 2025), science learning that incorporates technology can facilitate a more interactive, engaging, and enjoyable learning experience for students. However, in practice, classroom

learning is still often dominated by conventional approaches. Wahyuni et al., (2025) stated that traditional teaching methods tend to provide insufficient stimulation and are less effective in enhancing students' learning motivation. As a result, the integration of technology in the learning process has not been optimized. In fact, students' familiarity with digital devices makes technology an effective tool for supporting learning activities. In line with this, Legi et al., (2023) emphasized that the Merdeka Curriculum encourages students to use technology wisely and develop independent learning skills. Therefore, teachers need to be able to select, develop, and utilize digital learning media that align with the characteristics of digital native students.

Based on a preliminary survey conducted by the researchers at SMAN 8, SMAN 4, and SMAN 12 Pekanbaru, it was found that tenth grade students experienced difficulties in understanding the Biological Technology Innovation topic. Interviews with Biology teachers revealed that the topic contains numerous scientific terms, is abstract in nature, and is interdisciplinary, requiring broad conceptual understanding. This condition has contributed to lower students' daily assessment scores compared to those obtained in other Biology topics. The problem is further exacerbated by the limited quality of the student worksheets (LKPD) used in schools, which have not yet met appropriate standards and lack visual appeal. Consequently, students' interest and motivation in learning the topic tend to decrease.

The use of innovative and appropriate teaching materials can serve as a strategic solution to overcome these challenges. Student worksheets (LKPD) are important learning materials because they function as tools to develop students' skills and facilitate their understanding of the subject matter (Dermawati et al., 2019). In digital learning environments, electronic student worksheets (E-LKPD) are increasingly needed because they can be accessed anytime and contain tasks that can be completed directly online (Syafitri & Tressyalina, 2020). E-LKPDs have also been shown to enhance students' learning independence and interest due to their more interactive features and presentation (Zahroh & Yuliani, 2021). One platform that supports the development of E-LKPDs is Wizer.Me. Sobri et al., (2022) explained that Wizer.Me is a practical and engaging platform for assigning online learning activities. The platform provides various features that allow teachers to integrate images, audio, and automated feedback for students. Kopniak, (2018) stated that Wizer.Me offers a wide range of question types, including multiple-choice questions, fill-in-the-blank exercises, tables, and drawing tasks. Another advantage of Wizer.Me is its accessibility across multiple devices without limitations of time and place (Oktaviani et al., 2023).

To maximize its potential, the development of E-LKPD can also be enriched through the integration of Artificial Intelligence (AI) technology. The use of AI-powered platforms such as Canva, ChatGPT, and Perplexity enables teachers to create more adaptive, engaging, and effective visual designs and learning content for E-LKPD. Maulid et al., (2024) stated that AI-based learning media can create a more enjoyable learning environment and enhance students' learning motivation. This finding is consistent with Mardhiah et al., (2025), who emphasized that the

integration of AI-based technology can make a significant contribution to enhancing learning effectiveness and promoting active user engagement through a personalized approach.

Previous research conducted by Sitanggang & Lubis, (2023) demonstrated that a Wizer.Me-based E-LKPD on short story text material was rated as highly satisfactory and feasible for implementation. The study highlighted the considerable potential of Wizer.Me as a platform for developing digital student worksheets. However, the collaborative integration of Wizer.Me with Artificial Intelligence (AI) technology remains relatively uncommon, particularly in Biology education. Therefore, this study was conducted to develop a high quality E-LKPD assisted by Wizer.Me and Artificial Intelligence (AI) for the Biological Technology Innovation topic in tenth grade senior high school students. Through this development, students are expected to gain a better understanding of complex concepts, enhance their learning independence, and experience a more interactive learning process that aligns with contemporary educational demands and the principles of the Merdeka Curriculum.

2. Methodology

This study employed a Research and Development (R&D) approach aimed at developing an E-LKPD assisted by Wizer.Me and Artificial Intelligence (AI) for the Biological Technology Innovation topic. The development process adopted the ADDIE model, which comprises five stages: Analysis, Design, Development, Implementation, and Evaluation; however, this research was boundary limited and carried out systematically only up to the Development stage. During the Analysis stage, curriculum analysis, teaching material analysis, learning material analysis, and learner analysis were conducted. The curriculum analysis involved examining documents from the Merdeka Curriculum for Phase E of tenth-grade senior high school, including the Learning Outcomes (Capaian Pembelajaran/CP) and Learning Objectives Flow (Alur Tujuan Pembelajaran/ATP). The analyses of teaching materials, learning materials, and learners were carried out through observations and interviews with Biology teachers at SMAN 8 Pekanbaru, SMAN 12 Pekanbaru, and SMAN 4 Pekanbaru. The results of these analyses served as the foundation for developing the Wizer.Me- and Artificial Intelligence (AI)-assisted E-LKPD on the Biological Technology Innovation topic.

