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Developing an Interactive E-Book for Teaching World War I and II: A Design-Based Research in an Indonesian Senior High School

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ABSTRACT

This design-based research addresses the scarcity of contextual teaching materials for advanced history classes in Indonesia by developing an interactive e-book on World War I and II. Using the ADDIE model, the study involved needs analysis, design, development, implementation, and evaluation phases at a public high school in Purwokerto. The e-book integrates multimedia, augmented reality, and interactive assessments aligned with the national Independent Curriculum. Validation by subject matter, media, and practitioner experts yielded scores of 100%, 94%, and 98.5%, respectively. Teacher and student responses were highly positive, with satisfaction rates of 100% and 85.65%. Findings indicate that the e-book is a feasible and engaging supplementary resource that supports historical literacy and digital pedagogy in Indonesian classrooms. The study highlights the potential of locally developed digital media to bridge resource gaps and foster critical historical awareness in post-colonial educational contexts.

KEYWORDS
E-book development; History teaching materials; Digital pedagogy; World War history; ADDIE model

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ABSTRAK

Penelitian berbasis desain ini mengatasi kelangkaan bahan ajar kontekstual untuk kelas sejarah lanjutan di Indonesia dengan mengembangkan e-book interaktif tentang Perang Dunia I dan II. Menggunakan model ADDIE, penelitian melibatkan fase analisis kebutuhan, desain, pengembangan, implementasi, dan evaluasi di sebuah SMA negeri di Purwokerto. E-book ini mengintegrasikan multimedia, augmented reality, dan penilaian interaktif yang selaras dengan Kurikulum Merdeka nasional. Validasi oleh ahli materi, media, dan praktisi menghasilkan skor masing-masing 100%, 94%, dan 98,5%. Tanggapan guru dan siswa sangat positif, dengan tingkat kepuasan 100% dan 85,65%. Temuan menunjukkan bahwa e-book ini merupakan sumber daya suplemen yang layak dan menarik, mendukung literasi sejarah dan pedagogi digital di kelas Indonesia. Kajian ini menyoroti potensi media digital yang dikembangkan lokal untuk menjembatani kesenjangan sumber daya dan menumbuhkan kesadaran sejarah kritis dalam konteks pendidikan pascakolonial.

KATA KUNCI
Pengembangan e-book; Materi pengajaran sejarah; Pedagogi digital; Sejarah Perang Dunia; Model ADDIE

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Introduction

The world is currently entering the era of the Industrial Revolution 4.0, a period of profound transformation in production where technology and machinery replace human and animal labor, driving increased efficiency and significant socio-economic change. Digital technological advancements have rendered traditional boundaries obsolete, with progress and innovation becoming fundamental forces reshaping all facets of life(Bonfield et al., 2020; Rospigliosi, 2020). This sweeping change impacts diverse fields, from science and socio-culture to economics and education. Within this rapid technological evolution, history education holds a strategic role that cannot be overlooked. Although history is synonymous with the study of the past, the values and lessons it contains remain critically relevant for addressing contemporary and future challenges. In an era defined by digitalization, automation, and globalization, history learning serves as a crucial counterbalance, ensuring students become not only technologically proficient but also historically conscious, nationally aware, and morally grounded individuals.

The role of history education in the Industrial Revolution 4.0 is multifaceted. First, it is instrumental in instilling national and cultural values amidst a globalizing current that can erode national identity. History shapes a collective awareness of national struggle, unifying principles, and the importance of preserving diversity. Second, history serves as a medium for strengthening character education, as it is replete with moral values such as honesty, responsibility, tolerance, and courage. This aligns with AlMalki & Durugbo, 2023; McGrath et al., 2022), who states that one strategy to face the challenges of the Industrial Revolution 4.0 is to revitalize the learning system by integrating character education into the curriculum. This underscores that strengthening student character must be an educational priority, and history is a subject with strong potential in character formation. Third, history education contributes significantly to developing critical and reflective thinking skills, essential competencies for navigating the complexities of this new industrial era.

In the 21st century, the demand for quality human resources requires educational institutions to produce excellent outcomes. As noted by Abricot et al., 2022 and Hlungwani (2022), educational institutions must adapt to change and provide relevant learning programs and skill development to meet evolving educational challenges. The education system is thus tasked not only with cultivating intellectual intelligence but also with fostering strong character and adaptability. In this context, as previously explained, strengthening character education becomes an urgent necessity that must be comprehensively integrated into the school learning process. It should not be treated as an add-on but as an inseparable part of content, process, and learning objectives.

