

Innovative e-book to numeracy skill improvement: The role of flip HTML5 in digital pocket book development

Gida Kadarisma ^{1*}, Jihan Purnama Indah ², Delsyfa Putri Annisa ¹, Nury Ainun Fitria¹, Windriani R¹

¹ IKIP Siliwangi, Jawa Barat, Indonesia

² SMP Pasundan 7 Bandung, Jawa Barat, Indonesia

* Correspondence: gidakadarisma@ikipsiliwangi.ac.id

Received: 27 April 2024 | Revised: 18 May 2024 | Accepted: 5 July 2024 | Published: 1 August 2024

© The Authors 2024

Abstract

This research was prompted by the observed deficiency in numeracy skills among junior high school students. Consequently, the study aims to develop digital teaching materials utilizing Flip HTML 5 to enhance these skills. The research method employed is research and development (R&D) using the 4D model: Define, Design, Develop, and Disseminate. The instruments used in this study include expert validity sheets, student response questionnaires regarding the practicality of the teaching materials, and numeracy test instruments focused on number pattern material. The limited trial involved 8 randomly selected students from a junior high school in West Bandung Regency, while the implementation stage included 26 randomly selected students from the same region. The results indicated that the Flip HTML 5-assisted digital pocketbook teaching materials developed were valid, practical, and effective in improving students' numeracy skills. This study implies that the developed teaching materials can be an alternative for teachers seeking ICT-assisted resources to enhance students' numeracy abilities.

Keywords: digital pocket book, flip HTML 5, numeracy skill, patterns number

Introduction

Mathematics is a crucial branch of science at all educational levels, drawing significant attention from the broader community. This importance is evidenced by mathematics being a foundational competency in 78 countries (Schleicher, 2019). The Programme for International Student Assessment (PISA) focuses on reading literacy, mathematics literacy, and scientific literacy. Mathematics is inherently connected to various everyday contexts, employing numbers

and symbols as part of a scientific approach. Numeracy skills are essential for students, as they are integral to problem-solving in daily life (Fajriyah, 2022; Feriyanto, 2022). These skills extend beyond mere counting; they encompass the ability to apply mathematical concepts to solve real-world problems.

According to the 2022 PISA results, the average mathematics score of Indonesian students has decreased from 379 in 2018 to 366, indicating that their numeracy skills remain significantly lower than those of students in other countries (Sutrimo et al., 2024). This decline aligns with research by Winata et al. (2021), which found that students' literacy and numeracy skills are still suboptimal. Numeracy skills reflect the learning process in schools, where teachers must integrate numeracy concepts with a comprehensive literacy culture gradually (Zuhra & Safarati, 2021).

Numeracy literacy is considered crucial, as highlighted by Sa'adah et al. (2021), Elliott et al. (2021), Grotlüschen et al. (2020), and Vignoles (2016). Numeracy involves the ability to analyze and interpret information using numbers, extending beyond mathematical assessments to evaluating students' application of numerical concepts in real-life situations. Despite its importance, Panglipur and Yana (2023) noted that students' numeracy skills remain relatively low in reality, with middle school students often struggling to solve problems effectively.

Mathematics learning for junior high school students typically involves repetitive practice questions, leading to boredom and a lack of conceptual understanding (Wulandari, 2020). Many students focus solely on numerical values without considering the signs and fail to carefully read word problems and instructions (Fendiyanto et al., 2022). Thus, it is crucial for teachers to innovate learning strategies that cater to students' needs and foster an independent learning environment (Daga, 2021). Furthermore, teachers should focus on the following numeracy literacy indicators for their students, such as ability to use various numbers and symbols to solve practical problems in different everyday contexts, analyze information presented in various forms (graphs, tables, charts, etc.), and interpret the results of analyses to make predictions and draw conclusions (Kemendikbud, 2017).

One effective method to enhance numeracy skills is through teaching materials that relate subject matter to real-life situations. The quality of teaching materials significantly impacts the quality of learning (Kadarisma & Amelia, 2018). Teaching materials are essential tools that support the learning process, and they contain specific and general learning messages for educational purposes (Perwitasari & Wahjoedi, 2018). By innovating teaching materials, teachers can better support students in improving their numeracy skills.

The integration of technology in education is essential in the 21st century, as educational institutions increasingly utilize technological advancements to support learning (Hidayat et al., 2020). One such technological tool is the digital pocketbook. Derived from the English term "pocketbook," this tool serves as teaching material to facilitate students' understanding of content. Research by Yaqin & Rochmawati (2017) highlights the suitability of pocketbooks as learning media, while Sulistyani (2012) demonstrates significant differences in learning outcomes when digital pocketbooks are used compared to traditional methods.

Digital pocketbooks are vital in contemporary education for several reasons. They enhance accessibility and organization by allowing students to access and manage their notes across various devices. These pocketbooks integrate multimedia elements, promoting interactive and engaging learning experiences. They also support real-time collaboration and feedback, contributing to environmental sustainability by reducing paper usage. Features such as data backup, security, and productivity tools make digital pocketbooks essential for efficient and effective learning (Halifah & Suasti, 2023; Yuniarni et al., 2023). Additionally, teachers should ensure that teaching materials are accessible outside of school, allowing students to engage with the content at any time and place, thus facilitating pre-class learning.

Flip HTML 5 is a web-based flipbook application that converts PDF files into interactive flipbooks. By using Flip HTML 5, teachers can design engaging content with multimedia elements, making it more appealing for students. Research by Sugianto et al. (2017), Wu et al. (2022), and Handiar & Zulherman (2023) supports the use of Flip HTML 5 for creating digital e-books accessible from smartphones or laptops, thus facilitating learning both inside and outside the classroom. Furthermore, Safitri (2017) further emphasizes the ease of creating and using flipbooks, leading to better learning outcomes. Teaching materials developed with Flip HTML 5 must be validated to ensure they effectively support students' numeracy achievements (Widiyahti et al., 2015).