During the validation stage, the E-LKPD assisted by Wizer.Me and Artificial Intelligence was validated by four validators, consisting of two lecturers from the Biology Education Study Program, Faculty of Teacher Training and Education, Universitas Riau, and two senior high school biology teachers, namely one teacher from SMA Negeri 8 Pekanbaru and one teacher from SMA Negeri 7 Pekanbaru. The validation was conducted on several aspects, including visual media, typography, functionality and usefulness, language, content relevance, as well as the depth and breadth of the material, and the presentation of the content. The limited trial phase was conducted in two stages. The first limited trial was carried out at the Biology Education Study Program, Faculty of Teacher Training and

Education, Universitas Riau, involving 10 fifth semester Biology Education college students who had previously studied the Biological Technology Innovation topic. The second limited trial was conducted at SMA Negeri 8 Pekanbaru, involving 20 tenth grade students. The respondents were selected using a purposive sampling technique, specifically choosing college students and high school students who had already studied the Biological Technology Innovation material to ensure they could provide an accurate evaluation of the developed E-LKPD.

The data collection instruments consisted of validation sheets distributed to validators and user response questionnaires administered to college students and high school students during the limited trial phase. The data obtained from validations and user responses were analyzed using a quantitative descriptive method based on a 4 point Likert scale with a score range of 1–4. The obtained scores were averaged and interpreted according to the predetermined feasibility criteria as shown in Table 1. The score data from the validation and limited trials were analyzed using the average score formula, as follows:

$$\mathbf{M} = \frac{\sum \mathbf{Fx}}{\mathbf{N}}$$

Where:
M = Average score
Fx = Total score obtained
N = Number of validation components

Table 1. Validity Criteria of E-LKPD Assisted by Wizer.Me and AI

No	Criteria	Score Range
1	Highly Valid	$3{,}25 < x \leq 4$
2	Valid	$2{,}5 < x \leq 3{,}25$
3	Less Valid	$1{,}75 < x \leq 2{,}5$
4	Invalid	$1 \leq x \leq 1{,}75$

The overall quality score of the developed E-LKPD assisted by Wizer.Me and AI which had been validated and tested through the first and second limited trials was subsequently determined using the following average score formula:

$$\mathbf{X} = \frac{\sum \mathbf{X1} + \sum \mathbf{X2} + \sum \mathbf{X3}}{\mathbf{3}}$$

Where:
X = Overall average score (mean)
X1 = Average validation score
X2 = Average score of the first limited trial
X3 = Average score of the second limited trial

The quality of the developed E-LKPD assisted by Wizer.Me and AI was derived from the average scores of the validation phase and the first and second limited trials. The criteria for determining the quality of the E-LKPD assisted by Wizer.Me and AI for the Biological Technology Innovation topic can be seen in Table 2 below:

Table 2. Quality Criteria of E-LKPD Instructional Materials Assisted by Wizer.Me and AI

No	Criteria	Score Range
1	Excellent	$3{,}25 < x \leq 4$
2	Good	$2{,}5 < x \leq 3{,}25$
3	Fair	$1{,}75 < x \leq 2{,}5$
4	Very Poor	$1 \leq x \leq 1{,}75$

3. Results and Discussion

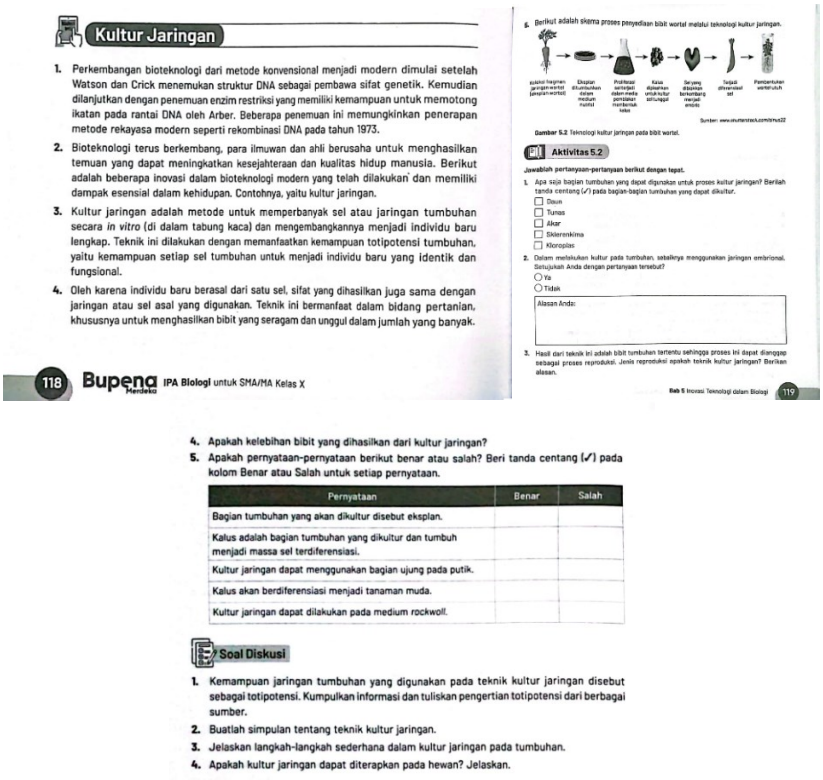
The development research of the E-LKPD assisted by Wizer.Me and AI for the Biological Technology Innovation topic was conducted through the stages of analysis, design, and development. These stages were carried out systematically and continuously, thereby producing an E-LKPD instructional material assisted by Wizer.Me and AI that is feasible for use in biology learning.