Through history learning, students are guided not merely to understand past chronologies and facts but to reflect on the noble values within historical events and apply them to contemporary life. Studying World War I and II, for instance, teaches not only the events themselves but also their multifaceted impacts, enabling students to comprehend chronological narratives and discern cause-and-effect relationships across time (Popa, 2023; Thorp & Persson, 2020). These events also offer invaluable lessons on the importance of peace, the destructive consequences of conflict and violence, and universal humanitarian values. However, practical learning, particularly concerning

World War I and II material, faces empirical challenges. Purnomo et al., (2024) identify low student interest in history as a primary obstacle, often stemming from a lack of student engagement and perceived irrelevance. A key issue is the underutilization of technology by teachers in delivering content, with material often presented conventionally through lectures without adequate digital or audiovisual support. This approach leads to less engaging, non-contextual, and rote-based learning, which also hampers the effective conveyance of the critical values embedded in these historical events (Malysheva et al., 2022).

A viable solution to these challenges lies in adopting more innovative learning approaches, particularly leveraging digital technology. Technology-based learning, such as e-learning, blended learning, and interactive applications, allows flexible and independent access to information, enriching the learning experience and fostering deeper engagement (Chiu, 2021; Müller & Mildenberger, 2021). This is further mandated by legislation and supported by educational theory. Law Number 14 of 2005 concerning Teachers and Lecturers obligates educators to utilize information and communication technology (ICT) for educational purposes, while Nguyen et al. (2022) and Runge et al. (2023) affirm that technology utilization significantly aids teachers in managing teaching and learning activities. Therefore, to ensure education keeps pace with scientific and technological (IPTEK) advancement, a revitalization of teaching processes is necessary.

The teacher's role in this educational process is diverse, extending beyond content delivery to that of coach, mentor, and facilitator (Borremans & Spilt, 2023; Ramey & Stevens, 2023). A conducive learning environment encompasses pedagogical approaches and supporting technologies. Meaningful learning occurs through harmonious and sustained interaction between teachers and students—a process (Kirschner et al., 2024; Sawyer, 2022) defines as cooperation in utilizing all existing potentials. The core components of this process are the interactions between teacher, student, and teaching materials (van Dulmen et al., 2023; Zeinstra et al., 2023). Teaching materials, as systematically designed media, are thus vital for facilitating this interaction and achieving desired competencies, highlighting their indispensable role in effective pedagogy.

Research Questions

1. To what extent does the interactive e-book effectively enhance student engagement and historical understanding compared to conventional textbooks, as evidenced by the positive teacher and student response rates?
2. How does the developed e-book address the specific gap between the pedagogical demands of the Independent Curriculum and the limitations of existing 2013 Curriculum teaching materials in advanced history classes?
3. What are the primary practical challenges—such as infrastructure, digital literacy, or access—identified during implementation that may affect the scalability and sustained use of this digital teaching material in similar educational contexts?

Theoretical Framework

This research is grounded in an interconnected theoretical framework that bridges educational technology, pedagogy, and history education. The development and evaluation

of the interactive E-book on World War I and II are primarily situated within the Constructivist Learning Theory, particularly its emphasis on active knowledge construction. This paradigm posits that learners build understanding through experiences and reflection, rather than passively receiving information (Banihashem et al., 2022; Ugwuozor, 2020). The E-book's design, featuring exploratory activities, multimedia stimuli, and reflective tasks, creates an environment where students actively engage with historical evidence, formulate connections, and construct personal meaning from the complex narratives of the World Wars, moving beyond rote memorization towards deeper comprehension.

To effectively integrate technology within this constructivist approach, the study employs the Technological Pedagogical Content Knowledge (TPACK) framework. TPACK emphasizes the necessary intersection of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) for successful technology-enhanced learning (Chaipidech et al., 2022; Lachner et al., 2021) , as implied in the focus on integration). The development process consciously addressed this intersection: deep historical content knowledge of the wars informed the material; pedagogical knowledge of differentiated learning and student engagement shaped the interactive activities; and technological knowledge guided the use of platforms like Canva and Heyzine to create a functional digital product. This synthesis ensures the E-book is not merely a digital repository but a pedagogically sound tool.

Furthermore, the research draws upon theories of Digital Literacy and New Literacies in history education. In the 21st century, historical literacy extends beyond reading texts to include the critical consumption and production of digital media (Churchill, 2020; Mavrommati & Repoussi, 2020). The E-book serves as both a medium for learning history and an object through which students develop digital competencies. By navigating its hyperlinked structure, evaluating embedded multimedia sources, and potentially creating digital outputs, students engage in the multimodal practices essential for participating in a digitally mediated society, thus aligning historical pedagogy with contemporary literacy demands.

Central to the historical discipline is the concept of Historical Thinking, which involves skills such as sourcing, contextualization, and corroboration (Goulding, 2021; Luís & Rapanta, 2020). The E-book's design aims to foster these competencies. Activities that require analyzing primary source images, understanding events within their global and local contexts (e.g., the impact on Indonesia), and comparing perspectives are structured to move students from learning *what* happened to critically examining *how* we know what happened. This approach transforms history from a static story into an interpretive process, cultivating critical thinkers rather than passive recipients of a singular narrative.

