



Interactive E-Book Design Assisted by Heyzine Flipbooks with the Learning Cycle Model to Enhance Learning Creativity

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Abstract

This study aims to design an interactive e-book assisted by Heyzine Flipbooks integrated with the Learning Cycle (7E) model to improve elementary school students' learning creativity in mathematical concepts. The research addresses the need for dynamic interaction of the model through animations, videos, audios and interactive quizzes features that conventional books cannot optimally provide. Using the ADDIE development model, product quality was tested through 5 experts' validation, practicality testing with 2 teacher and student responses, and effectiveness testing with 22 fifth-grade students using a one-group pretest-posttest design utilizing a learning creative attitudes questionnaire. Results indicate high validity of the e-book with an average score of 88.03%, while practicality reached a very good category with a score of 87.84. Furthermore, the interactive e-book proved effective in enhancing learning creativity, shown by a significant p-value of 0.00 and a moderate N-gain of 0.56. These findings indicate that this novel combination of Heyzine Flipbooks and the Learning Cycle (7E) model successfully created a more exploratory and reflective learning experience tailored to elementary school students. The implication is that this interactive e-book serves as an innovative digital resource to support student-centered learning and strengthen creative attitudes within technology-based curricula in elementary schools.

Keywords:

Heyzine Flipbooks, Interactive E-Books, Learning Creativity, Learning Cycle

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Abstrak

Penelitian ini bertujuan untuk merancang e-book interaktif yang didukung oleh Heyzine Flipbooks dan terintegrasi dengan Model Siklus Pembelajaran (7E) guna meningkatkan kreativitas belajar siswa sekolah dasar dalam memahami konsep matematika. Penelitian ini menjawab kebutuhan akan interaksi dinamis dari model tersebut melalui fitur animasi, video, audio, dan kuis interaktif yang tidak dapat disediakan secara optimal oleh buku konvensional. Dengan menggunakan model pengembangan ADDIE, kualitas produk diuji melalui validasi oleh 5 ahli, uji kepraktisan dengan tanggapan dari 2 guru dan siswa, serta uji efektivitas terhadap 22 siswa kelas 5 menggunakan desain pretest-posttest satu kelompok yang memanfaatkan kuesioner sikap kreatif belajar. Hasil menunjukkan validitas e-book yang tinggi dengan skor rata-rata 88,03%, sementara kepraktisannya mencapai kategori sangat baik dengan skor 87,84. Selain itu, e-book interaktif ini terbukti efektif dalam meningkatkan kreativitas belajar, ditunjukkan oleh nilai p yang signifikan sebesar 0,000 dan N-gain sedang sebesar 0,56. Temuan ini menunjukkan bahwa kombinasi inovatif antara Heyzine Flipbooks dan model Siklus Pembelajaran (7E) berhasil menciptakan pengalaman belajar yang lebih eksploratif dan reflektif yang disesuaikan dengan siswa sekolah dasar. Implikasinya adalah bahwa e-book interaktif ini berfungsi sebagai sumber daya digital inovatif untuk mendukung pembelajaran yang berpusat pada siswa dan memperkuat sikap kreatif dalam kurikulum berbasis teknologi di sekolah dasar.

Kata Kunci:

Heyzine Flipbooks, E-Book Interaktif, Kreativitas Belajar, Siklus Pembelajaran

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INTRODUCTION

Facing the era of technological disruption and the rapidly evolving flow of information, the world of education must be able to adapt to the demands of 21st-century learning. The competencies required in this era are known as the 4Cs, which include the ability to think critically, create, communicate, and work collaboratively (Supena et al., 2021). One of the main demands is student learning creativity. Creativity encompasses knowledge, desire, and ability (Chen & Chen, 2021). Creativity is considered a basic potential characterized by the ability to think originally in general, have flexibility, clarity of ideas, and fluency, all of which can be improved through the learning process (Dumas et al., 2024; Yeh et al., 2023). Furthermore, learning creativity is the ability of students to discover new ideas by utilizing data and information in solving learning problems (Yaftian, 2015).

