



Development of Interactive Learning Media: Context-Based E-Book APK and E-LKPD Live Worksheets to Improve Students Mathematical Literacy

Imam Taukhit*, Nur Baiti Nasution

Pendidikan Matematika Universitas Pekalongan, Indonesia

Email korespondensi: iammtkht@gmail.com

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ABSTRACT

The lack of interactive learning media integrating digital technology and contextual models contributes to low mathematical literacy in Indonesia. This study aims to develop interactive media in the form of an Android-based E-Book (APK) and Electronic Student Worksheets (E-LKPD) via Live Worksheets using a contextual approach. Following the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), research was conducted with tenth-grade students at MA Ma'arif Walisongo Kedungwuni. Data were gathered using validation sheets for 8 experts (3 lecturers, 5 teachers) and student questionnaires, then analyzed quantitatively. Results indicate the media is "highly valid" with an average validation score of 4.3. Implementation results showed high practicality, achieving a student response score of 4.3 (very practical). The media effectively engages students in learning arithmetic sequences through real-world contexts. This research contributes to providing contextual digital learning tools that support the Merdeka Curriculum implementation

Keywords: *E-Book APK, E-LKPD, Mathematical Literacy, LiveWorksheets, Contextual Learning*

INTRODUCTION

The results of the 2022 PISA (Program for International Student Assessment) report indicate that Indonesian students' mathematical literacy remains low, with Indonesia ranking 70th out of 81 countries. This challenge is evident at MA Ma'arif Walisongo Kedungwuni, where the lack of interactive learning media that integrates digital technology with contextual learning models has hindered students' ability to connect mathematical concepts with real-world situations. Most teachers still rely on conventional teaching methods and printed

textbooks, which often fail to engage students in the digital age.

Ideally, students should be able to apply mathematical concepts logically and contextually in daily life. However, learning conditions at MA Ma'arif Walisongo Kedungwuni still rely on conventional methods and printed materials, which are less interactive. This leads to low enthusiasm and difficulties in understanding topics like arithmetic sequences. On the other hand, students' frequent use of smartphones presents an opportunity for more relevant and contextual digital learning. To bridge this gap, this study developed interactive

media: an Android-based E-Book (built with Kodular) and E-LKPD via LiveWorksheets. These tools aim to support contextual learning and enhance mathematical literacy. Contextual learning encourages active student engagement through meaningful activities linked to real-life experiences (Putri et al., 2022). Previous research has shown the effectiveness of contextual approaches and digital media like E-Books and E LKPD in improving learning outcomes and mathematical literacy (Pratiwi et al., 2022). The theoretical foundation includes: E-Books as interactive learning resources (Adolph, 2016), Kodular as no-code platform for educational app (Rahmawati et development al., 2024), LiveWorksheets for active online learning (Widyaningsih et al., 2024). And the ADDIE model to ensure media validity and practically (Widyaningsih et al., 2024).

Several studies have explored the development of digital learning tools. For instance, Vonna et al. (2022) developed E-LKPD using Live Worksheets and achieved a validation score of 3.9. While effective, such studies often focus on a single platform for both material delivery and assessment. Furthermore, the implementation of the *Kurikulum Merdeka* (Merdeka Curriculum) demands more flexible, differentiated, and technology-rich learning resources that can facilitate students' independent exploration of mathematical literacy.

The novelty of this research lies in the integration of two distinct digital platforms into a single learning ecosystem: an Android-based E-Book developed via Kodular for comprehensive material delivery and an interactive E-LKPD via Live Worksheets for real-time assessment. Unlike previous studies that utilize these tools separately, this research synchronizes both platforms under a Contextual Teaching and Learning (CTL) approach specifically designed to improve students' mathematical literacy on the topic of arithmetic sequences. By bridging abstract formulas with real-life contexts, this integrated media provides a more holistic digital learning experience.

Therefore, this study aims to develop and evaluate the validity and practicality of an interactive E-Book APK and E-LKPD Live Worksheets. It is expected that this research will provide a significant practical contribution to mathematics education by providing a contextual digital tool that supports the implementation of the Merdeka Curriculum and addresses the challenges of 21st-century learning.