Analysis Phase

The analysis phase consisted of curriculum analysis, instructional material (LKPD) analysis, learning content analysis, and student analysis. The curriculum analysis was conducted by examining the Learning Outcomes (CP—*Capaian Pembelajaran*) within the Merdeka Curriculum. The Learning Outcomes for biological technology innovation are outlined in Phase E; by the end of Phase E, students are expected to be capable of formulating solutions to problems based on local, national, or global issues related to the comprehension of biological technology innovation. These learning outcomes are subsequently translated into specific learning objectives that facilitate the attainment of student competence, conceptual understanding, and content mastery.

Lestari et al., (2025) stated that the development of instructional materials must be carried out systematically by incorporating content that aligns with educational needs and is grounded in established learning objectives, thereby ensuring that learning activities are well-directed and measurable. Consequently, the instructional materials developed in this study were strictly aligned with the predefined learning objectives to directly contribute to the achievement of the designated Learning Outcomes.

The instructional material analysis was conducted on the LKPD used for the Tissue Culture topic in high school. This analysis aimed to identify the characteristics, strengths, and weaknesses of the existing LKPD to serve as a foundational baseline for developing the E-LKPD assisted by Wizer.Me and Artificial Intelligence (AI). Observation results indicated that the current LKPD still possessed several limitations in terms of content, visual layout, and the integration of technology into learning. The documentation of the analyzed LKPD can be seen in Figure 1.



Kultur Jaringan

1. Perkembangan bioteknologi dari metode konvensional menjadi modern dimulai setelah Watson dan Crick menemukan struktur DNA sebagai pembawa sifat genetik. Kemudian dilanjutkan dengan penemuan enzim restriksi yang memiliki kemampuan untuk memotong ikatan pada rantai DNA oleh Arber. Beberapa penemuan ini memungkinkan penerapan metode rekayasa modern seperti rekombinasi DNA pada tahun 1973.
2. Bioteknologi terus berkembang, para ilmuwan dan ahli berusaha untuk menghasilkan temuan yang dapat meningkatkan kesejahteraan dan kualitas hidup manusia. Berikut adalah beberapa inovasi dalam bioteknologi modern yang telah dilakukan dan memiliki dampak esensial dalam kehidupan. Contohnya, yaitu kultur jaringan.
3. Kultur jaringan adalah metode untuk memperbanyak sel atau jaringan tumbuhan secara *in vitro* (di dalam tabung kaca) dan mengembangkannya menjadi individu baru lengkap. Teknik ini dilakukan dengan memanfaatkan kemampuan totipotensi tumbuhan, yaitu kemampuan setiap sel tumbuhan untuk menjadi individu baru yang identik dan fungsional.
4. Oleh karena individu baru berasal dari satu sel, sifat yang dihasilkan juga sama dengan jaringan atau sel asal yang digunakan. Teknik ini bermanfaat dalam bidang pertanian, khususnya untuk menghasilkan bibit yang seragam dan unggul dalam jumlah yang banyak.

118 Bupena Mendeka IPA Biologi untuk SMA/MA Kelas X

6. Berikut adalah skema proses penyediaan bibit wortel melalui teknologi kultur jaringan.

Gambar 5.2 Teknologi kultur jaringan pada bibit wortel.

Aktivitas 5.2

Jawablah pertanyaan-pertanyaan berikut dengan tepat.

1. Apa saja bagian tumbuhan yang dapat digunakan untuk proses kultur jaringan? Berilah tanda centang (✓) pada bagian-bagian tumbuhan yang dapat dikultur.
   - ☐ Daun
   - ☐ Tunas
   - ☐ Akar
   - ☐ Sklerenkima
   - ☐ Kloroplas
2. Dalam melakukan kultur pada tumbuhan, sebaiknya menggunakan jaringan embrional. Setujukah Anda dengan pernyataan tersebut?
   - ○ Ya
   - ○ Tidak

   Alasan Anda:
3. Hasil dari teknik ini adalah bibit tumbuhan tertentu sehingga proses ini dapat dianggap sebagai proses reproduksi. Jenis reproduksi apakah teknik kultur jaringan? Berikan alasan.

Bab 5 Inovasi Teknologi dalam Biologi 119

4. Apakah kelebihan bibit yang dihasilkan dari kultur jaringan?
5. Apakah pernyataan-pernyataan berikut benar atau salah? Beri tanda centang (✓) pada kolom Benar atau Salah untuk setiap pernyataan.

Pernyataan	Benar	Salah
Bagian tumbuhan yang akan dikultur disebut eksplan.		
Kalus adalah bagian tumbuhan yang dikultur dan tumbuh menjadi massa sel terdiferensiasi.		
Kultur jaringan dapat menggunakan bagian ujung pada putik.		
Kalus akan berdiferensiasi menjadi tanaman muda.		
Kultur jaringan dapat dilakukan pada medium rockwoll.		

