



Systematic literature review: Development of multimodality-based electronic student worksheets

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ABSTRACT

This study aims to conduct a systematic literature review on the development of multimodal-based electronic student worksheets and its impact on the development of students' independent character. This research method is a Systematic Literature Review (SLR) with a literature search process through several stages, namely (1) Identification of Keywords, (2) Data Sources, (3) Inclusion and Exclusion Criteria. The results of the review indicate that electronic student worksheets that integrates various modes such as text, images, audio, and video have significant potential in increasing student independence. The interactive features provided in this electronic student worksheets, such as quizzes and direct feedback, allow students to learn independently, increase engagement, and encourage initiative and responsibility in their learning process. Research shows that the use of electronic student worksheets has significant potential in improving students' independent character. The literature that has been reviewed shows that independent character can develop through several main mechanisms offered by multimodal-based electronic student worksheets. However, this study has several limitations. First, limited access to adequate technology and infrastructure can affect the effectiveness of the use of electronic student worksheets in various educational contexts. Second, the reviewed studies mostly focused on short-term outcome measurements, so the long-term impact of the use of electronic student worksheets on the development of independent character has not been widely revealed. This literature review concludes that the development and use of multimodal-based electronic student worksheets is an effective and innovative approach in an effort to improve students' independent character. As a follow-up to these findings, it is recommended that further research be conducted with a focus on the implementation of electronic student worksheets in various different



learning environments, as well as its influence on the development of independent character in the long term. In addition, collaboration between teachers, parents, and technology providers is essential to ensure the successful implementation of this electronic student worksheets in schools. Thus, multimodal-based electronic student worksheets can be optimized as an effective tool in character-based learning in the digital era.

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INTRODUCTION

The Student Worksheet (LKPD) has characteristics that are systematic, interactive, and in accordance with the needs of students. LKPD is designed to guide students in understanding the material through various activities, such as observing, questioning, trying, reasoning, and communicating learning outcomes. The use of LKPD is very important because it helps students develop critical thinking skills, independence, and teamwork skills in groups. In addition, LKPD can also increase student involvement in learning and provide a more structured and enjoyable learning experience. One of the innovations that is developing is the use of multimodal-based electronic Student Worksheets (LKPD) (D.A.I. Wijayanti et al., 2022). This electronic LKPD not only utilizes digital technology, but also integrates various learning modes such as text, images, audio, and video to create a more interactive and engaging learning experience (Puspita & Dewi, 2021; Putra et al., 2022). The Student Worksheet (LKPD) is a learning tool used to guide students in teaching and learning activities (M. Putri & Raharjo, 2024; Suryani & Rini, 2023; Widiyanti & Fitrotun Nisa, 2021). The use of LKPD is expected to encourage students to learn independently.

Independent character development in elementary school students is one of the main focuses in character education. This is because independent character is a character that is relevant to the conditions of technological progress and the digitalization of education (Bukoting, 2023; Khotimah, 2019). Independent character includes the ability of learners to learn independently, take initiative, and take responsibility for their own learning process (Fironika Kusumadewi et al., n.d.; Fuji Lestari & Harjono, 2021; Wuryandani & Ambarwati, n.d.). In this context, multimodality-based electronic LKPD is expected to be an effective tool to support the development of these independent characters (Fadhilulloh & Hidayati, 2021). With technological advancements, the development of multimodal-based electronic LKPD has become increasingly relevant. Multimodal-based electronic LKPD can utilize various media to present learning materials in a more interesting and interactive manner (Ni Made Sinta Suwastini et al., 2022; Novitasari et al., 2023; Tarisna et al., 2023; Utami & Suniasih, 2023). This can increase students' interest and motivation to learn, as well as support the development of independent character.

This study aims to conduct a systematic literature review regarding the development of multimodal-based electronic LKPD and its impact on the development of students' independent character. This study presents an in-depth study of the development and impact of the use of multimodal-based electronic LKPD. The novelty of this research lies in the effort to identify the latest trends in the development of electronic LKPD that can support students' independent learning. The importance of this

research lies in the current learning context that is increasingly dependent on technology. By understanding the impact of the use of multimodal-based electronic LKPD on student independence, this study can provide relevant recommendations for educators and learning material developers in designing effective and efficient learning.