METHODS

1. Research Design

This study employs a Research and Development (R&D) approach using the ADDIE development model, which consists of five systematic stages: Analyze, Design, Develop, Implement, and Evaluate (Fig. 1). This model was chosen because it allows for the step-by-step and systematic design and development of instructional media tailored to users' needs.

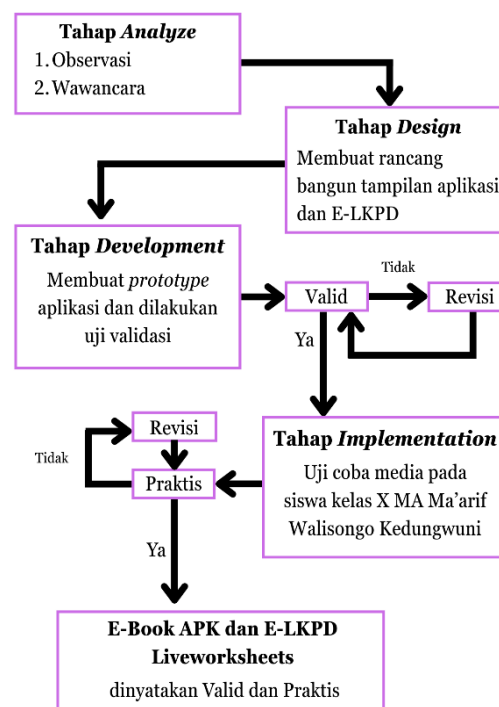


Figure 1. Research Framework

In the Analyze stage, learning needs were identified through classroom observations and interviews with mathematics teachers at

MA Ma'arif Walisongo Kedungwuni. The analysis focused on challenges in teaching arithmetic sequences, the need for interactive digital media, and student characteristics. The Design stage involved creating an initial draft of the learning media, including content structure, E Book navigation flow, question formats for the E-LKPD, and user interface layout. The E-Book was developed using the Kodular platform, while the E-LKPD was created using LiveWorksheets. In the Develop stage, the initial design was developed into a media prototype. Expert validation was then conducted, involving three lecturers and five teachers. The validation criteria included content, language, visual design, and media functionality. The validated media were then implemented in an actual learning setting through a limited trial with one tenth-grade class.

Evaluation was carried out to assess the practicality of the media based on student responses. The aspects evaluated included ease of use, visual appeal, understanding of the material, and the usefulness of the media.

The research was conducted at MA Ma'arif Walisongo Kedungwuni. The subjects of the study were tenth-grade students (Class X). For the expert validation phase, 8 experts were involved, consisting of 3 university lecturers and 5 mathematics teachers. For the readability test (practicality trial), a group of students from the same grade was selected to provide feedback on the media's usability.

Data were collected using two primary types of instruments:

1. Expert Validation Sheets: Used to assess the validity of the media and material. The instruments utilized a Likert scale ranging from 1 to 5, covering four aspects: Content, Presentation, Language, and Media Design.
2. Student Response Questionnaires: Used to measure practicality during the implementation phase. It consisted of several items focused on ease of use,

visual appeal, and the clarity of the contextual problems presented.

Data Analysis Technique

The data obtained from the validation sheets and questionnaires were analysed using descriptive quantitative analysis using Aiken's formula and was categorized using criteria shown in Table 1.

Table 1. Category of Validation Score

Validation Score	Category
$V < 0,4$	Low
$0,4 \leq V < 0,8$	Acceptable
$V \geq 0,8$	High

Meanwhile, practicality score was analysed using average score of practicality instrument and was categorized using criteria shown in Table 2.