Methodologically, the study is guided by Research and Development (R&D) theory, specifically the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). This systematic instructional design framework provides a structured, iterative process for creating effective educational interventions (Dick et al., 2022; Guitert et al., 2020). Each phase—from initial needs analysis to final evaluation—was informed by theoretical considerations, ensuring the product was theoretically grounded, user-centered, and empirically validated through expert review and field testing, thereby enhancing its validity and practical utility.

In the end, the entire endeavor is contextualized within the policy and philosophy of the Independent Curriculum (Kurikulum Merdeka). This curriculum's theoretical

underpinnings stress flexibility, differentiation, and the development of student character and competencies (Mulyasa, 2023). The E-book's development is a direct response to this policy shift, operationalizing its principles by offering a flexible resource that supports project-based learning, caters to diverse learning paces, and integrates the reinforcement of the Pancasila Student Profile through historical reflection. Thus, the framework positions this digital teaching material as a concrete instrument for enacting contemporary curricular reforms in the history classroom.

Method

Research Design and Development Model

This study employed a Research and Development (R&D) design. The primary objective was to develop and evaluate the feasibility of a specific product—a digital book (E-book) for teaching World War I and II history to Class XI students at SMA Negeri 4 Purwokerto. This method is characterized by a longitudinal, phased approach, starting with a needs analysis and culminating in product effectiveness testing. Although more common in the natural sciences and engineering, R&D is highly applicable in social sciences like education, particularly for creating tangible educational tools and materials (McKenney & Reeves, 2019; Philippakos & Reinking, 2021).

The development process was guided by the ADDIE instructional design model, which consists of five systematic and iterative stages: Analysis, Design, Development, Implementation, and Evaluation (Larson et al., 2020; Yu et al., 2021). This model was selected for its effectiveness and efficiency in educational product development, including teaching materials, strategies, and methods (Daryanes et al., 2023; Keating et al., 2022). Its structured, interconnected phases ensure the final product is aligned with learner needs and learning objectives while allowing for continuous identification and revision of shortcomings throughout the development cycle.

Research Procedure: The ADDIE Stages

The research procedure followed the five stages of the ADDIE model, as illustrated in the accompanying schematic. This initial stage involved a comprehensive analysis to establish the foundation for development. The researcher identified learning objectives and competency indicators based on the national Independent Curriculum (*Kurikulum Merdeka*). The analysis ensured the E-book would support comprehensive understanding of World War I and II—including causes, events, consequences, and global implications—and foster broader values like peace and diplomacy. The design aimed to address cognitive (understanding concepts), affective (instilling historical awareness), and psychomotor (developing critical thinking skills) learning domains (Bartelds et al., 2020; López-Fernández et al., 2023).

This phase began with identifying existing resource gaps. An interview with the history teacher revealed a shortage of teaching materials, particularly the absence of dedicated digital resources for the Advanced History subject. The teacher expressed a need for interactive digital materials to address quantity limitations and enhance student engagement.

The researcher observed Class XI students to assess their learning capacity and skills. This focused on their ability to comprehend text and visual materials and their proficiency in using technology for learning (Forsyth, 2023; Tilak et al., 2023). Identifying potential challenges, such as varying levels of digital literacy, informed the design of supportive features like user guides within the E-book to maximize learning outcomes (Marczyk et al., 2022; Wegman, 2023).

In this stage, the blueprint for the E-book was created. The design was tailored to the cognitive level, interests, and technological aptitude of Class XI students. The strategy emphasized active learning through interactive multimedia content (images, videos), independent exercises, and quizzes. A Problem-Based Learning approach was integrated to encourage analysis of key historical case studies. Assessment methods, including formative tests and learning reflections, were designed to allow students to self-evaluate and enable the researcher to measure competency achievement (Barnes & Fives, 2020; Brookhart & McMillan, 2020).

This stage involved translating the design specifications into a tangible prototype and then a finished product (Hrastinski, 2023; Macdiarmid et al., 2021). Activities included:

1. Collecting and compiling accurate reference materials from books, journals, and digital documents.
2. Selecting and arranging visual components (illustrations, images).
3. Typing content and designing an attractive, readable layout (fonts, colors, page composition).
4. Developing evaluation instruments (practice questions and quizzes).
5. Conducting validation by subject matter experts, media experts, and practitioners, followed by revisions based on their feedback.
6. Optimizing the E-book format for easy access across various digital devices. Validation is a critical component of development, serving as the basis for evaluating the product's quality and alignment with stated objectives (Reis et al., 2022; Wang et al., 2022).

The developed E-book was implemented in a real classroom setting for a limited trial. The trial was conducted with 36 students from Class XI Mandiri 1 on April 22, 2025. A small-scale implementation was chosen due to time and resource constraints, allowing the researcher to assess feasibility and identify potential technical or practical issues before broader application (Bell & Barr, 2024; Chin et al., 2024)).