Soal Diskusi

1. Kemampuan jaringan tumbuhan yang digunakan pada teknik kultur jaringan disebut sebagai totipotensi. Kumpulkan informasi dan tuliskan pengertian totipotensi dari berbagai sumber.
2. Buatlah simpulan tentang teknik kultur jaringan.
3. Jelaskan langkah-langkah sederhana dalam kultur jaringan pada tumbuhan.
4. Apakah kultur jaringan dapat diterapkan pada hewan? Jelaskan.

Figure 1. Survey results of the LKPD analysis used in schools.

Based on the analysis results shown in Figure 1, the visual aspect of the LKPD currently used by teachers exhibits deficiencies, particularly in its unappealing layout and monotonic color scheme. The images within the LKPD remain black and white, rendering them visually unengaging. According to Firdaus et al., (2025), engagement with instructional materials is of paramount importance in the learning process, as it captivates students' interest to utilize the materials while simultaneously fostering enthusiasm and motivation during learning activities. Furthermore, in terms of functionality and utility, the LKPD used is still in printed format rather than an electronic one. Danial et al., (2022) asserted that in response to contemporary advancements, it is essential to develop instructional materials that offer ease of use and flexibility, specifically electronic LKPDs (E-LKPDs). Regarding the depth and breadth of the content, the current LKPD only comprises five questions and lacks an introductory discourse at the beginning. As noted by Purohita et al., (2023), presenting an introductory discourse through narratives and images can effectively build students' apperception before they engage in the LKPD activities, thereby facilitating a better understanding of the concepts.

The learning content analysis was conducted to determine the specific material content of the developed E-LKPD. Based on this analysis, the core material was structured into four distinct instructional meetings. Meanwhile, the student analysis aimed to identify the cognitive capabilities and characteristics of the students targeted for the research trials. In this context, the target subjects were 10th-grade students aged between 15 and 16 years. Within this age range, students' cognitive capacities expand rapidly, enabling them to acquire and process information more

effectively than younger learners. According to Nainggolan & Daeli, (2021), cognitive development at the age of 15 and above reaches its peak level, classified under the formal operational stage. This stage represents the fourth phase of child cognitive development, characterized by the ability to reason, analyze phenomena, and engage in systematic and effective thinking.

Design Phase

The design phase involved drafting the instructional instruments, designing the E-LKPD assisted by Wizer.Me and AI, and constructing the validation sheets and user response questionnaires. The results of the instructional instrument design included the learning outcomes flow (ATP—*Alur Tujuan Pembelajaran*) and the teaching modules (*modul ajar*). The ATP outlines the distribution of learning objectives across each instructional meeting and learning activity. The outcomes of this ATP design serve as a reference for constructing the teaching modules, which elaborate on the learning process in detail. Mahmudah et al., (2023) stated that the learning outcomes flow serves a function identical to that of a syllabus, acting as a baseline reference for developing teaching modules. The design of the teaching modules comprises general information, core components, learning activities, assessments, enrichment and remedial actions, teacher and student reflections, a bibliography, and a glossary.

A teaching module is an integrated and systematically packaged instructional program unit that encompasses a set of planned learning experiences designed to assist students in attaining a series of specific and clearly defined objectives (Salsabilla et al., 2023). Subsequently, the design of the E-LKPD assisted by Wizer.Me and AI was carried out. The E-LKPD was structured utilizing the Wizer.Me platform and enriched with illustrations generated through Artificial Intelligence (AI). The layout of this E-LKPD design consists of a cover page, identity section, learning objectives, operational steps, introductory discourse, learning activities, and the researcher's profile. The final step in this phase involved designing the validation sheets and response questionnaires. The validation sheets were utilized to evaluate the validity of the developed E-LKPD assisted by Wizer.Me and AI. Meanwhile, the respondent questionnaires were designed to assess the quality of the E-LKPD from the perspective of the respondents, namely undergraduate students and high school students. Evaluating validation sheets and questionnaires across various aspects can provide an indication that the E-LKPD assisted by Wizer.Me and AI is capable of stimulating students' motivation to study the subject matter, thereby fostering their active participation in the learning process (Yasa et al., 2021).

Development Phase

The designed instructional instruments, validation sheets, user response questionnaires, and the E-LKPD assisted by Wizer.Me and AI were fully developed into ready-to-use instructional materials. The E-LKPD assisted by Wizer.Me and AI was structured into four distinct sessions. Session 1 covers the basic concepts, types, and applications of biotechnology; Session 2 addresses the role of

biotechnology across various fields; Session 3 focuses on plant tissue culture; and Session 4 encompasses genetic engineering and the impacts of biotechnology on human life. The final results of the developed E-LKPD assisted by Wizer.Me and AI for the Biological Technology Innovation topic can be seen in Figure 2.

Figure 2. The interface of the E-LKPD assisted by Wizer.Me and AI for the Biological Technology Innovation topic.