Table 2. Category of Practicality Score

Validation Score	Category
$X < 1.8$	Highly not feasible
$1.8 \leq X < 2.6$	Not feasible
$2.6 \leq X < 3.4$	Fairly Feasible
$3.4 \leq X < 4.2$	Feasible
$X \geq 4.2$	Highly feasible

RESULTS AND DISCUSSION

Analyze

At the analysis stage, through observation and interview methods, the researcher identified several issues. The implementation of the Merdeka Curriculum places greater emphasis on character development and literacy activities, which results in less optimal understanding of mathematical concepts. Additionally, the teaching methods used are still conventional, leading to a lack of enthusiasm among some students in learning mathematics. Moreover, several students faced difficulties in understanding the material when using printed textbooks, particularly on topics such as arithmetic sequences.

Based on these conditions, this study aims to develop interactive learning media: an application-based e-book and a LiveWorksheets-based E-LKPD using a contextual learning model to improve the mathematical literacy understanding of students at MA Ma'arif Walisongo Kedungwuni, similar to the research conducted by Vonna et al., (2022).

Design

At the design stage, the researcher designed the content structure and initial interface layout using kodular.io as was shown in Fig 2.



Fig. 2 Initial Layout of the Media

In the initial interface shown above, the menu clearly displays the cover; "TP & CP" presents the Learning Outcomes and Learning Objectives; "Instructions" provides guidance on how to study the material; and the "Start Learning" button serves as the entry point to access the learning content when clicked.

The content display (Fig. 3) includes "Next" and "Back" buttons with their respective functions: to proceed to the next layer, and "Back" "Next" to return to the previous layer.

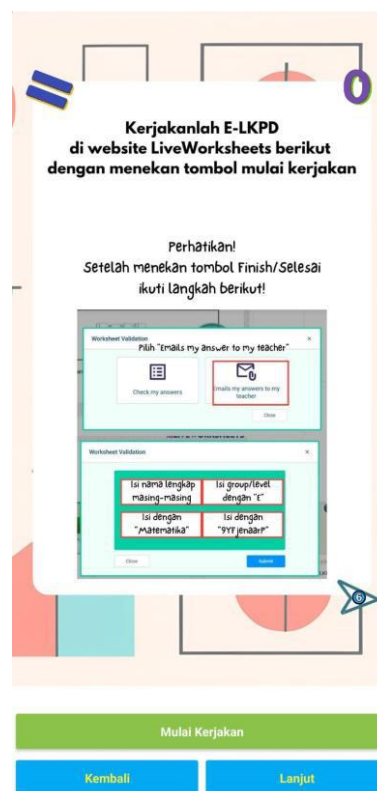


Fig 3. Content Display

Additionally, there is a "Start Working" button that links directly to the E-LKPD page, which was created using LiveWorksheets.com. The E-LKPD interface created with the help of LiveWorksheets provides two types of questions: drag and drop and short answer.

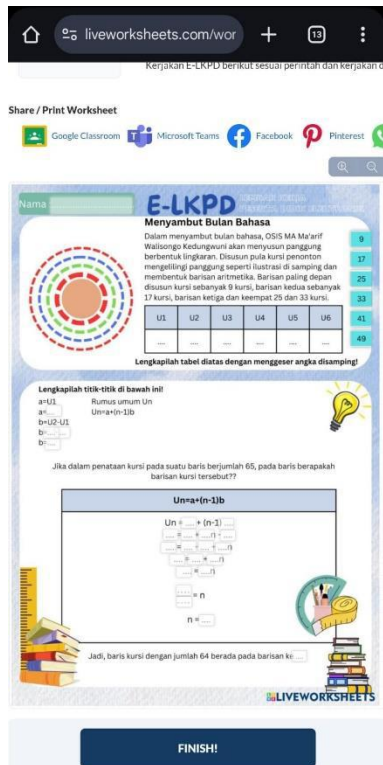


Fig 4. Worksheet Display

Development The media development stage involved validation by experts. The validation was conducted by 3 lecturers and 5 teachers, and the results are shown in Table 3.

Table 3. Validation Result

Aspect	Average Score	Criteria
Material	4.2	Good
Presentation	4.5	Very Good
Language	4.1	Good
Ease of Access	4.3	Very Good
Design	4.3	Very Good

Based on these results, the media achieved an average score of 4.3, placing it in the "very valid" category, and thus it is eligible to proceed to the trial implementation stage.