This research can contribute to the development of more effective learning models and support the formation of independent character (Panjaitan et al., 2023). This review is expected to provide a deeper understanding of the effectiveness of the use of technology in learning, especially in the context of developing students' character. In this review, various relevant literature sources will be analyzed to identify strategies, methods, and results of previous research related to the use of multimodal-based electronic LKPDs. By reviewing various previous studies, it is hoped that a comprehensive picture can be obtained regarding the effectiveness and challenges in the implementation of multimodal-based electronic LKPD in the development of students' independent character.

METHOD

This study uses *the Systematic Literature Review (SLR) method*. *Systematic Literature Review (SLR)* is a systematic, explicit, and reproducible approach to identifying, evaluating, and interpreting all relevant evidence related to a particular research topic (Borrego et al., 2014; Chalkiadaki, 2018).

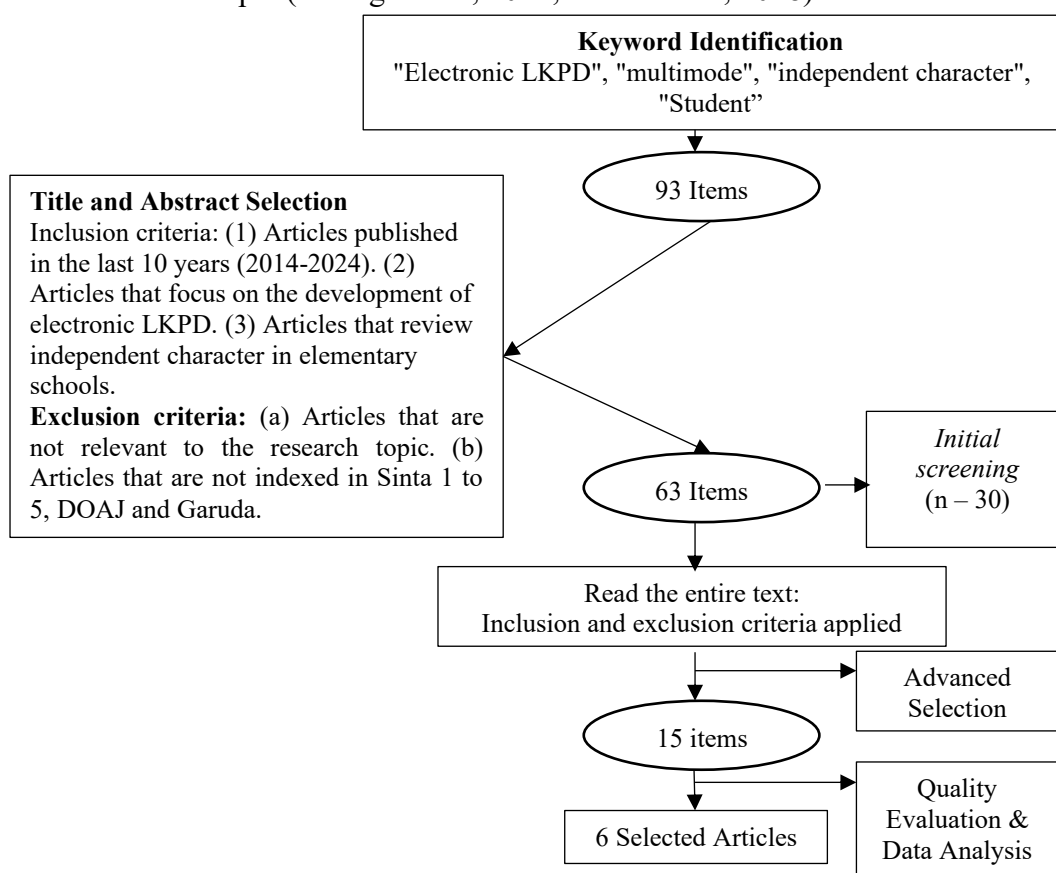


Figure 1. Chart of the Stages of Mapping Review

This method is carried out before empirical research, and this literature review can be used as a background for related empirical research (Xiao & Watson, 2019). The review model used is *the mapping review* (Grant & Booth, 2009). The review process is carried out systematically and transparently, including the stages of search, selection

and evaluation, and data synthesis (Rother, 2007). This research was carried out in the period from May 2024 to September 2024. The flow of stages in *this literature review* can be presented in the form of a chart as shown in Figure 1.