Given the above considerations, there is a need for technology-assisted learning resources to enhance numeracy skills among junior high school students, particularly in solving number pattern problems. Innovative solutions, such as digital teaching materials, can improve numeracy skills and students' ability to utilize modern digital technology. Therefore, this research aims to develop a digital pocketbook using Flip HTML 5 that is valid, practical, and effective for enhancing junior high school students' numeracy literacy skills. This digital pocketbook provides an innovative tool for teaching and learning numeracy skills and can serve as a model for other educational content development initiatives.

Methods

The research employs the Research and Development (R&D) method utilizing the 4D model by Thiagarajan, consisting of four stages: definition, design, development, and dissemination (Simatupang et al., 2022), as shown in Figure 1. This study focuses on junior high school students and aims to develop teaching materials using digital pocketbooks with the assistance of Flip HTML 5.

Figure 1 illustrates the 4D research flow, starting with the define stage. According to Hariyanto et al. (2022), this initial stage involves a needs analysis for product development, where developers collect information to determine the necessary scope of development. In this research, the define stage entails conducting a needs analysis by distributing questionnaires to identify the most suitable teaching materials for students.

In the subsequent design stage, researchers select appropriate media, prepare it based on the needs analysis, and design the necessary instruments, including test instruments and validation sheets, to evaluate the media. During the develop stage, an expert assessment is

conducted on the previously designed digital pocketbook, involving both media and material experts. The product is revised according to the experts' input. Following this, a small group trial with 8 students is conducted to assess the product's practicality. Lastly, in the dissemination stage, the validated and practical product is implemented with a larger group of students to evaluate its effectiveness in enhancing numeracy skills.

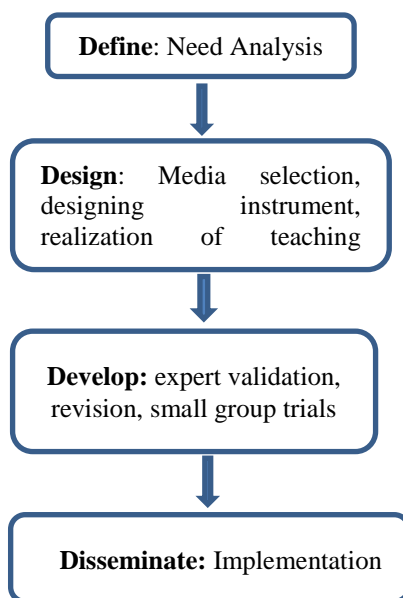
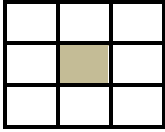
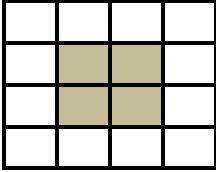
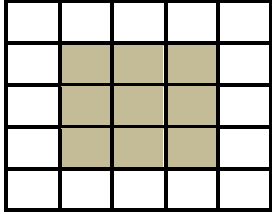


Figure 1. Research Flow

The subjects involved in the implementation stage consisted of 26 randomly selected students from a junior high school in West Bandung Regency. This stage utilized both test and non-test instruments. Test instruments were employed to measure students' numeracy abilities following the implementation of the teaching materials. Concurrently, non-test instruments included validation sheets utilized by media and material experts to validate the teaching materials. Additionally, a student practicality sheet was employed as an instrument for assessing the digital pocketbooks, which students completed after their implementation. Details of the test instruments utilized are summarized in [Table 1](#).

Table 1. Numeracy test instruments

No	Numeracy indicators (Kemendikbud, 2017)	Question items
1	Estimating and calculating with whole numbers	The following is a sequence of integers from smallest to largest: ..., -16, -10, -4, x, 8, 14, 20, ... what is the x value of the sequence ...

No	Numeracy indicators (Kemendikbud, 2017)	Question items
2	Using fractions, decimals, percents and comparisons	Determine the next two terms of the following sequence! $\frac{1}{2}, 1, \frac{3}{2}, 2, \frac{5}{2}, \dots$
3	Recognize and use patterns and relationships	Look at the following image! <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Pattern 1</p>  </div> <div style="text-align: center;"> <p>Pattern 2</p>  </div> <div style="text-align: center;">  </div> </div> <p>How many white squares are there if there are 144 gray squares?</p>

To calculate the score from the validation sheet and practicality sheet, use the following formula:

$$S = \frac{\text{Number of Score Obtain}}{\text{ideal maximum score}} \times 100\%$$

Table 2 shows the validity criteria for the teaching materials used in this research.

Table 2. Validity test criteria

Percentage	Category
85,1% - 100%	Very valid/used without revision
70,1 % - 85%	Fairly valid/used with minor revisions
50,1% - 70%	Invalid/not used needs major revision
0,1% - 50%	Invalid/unusable

(Akbar, 2013)

Meanwhile, for the practicality criteria for teaching materials used in this research is presented in Table 3.

In this research, the effectiveness of the implemented teaching materials is assessed using the paired sample t-test, comparing mean pretest and posttest scores during the large group test. Data analysis is conducted using SPSS software, starting with a normality test. If the significance value (Sig) is ≥ 0.05 , the data is considered normally distributed; if $\text{Sig} < 0.05$, the data is not normally distributed. For normally distributed data, the paired sample t-test is performed. A significance level (α) of 0.05 is used, where rejecting the null hypothesis (H_0) indicates a significant difference between pretest and posttest scores. Lastly, validity of the

teaching materials is determined by achieving a validity percentage $> 70.1\%$. Practicality is assessed based on practicality sheet responses, with a threshold of $> 60\%$. Effectiveness is confirmed if the paired sample t-test yields a significant difference between pretest and posttest scores.

Table 3. Interpretation of practicality criteria

Persentase %	Practicality criteria
81%-100%	Very Practical
61%-80%	Practical
41%-60%	Quite Practical
21%-40%	Less Practical
0%-20%	Impractical

(Riduwan, 2011)

Results and Discussion

The media developed for this research is a digital pocketbook, created using Flip HTML 5. Once the digital pocketbook is completed, it undergoes stages of material validation and media validation tests. These stages are crucial to assess the suitability of the media developed by the researcher and to refine it based on feedback from validators.