It is undeniable that student learning creativity remains low (Usmeldi & Amini, 2022). Students' mathematics learning creativity is still relatively low, as evidenced by the limited use of alternative methods and suboptimal problem solving (Bistari et al., 2024). The reality on the ground shows that the learning process is often one-way and teacher-centered, emphasizing target outcomes rather than the teaching process, thus providing little room for students to enhance their learning creativity. One cause of the low development of student thinking skills is the lack of innovation in the use of learning media. Learning tends to be less effective (Nurzanna et al., 2020). Media used in the classroom is often textual and monotonous, non-interactive, and does not facilitate students' increasingly diverse learning styles (Nurbaiti et al., 2021; Putri & Annas, 2024; Siahaan et al., 2022). Furthermore, the lack of optimization in the use of digital technology means that teachers have not maximized the opportunity to provide more dynamic learning.

Based on the identified problems, determining the appropriate learning model is a crucial alternative that warrants consideration. The Learning Cycle model emerged as an application of constructivist theory, which emphasizes that students construct their own knowledge independently

through the learning process (Balta & Sarac, 2016). The learning cycle is known as the 4E model, the 5E model, and the 7E model. The 7E learning model stages developed by Eisenkraft are the learning model used in this study. The 7E Learning Cycle involves Eliciting Initial Knowledge, Engaging Students' Attention, Exploring, Explaining, Elaborating, Evaluating, and Extending (Nurzanna et al., 2024; Sarac & Tarhan, 2017). Through the use of 7E in learning, it is hoped that learning activities will be more varied.

In addition to implementing appropriate learning models, the development of interactive e-books in this context is a strategic alternative that can address various learning challenges. Textbooks, which have traditionally served as the primary learning resource, should be transitioned to a digital format in the form of e-books (Nurzanna et al., 2022). One of the advantages of e-books is their more affordable access costs and ease of accessing the information they contain, which can be done anytime and anywhere (Fager et al., 2020; Hutagalung & Ginting, 2025; Winarni et al., 2021). Furthermore, their development is also driven by the current shift in book formats, from traditional printed books to e-books (Saripudin et al., 2022). The Heyzine Flipbooks platform enables the creation of e-books with an attractive appearance and reading experience that resembles printed books, but with richer features (Bhira et al., 2024; Muhaimin et al., 2024; Qouri & Zulherman, 2023). Through the development of interactive e-books supported by Heyzine Flipbooks and integrated with the Learning Cycle model, this research aims not only to present innovative digital learning media that are attractive and easily accessible but also to possess substantial pedagogical value in supporting increased student creativity and learning. The findings of this study are expected to provide an alternative solution to overcome passive learning practices, while also making a significant contribution to the advancement of more contextual and adaptive education in the digital era. Previous research has developed interactive e-book media and implemented the Learning Cycle model separately to improve student learning outcomes (Balta & Sarac, 2016; Nurbaiti et al., 2021; Nurzanna et al.,

2024; Sarac & Tarhan, 2017; Siahaan et al., 2022). However, few studies have explicitly combined Heyzine Flipbooks-based interactive e-books with the Learning Cycle model in a comprehensive and systematic learning design. The uniqueness of this research lies in the development of digital media that integrates the visual and interactive advantages of online flipbooks with a scientific learning approach based on the Learning Cycle, thereby simultaneously honing learning creativity a key competency in 21st-century education.

Students' difficulties in understanding number concepts are generally caused by the abstract nature of the material and limited learning media that lack visualization and meaningful learning experiences (Bouchée et al., 2022; Rusmawati, 2021). This situation can be overcome by utilizing the interactive features offered by Heyzine, such as animations, dynamic illustrations, explanatory videos, and interactive exercises that allow students to interact directly with number concepts (Pratiwi et al., 2025). Through these features, number concepts are not only presented symbolically but also visualized in a concrete and contextual context, thereby helping students build a deeper conceptual understanding and reducing misconceptions in mathematics learning.