Search Stage

The literature search process is carried out through several stages as follows: (1) Keyword Identification. Keywords used in literature searches include: "electronic LKPD", "multimode", "independent character", "learner". These keyword combinations are used to ensure a wide and comprehensive search coverage. (2) Data Sources. The literature studied was taken from journals indexed in Sinta 1, 2, 3, 4 and 5. Data sources include Google Scholar, DOAJ, and national journal databases such as Garuda. In addition, it also uses *the Publish and Perish 8* application to find the necessary data sources. (3) Inclusion and Exclusion Criteria. Inclusion criteria; (a) Articles published in the last 10 years (2014-2024). (b) Articles that focus on the development of electronic LKPDs. (c) Articles that examine independent character in elementary school. (4) Exclusion criteria; (a) Articles that are not relevant to the research topic. (b) Articles that are not indexed in Sinta 1 to 5, DOAJ and Garuda.

Selection and Evaluation Stage

The selection process is carried out in several stages; (1) Initial screening: Selecting the title and abstract of the articles found. (2) Advanced selection: Reading the entire text of articles that pass the initial selection to ensure the relevance and quality of the research based on the inclusion and exclusion criteria. (3) Quality evaluation: Assessing the quality of the selected articles using a checklist developed based on the Systematic Literature Review guidelines (Boelens et al., 2017; Rother, 2007). After the selected articles, a thematic analysis was conducted to identify the main themes related to the development of electronic LKPD, multimodal, and the development of students' independent character. Data analysis was conducted by; (1) Grouping articles based on the main theme. (2) Identifying patterns and trends in existing research. (3) Compiling a synthesis of findings from various articles.

RESULTS AND DISCUSSION

Literature study begins by collecting literature relevant to the research topic. Literature can be in the form of articles from national journals indexed in Sinta 1, 2, 3, 4 and 5. The search process uses *the Publish and Perish 8 application* with the keywords "electronic LKPD", "multimode", "independent character", "learner". Data sources are from Google Scholar, DOAJ, and Garuda's national journal database. Based on the identification of keywords, 93 articles were obtained. Based on *the initial screening* of 93 articles, 63 articles met the criteria.

The results of the advanced selection based on inclusion and exclusion criteria were obtained for 15 suitable articles. Furthermore, quality evaluation and data analysis from 15 articles related to the development of multimodal-based electronic LKPD (Student Worksheet) that has an impact on the independent character of students is carried out. So that 6 articles relevant to the research theme were obtained. The article is presented in the following table:

Table 1. Article Review Results

Article	Data Source	Research Results
Mardianti et al. (2022). Development of LKPD Interactive Electronics	Didactic Methodology: Journal	The results of the research were 97.5% material validation (very valid), 97.9% of media validation (very valid), user

Article	Data Source	Research Results
Educational Game Based Integrated Creative Characters On the Contents of Science Class IV SD Meilasaria, Silvi., Barus, Yohannes K., & Ahadianto, Erif (2024). E-Module Development With Loaded Independent Character On Types of Materials Businesses in the Field Economy Class V Primary school	Elementary Education, 18(1), 10–21. JP2SD (Journal of Elementary School Thought and Development), 12 (1) pp. 52-67	(teacher) validation 97.5% (very valid), 100% small-scale trial (very interesting), and 98.3% large-scale trial (very interesting). The results of the study showed an increase in the learning achievement of students in grade V of SDN Kauman 02 Blitar City using e-module learning media, which is evident from the average between pre-test and post-test learning outcomes. Overall, based on the findings of the research, it can be concluded that e-modules with materials on types of businesses in the field of economics are considered feasible by experts and practical to be applied in learning activities to improve students' learning achievement.
O'Neill, Your Excellency, Henny, Henny. Dewi (2021). Development Learning Media Comic Based for Improving Character Learning Independence Elementary School Students	JURNAL BASICEDU, 5 (6) Hlm. 5100 - 5111	The results of the study show that comic media to improve the learning independence character of grade 3 elementary school students is very feasible to use. It is evidenced by the results of the validation test of learning media experts with a score of 75% which is included in the high category, the assessment of learning materials with a score of 71% in the high category and the assessment of learning language with a score of 75% which is included in the high category.
Eko Putri Wardani, Adelia., Ibn Zaman, Wahid., & Afandi, Zainal (2024). Development of E-LKPD Interactive-Based Ethnomathematics On Building Materials Tubes with reinforcement Independent Character of Students Class V Sdn 3 Jatikalen	Pendas: Scientific Journal of Basic Education, 9 (2) pp. 2009 - 2020	The results of the study showed that the validation carried out by material experts and media experts got an average score of 90.7%, indicating a very valid category. The response from teachers received an average score of 93.3%. As for the responses from students in the limited trial and the extensive trial, the average score was 97% and 97.4%, indicating a very practical category. Effectiveness was measured through a posttest after the use of ethnomathematics-based interactive E-LKPD, with an average posttest score of 88.9 and a classical completeness rate of 89.5%. Based on the results of the research that has been conducted, a conclusion can be drawn that the development of ethnomathematics-based interactive E-LKPD in learning to build tube chambers in grade V of SDN 3 Jatikalen has proven to be very effective in supporting the teaching and learning process and improving learning outcomes and strengthening the independent character of students.
Friska dkk., (2022). LKPD elektronik dengan 3D Pageflip Professional	Jurnal Basicedu, 6 (2) 3200–3206.	The results of the study show that the effectiveness of creatively designed electronic LKPD to support learning,