During the material validation test, experts evaluate the content and educational value of the digital pocketbook. They provide feedback and suggestions to enhance the clarity, accuracy, and effectiveness of the materials. Simultaneously, in the media validation test, the functionality and usability of Flip HTML 5 as the platform for the digital pocketbook are assessed. Validators provide input on the navigability, accessibility, and overall user experience of the digital pocketbook. These validation tests ensure that the digital pocketbook meets the required standards for educational content and usability, allowing for necessary improvements to be made before implementation in the research study.

Define Phase

At this stage of the research, the researcher conducted a preliminary analysis by administering a questionnaire to assess the needs for developing teaching materials. The analysis focused on selecting material suitable for creating learning media in the form of a digital pocketbook using Flip HTML 5. Based on the findings, it was determined that number pattern material was chosen due to students currently encountering difficulties in achieving desired numeracy skills. Therefore, there is a necessity for learning media to enhance comprehension of this material and aid students in overcoming challenges related to numeracy skills.

Additionally, a needs analysis was conducted on 26 ninth-grade students from a junior high school in West Bandung district. This analysis aimed to identify specific requirements and preferences in developing the teaching materials.

Figure 2 presents the results of the needs analysis conducted among students regarding their preferences for teaching materials. A significant majority, 89%, expressed a preference for digital teaching materials due to their perceived practicality. Regarding visual elements, 65% of students favored the inclusion of interesting animations in the teaching materials. Furthermore, 73% of students preferred using the Flip HTML 5 application over materials in PDF format.

Regarding content, students identified number pattern material as challenging and in need of development. Specifically, 90% of students indicated a preference for teaching materials that include columns for answering practice questions, while 94% preferred materials that are visually engaging with vibrant colors. In summary, based on the initial analysis questionnaire, students desire digital teaching materials focused on number patterns, enriched with captivating animations and colorful visuals, using the Flip HTML 5 application. These preferences highlight the importance of interactive and visually appealing elements in enhancing learning experiences.

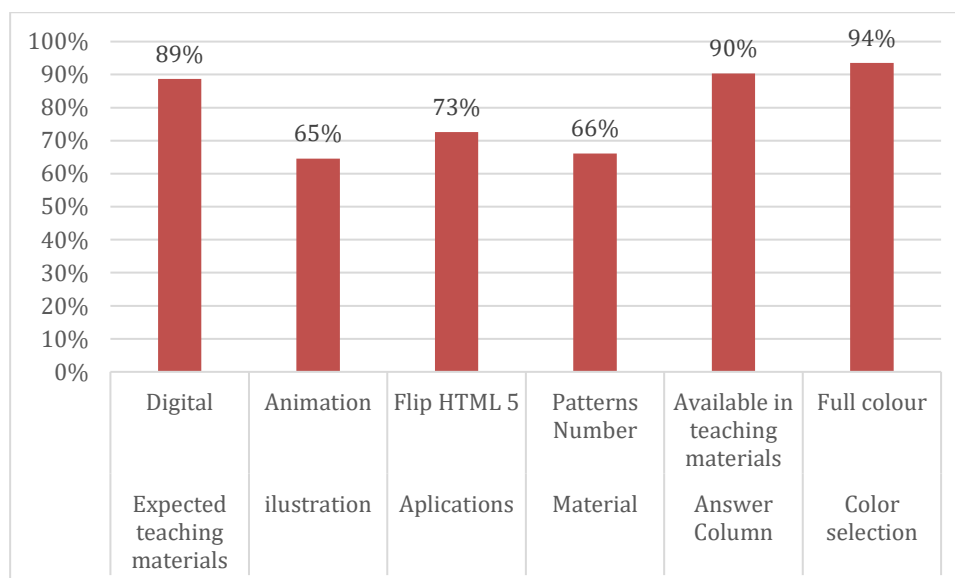


Figure 2. Results of needs analysis

Design Phase

In the design phase, the researcher develops teaching materials based on the outcomes of the needs analysis conducted in the define stage. Additionally, this phase involves designing test instruments and validation sheets. Figure 3 illustrates the design of the teaching materials that have been created based on these considerations.

Figure 3 illustrates a structured digital pocketbook designed to enhance understanding of number patterns among students. The media begins with a cover featuring the title, followed by a foreword that sets the context. A detailed table of contents aids navigation, while a concept map visually outlines the topics to be explored. Throughout the media, students encounter practice questions and competency assessments to gauge their understanding.

The storyboard prominently displays sections such as the foreword, table of contents, introduction, comprehensive material discussions, practice sessions, and concluding sections. Core content includes clear learning objectives, essential competencies, and in-depth explorations of various number patterns. These include discussions on odd and even number patterns, square and rectangular number patterns, triangular and Pascal's triangle number patterns, as well as Fibonacci, arithmetic, and geometric number patterns.

This structured approach ensures that students engage effectively with the material, supported by interactive elements and visual aids integrated using Flip HTML 5. The digital pocketbook serves as a comprehensive learning resource tailored to improve numeracy skills through a variety of engaging and informative sections.