The developed E-LKPD assisted by Wizer.Me and AI was subsequently validated by expert validators. The evaluation criteria during this validation stage encompassed the aspects of visual media, typography, functionality and utility, language, content alignment, content depth and breadth, as well as instructional

presentation. The average validation results for the E-LKPD assisted by Wizer.Me and AI across all assessed aspects are presented in Table 3 below.

Table 3. Overall Validation Results across All Aspects

No	Aspects	Average Score	Category
1	Visual Media	3.71	Highly Valid
2	Typography	3.85	Highly Valid
3	Functionality and Utility	3.83	Highly Valid
4	Language	3.86	Highly Valid
5	Content Alignment	3.75	Highly Valid
6	Content Depth and Breadth	3.67	Highly Valid
7	Instructional Presentation	3.83	Highly Valid
Overall Average		**3.79**	**Highly Valid**

The table above demonstrates that the validation results for the developed E-LKPD assisted by Wizer.Me and AI fall into the "highly valid" category, achieving an overall average score of 3.79. The criteria with the highest average was language, which secured a score of 3.86, also falling within the highly valid category. In terms of the language aspect, the linguistic presentation within the E-LKPD assisted by Wizer.Me and AI utilizes language that is easily understood, appropriate for the students' developmental level, and compliant with proper grammatical rules. An E-LKPD structured with strict adherence to correct linguistic conventions effectively mitigates the potential for misunderstandings when students read instructions or learning materials. According to Husain et al., (2024), the use of proper and standard grammar serves as a foundational baseline to familiarize students with using accurate language within an academic context. This underscores the paramount importance of a deep understanding of grammar in educational settings, particularly within electronic formats such as the interactive and well-structured E-LKPD.

The next aspect with the highest average score was functionality and utility, which achieved a score of 3.83, placing it in the "highly valid" category. In terms of functionality and utility, the E-LKPD assisted by Wizer.Me and AI offers ease of use, practicality, and visual appeal in supporting the learning process for the Biological Technology Innovation topic. The E-LKPD assisted by Wizer.Me and AI can be accessed across various devices (smartphones, tablets, and laptops) without requiring any specialized installation. This cross-device accessibility serves as a primary factor in enhancing students' learning engagement, as they are not restricted to a single device type when accessing the instructional medium. This is in line with Maulani et al., (2025), who stated that digital-based learning media accessible across multiple devices provide convenience for students to engage in independent learning.

The E-LKPD assisted by Wizer.Me and AI for the Biological Technology Innovation topic is highly capable of stimulating students' interest in learning. An appealing interface, interactive features, and seamless navigation within the E-LKPD foster students' curiosity and render the learning process more enjoyable. According to Elisa et al., (2024), the utilization of the Wizer.Me platform enables learning materials to be presented more vividly through varied and interactive

assignments, thereby fostering instructional innovation capable of enhancing student enthusiasm. In line with this, Imran et al., (2025) added that the interactive digital format of electronic instructional materials allows students to access content repeatedly and receive immediate feedback, which serves as a crucial factor in optimizing their understanding and learning outcomes. Consequently, the deployment of the Wizer.Me-based E-LKPD stands as an effective digital learning innovation capable of significantly enhancing students' learning interest (Saftri et al., 2025). The validated E-LKPD assisted by Wizer.Me and AI was subsequently ready for limited trials with undergraduate and high school students. The results of the limited trials I and II are presented in Table 4 below.

Table 4. Results of Limited Trials I and II

No	Aspect	Average Score		Category
		Limited Trial I	Limited Trial II	
1	Visual Media	3.92	3.86	Highly Valid
2	Functionality and Utility	3.85	3.81	Highly Valid
3	Typography	3.92	3.85	Highly Valid
4	Language	3.87	3.88	Highly Valid
5	Content Alignment	3.62	3.80	Highly Valid
6	Instructional Presentation, Content Depth and Breadth	3.70	3.76	Highly Valid
Overall Average		**3,81**	**3,82**	**Highly Valid**

Based on the table above, it can be inferred that the results of limited trials I and II for the developed E-LKPD assisted by Wizer.Me and AI fall within the "highly valid" category, achieving overall average scores of 3.81 and 3.82, respectively. The aspect with the highest average score was visual media, which secured scores of 3.92 and 3.86, placing it in the highly valid category. The E-LKPD assisted by Wizer.Me and AI incorporates cutting-edge Artificial Intelligence (AI)-based illustrations that support the instructional material and align with the learning context. AI-generated illustrations are capable of presenting clear, detailed, and adaptive visuals tailored to the students' learning needs, thereby enhancing deep conceptual understanding and fostering active learning engagement. AI delivers an adaptive and inclusive learning experience that reinforces the overall quality of instruction (Saputro et al., 2024). This is consistent with an undergraduate student's response, which stated that "the E-LKPD is engaging and helps me understand the material more deeply, and the use of illustrations such as images greatly assists in visualizing the content." Furthermore, in limited trial I, typography obtained the second-highest average score at 3.92, falling into the highly valid category. The typefaces utilized in the E-LKPD assisted by Wizer.Me and AI are easily readable, and the font sizes are proportional meaning they are neither too small nor too large thus ensuring visual comfort for students while working on the E-LKPD.