Article	Data Source	Research Results
Berbasis Problem Solving pada Tema Lingkungan Sahabat Kita di SD Prihaswati, Martiyana., Yuliani, Istiqomah., Purnomo, Eko Andy., Adnan, Mazlini & Khasanah, Uswatun (2023). Desain E-LKPD Berbasis STEM Tema Kearifan Lokal Bernuansa Pendidikan Karakter Materi Lingkaran	JIPMat (Jurnal Ilmiah Pendidikan Matematika), 8 (2) Hlm. 151 -162	which is relevant to the development of technology-based LKPDs The results of the overall material validation obtained an average of 85% and were in the interval of 80 – 100% with a very valid category. The learning media is not retested and minor revisions are made according to suggestions/criticisms from material experts. Based on media experts and material experts, E-LKPD received a combined average of 87% with a very valid category. The category is very valid showing that the design of E-LKPD can help students to find concepts independently, including a stimulant for the spirit of learning while instilling local cultural values.

The focus of this research is to describe how the development of electronic LKPD can strengthen the independent character of students. The first category of surveys, which are intended to be descriptive, is the most general and easily recognizable survey. A descriptive review examines the state of the literature related to a particular research question, topic area, or concept. The difference between this review category and other review categories is that the descriptive review does not aim to expand the literature, but rather to provide an overview of the state of the literature at the time of the review (Xiao & Watson, 2019). The following are the results of the literature study regarding the focus of the research.

Development of Multimodal Based Electronic LKPD

The development of multimodal-based electronic LKPD is an important innovation in learning in the digital era, especially in the context of basic education. The use of multimodes in LKPD, such as text, images, audio, and video, provides a richer and more immersive learning experience for learners. This is in line with the multimodal learning theory which states that information conveyed through various modalities can improve the understanding and retention of information by students (Mayer, 2005).

In addition, the use of electronic LKPD allows for the integration of technology in learning, which can increase student motivation and engagement. The use of technology-based media in learning can significantly improve student learning outcomes (Anggraini et al., 2022; Luh Dera Adnyani & Tegeh, 2023; Nuraini et al., 2023). In addition, the use of electronic LKPD allows for the integration of technology in learning, which can increase student motivation and engagement. The use of technology-based media in learning can significantly improve student learning outcomes (Meilasari et al., 2024; Panjaitan et al., 2023; Retno Palupi et al., n.d.).

The development of multimodal-based LKPD is also relevant in developing independent character in elementary school students. Through the use of interactive elements in LKPD, such as collaborative tasks and self-reflection, students are invited to work together with their peers and develop critical thinking skills and independence in learning (Palupi & Pujiyanto, 2021; Sakiyah et al., 2021). Study by Eko Putri Wardani (2024) found that the implementation of project-based learning through electronic LKPD

was able to improve students' collaborative skills and independence (Prihaswati et al., 2023a; R. T. H. Putri, 2024).

Furthermore, in the context of character education, the development of multimodal-based electronic LKPD can be adjusted to the character values that are to be developed in students (Setiawan & Susilo, 2017). For example, the tasks in the LKPD can be designed in such a way as to encourage learners to take initiative and responsibility for their own learning, which is an important aspect of independent character (Santiana et al., 2022). This is supported by the results of the research Panjaitan et al., (2023) which shows that the development of multimedia-based electronic LKPD can strengthen the character of students, especially in the aspect of independence (R. T. H. Putri, 2024; Rozi & Utami, 2023).

Overall, the development of multimodal-based electronic LKPD not only enriches the learning experience of students, but also becomes an effective tool in character formation (Situmorang, 2023; Sumantri, 2022). With the integration of technology and a multimodal approach, electronic LKPD has great potential to improve the quality of learning and overall character development of students (Syar & Meriza, 2020).