The integration of Heyzine Flipbooks into the Learning Cycle (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend) enables students to discover and develop knowledge both independently and collaboratively. The Learning Cycle incorporates instructional stages that facilitate both individual and group learning activities, thereby fostering student interaction in the learning process. Through this interaction, students are able to explore their knowledge and engage in the exchange of ideas to solve problems posed by the teacher (Santika et al., 2016). Furthermore, the use of Heyzine Flipbooks as an interactive e-book in enhancing students' cognitive creativity can be explained through its capacity to manage cognitive load optimally—specifically by reducing extraneous load, regulating intrinsic load, and enhancing germane load (Nurhatmi, 2025; Putra et al., 2025;).

Based on the previous description, the urgency of this research lies in the effort to uncover the development process and assess the quality of the interactive e-book design supported by Heyzine Flipbooks, in terms of validity, effectiveness, and practicality. This product is integrated with the Learning Cycle learning model with the aim of enhancing students' learning creativity.

METHODS

This research is developmental research using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. The main objective of this research is to design an interactive e-book product based on Heyzine Flipbooks that implements the Learning Cycle model to improve the perception of learning creativity in elementary school students. To ensure the feasibility of the product, a series of tests were conducted covering the aspects of validity, practicality, and effectiveness at the stages of e-book product development.

The research was conducted using quantitative and qualitative approaches, involving five validators, two teachers, and 22 elementary school students as respondents. The product trial was conducted with fifth-grade students at SDN 200106 Padangsidimpuan. The trial design used a one-group pretest-posttest design. This research design is also used in product trials involving pretest and posttest in the experimental class (Ahmad et al., 2025; Hutagalung & Ginting, 2025; Qouri & Zulherman, 2023).

The data collection process in this study was carried out through a validation sheet and questionnaire. The validation sheet was used to assess the feasibility of the developed e-book product, by validating the product to five experts who have expertise in the field of interactive e-book-based mathematics learning using Heyzine Flipbooks with a learning cycle model approach. The assessment of product validity covers several aspects, namely the feasibility of content, presentation, language, and the approach used in the Heyzine Flipbooks-Assisted Interactive E-Book, with a total of 32 statement items responded to by the validator. In addition, input and responses were obtained aimed at refining the design to make it more feasible to use.

In addition, the practicality aspect was evaluated through a questionnaire containing six indicators, namely ease, attractiveness, usefulness, efficiency, clarity of content, and appropriateness of language use. This indicator is also in accordance with the practicality indicator used (Angin et al., 2025) with each aspect consisting of 4 statement items. Furthermore, a learning creativity questionnaire was used as a measuring tool to determine the level of achievement of students' creativity perceptions before and after the learning process took place. This effectiveness data collection involved a one-group pretest-posttest design. The pretest and posttest instruments had gone through a previous trial phase, with the results showing an adequate level of validity and reliability as a measuring tool. The instrument trial was conducted on 16 sixth grade students with the correlation index obtained from items 1-16 respectively being 0.913, 0.802, 0.634, 0.861, 0.888, 0.907, 0.798, 0.719, 0.839, 0.913, 0.886, 0.950, 0.847, 0.716, 0.876, 0.716 which indicates the level of validity of the validated items is in the valid criteria further obtained through Reliability Statistics analysis obtained Cronbach's Alpha index 0.970 which indicates that the developed learning creativity questionnaire instrument meets the reliable criteria.

Data analysis was conducted by reviewing the validity, effectiveness, and practicality aspects of the developed product. Meanwhile, data related to validity and practicality were analyzed using a descriptive approach. The Percentage Mean Score (PMS) values of both aspects were then interpreted based on the classification categories (Ahmad et al., 2025):

$86 \leq PMS \leq 100$: very good;

$76 \leq PMS < 86$: good;

$66 \leq PMS < 76$: fair;

$56 \leq PMS < 66$: poor;

$0 \leq PMS < 56$: very poor

Furthermore, the effectiveness achievement was analyzed using inferential statistics of the Paired sample t-test and the normalized N-gain test with the help of SPSS 20. The criteria for the normalized N-gain effectiveness level (Meltzer, 2002) with the Effectiveness Interpretation categories:

$N - gain < 0.3$ (Low);

$0.3 \leq N - gain < 0.7$ (moderate);

$N - gain \geq 0.7$ (High);

Determination of effectiveness criteria based on the level of N-gain achievement was also carried out in various previous research product developments (Ahmad et al., 2025; Hani et al., 2025; Hutagalung & Ginting, 2025).