The final stage involved a summative evaluation of the product based on feedback from the trial. Data from expert validators, student response questionnaires, and teacher response questionnaires were analyzed on April 28, 2023. The evaluation aimed to: 1) observe the learning process using the E-book; 2) identify achievements and shortcomings; and 3) gather information to improve the quality of teaching and learning (Bartelds et al., 2023; Wilke et al., 2022). This assessment determined the overall feasibility and effectiveness of the E-book as a teaching resource.

Trial Subjects

The product trial subjects were 36 students from Class XI Mandiri 1 at SMA Negeri 4 Purwokerto. The trial procedure involved a pre-test to gauge initial understanding, a presentation and guided use of the E-book, followed by learning activities from the E-book, a

post-test to measure learning gains, and finally, the administration of student and teacher response questionnaires.

Data Types, Sources, and Collection Techniques

The research utilized both qualitative and quantitative data.

1. Qualitative Data: Obtained from interviews, observations, and descriptive comments/suggestions from validators (subject matter expert, media expert, and practitioner teacher).
2. Quantitative Data: Obtained from scored questionnaires (using a Likert scale) completed by the validators, the teacher, and the students.

Data collection techniques included:

1. Interviews: Structured and unstructured interviews were conducted with the history teacher (August 29, 2024) and two students (September 14, 2024) during the Analysis stage to identify foundational needs (Flick, 2023).
2. Literature Study: Conducted during the Design and Development stages to gather theoretical guidance and reference materials for the E-book content and structure (McGregor et al., 2021; Skårås, 2021). Key sources included textbooks on the World Wars, curriculum modules, and the school's teaching modules.
3. Questionnaires: Used during Implementation and Evaluation. Different questionnaires were deployed: needs analysis questionnaire (initial), validation questionnaires for subject matter experts, media experts, and practitioners, and response questionnaires for teachers and students (post-trial).

Validation and response instruments were developed based on criteria for learning media assessment covering material and media aspects(Mayer & Fiorella, 2022; Morrison et al., 2019). Detailed grids specifying aspects, descriptors, and question types were created for the validation of material, media, and practical use, as well as for teacher and student responses.

Data Analysis Technique

Data analysis involved both qualitative and quantitative methods.

1. Quantitative Analysis: Questionnaire data from the Likert scale (1-4 for validation; 1-4 for responses) were analyzed using descriptive statistics. The percentage score was calculated using the formula: (Obtained Score / Maximum Score) * 100%. Validation Data: Percentage scores from expert validators were categorized into feasibility levels using predetermined intervals (see Tables 8 & 9). A score between 81.25% - 100% was classified as "Highly Feasible." Trial Response Data: Scores from teacher and student response questionnaires were similarly calculated and categorized (Table 11) to determine product acceptability.
2. Qualitative Analysis: Descriptive feedback and suggestions from validators and open-ended responses were analyzed thematically to inform revisions and interpret the quantitative findings.

Results

Needs Assessment for Teaching Materials on World War I and II in Class XI History at SMA Negeri 4 Purwokerto

This study, aimed at developing an E-book for teaching World War I and II history, was conducted at SMA Negeri 4 Purwokerto. The research process initiated with an observational phase to pinpoint existing challenges within the school context. An initial observation on September 30, 2024, gathered foundational data through interviews with history teachers and students. To further enrich the understanding of the contextual background, a student needs questionnaire was administered via Google Forms on February 2, 2023. Insights derived from both observation and the questionnaire informed the subsequent instructional design, which was structured around the systematic ADDIE model encompassing the stages of Analyze, Design, Development, Implementation, and Evaluation.

The initial Analyze phase involved a comprehensive needs assessment, drawing on data from 36 students in Class XI Mandiri 1 and one history teacher. This assessment was organized into four analytical domains: curriculum, users, learning facilities, and existing teaching materials.

Curricular analysis entails evaluating a curriculum to gauge its efficacy, pinpoint strengths and deficiencies, and devise enhancement strategies. Within the national Independent Curriculum (*Kurikulum Merdeka*), World War I and II constitute essential subject matter in the Advanced History course, positioned alongside other pivotal themes such as major world civilizations, influential ideologies, significant global revolutions, the Cold War, and contemporary international events. Questionnaire data pertaining to curricular alignment revealed that 66.7% of students (24 individuals) agreed and 33.3% (12 individuals) strongly agreed with the statement, "Through history learning, I understand world developments, including World War I and II." This consensus underscores the perceived role of history education in fostering students' comprehension of global dynamics, particularly seminal events like the World Wars, thereby aligning with the intended learning outcomes of the Advanced History curriculum.