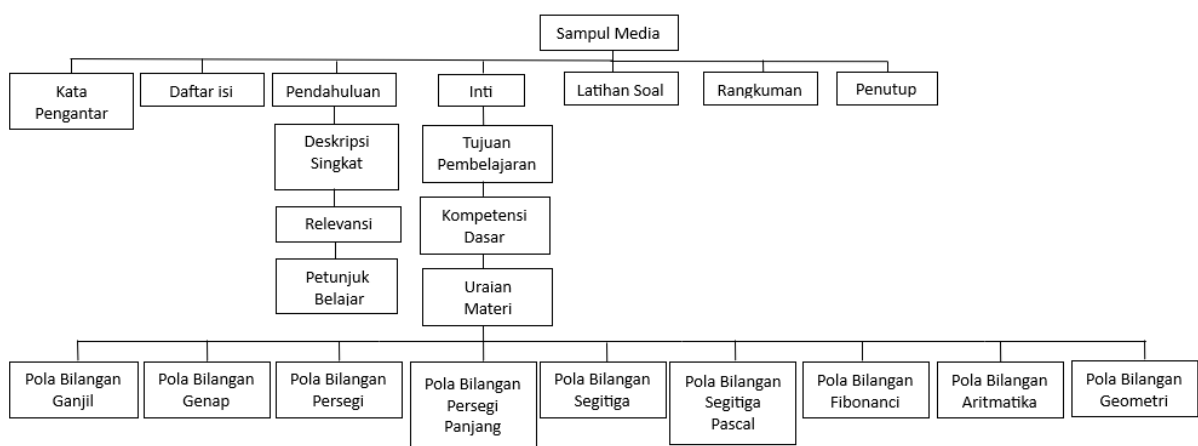


Figure 3. History board Digital Pocket Book Flip HTML 5- Assisted

The initial design, previously prepared, was further developed into a Digital Pocket Book using Flip HTML 5, illustrated in Figure 4 as the main cover view. This medium incorporates navigation features located at the top of the e-Book interface, including buttons for home (returning to the main menu), zoom in (enlarging pages), search (direct material lookup), auto flip (automatic page turning), first (returning to the first page), previous page (navigating to the preceding page), next page (advancing to the subsequent page), last (moving to the final page), sound on & off (audio control), social share (sharing on social media platforms), full screen (maximizing page display), and email (direct email sharing).

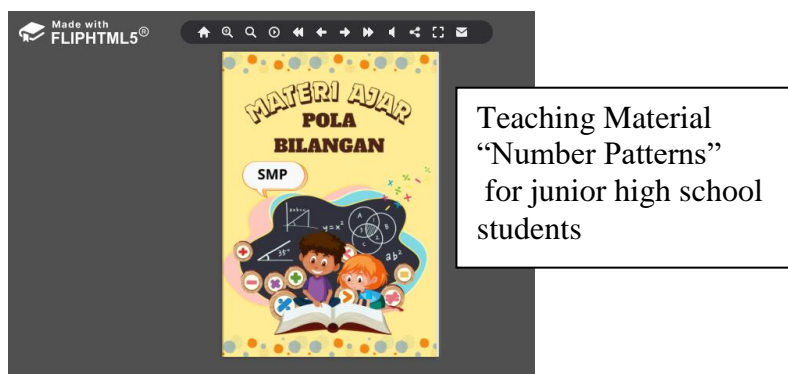


Figure 4. Cover Page

In addition to the aforementioned navigation buttons, the Digital Pocket Book also features additional controls positioned centrally within the e-book, situated on both the right and left sides. Furthermore, navigation buttons are located at the bottom of the e-book, facilitating direct page selection based on user requirements. These features simulate the experience of physically flipping through pages of a real book as shown in Figure 5.

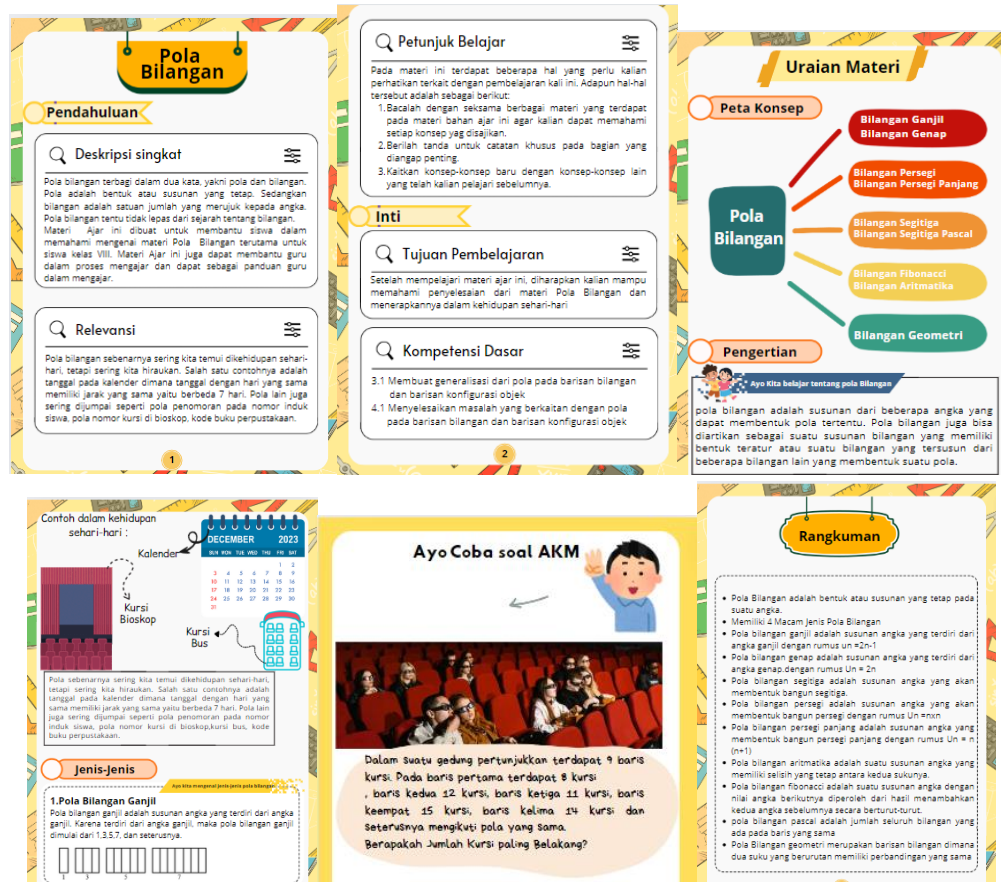


Figure 5. Display of the contents of the Digital Pocket Book with the help of Flip HTML 5

Figure 5 illustrates the content display within the digital pocket book created using Flip HTML 5 on a specific page. This digital medium features an introductory section that includes concise descriptions, relevance to real-world contexts, and learning instructions for each topic. This aids in ensuring students grasp the material's purpose and practical applications. Additionally, the book outlines clear learning objectives and essential competencies as learning targets for students.

At the heart of the material, concept maps and detailed explanations are provided, beginning with real-world problems to enhance comprehension. The media also integrates animated visuals to illustrate theoretical concepts, offering concrete examples for deeper understanding. Furthermore, the book includes Minimum Completeness Assessment (MCA) type practice questions aimed at fostering students' numerical proficiency.