RESULTS AND DISCUSSION

Analysis Stage

In mathematics learning, students learn about numbers and calculations, which include sub-topics such as the definition and types of numbers, number sequences, and the operations of addition, subtraction, multiplication, and division. The textbooks used are generally printed books, including one that is widely used in elementary schools. The results of this study were obtained through the development stages, utilizing the ADDIE model. In the analysis stage, a study was conducted on the characteristics of fifth-grade elementary school students, who are generally between 10 and 11 years old. They are in the concrete operational development phase, where logical thinking skills begin to develop, but still require real examples to understand abstract concepts. At this stage, students demonstrate a higher level of independence, tend to work collaboratively, and begin to seek recognition from their peers. Their language skills are quite developed, although they still need guidance in organizing ideas coherently. Students of this age also tend to prefer learning methods that are interactive, fun, and related to everyday life situations. Therefore, a collaborative, varied learning approach, supported by the use of interactive e-books based on Heyzine Flipbooks, is considered highly relevant in fostering their learning creativity.

Students in mathematics learn about numbers and calculations, which encompass subtopics such as the definition of numbers and their types, number sequences, and the operations of addition, subtraction, multiplication, and division. The textbooks commonly used in learning activities are generally printed, one of which is "Learning with Your Friends: Mathematics for

Elementary Schools, Grade V, Volume 1." This textbook is considered standard because it does not apply a specific learning approach or model in its development and does not direct students towards developing particular skills. Based on these conditions, we deemed it necessary to create an interactive e-book supported by Heyzine Flipbooks, as it is considered capable of encouraging increased student learning creativity.

Design Stage

Generally, the design stage involves creating a research product in the form of an interactive e-book that utilizes Heyzine Flipbooks, employing the Learning Cycle Model approach to enhance student learning and creativity. The e-book design process included the preparation of sections such as the front cover (see Figure 1), introduction, learning implementation instructions, learning outcome map, Table of contents, content or study materials, bibliography, and a back cover, complete with a synopsis of the e-book. Additionally, supporting instruments were prepared to meet the data collection needs during the field trial phase. These instruments included an e-book validation sheet, a student learning creativity questionnaire, a teaching module for four meetings, and a questionnaire on the practicality of using the textbook.



Figure 1. E-Book Cover Design

Development Stage

This stage includes the development process for the e-book product designed in the previous stage. In accordance with the research objectives, the interactive e-book product was validated by validators to obtain assessments, feedback, and suggestions for product


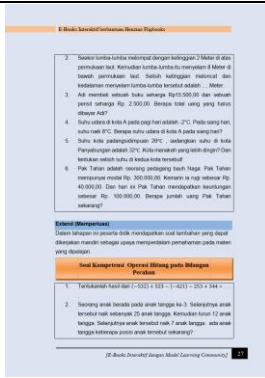


improvement. The results of the validator assessment of the developed product are shown in Table 1.

Table 1. Results of E-Book Validator Assessment

Validation Aspect	Mean PMS
Content Eligibility	83.49
Appropriateness of Material to Learning Objectives	4.13
Material Accuracy	3.94
Material Up-to-Date	4.45
Presentation Appropriateness	87.47
Presentation Techniques and Support	4.42
Learning Presentation	4.30
Coherence and Coherence of Thought Flow	4.40
Language Appropriateness	86.47
E-book Language Clarity	4.32
Dialogic and Interactive	4.35
Appropriateness to Language Rules	4.30
Appropriateness of Learning Approaches	90.14
Learning Cycle Model Components	4.37
Creativity in Learning	4.65
Student Mathematical Ability	4.50
Total Average	4.34 88.03

Quantitative validation results indicate that the developed product is classified as highly valid based on the validators' assessment. Furthermore, the validators provided input and comments for improvement of the e-book. Some of the suggestions and improvements are shown in Table 2.