Typography plays a vital role in determining how text is read and comprehended; elements such as typeface selection, font size, letter-spacing (tracking), and line-spacing (leading) exert a substantial impact on readers' visual comfort (Setiawan & Amayati, 2025). In limited trial II, the language aspect achieved the third-highest average score at 3.88, falling into the "highly valid" category. The language

employed was designed to be communicative, clear, and Agustina & Okmarisa, (2023) straightforward, thereby facilitating students in completing the E-LKPD assisted by Wizer.Me and AI. Additionally, the linguistic presentation within the E-LKPD was tailored to the students' developmental and maturity levels to optimize comprehension. explained that the language used in student worksheets (LKPD) must consider the students' maturity level and utilize clear sentence structures so that students can easily grasp the learning materials. This aligns with a student's response, Syariah Adela, who stated that "the language used in the E-LKPD is simple, easy to understand, and not confusing when reading the instructions or the text (discourse)." Furthermore, the overall quality of the E-LKPD assisted by Wizer.Me and AI can be determined based on the average results of the validations and limited trials. The comprehensive quality of the developed E-LKPD is presented in Table 5 below.

Table 5. Comprehensive Quality of the E-LKPD Assisted by Wizer.Me and AI

No	Aspect	Average Score	Category
1	Expert Validation	3.79	Excellent
2	Limited Trial I	3.81	Excellent
3	Limited Trial II	3.82	Excellent
Overall Average		**3.80**	**Excellent**

Based on the table above, it can be inferred that the developed E-LKPD assisted by Wizer.Me and AI falls into the "excellent" quality category, achieving an overall average score of 3.80. The high-quality E-LKPD for the Biological Technology Innovation topic is highly feasible for implementation in biology instruction. Quality instructional materials significantly influence conceptual understanding, particularly regarding complex topics within Biological Technology Innovation that students previously found challenging to comprehend. A robust conceptual grasp among students subsequently leads to an improvement in their learning outcomes. According to Sopani et al., (2024), AI-generated imagery within an E-LKPD effectively assists students in grasping core subject concepts. This aligns with the trial results, which demonstrate that the developed E-LKPD received an excellent response from the students. According to Abdurrahman et al., (2025), the practicality level of an educational technology product in the classroom can be measured through a user experience perspective, wherein positive user feedback indicates that the product effectively facilitates the execution of the learning process. Consequently, the superior quality and positive responses elicited during these trials confirm that the developed E-LKPD meets optimal practicality standards for classroom instruction.

Based on the results of the limited trials conducted with students, the developed E-LKPD assisted by Wizer.Me and AI exhibits several key advantages. This E-LKPD features an appealing interface enhanced by Artificial Intelligence (AI)-based illustrations, offers seamless cross-device accessibility, employs highly comprehensible language, and incorporates instructional activities that effectively guide students toward a deep understanding of Biological Technology Innovation concepts. Furthermore, the integration of the Wizer.Me platform enables students to engage in learning activities that are significantly more interactive compared to

traditional printed worksheets. Conversely, a primary limitation of the developed E-LKPD is its reliance on stable internet connectivity and adequate digital devices, which may pose instructional challenges in environments with unstable networks. Additionally, some students still required initial guidance during the early stages of utilization to optimally leverage all available interactive features. Nevertheless, based on the comprehensive validation and trial outcomes, these limitations do not diminish the overall quality of the E-LKPD, rendering the final product highly feasible for integration into biology instruction.

4. Conclusion

Based on the research findings, it can be concluded that the development of the E-LKPD assisted by Wizer.Me and AI for the Biological Technology Innovation topic was successfully executed and met outstanding quality standards. The final product achieved high validity based on expert assessments and was evaluated as excellent throughout the limited student trials. The evaluation verified that all structural components, including the visual presentation, typography, functional utility, and contextual language alignment, successfully facilitated learning activities. Furthermore, positive responses from both undergraduate and high school students confirmed that the interactive features and AI-based illustrations successfully generated high motivation and resolved technical abstractions in biology learning. Although the digital application remains constrained by internet stability and requires brief initial orientation, these boundaries do not lessen the product's value. Ultimately, this developed E-LKPD serves as a highly feasible, practical, and effective digital instructional medium ready for broad classroom implementation.

References

Abdurrahman, N., Soeprijanto, S., & Muksin, M. (2025). Measuring the Usability and Appeal of an E-Module Using the User Experience Questionnaire. *Journal of Educational Sciences*, *9*(6), 5002–5013. https://doi.org/https://doi.org/10.31258/jes.9.6.p.5002-5013 This

Agustina, D., & Okmarisa, H. (2023). Pengembangan E-Lkpd Berbasis LSLC untuk Mendukung Literasi Sains Siswa pada Materi Kesetimbangan Kimia. *Jurnal Pendidikan Kimia Dan Terapan*, *7*(1), 43–54. https://doi.org/http://dx.doi.org/10.24014/konfigurasi.v7i1.21599