Develop Phase

After completing the product development phase, the subsequent step involves validating the digital pocketbook E-book media using Flip HTML5 to assess its feasibility. Validation tests are conducted by a panel of experts, including subject matter experts and media specialists. This process engages four validators: two subject matter experts and two media specialists. The findings from the validators' evaluations are detailed in [Table 4](#).

The validation results for the media aspects, encompassing ease of use, learning design, and overall presentation, reflect a high level of adequacy. This is attributed to the appealing visual aesthetics of the digital pocketbook media created with Flip HTML 5, featuring animated images that complement the content. Such features facilitate student comprehension, enhance motivation, and foster active engagement in knowledge construction. This aligns with Setiadi and Zainul's (2019) assertion that learning facilitated by Flip HTML5 yields superior educational outcomes.

Table 4. Recapitulation results of material and media expert feasibility tests

Aspect	Indicators	Percentage		Category
		Validator A	Validator B	
Media	Ease of Use Aspect	100%	90%	Very Valid
	Learning Design Aspects	95%	90%	
	Presentation Aspects	90%	90%	
Material	Material/Content Aspects	91%	94%	Very Valid
	Construction Aspects (Presentation Components)	95%	90%	
	Linguistic Aspects of Language	95%	95%	

Similarly, the validation results for material aspects, covering content relevance, structural coherence, and language clarity, indicate strong validity. The digital pocketbook media developed with Flip HTML 5 includes engaging content presented systematically to cater to students' developmental needs. Moreover, the practical and communicative language used in the media ensures clarity and provides explicit instructions, enhancing usability. This supports Widiyahti et al.'s (2015) view that practical products enhance user accessibility and usability across various settings. Considering both media and material aspects, it can be concluded that the digital pocketbook media created with Flip HTML 5 represents a viable option to enrich the learning process.

Furthermore, during the validation process, [Table 5](#) outlines several recommendations for enhancement put forward by the validators. Following suggestions for improvement from both the media and material validators, comprehensive enhancements were implemented, as depicted in [Figure 6](#). Recommendations from the media validator included adding a column for student responses, aligning the cover illustration with the number pattern content, and refining typography.

Table 5. Revised Aspects

No	Improvement Suggestions
1	Add a column for students to work on questions
2	The cover illustration should match the material about number patterns
3	Pay attention to typing (typography)
4	The e-book title should be added "Digital Pocket Book Number Pattern Material"
5	There is no page yet
6	Correct typing errors such as "arithmetic" and so on
7	Change the term "friend" to "you"
8	Add motivational sentences like "let's learn types of number patterns!"

Suggestions from the material validator focused on appending the title 'Digital Pocket Book Number Pattern Material', enhancing e-book page structure, improving mathematical sentence typography, revising content for student comprehension, and integrating motivational statements to foster student enthusiasm.



Figure 6. Digital Pocket Book display assisted by Flip HTML 5 before and after revision

Subsequently, based on these recommendations, the researcher proceeded with the improvement phase. The recapitulated results of the feasibility test by media and material experts indicate a high feasibility rating of 92.5% for media and 93% for material, both falling within the 'very feasible' category. Therefore, it can be concluded that the developed media, the Digital Pocket Book created with flipHTML5 for teaching number patterns, presents a viable option for enhancing learning processes, particularly in cultivating numeracy skills among junior high school students. After conducting a validity test with experts, a pilot study was conducted involving 8 students who had engaged with the number pattern material. The aim of this pilot study was to assess students' feedback regarding the practicality of the instructional materials. The outcomes of the practicality assessment are detailed in [Figure 7](#).

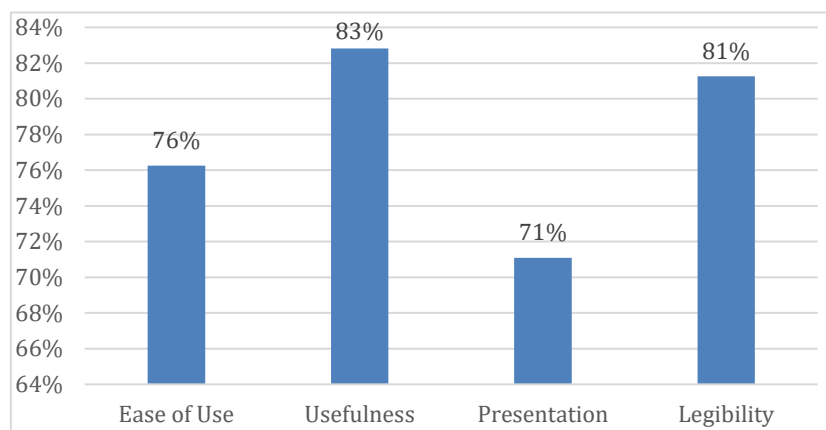


Figure 7. Digital pocketbook practical results

Figure 7 presents the findings regarding the practicality of the instructional materials, focusing on ease of use, usefulness, presentation, and readability. Usability and readability achieved the rating of 'very practical', while ease of use and appearance were rated as 'practical'. Based on data analysis, the developed digital pocketbook is deemed practical for use and can proceed to the dissemination stage.

Disseminate Phase

After confirming the practicality of the teaching materials, further testing was conducted to assess their effectiveness in enhancing numeracy skills among junior high school students. This implementation involved 26 students from a junior high school in West Bandung Regency. Prior to the learning sessions, students completed pre-test assessments. Subsequently, the teaching materials were delivered over four sessions, culminating in a post-test to evaluate numeracy proficiency. Figure 8 presents a summary of the post-test results, detailing achievements across various numeracy indicators.