Table 2. Validator's Suggestions and Improvements

Initial Product	Product Improvements
Suggestion: It is hoped that the writing of e-books will be more in line with EYD	
 <p>The screenshot shows a page from an e-book with several text errors. A red box highlights a paragraph with misspellings and incorrect punctuation. A yellow box highlights a list of items with inconsistent formatting. A red box highlights a list of items with inconsistent formatting. A red box highlights a list of items with inconsistent formatting.</p>	 <p>The screenshot shows the same page after corrections. The text is now correctly spelled and formatted according to EYD. The list items are consistently formatted. The overall layout is cleaner and more professional.</p>
Suggestion: It would be better if the media image display was provided in the illustration of the object being studied	
 <p>The screenshot shows a page with text and a list of items, but no images are present to illustrate the objects being discussed.</p>	 <p>The screenshot shows the same page with images added to illustrate the objects being discussed. The images are clear and relevant to the text.</p>

Cycle Model, ensuring its suitability for field testing. The results of the feasibility test showed that the four assessed aspects received ratings in the good to very good category. Of this assessment, the feasibility aspect was the lowest, with a PMS score of 83.49. This assessment result is within a good interpretation. This was followed by the language appropriateness aspect, with a PRS score of 86.47, and the presentation appropriateness aspect, with a PMS score of 87.47. Both outcomes were classified as very good in interpretation. The element with the highest score was the use of the applied approach, with a PMS score of 90.14. Overall, the total PMS score achieved was 88.03, which is also considered very good. Therefore, the developed e-books can be regarded as highly valid.

In terms of content appropriateness, the developed e-books focused on number and calculation topics for fifth-grade elementary school students. Subtopics covered included the concept of numbers and their types, number sequences, addition and subtraction operations, and multiplication and division operations. This material covered integers, fractions, and decimals, which are common topics in elementary school mathematics. Meanwhile, in terms of presentation, e-books are equipped with essential elements such as an attractive front cover, a foreword emphasizing the urgency of learning, instructions for using the book, a map of learning outcomes, a Table of contents, a description of the material on numbers and calculations, a bibliography, and a synopsis at the back. The presentation of the material is enriched with images, animations, and interactive videos to support understanding and facilitate visualization of the concepts presented to students. In terms of language, these e-books are structured using clear, communicative language and adhere to applicable language rules. The language components in this textbook demonstrate the use of correct grammar, simple yet effective sentences, and the delivery of meaning that avoids ambiguity (Sabri et al., 2023).

Furthermore, the language presentation used employs dialogue that encourages readers to engage actively with the content of the e-books. The chosen approach, based on the

Revisions to the product were made in accordance with the input and comments provided by the validators, ensuring that the developed product was deemed suitable for testing. The E-books feasibility test process is the initial step carried out after preparing the Heyzine Flipbooks-Assisted Interactive E-Books, which are aligned with the Learning Cycle Model and learning competencies based on the applicable curriculum. At this stage, the feasibility of the E-books in terms of number and calculation material was assessed by five validators who have expertise in developing similar products. The feasibility assessment was conducted by considering several aspects, including the feasibility of content, presentation, language, and suitability in relation to the learning approach used (Angin et al., 2024). This action was undertaken to assess the feasibility of the Heyzine Flipbooks-assisted interactive e-book about the Learning

seven stages of the learning cycle involving the 7E (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extend), serves as the primary foundation for developing the e-book content. Therefore, the four chapters or learning activities are structured based on the 7E.

Implementation Stage

The implementation stage is the process of implementing the designed interactive e-book. The stage involved administering a questionnaire to students and teachers who had participated in learning activities using the developed product. The questionnaire aimed to measure the practicality of the developed product. The analysis of the practical product data is presented in Table 3.

Table 3. E-Book Practicality Assessment

Assessment Indicators	Score	PMS	Interpretation
Content Suitability	371/440	84.32	Good
Language Suitability	376/440	85.45	Good
Ease of Use	384/440	87.27	Very Good
Interest	400/440	90.91	Very Good
Usefulness	391/440	88.86	Very Good
Efficiency	397/440	90.23	Very Good
Average Score	387/440	87.84	Very Good