User analysis focuses on identifying the requirements, expectations, and preferences of the end-users—students and teachers—regarding the educational product. Questionnaire responses yielded significant insights into user tendencies. Concerning the statement, "I prefer learning history using digital media compared to conventional methods," 38.9% of students (14) strongly agreed, 50% (18) agreed, and 11.1% (4) disagreed. This indicates a predominant student preference for digital media in history education, reflecting an expectation for technological integration in contemporary pedagogy. Teacher interviews corroborated this trend, revealing participation in In-House Training (IHT) programs aimed at enhancing technology-aligned instructional competencies.

Furthermore, an overwhelming majority of students expressed a need for accessible teaching materials. In response to the statement, "I need history teaching materials that can be accessed anytime and anywhere," 25% (9 students) strongly agreed and 75% (27 students) agreed. Interviews clarified that this need stems from the limited availability of

physical textbooks, which are insufficient in number for individual student ownership and must remain on school premises. Consequently, digital books or E-books were identified as a practical solution to overcome this accessibility barrier.

The practicality of digital formats was also affirmed. Regarding the statement, "I find it more practical if teaching materials are available in digital book form," 13.9% (5 students) strongly agreed, 72.2% (26) agreed, and 13.9% (5) disagreed. Students acknowledged the advantages of digital books, including flexibility, omnipresent accessibility, elimination of physical storage needs, and greater durability compared to traditional printed books, which are prone to damage and obsolescence.

Adequate learning facilities are a critical external factor supporting educational outcomes. SMA Negeri 4 Purwokerto is equipped with generally sufficient infrastructure. Data from the odd semester of the 2024/2025 academic year indicates the school operates 30 classrooms, two library rooms, and eight laboratory rooms that support practical learning, primarily for the sciences. However, a notable gap is the absence of dedicated practicum rooms for subjects like history or geography that require exploratory, non-laboratory spaces. The school also provides two rooms for teachers and administration and ten rooms for guidance and counseling services, deemed adequate for operational and student support functions.

An evaluation of currently employed resources revealed a significant discrepancy. While national policy mandates the implementation of the Independent Curriculum, history instruction at the school still relies on textbooks from the 2013 Curriculum. This creates a misalignment, as the 2013 Curriculum materials tend to be dense, linear, and teacher-centered, contrary to the Independent Curriculum's emphasis on differentiated, project-based, and student-centric learning aimed at strengthening the Pancasila Student Profile.

In response to this resource gap, teachers have independently developed supplementary presentation materials using PowerPoint, drawing from textbooks and online sources. Although this demonstrates initiative, the quality and curricular alignment of these self-developed materials are inconsistent due to the lack of a standardized framework and guidance. This situation, coupled with unequal student access to both physical and digital resources, risks creating disparities in learning experiences and outcomes, highlighting the urgency for a purpose-built, high-quality digital teaching material aligned with the current curriculum.

Further investigation into the specific context of Class XI revealed that the History subject is divided into Indonesian History and Advanced History. For the Advanced History course, teachers resort to using the outdated 2013 Curriculum advanced history textbook due to the unavailability of an official government-issued textbook for the new curriculum. The selected topic for this development, World War I and II, was identified as particularly challenging. Teachers noted the material's density and complexity necessitate supportive instructional media, while students reported finding the content difficult to comprehend, often leading to disengagement.

Interviews with students confirmed they possess a basic understanding but struggle with the volume and integration of information, describing the material as "excessive and hard to remember" and sometimes "causing confusion." Classroom observations noted that even in well-structured lessons, students faced difficulties interpreting visual aids like historical illustrations. These findings collectively pointed to a need for teaching materials that are not only aligned with the current curriculum but also designed to reduce cognitive load through integrated visual-textual presentation, interactive elements, and flexible digital access. The proposed solution was a dedicated E-book that could provide structured, engaging, and accessible content on World Wars I and II.

Development of the E-book Teaching Material

Guided by the ADDIE model, the development process proceeded to the Design and Development stages. The E-book was conceived as a comprehensive digital resource integrating text, images, video, and interactive components to facilitate a cohesive learning experience on World War I and II for Class XI students.

The design phase involved gathering references for digital book layouts and selecting appropriate multimedia components. The final media mix included core textual material, instructional videos, Augmented Reality (AR) experiences, student activity sheets, and evaluative assessments. A detailed blueprint was created to map out the E-book's structure and pedagogical flow.

The subsequent development phase involved creating a prototype and then the full E-book product using digital design tools. The final E-book was structured into several key sections:

1. A front cover displaying the title and target audience.
2. Standard publishing information (identity) and a preface outlining the E-book's purpose.
3. A section explaining the rationale for digitizing history teaching materials and clear instructions for use.
4. A navigational table of contents and list of included visuals.
5. A conceptual map linking key ideas, along with official Learning Outcomes (*Capaian Pembelajaran*) and specific Learning Objectives (*Tujuan Pembelajaran*) aligned with national standards.
6. The core instructional content, systematically divided into sub-chapters covering the background, events, consequences, and global impact of both World Wars, including their specific influence on Indonesia. This section incorporates trigger videos and illustrative visuals.
7. Interactive student activities, including group tasks analyzing historical figures and war impacts, and an experiential learning component using Augmented Reality (AR) to explore 3D models of wartime objects.
8. A concise summary of key points, a reflective exercise for students, and a set of evaluative questions to gauge understanding.
9. A bibliography of sourced material and a brief biography of the compiler.
10. A simple back cover.