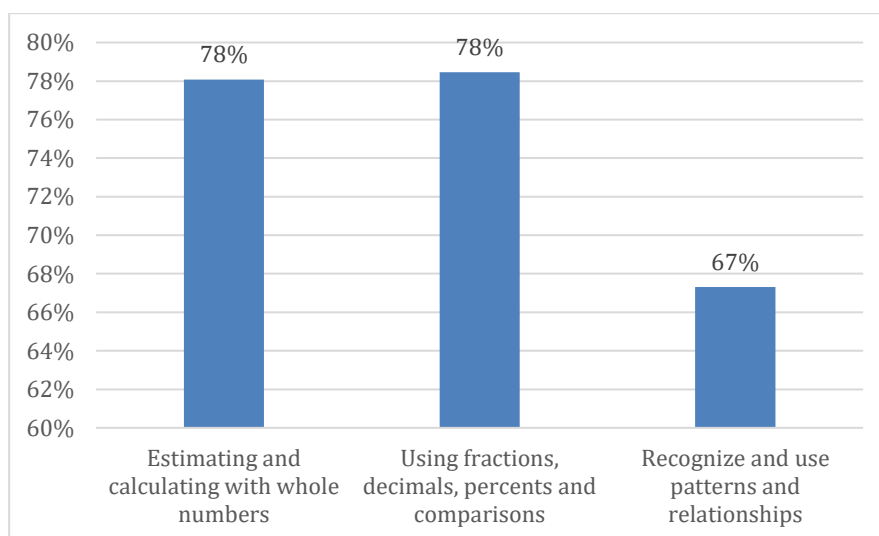


Figure 8. Numeracy Achievement Across Indicators

Figure 8 explains that the highest achievements were observed in indicators 1 and 2, with scores of 78% each, followed by indicator 3 with 67%. To assess the effectiveness of the implemented teaching materials, researchers conducted a paired sample t-test. Prior to this, a normality test was performed on both the pre-test and post-test data. Table 6 displays the results of the normality test.

Table 6. Pretest and Posttest Normality Test Results

Kelas	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Nilai Pretes	.142	26	.188	.953	26	.273
Postes	.153	26	.120	.942	26	.147

a. Lilliefors Significance Correction

Table 6 displays the results of the normality test (Kolmogorov-Smirnov test) for the pretest data, yielding a significance value of 0.188, and for the posttest data, with a significance value of 0.942. Both values are ≥ 0.05 , indicating that according to the criteria, both pretest and posttest data are normally distributed. Subsequently, a paired sample t-test was conducted to analyze the differences between the pretest and posttest data. The results of the t-test are presented in Table 7.

Table 7. Results of t-Test 2 Paired Samples

Paired Differences	t	df	Sig. (2-tailed)	95% Confidence Interval of the Difference	
				Lower	Upper
Mean					
Std. Deviation					
Std. Error					
Pair 1 Pretes - Postes	-15.707	25	.000	-9.919	-7.619

Table 7 illustrates that the mean difference between the average pretest and posttest scores is -8.769, with a significance value of 0.00. Given that this significance value is < 0.05 , the null hypothesis (H_0) is rejected, indicating a significant difference between the mean values of the pretest and posttest scores. Consequently, the alternative hypothesis (H_a) is accepted. For further analysis, descriptive statistics of the pre-test and post-test results are presented in Table 8.

Table 8. Descriptive Statistics of Pretest and Posttest Scores

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Pretest	13.62	26	2.385	.468
Posttest	22.38	26	2.002	.393

Based on the results of the paired sample t-test, a significant difference is observed between the average pre-test and post-test scores, with an average difference of 8.769. According to [Table 8](#), the mean pre-test score is 13.62, while the post-test score is 22.38 (with $SMI = 30$). This indicates that students' numeracy skills significantly improved after using the digital pocketbook teaching materials assisted by Flip HTML 5.

The importance of technology-assisted teaching materials has been highlighted, particularly since the onset of the Covid-19 pandemic, which impacted the education sector. The incorporation of multimedia resources, such as animations, visual aids (e.g., diagrams and graphs), problem-based projects, and practical assignments, can positively influence students' mathematical literacy abilities. Additionally, contextualizing material with real-life applications and case studies is crucial for helping students understand and apply numeracy concepts in various situations. Educators are increasingly designing technology-assisted teaching materials to effectively convey content to students.

The use of Flip HTML 5-assisted teaching materials enhances students' learning interest due to their dynamic nature, ease of use, and attractive presentation similar to printed books. This aligns with the findings of [Abdul et al. \(2022\)](#) in their study on the development of number pattern teaching materials using a scientific approach assisted by ICT to improve MTs students' concept understanding. Their research demonstrated that student worksheets and pocketbooks on number pattern material, supported by ICT, received positive feedback from students and were effectively utilized in learning. This supports the current study by showing that ICT-assisted materials, including flipbooks, can enhance concept comprehension, suggesting that dynamic and interactive materials are beneficial in educational settings.

Similarly, [Fitriani et al. \(2023\)](#) found that using flipbook learning media was effective in teaching functional limit material. Their study highlighted that the engaging and interactive nature of flipbooks helps maintain students' interest and facilitates a better understanding of complex concepts. This directly complements the current study's findings, as both emphasize the efficacy of flipbooks in making challenging subjects more accessible and engaging for students. Furthermore, research by [Hevitria et al. \(2023\)](#) and [Insaf \(2023\)](#) observed that pocketbooks with contexts related to daily life improved students' numeracy skills. This supports the current study by reinforcing the idea that contextual and relatable content in teaching materials can significantly enhance students' learning experiences and outcomes. The use of flipbooks, which can incorporate real-life scenarios in an interactive format, aligns with these findings by providing a versatile tool that caters to various educational needs and preferences.

Numeracy ability is one of the literacy skills considered essential. Numeracy involves the ability to analyze using numbers. In this context, numeracy ability extends beyond assessing mathematics learning to evaluating students' ability to apply numerical concepts in real life ([Sa'adah et al., 2021](#)). Furthermore, [Nurcahyono \(2023\)](#) defines numeracy literacy as the ability to apply number concepts and numerical operation skills in daily life, for instance, within the school environment by non-teaching staff or through routine activities at school. This includes providing students with real opportunities to practice their numeracy literacy skills, such as making budgets for various school activities and interpreting quantitative information in their surroundings.

Finally, integrating these findings indicates that flip-assisted teaching materials, including flipbooks, offer a dynamic, engaging, and effective approach to enhancing students' interest and learning abilities. This comprehensive support underscores the potential of such materials in fostering better educational outcomes across different subjects and educational contexts. Therefore, using engaging teaching materials supported by technology can be an alternative in developing numeracy skills.