Based on the results of the e-book product practicality test in Table 3, the assessment score is in the good to very good category. The good category is reflected in the indicators of content and language suitability, while the indicators of ease, attractiveness, usefulness, and efficiency are included in the very good category. From the practicality achievement, it can be seen that the total average percentage achievement is 87.84. This achievement indicates that the practicality of the textbook is in the very good category. The practicality of the Interactive E-Book, equipped with Heyzine Flipbooks and based on the Learning Cycle Model, is measured through the results of a questionnaire distributed to gather student responses to the developed e-book. The practicality test was conducted on all 22 students, who participated

in the learning process in four meetings. Student responses to the e-book, covering aspects of content, language use, ease of access, attractiveness, usefulness, and efficiency, indicate that the product is classified as very practical. This result was achieved because the e-book was compiled in line with learning needs and in accordance with student interests. The use of developed e-books also provides convenience for both teachers and students in the learning process, as they can be accessed in a variety of settings.

Furthermore, the use of Heyzine in e-books helps teachers deliver material flexibly and supports the creation of a more effective classroom atmosphere (Putri & Annas, 2024). Students stated that using e-books greatly facilitates learning, both in and outside of class. Interactive e-books developed with the support of Heyzine Flipbooks are equipped with video content and online practice questions, all connected through specific links, providing instant responses or feedback to students. The existence of this medium contributes to reducing reliance on paper and makes it easier for students to obtain feedback without needing access to printed textbooks. E-books designed using the Heyzine platform offer various features that enable users to edit and customize digital content as needed easily (Erawati et al., 2022).

Evaluation

This stage employed a one-group pretest-posttest research design, which included completing an initial questionnaire, administering treatment through four learning sessions, and administering a final questionnaire. The questionnaire aimed to evaluate improvements in student learning creativity. The results of the pre and post test questionnaires, based on descriptive statistical analysis, are presented in Figure 2.

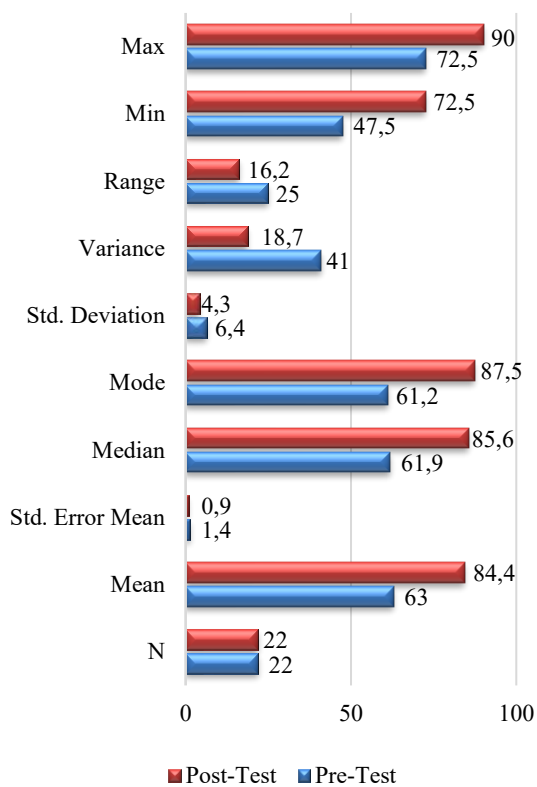


Figure 2. Descriptive Statistics of Learning Creativity

From the descriptive analysis of 22 students, the average score on the initial questionnaire was 63 and the final score was 84.4, indicating a 33.97% increase. Furthermore, inferential statistical analysis was conducted based on these scores by first determining the level of data normality using the Shapiro-Wilk statistical test. The results of this test can be seen in Table 4.

Table 4. Data Normality Analysis

Information	Shapiro-Wilk		
	Statistic	df	Sig.
Pre-test Creativity Learning Questionnaire	.953	22	.357
Post-test Creativity Learning Questionnaire	.916	22	.062

From the Shapiro-Wilk statistical test conducted, it can be observed that the significance value obtained is greater than 0.05, which means that the initial and final questionnaire data are normally distributed. Furthermore, through the homogeneity test

with the Levene Statistic test, the output obtained is as in Table 5.

Table 5. Results of Data Homogeneity Analysis

Levene Statistic	df1	df2	Sig.
2.260	1	42	.140

The data obtained showed a significance index of 0.140, which is above 0.05, or greater than the alpha level. This indicates that the initial and final questionnaire data were homogeneously distributed. This implies that the data can be analyzed using parametric statistical tests using the paired t-test. The results of the test are as shown in Table 6.