The completed E-book was then converted into an interactive flipbook format, enabling features like clickable navigation and embedded video playback.

To ensure quality and appropriateness, the E-book underwent a rigorous two-stage validation process by three distinct experts: a subject matter specialist, a media design specialist, and a practicing teacher (practitioner).

The subject matter expert, a university lecturer specializing in World War history, provided an initial feasibility rating of 75%. Recommendations included refining contextual accuracy, simplifying complex diction, and expanding content on technological advancements stemming from the wars. After implementing these revisions—such as adding a section on wartime technological developments in weaponry, medicine, and transportation—the second validation achieved a perfect score of 100%.

The media design expert, a lecturer in instructional media, gave an initial rating of 80%. Feedback highlighted needed improvements in the functionality of the evaluation section, the layout of sub-chapters, and the sizing of images for optimal readability. Revisions involved integrating an external Google Form for seamless evaluation submission and adjusting the design layout and graphic scales. These amendments elevated the second validation score to 94%.

The practitioner expert, the collaborating history teacher, awarded a high initial rating of 91.18%. Suggestions for enhancement included adding a specific learning objective concerning the wars' impact on Indonesia, correcting a minor typographical error, and optimizing group activity sizes to between 3-5 members for effectiveness. Upon addressing these points, the final validation score rose to 98.53%.

The consistent and significant improvement in scores across all validation stages confirmed the E-book's enhanced quality, pedagogical soundness, and readiness for classroom implementation.

Implementation and Feasibility Assessment

The Implementation stage involved a trial of the E-book with 36 students from Class XI Mandiri 1 on April 22, 2025. Following an orientation to the learning objectives and E-book navigation, students used the resource in groups during their history lesson. Subsequently, feedback was collected via structured questionnaires from both the participating teacher and the students.

The teacher's questionnaire comprised ten statements assessing the E-book's utility. The teacher responded with "Strongly Agree" to every item, resulting in a 100% positive response rate. The feedback affirmed that the E-book effectively aided student comprehension, was well-structured, contained supportive visuals, enhanced teaching efficiency, increased student motivation, included appropriate evaluations, was easily accessible, provided accurate references, was technologically innovative, and was overall a worthy teaching resource.

The student questionnaire, consisting of eighteen statements across various indicators, also yielded highly positive results, with an average agreement rate of 85.65%. Overwhelming majorities of students agreed or strongly agreed on the E-book's visual appeal

(97.2%), legibility and layout (100%), clarity of learning goals (100%), alignment of content with objectives (100%), comprehensibility of material (97.2%), quality and helpfulness of multimedia (100%), usefulness of evaluations (100%), clarity of instructions (100%), compatibility with school facilities (97.2%), effectiveness compared to print books (100%), accessibility (97.2%), proper language use (100%), appropriate terminology (100%), and overall suitability as a teaching material (100%).

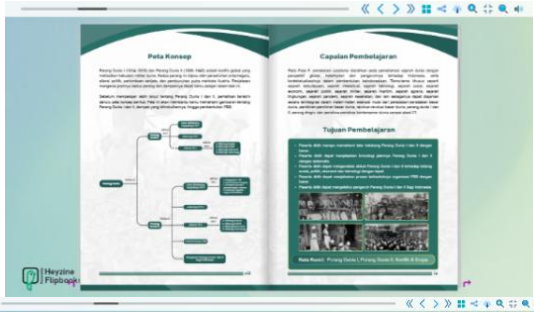
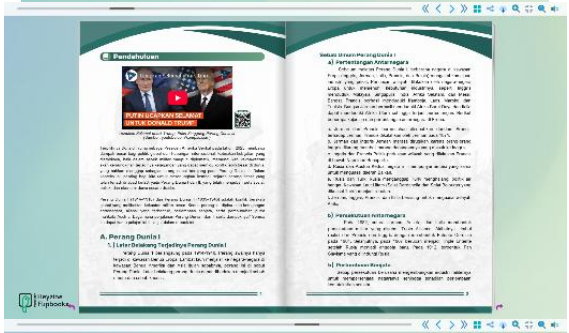
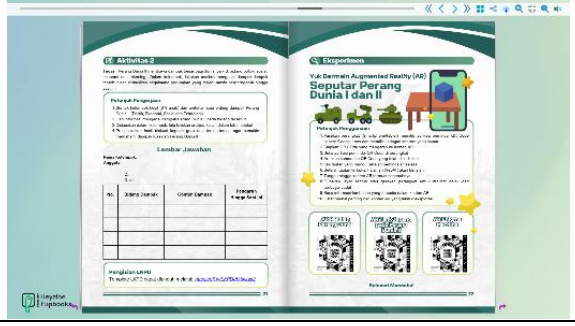
Isolated dissenting opinions were minimal. A single student each expressed disagreement regarding the cover's attractiveness, the material's ease of understanding, and the ease of access. One student strongly disagreed concerning the E-book's compatibility with school facilities like Wi-Fi. These isolated points suggest potential areas for minor refinement in future iterations, such as visual design tweaks, further simplification of certain textual passages, and ensuring robust compatibility with various devices and network conditions.