Danial, M., Rano, F. Y., & Herawati, N. (2022). Pengembangan Lembar Kerja Peserta Didik (LKPD) Elektronik Berbasis Masalah pada Materi Larutan Asam dan Basa. *Chemistry Education Review*, *5*(2), 129–139. https://doi.org/https://doi.org/10.26858/cer.v5i2.32721

Dermawati, N., Suprapta, S., & Muzakkir, M. (2019). Pengembangan lembar kerja peserta didik (lkpd) berbasis lingkungan. *Jurnal Pendidikan Fisika*, *7*(1), 74–78. https://doi.org/https://doi.org/10.24252/jpf.v7i1.3143

Elisa, S. N., Kurnia, D., & Anwar, W. S. (2024). Pengembangan E-LKPD Menggunakan Aplikasi Wizer. Me Pada Mata Pelajaran IPAS Materi Transformasi Energi Di Sekitar Kita. *Jurnal Ilmiah Pendidikan Guru*

Sekolah Dasar, *16*(2), 124–132. https://doi.org/https://doi.org/10.33369/pgsd.16.2.124-132.

Firdaus, A. T. B., Febrianto, P. T., Pritasari, A. C., & Assayyidah, J. (2025). Pengembangan E-LKPD Liveworksheets Materi Manfaat Dan Melestarikan Keberagaman Budaya Siswa Kelas IV SDN Keleyan 1. *Jurnal Imiah Pendidikan Dasar*, *5*(1), 677–704. https://doi.org/https://doi.org/10.37081/jipdas.v5i1.2562

Husain, N., Hamzah, R. A., & Dwisaputri, R. (2024). Pengajaran Tata Bahasa dan Ejaan Bahasa Indonesia di SD. *Jurnal Pendidikan Guru Sekolah Dasar*, *9*(3), 8–18. https://doi.org/https://doi.org/10.17509/jpgsd.v9i3.76314

Imran, M. A., Akhir, M., & Arif, T. (2025). Development of a Prototype of Children ' s Literature E-Module Reading Literacy of Students in Elementary Schools. *Journal of Educational Sciences*, *9*(4), 2678–2686. https://doi.org/https://doi.org/10.31258/jes.9.4.p.2678-2686 This

Khusnunnisa', M., & Andriani, A. E. (2025). Journal of Educational Sciences. *Journal of Educational Sciences*, *9*(5), 4370–4387. https://doi.org/https://doi.org/10.31258/jes.9.5.p.4370-4387

Kopniak, N. B. (2018). The Use of Interactive Multimedia Worksheets at Higher Education Institutions. *Information Technologies and Learning Tools*, *63*(1), 116–129. https://doi.org/10.33407/ITLT.V63I1.1887

Legi, H., Riwu, M., & Hermanugerah, P. (2023). Pembelajaran Transformatif Kurikulum Merdeka di Era Digital. *Journal Education Innovation*, *1*(1), 60–68. https://doi.org/https://doi.org/10.65474/m736p177

Lestari, C. A. A., Lestari, A. D., Magfirah, I., & Susilawati, S. (2025). Peran Bahan Ajar, Media dan Sumber Belajar: Kunci Sukses dalam Pembelajaran Pendidikan Agama Islam. *Jurnal At-Thullab*, *7*(1), 1–21. https://doi.org/10.20885/tullab.vol7.iss1.art1

Mahmudah, I., Sulistyowati, S., & Jasiah, J. (2023). Pendampingan Persiapan Guru dalam Mengimplementasikan Kurikulum Merdeka di MI Fathul Iman Palangka Raya. *Jurnal Abdi Masyarakat Indonesia*, *3*(2), 727–732. https://doi.org/https://doi.org/10.54082/jamsi.734

Mardhiah, A., Hajar, I., Purwati, D., Muna, H., & Ariani, R. (2025). Leveraging Artificial Intelligence (AI) to Enhance Teachers' Spoken English at an Islamic Boarding School. *Journal of Educational Sciences*, *9*(6), 5163–5176. https://doi.org/https://doi.org/10.31258/jes.9.6.p.5163-5176 This

Maulani, T. A., Sulistyaningsih, D., & Mawarsari, V. D. (2025). Implementasi Penggunaan E-LKPD Pendekatan Open-Ended pada Materi. *Journal of Education*, *07*(02), 11040–11052. https://doi.org/https://doi.org/10.31004/joe.v7i2.7971

Maulid, T. A., Maulana, M., & Isrok'atun, I. (2024). Keterampilan Guru dalam Membuat Media Pembelajaran Digital dengan Menggunakan Artificial Intelligence Aplikasi Canva. *Jurnal Kependidikan*, *13*(1), 281–294. https://doi.org/https://doi.org/10.58230/27454312.485

Nainggolan, A. M., & Daeli, A. (2021). Analisis Teori Perkembangan Kognitif Jean Piaget dan Implikasinya bagi Pembelajaran. *Journal of Psychology Humanlight*, *2*(1), 31–47. https://doi.org/https://doi.org/10.51667/jph.v2i1.554

Oktaviani, F., Mulyawati, Y., & Susanto, L. H. (2023). Pengembangan E-LKPD

Interaktif Berbasis Wizer. Me pada Tema 9 Subtema 1 Pembelajaran 3. *Jurnal Ilmiah Pendidikan Dasar*, *8*(3), 637–648. https://doi.org/https://doi.org/10.23969/jp.v8i3.10603