Conclusion

The Digital Pocket Book developed with the assistance of Flip HTML 5 has been validated to be valid, practical, and effective for teaching number pattern material. This tool has the potential to significantly enhance the numeracy skills of junior high school students and can be effectively utilized by both teachers and students. Furthermore, this study has several limitations. Firstly, the sample size at the implementation stage was relatively small, which may affect the generalizability of the results. Secondly, the focus of the material was limited to number patterns, which restricts the applicability of the findings to other mathematical topics.

Finally, further research is recommended to address these limitations. Future studies should involve a larger and more diverse sample of students to validate the findings on a broader scale. Additionally, expanding the scope of the study to include various mathematical topics beyond number patterns would provide a more comprehensive understanding of the effectiveness of the Digital Pocket Book across different areas of mathematics. Moreover, exploring the long-term impacts of using such digital teaching materials on students' overall academic performance and engagement would offer valuable insights. The implications of this research are significant for the field of education. The developed teaching materials present an innovative, ICT-assisted alternative for enhancing students' numeracy skills. By integrating engaging, interactive, and contextually relevant content, these materials can motivate students and improve their conceptual understanding. Educators are encouraged to incorporate such digital tools into their teaching practices to foster a more effective and dynamic learning environment.

Acknowledgment

The authors express their deepest gratitude to Institut Keguruan dan Ilmu Pendidikan (IKIP) Siliwangi for their generous financial support, which made this research possible. We also extend our thanks to all the participants and collaborators who contributed their time and effort to this study. Their support and commitment were invaluable to the success of this research.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

References

Abdul, N., Sylviana, Zanthi, L., & Hendriana, H. (2022). Pengembangan bahan ajar pola

- bilangan menggunakan pendekatan saintifik berbantuan ICT untuk meningkatkan kemampuan pemahaman konsep siswa MTs. *Jurnal Pembelajaran Matematika Inovatif*, 5(6), 1715–1724. <https://doi.org/10.22460/jpmi.v5i6.1715-1724>
- Akbar, S. (2013). *Instrument perangkat pembelajaran*. Bandung: PT Remaja Rosdakarya.
- Daga, A. T. (2021). Makna merdeka belajar dan penguatan peran guru di sekolah dasar. *Jurnal Educatio FKIP UNMA*, 7(3), 1075–1090. <https://doi.org/10.31949/educatio.v7i3.1279>
- Elliott, L., Zheng, P., & Libertus, M. (2021). Individual differences in parental support for numeracy and literacy in early childhood. *Education Sciences*, 11(9), 1-18. <https://doi.org/10.3390/educsci11090541>
- Fajriyah, E. (2022). Kemampuan literasi numerasi siswa pada pembelajaran matematika di Abad 21. *Seminar Nasional Pendidikan*, 4, 403–409. <https://prosiding.unma.ac.id/index.php/semnasfkip/article/view/824>
- Fendiyanto, P., Faridhatijannah, E., & Untu, Z. (2022). Kemampuan menyelesaikan soal cerita matematika pada siswa berkepribadian ekstrovert dan introvert. *AKSIOMA: Jurnal Matematika Dan Pendidikan Matematika*, 13(2), 325–330. <https://doi.org/10.26877/aks.v13i2.12071>
- Feriyanto. (2022). Strategi Penguatan Literasi Numerasi Matematika Bagi Peserta Didik Pada Kurikulum Merdeka Belajar. *Jurnal Gammath*, 7(2), 86–94. https://karya.brin.go.id/id/eprint/23928/1/2541-2612_7_2_2022-3.pdf
- Fitriani, C., Wandari, W., & Fadillah, R. (2023). Analisis kemampuan komunikasi matematis siswa melalui pembelajaran dengan media flipbook pada materi limit fungsi. *Journal Numeracy*, 10(2), 134–151. <https://doi.org/10.46244/numeracy.v10i2.2314>
- Grotlüschen, A., Desjardins, R., & Liu, H. (2020). Literacy and numeracy: Global and comparative perspectives. *International Review of Education*, 66, 127–137. <https://doi.org/10.1007/s11159-020-09854-x>
- Halifah, S. N., & Suasti, Y. (2023). Pengembangan buku saku digital pembelajaran geografi pada materi konsep dasar ilmu geografi menggunakan aplikasi Canva dan Flipbook. *Jurnal Pendidikan Tambusai*, 7(3), 23007–23013. <https://doi.org/10.31004/jptam.v7i3.10242>
- Handiar, A., & Zulherman. (2023). Flip HTML5 assisted e-book to improving elementary school students' motivation. *International Journal of Elementary Education*, 7(3), 375–381. <https://doi.org/10.23887/ijee.v7i3.61566>
- Hariyanto, B., Mz, I., SU, W., & Rindawati. (2022). 4D model learning device development method of the physical geography field work guidance book. *MATEC Web of Conferences*, 372, 05008. <https://doi.org/10.1051/matecconf/202237205008>
- Hevitria, Rachma Kurniasi, E., Safitri, I., Meilidya, & Wulandari. (2023). Pengembangan buku saku literasi numerasi konteks budaya Bangka Belitung untuk siswa SD kelas tinggi. *Jurnal Pendidikan Matematika (JPM)*, 9(2), 172–186. <https://doi.org/10.33474/jpm.v9i2.20072>