Table 6. Paired-Sample T-test Result

Information	t	df	Sig.(2-tailed)
Creativity Learning Questionnaire	41.04	43	0.00

The data obtained showed a significance index of 0.00, which is below 0.05; in other words, it is smaller than the alpha level. This achievement indicates that the initial and final questionnaire data have significantly different achievements. In other words, Interactive E-Books Assisted by Heyzine Flipbooks, incorporating the Learning Cycle Model, have a significant influence on student learning and creativity. This is supported by research findings (Nurzanna et al., 2024), which revealed a substantial impact of the Learning Cycle learning model on the learning outcomes of fifth-grade elementary school students. Furthermore, an N-gain value analysis was conducted by comparing the initial and final questionnaire results, yielding a value of 0.56 (Medium Category). Thus, the achievement of student learning creativity increased significantly with moderate criteria. This aligns with research findings by Hani et al. (2025) on the development of Heyzine-assisted e-books for fifth-grade students at Islamic Elementary Schools (Madrasah Ibtidaiyah), which showed that the N-Gain test averaged 0.67 (quite effective) and a t-test significance value of $0.000 < 0.05$, indicating Heyzine-assisted e-books were effective in developing students' critical thinking skills.

The development of an interactive e-book supported by Heyzine Flipbooks using the Learning Cycle to enhance students' learning creativity revealed that the fluency indicator emerged as the most significantly improved aspect. This finding can be attributed to the use of interactive e-books, which create a stimulus-rich and engaging learning environment that effectively encourages students to generate ideas more spontaneously and continuously. The visual features, dynamic navigation, and multimedia integration within the e-book enable students to access information in a non-linear manner, thereby expanding cognitive associations and improving the fluency of idea generation. Furthermore, the stages of the Learning Cycle, such as engagement, exploration, and elaboration, provide ample opportunities for students to explore various possible answers without pressure, allowing ideas to emerge more freely. This condition underscores that fluency represents the most readily stimulated initial stage of creativity through the provision of diverse and open learning experiences (Ahmad et al., 2023). Therefore, the dominant improvement in the fluency indicator indicates that the combination of interactive media and student-centered learning approaches is effective in fostering a learning environment that supports the quantitative production of ideas, although the development of other creativity aspects, such as flexibility and originality, still requires more in-depth and targeted strategies.

The effectiveness of Heyzine Flipbooks-assisted interactive e-books, using the Learning Cycle model, was determined through initial and final questionnaires that assessed the learning creativity of 22 students in a trial of the e-book product. The use of the 7E cycle in elementary school mathematics lessons significantly improved students' learning, creativity, and conceptual development. The 7E learning cycle model is relevant for student learning because it provides opportunities for exploration and clear model phases, resulting in effective learning (Balta & Sarac, 2016). The results of the trial showed that students' learning creativity increased through the use of the developed e-books. Based on the research findings, there was an improvement in student

learning outcomes using the developed teaching materials. This improvement was evident in the results of the initial and final questionnaires. Students found learning easier and more engaging compared to having to open printed textbooks. The interactive e-books, supported by Heyzine Flipbook Maker, facilitated student learning because they can be accessed anywhere and at any time via their smartphones. Research conducted by Muhaimin et al. (2024) showed that the Interactive Digital Materials for PjBL Assisted by Heyzine Flipbook Maker, through a limited trial, demonstrated the effectiveness of the e-module with a high average n-gain score of 0.74, indicating that the learning objectives were achieved, as indicated by improved knowledge and positive student learning outcomes.