The final Evaluation stage of the ADDIE model synthesized all feedback and observational data. The analysis confirmed the high feasibility and positive reception of the E-book while acknowledging the minor areas for improvement noted above. Final revisions were made to polish the visual design, streamline content for maximum clarity, and simplify language where necessary.

The conclusive output of this design-based research is a validated, fully developed interactive E-book on World War I and II. This digital teaching material is systematically structured, pedagogically aligned with the national Independent Curriculum, enriched with multimedia and interactive components, and has demonstrated high levels of acceptability and perceived usefulness among both educators and learners at SMA Negeri 4 Purwokerto. It stands as a viable and engaging supplementary resource designed to bridge pedagogical gaps and foster critical historical awareness in the post-colonial Indonesian classroom context.

Table 1. Final Product

No	Sections	E-book display
1	Cover	
2	Book Identity and Foreword	

3	Foreword	
4	Table of Contents and List of Figures	
5	Concept Map, Learning Outcomes, and Learning Objectives	
6	Learning Materials and Student Activities	
7	Activity and Experiment Display	

8	Bibliography and Author's Identity	
9	Back Cover	

Discussion

The development and implementation of this interactive E-book for teaching World War I and II within the Independent Curriculum framework present several critical points for discussion regarding digital pedagogy, historical literacy, curriculum implementation, and teacher readiness in the Indonesian context.

Firstly, the shift towards the Independent Curriculum, which emphasizes differentiated learning and the Pancasila Student Profile, necessitates innovative teaching materials that move beyond conventional textbooks (Mulyasa, 2023). The existing reliance on 2013 Curriculum textbooks, as identified in the needs analysis, creates a pedagogical gap. These older resources often present history in a linear, teacher-centered manner, conflicting with the curriculum's call for student-centric and project-based approaches (Claravall & Irey, 2022; Neumann, 2021). The developed E-book directly addresses this by structuring complex historical narratives into interactive, multimedia modules that facilitate independent and group exploration, aligning with the curriculum's adaptive learning principles (McLaren, 2023; Walldén & Larsson, 2021). This demonstrates how locally developed digital media can serve as a crucial bridge, translating national curricular mandates into tangible classroom resources, thereby supporting a more effective transition from policy to practice (Halvorsen et al., 2021; Suh et al., 2021).

Secondly, the positive student response, particularly their preference for digital and accessible materials, underscores a significant shift in learner expectations and characteristics in the digital age. Students' difficulties with dense textual material and their need for visual supports highlight the limitations of traditional pedagogical methods for a generation of digital natives (Adriaansen, 2020; November et al., 2021). The E-book's integration of videos, Augmented Reality (AR), and interactive assessments caters to these multimodal learning preferences, potentially increasing engagement and reducing cognitive load. This aligns with constructivist theories, where tools like interactive E-books can create immersive environments that allow students to actively construct historical understanding rather than passively receive information (Patterson et al., 2022; Thees et al., 2020). Therefore, the product is not merely a digitized textbook but a response to the

evolving epistemic needs of 21st-century learners, fostering digital literacy alongside historical thinking skills (McGrew, 2022; van der Eem et al., 2023).

Thirdly, the role of the E-book in fostering deeper historical awareness and critical thinking warrants examination. Learning about global conflicts like the World Wars requires students to navigate cause-and-effect relationships, multiple perspectives, and long-term consequences (Abbey & Wansink, 2022; Sendur et al., 2021). The E-book's design, which includes analytical activities, reflective questions, and material on the wars' impact on Indonesia, encourages students to move beyond memorization. It prompts them to connect global events to local and national historical narratives, fostering the "global historical awareness" emphasized by (Kim, 2021; Mansfield, 2023). By framing history as an interconnected web rather than an isolated chronology, such resources can help cultivate the critical and reflective competencies central to the Pancasila Student Profile, such as critical reasoning and global diversity (Santiago & Dozono, 2022; Warikandwa et al., 2023). This positions the E-book as a tool for character building through historical contextualization.