- Hidayat, H., Mulyani, H., Nurhasanah, S. D., Khairunnisa, W., & Sholihah, Z. (2020). Peranan teknologi dan media pembelajaran bagi siswa sekolah dasar di dalam pembelajaran pendidikan kewarganegaraan. *Jurnal Pendidikan Kewarganegaraan Undiksha*, 8(2), 57–65. <https://doi.org/10.23887/jpku.v8i2.24759>
- Insaf, R. (2023). Pengembangan media buku saku untuk meningkatkan ketrampilan literasi numerasi pada materi lingkaran kelas VI SDN Pandanrejo 01 Kota Batu tahun 2022/2023. *Jurnal Pendidikan Taman Widiya Humaniora (JPTWH)*, 2(2), 1–23. Retrieved from: <https://jurnal.widyahumaniora.org/index.php/jptwh/article/view/148/149>
- Kadarisma, G., & Amelia, R. (2018). Epistemological obstacles in solving equation of straight line problems. *International Conference on Mathematics and Science Education of Universitas Pendidikan Indonesia*, 3, 905–910. Retrieved from: https://dosen.ikipsiliwangi.ac.id/wp-content/uploads/sites/6/2020/06/190-Article-Text-347-1-10-20190122_2.pdf
- Kemendikbud. (2017). *Materi Pendukung Literasi Numerasi*. Jakarta: Kementerian Pendidikan dan Kebudayaan.
- Nurchayono, A. (2023). Peningkatan kemampuan literasi dan numerasi melalui model pembelajaran. *Hexagon: Jurnal Ilmu Dan Pendidikan Matematika*, 1(1), 19–29. <https://doi.org/10.33830/hexagon.v1i1.4924>
- Panglipur, I., & Yana, S. ida. (2023). Fenomena literasi numerasi siswa dalam memahami operasi aljabar pada materi operasi hitung bilangan bulat. *Jurnal Ilmiah Matematika Realistik (JI-MR)*, 4(2), 1–32. <https://doi.org/10.33365/ji-mr.v4i2.2523>
- Perwitasari, S., & Wahjoedi, W. (2018). Pengembangan bahan ajar tematik berbasis kontekstual. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, 3(3), 278–285. <https://dx.doi.org/10.17977/jptpp.v3i3.10623>
- Riduwan. (2011). *Skala pengukuran variabel-variabel penelitian*. Bandung: Alfabeta.
- Sa'adah, A., Ningrum, F. Z., & Farikha, N. (2021). Scaffolding dalam pembelajaran trigonometri berbantuan soal hots untuk meningkatkan kemampuan literasi numerasi matematika. *Seminar Nasional Pendidikan Matematika UNIKAL*, 2(1), 167–174. <https://proceeding.unikal.ac.id/index.php/sandika/article/view/556>
- Safitri, I. (2015). Pengembangan E-Module Dengan Pendekatan pembelajaran matematika realistik berbantuan flipbook maker pada materi bangun ruang sisi datar kelas VIII SMP. *Aksioma: Jurnal Matematika dan Pendidikan Matematika*, 6(2), 1–10. <https://doi.org/10.26877/aks.v6i2.1397>
- Schleicher, A. (2019). *PISA 2018: Insights and interpretations*. Paris: OECD Publishing.
- Simatupang, H., Hardinata, A., Ningsih, W., Bukhari, I., & Sihombing, R. A. (2022). Validation of teaching books and STEM subjects e-learning content. *AIP Conference Proceedings*, 2659(1), 1–5. <https://doi.org/10.1063/5.0113531>
- Sugianto, D., Abdullah, A. G., Elvyanti, S., & Muladi, Y. (2017). Modul virtual: Multimedia flipbook dasar teknik digital. *Innovation of Vocational Technology Education*, 9(2), 101–

116. <https://doi.org/10.17509/invotec.v9i2.4860>
- Sulistiyani, Nurul H. D., Jamzuri, & Rahardjo, D. T. (2013). Perbedaan hasil belajar siswa antara menggunakan media pocket book dan tanpa pocket book pada materi kinematika gerak melingkar kelas X. *Jurnal Pendidikan Fisika*, 1(1), 164-173. Retrieved from: <https://media.neliti.com/media/publications/120258-ID-none.pdf>
- Sutrimo, S., Sajdah, S. N., Sinambela, Y. V. F., & Bagas, R. (2024). Peningkatan literasi numerasi melalui model pembelajaran dan hubungannya dengan kemampuan self-efficacy: Systematic literatur review. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 7(1), 61–72. <https://doi.org/10.22460/jpmi.v7i1.21650>
- Vignoles, A. (2016). What is the economic value of literacy and numeracy?. *IZA World of Labor*. <https://doi.org/10.15185/izawol.229.v2>
- Widiyahti, U. N., Suprpto, E., & Adamura, F. (2015). Pengembangan media pembelajaran matematika berkarakter melalui permainan edukatif matcindo sebagai learning exercise bagi siswa. *JIPM (Jurnal Ilmiah Pendidikan Matematika)*, 4(1), 59. <https://doi.org/10.25273/jipm.v4i1.839>
- Winata, A., Widiyanti, I. S. R., & Cacik, S. (2021). Analisis kemampuan numerasi dan literasi membaca peserta didik kelas XI MA Islamiyah Senori Tuban. *Prosiding SNasPPM*, 659–666. Retrieved from: <http://prosiding.unirow.ac.id/index.php/SNasPPM/article/download/622/724>
- Wu, F., Chen, J., Huang, X., Mo, W., Hu, L., Li, X., & Liao, L. (2022). Nursing undergraduates' perception towards the flipped classroom of Operating Room Nursing Operation based on the HTML5 mobile micro-class : A qualitative study. *Research Square*, 1, 1-16. <https://doi.org/https://doi.org/10.21203/rs.3.rs-2301824/v1>
- Wulandari, S. (2020). Media pembelajaran interaktif untuk meningkatkan minat siswa belajar matematika di SMP 1 Bukit Sundi. *Indonesian Journal of Technology, Informatics and Science (IJTIS)*, 1(2), 43–48. <https://doi.org/10.24176/ijtis.v1i2.4891>
- Yaqin, A., & Rochmawati. (2017). Pengembangan buku saku digital berbasis android sebagai pendukung bahan ajar pada materi PPh Pasal 21. *Jurnal Pendidikan Akuntansi (JPAK)*, 5(1), 1-5. Retrieved from: <https://ejournal.unesa.ac.id/index.php/jpak/article/view/17965>
- Yuniarni, D., Halida, H., Amalia, A., Solichah, N., & Satwika, P. A. (2023). Pengembangan buku saku: Pendampingan orang tua untuk optimalisasi perkembangan bahasa anak usia dini di era digital. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, 7(5), 5767–5778. <https://doi.org/10.31004/obsesi.v7i5.5306>
- Zuhra, F., & Safarati, N. (2021). Pelatihan implementasi literasi dan numerasi dalam proses pembelajaran untuk guru MTsS. *Journal Ummat*, 5(6), 5–12. <https://doi.org/10.31764/jmm.v5i6.5073>