Implementation

The trial implementation stage was conducted at MA Ma'arif Walisongo through guided exploration. Students simultaneously downloaded the application, explored its features, practiced using the E LKPD, and

then completed the student response questionnaire. Result of the students' response was shown in Table 4.

Table 4. Students' Response

Aspect	Average	Criteria
Ease of Use	4.2	Good
Benefit	4.3	Very Good
Time	4.5	Very Good
Attractiveness	4.0	Good

Based on the results of the student response questionnaire, the average total score was 4.3, which falls into the "very practical" category. During the implementation process, students demonstrated high enthusiasm and were motivated to learn using the application. This finding is in line with a study by Purwanto (2015) which stated that the use of technology-based learning media significantly increases students' motivation and engagement in the learning process.

CONCLUSIONS

Based on the stages carried out in this research on the development of interactive learning media—context-based E-Book APK and E-LKPD LiveWorksheets to improve students' understanding of mathematical literacy—the media were declared highly valid, with an empirical average score of 4.3, as validated by three lecturers and five mathematics teachers.

Following the validation results, suggestions and revisions to the learning media were applied in a tenth-grade class at MA Ma'arif Walisongo Kedungwuni. The students' responses showed an empirical average score of 4.3, categorized as very practical. Therefore, the developed learning media are deemed suitable for use in classroom instruction. The authors suggest that future researchers further develop this media to test its effectiveness with a broader population, and encourage teachers to expand and adapt the provided questions in accordance with the learning material and students' needs.

REFERENCES

- Adolph, R. (2016). *Media Pembelajaran* (U. Khasanah (ed.); 1st ed.). Tahta Media Group.
- Ahmad, M., & Nasution, D. P. (2019). Peningkatan Kemampuan Literasi Matematika Siswa Sekolah Menengah Pertama melalui Pendekatan Kontekstual. *Jurnal Education and Development*, 7(2), 103–112. <http://journal.ipts.ac.id/index.php/ED/article/view/883/395>
- Ajje, D. B. P. (2021). Perancangan Aplikasi Perpustakaan E-Book Berbayar Berbasis Android. *JIKA (Jurnal Informatika) Universitas Muhammadiyah Tangerang*, 337–346. <https://jurnal.umt.ac.id/index.php/jika/article/view/3621>
- Arikunto, S. (2006). *Prosedur penelitian: Suatu pendekatan praktik (Edisi revisi VI)*. Jakarta: Rineka Cipta.
- Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer
- Bretz, R. (1971). Visual Literacy and the Concept of Visual Instruction. *AV Communication Review*, 19(1), 5–26.
- Dewanto, D. (2023). Pengembangan bahan ajar digital berbantuan LiveWorksheets (edisi pertama, hlm. 12). Magelang: Tidar Media.
- Fauzi, F. A., Ratnaningsih, N., & Lestari, P. (2022). Pengembangan Digibook Barisan dan Deret Berbasis Anyflip untuk Mengeksplor Kemampuan Berpikir Komputasional Peserta Didik. *06(01)*, 191–203.
- Felitasari, A., & Rusmini, R. (2022). Development of E-Worksheet Assisted by Liveworksheets to Improve Science Process Skills and Collaboration on Chemical Equilibrium Materials. *Scientiae Educatia*, 11(1), 10. <https://doi.org/10.24235/sc.educa.v11i1.10235>
- Firtsanianta, H., & Khofifah, I. (2022). Efektivitas E-LKPD Berbantuan Liveworksheets Untuk Meningkatkan Hasil Belajar Peserta Didik. *Conference of Elementary Studies*, 140–147.
- Guzdial, M. (2015). *Learner-Centered Design of Computing Education: Research on Computing for Everyone*. San Rafael, CA: Morgan & Claypool Publishers
- Hanum, L., & Amini, R. (2023). Pengembangan E-LKPD Berbasis Problem Based Learning Menggunakan Aplikasi Book Creator di Kelas III Sekolah Dasar. *Jurnal Elementaria* <https://doi.org/10.31949/jee.v6i4.7963>
- Hapsari, T. (2019). Literasi Matematis Siswa. *Euclid*, 6(1), 84. <https://doi.org/10.33603/e.v6i1.1885>
- Hendriawan, N. K., Basrowi, B., & Rahmadani, K. (2023). Pengembangan Media Pembelajaran Aplikasi Kodular pada Mata Pelajaran Teknologi Informasi dan Komunikasi Kelas X di SMK Pasudan 1 Kota Serang. *JIIP - Jurnal Ilmiah Ilmu Pendidikan*, 6(12), 10491–10495. <https://doi.org/10.54371/jiip.v6i12.2927>
- Hernawati, Z., & Suparman. (2020). Design of LKPD based on STAD method to improve mathematical communication skills. *International Journal of Scientific and Technology Research*, 9(3), 5596–5602.
- Jamil, A. F., & Khusna, A. H. (2021). Pengembangan Asesmen Berorientasi Kontekstual Untuk Meningkatkan Kemampuan Literasi Matematis Dan Numerasi Mahasiswa. *Jurnal Ilmiah Mandala Education*, 7(4). <https://doi.org/10.58258/jime.v7i4.2385>
- Joyce, B., Weil, M., & Calhoun, E. (2002). *Models of Teaching* (6th ed.). Boston: Allyn and Bacon.