Independent Character of Students

Independent character development is one of the important aspects of education that is expected to produce students who are able to take responsibility for themselves, have initiative, and can solve problems independently. Electronic LKPD (Student Worksheet) is one of the learning media that can support the development of this character, especially in the context of basic education (Ana & Achdiani, 2017). The use of electronic LKPD provides space for students to be more active in the learning process. According to research conducted by Retno Palupi et al., n.d. (2021), The use of media allows learners to access the material independently, work on tasks with flexible time, and evaluate their own learning outcomes (Hidayat et al., 2020; Sutarno et al., 2015). This is in line with the principles of technology-based learning that supports independent learning (Sutisna, 2016; Usman, 2019).

In addition, the electronic LKPD provides interactive features such as videos, quizzes, and live feedback that can increase students' motivation and engagement in learning (Hidayat et al., 2020). With this feature, students can feel the impact of the efforts they make, which is very important in building independent character (Sutarno et al., 2015). Other research shows that interaction with structured digital content helps learners to better understand their responsibilities in completing tasks, which ultimately increases their independence (Wibowo & Koeswanti, 2021).

The use of electronic LKPD also develops students' ability to learn independently without relying entirely on teachers (Simamora & Asri, 2024). Menurut Panjaitan et al., (2023), In his research at SMP IT Indah Medan, the use of electronic LKPD has been proven to be effective in encouraging students to explore the material independently and find solutions to the problems they face during the learning process. This shows that electronic LKPD can be an effective means to develop students' independence in the digital era (Nafilah et al., 2023).

In addition, the involvement of students in the learning process using electronic LKPD also improves their ability in time management and decision-making (Ningsih & Sirait, 2024). They are invited to prioritize completing tasks, manage their time well, and reevaluate their work (Suhartiningsih et al., 2023). These aspects are important skills in building independent character (Hidayat et al., 2020; Sutarno et al., 2015; Sutisna, 2016).

However, challenges in developing independent character through electronic LKPD also need to be considered. One of the main challenges is the accessibility of technology and the readiness of students to utilize technology optimally (Nafilah et al., 2023). To overcome this, there needs to be continuous training and mentoring for students in the use of electronic LKPD, so that they can use it effectively and efficiently (Kusuma et al., 2023; Suhartiningsih et al., 2023). Research by Prihaswati et al., (2023) shows that E-LKPD can help students to find concepts independently, including a stimulant for the spirit of learning while instilling local cultural values. In addition, good mentoring by teachers and parents can increase the effectiveness of the use of electronic LKPD in the development of independent character (Hisbullah, 2020). Collaboration between teachers, parents, and students is the key to success in the implementation of electronic LKPD as a tool to build independence (Kusuma et al., 2023). This research has several limitations. First, limited access to adequate technology and *software* and *hardware* can affect the effectiveness of the use of electronic LKPD in various educational contexts. Second, the studies reviewed mostly focused on short-term outcome measurement, not much has revealed the long-term impact of the use of electronic LKPD on the development of independent character.

CONCLUSION

Based on a systematic literature review of the development of multimodal-based electronic LKPD, it can be concluded that the use of this learning media has significant potential in improving the independent character of students. Electronic LKPD that integrates various modes such as text, images, audio, and video is able to provide a more interactive and engaging learning experience, thus encouraging students to be more active and responsible in their learning process.

The literature that has been reviewed shows that self-sustaining character can develop through several key mechanisms offered by multimode-based electronic LKPDs. First, the flexibility of time and place in accessing the material allows students to learn independently without having to depend on the presence of the teacher in person. Second, the interactive features contained in the multimodal LKPD, such as quizzes and live feedback, provide opportunities for learners to measure and improve their own understanding, which is an important aspect of independent learning.

However, the success in the implementation of multimodal-based electronic LKPD to improve independent character is highly dependent on the readiness of technology, infrastructure, and adequate assistance from teachers and parents. Therefore, there is a need for a comprehensive and collaborative implementation strategy to ensure that all students can make optimal use of this LKPD.

Overall, this literature review confirms that the development and use of multimodal-based electronic LKPD is an effective and innovative approach in an effort to improve the independent character of students. Based on the limitations of the research, it is necessary to carry out follow-up research findings. Therefore, it is suggested that further research be carried out with a focus on the application of electronic LKPD in various heterogeneous learning environments, as well as focusing on the influence on student independence in the long term. The next suggestion is that cooperation between teachers, parents, and technology providers is needed to ensure the successful implementation of this electronic LKPD in educational institutions. Thus, multimodal-based electronic LKPD can be maximized as an effective medium in learning based on the character of student independence in the era of educational digitalization.

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