Fourthly, the rigorous validation process involving subject matter, media, and practitioner experts highlights the importance of a multi-faceted approach to educational design. The iterative revisions based on expert feedback were crucial for ensuring content accuracy, pedagogical soundness, and practical usability (Taylor et al., 2022; Tsai & Chou, 2023). The high final validation scores (100%, 94%, 98.5%) indicate that the product meets established standards for quality teaching materials. This process mirrors the systematic design principles of models like ADDIE, which emphasize evaluation and revision as keys to effectiveness (Brown & Green, 2024; Dick, Carey, & Carey, 2001). The practitioner's input, in particular, ensured the E-book's feasibility in real classroom settings, addressing logistical concerns like group size and alignment with specific learning objectives (Martinelle, 2020). This collaborative validation model serves as a best-practice example for developing contextually relevant educational technology.

Fifthly, the study reveals both the potential and the challenges of integrating digital tools in Indonesian classrooms. While the E-book was highly rated, the needs analysis identified infrastructural and skill-based constraints. Although SMA Negeri 4 Purwokerto has adequate basic facilities, the absence of dedicated practicum rooms and variable internet access point to systemic challenges (Jones & Piper, 2024; Martell, 2022). Furthermore, the teacher's proactive upskilling through In-House Training reflects the ongoing need for professional development to empower educators as effective facilitators of digital learning (Cinnamon et al., 2021; Rantala & Khawaja, 2021). The success of such innovations is therefore contingent not only on the quality of the digital resource itself but also on sustained investment in school infrastructure and comprehensive teacher training programs that build technological pedagogical content knowledge (TPACK).

Finally, this research contributes to the discourse on decolonizing educational resources and promoting local content development. By creating a tailored E-book that connects World History to the Indonesian experience, the study moves away from sole dependence on potentially foreign or nationally generic textbooks. It empowers local teachers and researchers to produce materials that resonate with their students' contexts, a principle supported by advocates for localized history education (Grimshaw & Mates, 2022; Lidher et al., 2024; Rodríguez et al., 2023). The E-book format also offers

sustainable and scalable distribution, overcoming the physical limitations and high costs associated with printed book publishing. As such, this development model can inspire similar initiatives for other complex historical topics, fostering a richer, more diverse, and more accessible ecosystem of learning resources that support the ambitious goals of the Independent Curriculum in diverse educational settings across Indonesia.

Conclusion

This study successfully developed and implemented an interactive E-book for teaching World War I and II within the Advanced History curriculum at SMA Negeri 4 Purwokerto. Utilizing the systematic ADDIE model, the research progressed from a comprehensive needs analysis to a final evaluated product. The E-book was explicitly designed to address critical gaps, including the misalignment between available 2013 Curriculum textbooks and the demands of the new Independent Curriculum, limited student access to physical materials, and the need for more engaging, multimodal learning resources. Validation by subject matter, media, and practitioner experts yielded exceptionally high scores of 100%, 94%, and 98.5% respectively, confirming the product's content accuracy, design quality, and pedagogical feasibility. Furthermore, implementation trials resulted in highly positive responses from both the teacher (100% satisfaction) and students (85.65% satisfaction), indicating that the E-book is an effective, appealing, and viable digital teaching material that supports historical literacy and aligns with modern digital pedagogy.

The findings of this research carry both practical and theoretical implications. Practically, the validated E-book serves as a ready-to-use, high-quality teaching resource that can be directly adopted by history teachers at SMA Negeri 4 Purwokerto and similar schools, facilitating the transition to the Independent Curriculum. It provides a concrete model for how to integrate technology to create student-centered, interactive learning experiences that foster critical historical thinking. For educational policymakers and curriculum developers, this study demonstrates the urgent need and significant benefit of supporting localized digital content creation to bridge resource gaps and ensure equitable access to curriculum-aligned materials.

Theoretically, this study reinforces the effectiveness of the constructivist and TPACK frameworks in guiding the development of educational technology. It illustrates how digital tools, when pedagogically grounded, can transform history from a subject of passive reception into an active process of inquiry and knowledge construction. The research also contributes to the growing body of knowledge on "digital historical literacy," showing how carefully designed e-books can simultaneously develop students' understanding of history and their competency in navigating digital information.

Despite its positive outcomes, this study acknowledges certain limitations. First, the research was conducted within a single public high school and with one specific class (XI Mandiri 1), involving 36 students and one teacher. Therefore, the generalizability of the findings to other schools with different socio-cultural contexts, student characteristics, or levels of technological infrastructure may be limited. Second, the implementation and evaluation phase was relatively short-term. The study measured initial perceptions and feasibility but did not assess the long-term impact of using the E-book on students' academic achievement, retention of historical knowledge, or development of critical thinking skills over an extended period.

While the E-book was designed for accessibility, the study identified minor technical constraints during implementation, such as dependence on stable internet connectivity and adequate digital devices for optimal use. The research did not fully explore solutions for students with very limited access to technology outside the school environment. Future development could consider lightweight offline versions or alternative deployment strategies to ensure true inclusivity.

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