Kamal, K. (2020). Pengembangan Media Pembelajaran Berbasis Buku Elektronik pada Materi Sistem Imun. [Skripsi, Institut Agama Islam Negeri Pare].

Kustandi, C., & Darmawan, D. (2020). Pengembangan Media Pembelajaran: Konsep & Aplikasi Pengembangan Media Pembelajaran bagi Pendidik di Sekolah dan Masyarakat. Jakarta: ex.php/islamika Prenada Media/Kencana.

Lestari, A. B. (2022). Pengembangan Media Pembelajaran Lembar Kerja Peserta Didik Elektronik (E-Lkpd) Berbasis Web Liveworksheet Di SMAN 5 Metro. Seminar Nasional Pendidikan Ekonomi, 11(1), 39-50.

Mahmudatusaadah, A. (2017). Pendekatan Inkuiri-Kontekstual Berbasis Teknologi Informasi Untuk Meningkatkan Keterampilan Berfikir Kritis Mahasiswa. *Innovation of Vocational Technology Education*, 7(2), 115–127. <https://doi.org/10.17509/invotec.v7i2.6288>

Majid, A. (2005). Perencanaan pembelajaran: Mengembangkan standar kompetensi guru. Bandung: Remaja Rosdakarya.

Mentari. (2018). E-book sebagai media pembelajaran digital interaktif. Jakarta: Penerbit Mentari Edukasi.

Mispa, R., Prahata Putra, A., & Zaini, M. (2022). Penggunaan E Lkpd Berbasis Live Worksheet pada Konsep Protista terhadap Hasil Belajar Peserta Didik Kelas X Sman 7 Banjarmasin. *Jurnal Pendidikan Indonesia*, 3(01), 1-12. <https://doi.org/10.59141/japendi.v3i01.478>

Nurillahwaty, E. (2021). Peran Teknologi dalam Dunia Pendidikan. *Jurnal Keislaman Dan Ilmu Pendidikan*, 3(1), 123-133. <https://ejournal.stitpn.ac.id/ind>

Nurlina, A. (2017). Keefektifan Model Pembelajaran CTL (Contextual Teaching and

Learning) Terhadap Penalaran Matematika pada Materi Komposisi Fungsi dan Invers Fungsi pada Siswa Kelas XI SMA Negeri 2 Torgamba. *Jurnal Pembelajaran*, 3 (2)(2), 61–66.

OECD. (2023). PISA 2022 results (Volume I): The state of learning and equity in education. OECD Publishing.

Permatasari, E., Effendi, H., & Azmi, M. (2023). Pengembangan media pembelajaran matematika berbasis Android menggunakan Kodular untuk meningkatkan motivasi dan hasil belajar siswa. *JTAM: Jurnal Teori dan Aplikasi Matematika*, 7(1), 133–145.