Purohita, I. G. A. A. M., Subagia, I. W., & Suma, K. (2023). Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Open Ended Problem untuk Meningkatkan Keterampilan Proses Sains. *Wahana Matematika Dan Sains: Jurnal Matematika, Sains, Dan Pembelajarannya*, *17*(1), 37–49. https://doi.org/https://doi.org/10.23887/wms.v17i1.54888

Saftri, A. D., Mz, A. F. S. A., & Irmaningrum, R. N. (2025). Pengembangan E-LKPD Berbasis Wizer. Me untuk Meningkatkan Penguasaan Konsep Peserta Didik pada Mata Pelajaran IPAS Kelas V Sekolah Dasar. *Jurnal Kiprah Pendidikan*, *4*(3), 389–400. https://doi.org/https://doi.org/10.33578/kpd.v4i3.p389-401

Salsabilla, I. I., Jannah, E., & Juanda, J. (2023). Analisis Modul Ajar Berbasis Kurikulum Merdeka. *Jurnal Literasi Dan Pembelajaran*, *3*(1), 33–41. https://doi.org/https://jurnalfkip.samawa-university.ac.id/JLPI/article/view/384

Saputro, A. A., Andreana, P. A., & Puspitasari, N. (2024). Analisis Penerapan Pembelajaran Berbasis AI sebagai Tutor Virtual dalam Optimalisasi Kurikulum Pendidikan. *Seminar Nasional Amikom Surakarta*, *2*, 307–319. https://ojs.amikomsolo.ac.id/index.php/semnasa/article/view/561

Setiawan, H., & Amayati, V. (2025). Analisis Tipografi Dan Tata Letak Terhadap Daya Serap Informasi Dalam Media Cetak. *Syi`ar : Jurnal Ilmu Komunikasi, Penyuluhan Dan Bimbingan Masyarakat Islam*, *8*(1), 42–52. https://doi.org/https://doi.org/10.37567/syiar.v8i1

Sitanggang, C. A., & Lubis, F. (2023). Pengembangan E-LKPD Interaktif Materi Teks Cerita Pendek Berbasis Website Wizer.me Kelas XI SMA Tahun Pembelajaran 2022/2023. *Multiverse: Open Multidisciplinary Journal*, *2*(2), 162–172. https://doi.org/https://doi.org/10.57251/multiverse.v2i2.1083

Sobri, M., Indraswati, D., Rahmatih, A. N., Fauzi, A., & Amrullah, L. W. Z. (2022). Pelatihan Pembuatan Worksheet Interaktif Dengan Wizer.Me untuk Mengoptimalkan Pembelajaran di SD Negeri 26 Mataram. *Jurnal Warta Desa*, *4*(2), 118–124. https://doi.org/10.29303/jwd.v4i2.189

Sopani, A., Zahra, A., Putri, A. D., & Agustiani, R. (2024). Pengembangan LKPD dengan Bantuan Artificial Intelligence (AI) Materi Penyajian Data untuk Penguatan Kemampuan Numerasi. *MathEdunesa*, *13*(3), 1000–1012. https://doi.org/10.26740/mathedunesa.v13n3.p1000-1012

Syafitri, R. A., & Tressyalina, T. (2020). The Importance of the Student Worksheets of Electronic (E-LKPD) Contextual Teaching and Learning (CTL) in Learning to Write Description Text during Pandemic COVID-19. *Proceedings of the 3rd International Conference on Language, Literature, and Education*, *485*, 284–287. https://doi.org/https://doi.org/10.2991/assehr.k.201109.048

Wahyuni, R., L.N., F., Putra, R. A., Linggasari, M. N., Wulandari, P. A., & Fadilah, M. (2025). Project-Based Learning (PjBl) Green Pedagogy E-Module in Improving Creative Thinking and Digital Literacy Resma. *Journal of Educational Sciences*, *9*(2), 876–885. https://doi.org/https://doi.org/10.31258/jes.9.2.p.876-885 A

Yasa, I. K. D. C. A., Agung, A. A. G., & Simamora, A. H. (2021). Meningkatkan Semangat Belajar Siswa Melalui Multimedia Interaktif Pada Mata Pelajaran IPA. *Jurnal Edutech Undiksha*, *8*(1), 104–112. https://doi.org/https://doi.org/10.23887/jeu.v9i1.32523

Zahroh, D. A., & Yuliani, Y. (2021). The Development of Scientific Literacy Based E-LKPD to Train Student's Critical Thinking Skills in Growth and Development Materials. *Berkala Ilmiah Pendidikan Biologi*, *10*(3), 605–616. https://doi.org/https://doi.org/10.26740/bioedu.v10n3.p605-616

How to cite this article:

Antoni, G. N., Zulfarina., & Darmawati. (2026). Development of E-LKPD Assisted by Wizer.Me and Artificial Intelligence on Biological Technology Innovation Material for Class X SMA. *Journal of Educational Sciences*, *10(7)*, 328-342.