Pepriyanti, L., Yunita, L., & Melisa, M. (2023). Pengembangan E Modul Berbasis Android Menggunakan Kodular untuk Meningkatkan Creative Mathematical Thinking Siswa SMP. *Juring (Journal for Research in Mathematics Learning)*, 6(1), 77–86.

Poernomo, E., Kurniawati, L., & Atiqoh, K. S. N. (2021). Studi Literasi Matematis. *ALGORITMA: Journal of Mathematics Education*, 3(1), 83–100. <https://doi.org/10.15408/ajme.v3i1.20479>

Pratama, A., & Wibowo, A. (2021). Comparative Analysis of MIT App Inventor and Kodular for Educational App Development. *Journal of Educational Technology*, 15(2), 45–60.

Pratiwi, A. D. P., Kristiani, & Noviani, L. (2022). The Effectiveness of Using E-Book to Improve Student's Critical Thinking Skill. *International Journal of Multicultural and Multireligious Understanding*, 9(10), 196–201. <http://ijmmu.comhttp://dx.doi.org/10.18415/ijmmu.v9i10.4095>

Purwanto, P. (2015). Pengembang Teknologi Pembelajaran: Kebutuhan Peluang Dan Tantangan Di Indonesia. *Jurnal Teknodik*, 3, 161–172.

<https://doi.org/10.32550/teknodik.v19i2.157>

Puspita, V., & Dewi, I. P. (2021). Efektifitas E-LKPD berbasis Pendekatan Investigasi terhadap Kemampuan Berfikir Kritis Siswa Sekolah Dasar. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 5(1), 86–96. <https://doi.org/10.31004/cendekia.v5i1.456>

Rismen, S., Putri, W., & Jufri, L. H. (2022). Kemampuan Literasi Matematika Ditinjau dari Gaya Belajar. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 6(1), 348–364. <https://doi.org/10.31004/cendekia.v6i1.1093>

Rohmah, M. (2022). Penggunaan Media Google Classroom Berbantu Liveworksheets Untuk Meningkatkan Hasil Belajar Ipa Materi Kemagnetan Siswa Smp. *EDUTECH : Jurnal Inovasi Pendidikan Berbantuan Teknologi*, 2(1), 16–26. <https://doi.org/10.51878/edutec h.v2i1.951>

Sari, Y. P., & Silfianah, I. (2024). E LKPD interaktif berbasis materi laju reaksi. *Jurnal Inovasi Pendidikan Kimia*, 18(1), 1–10. Soeparno. (1987). *Media Pendidikan*. Yogyakarta: Kanisius.

Sudi, W., Jafar, J., Kadir, K., & Salim, S. (2022). Efektivitas Pendekatan Pembelajaran Matematika Realistik Terhadap Literasi Matematika Siswa. *Jurnal Amal Pendidikan*, 3(2), 160. <https://doi.org/10.36709/japend.v3i2.28874>

Sugiyono. (2020). *Metodologi Penelitian Kuantitatif, Kualitatif dan R & D*. Susilawati, T., & Rusdinal. (2022). Pengembangan Media Pembelajaran E-Book Berbasis Blended Learning Tematik Terpadu Di Kelas Iv Sekolah Dasar. *Jurnal Cakrawala*

Pendas, 8(2), 378–387. <https://doi.org/10.31949/jcp.v8i2.2285>

Trilling, B., & Fadel, C. (2009). *21st Century Skills: Learning for Life in Our Times*. San Francisco, CA: Jossey-Bass.

Umbara, U. (2023). *Literasi matematis, ethnomathematics, dan ethnomodelling*. Bandung: Refika Aditama.

Vonna, A. M., Saputra, N. N., & Saleh, H. (2022). Pengembangan Media Pembelajaran Berbasis Kontekstual Lembar Kerja Peserta Didik Elektronik (E – Lkpd) Berbantuan Liveworksheet. *Seminar Nasional Pendidikan Matematika Umt 2022*, 149–157.