Discussion

Based on the research results showing an increase in students' perception of learning creativity with an N-gain value of 0.56 (moderate category), this finding can be explained theoretically through the integration of Heyzine Flipbooks' interactive features and the 7E Learning Cycle Model stages. This increase is mainly influenced by the Engage and Extend stages. In the Engage stage, the use of Heyzine features in the form of embedding videos, animations, and attractive visual displays plays a role in arousing students' curiosity and initial interest in the learning material. Theoretically, initial interest is an important prerequisite for the emergence of creativity, because students are encouraged to be actively involved and open to new ideas (Broekhoven, 2025; Pratiwi et al., 2025). Furthermore, a significant contribution is also seen in the Extend stage, when students are given the opportunity to relate learned concepts to new contexts or real-life problems through exploratory activities facilitated by Heyzine's interactive features, such as external links, self-reflection, and open-ended assignments. This stage aligns with learning creativity theory, which emphasizes students' ability to develop new ideas, elaborate, and apply knowledge flexibly (Ahmad et al., 2023; Sinaga et al., 2022). Thus, the increase in students' learning creativity is reflected in the synergy between the initial learning attraction

in the Engage stage and the reinforcement of creative thinking in the Extend stage, which together contribute to achieving the N-gain score in students' perceived learning creativity.

These findings have a significant, transformative impact on the development of learning theory, particularly in the context of digital learning in elementary schools. The success of this intervention confirms that the Heyzine Flipbooks-assisted e-book design combined with the Learning Cycle Model not only improves perceived learning creativity scores but also constructs learning experiences aligned with students' cognitive development needs. These findings reinforce the view that learning effectiveness is measured not only by the magnitude of quantitative improvements but also by the quality of changes in how students interact with the material, from passive recipients of information to active learners who explore, elaborate, and expand ideas creatively.

Furthermore, the main contribution of this research lies in its connection to the psychological characteristics of fifth-grade elementary school students who are in the concrete operational stage. At this stage, students tend to understand concepts optimally through concrete, visual, and manipulative representations (Nurzanna et al., 2025). The integration of Heyzine's interactive visual features, such as animations, dynamic illustrations, and simple simulations, within the Learning Cycle stages allows students to gradually build conceptual understanding, moving from concrete experiences to conceptual abstraction. The Engage and Explore stages serve as an initial bridge, linking students' prior knowledge with meaningful visual experiences, while the Explain and Elaborate stages facilitate conceptual reinforcement through structured visual representations.

Digital visualizations in Heyzine Flipbooks play a crucial role in supporting students' cognitive transition from concrete to abstract thinking, particularly in the context of numbers, which are often perceived as difficult and symbolic. The gradual presentation of visualizations allows students to interpret number symbols as representations of quantities and relationships (Qouri & Zulherman, 2023), rather than simply

mathematical symbols. This study provides a valuable theoretical contribution by demonstrating that digital visual-based learning designed in alignment with students' cognitive developmental stages can bridge the gap between concrete and abstract understanding, while simultaneously expanding the meaning of learning effectiveness from merely improving outcomes to transforming the learning process into a more creative and meaningful one.

Furthermore, teachers also find the innovative e-books greatly helpful, as they can support their competency development through this medium. Based on the previous description, the design product of Interactive E-Books Assisted by Heyzine Flipbooks, which incorporates the Learning Cycle Model, effectively meets the levels of validity, effectiveness, and practicality in teaching students' learning creativity. The findings of this study are in line with the development research carried out by Hutagalung & Ginting (2025) and Putri & Annas (2024), which revealed that interactive teaching materials developed with the help of Heyzine Flipbook have a very high level of validity, good effectiveness, and superior practicality so that they are suitable for use as learning media. The presence of this e-book offers an alternative solution for teachers to deliver lesson materials in a more engaging manner, thereby enhancing the interactive learning process in the classroom and fostering student enthusiasm for learning. The application of the 7E learning cycle model in compiling materials, which are also enriched with multimedia elements, has been proven to have a positive impact on academic achievement and increase students' retention of the material studied (Sarac & Tarhan, 2017). The use of the Heyzine application in developing e-modules is highly relevant to today's learning needs, which align with the rapid advancement of information technology. Additionally, the design of technology-based modules encourages increased teacher competence in integrating technology into learning. It can motivate students to continue learning creatively and innovatively, while also familiarizing them with using technology as a supporting tool in life, especially during the learning process.

CONCLUSION

The development of the Interactive E-Book Design supported by Heyzine Flipbooks through the Learning Cycle Model approach was carried out using the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. All stages were successfully carried out well, so that the resulting product was declared to meet the criteria of validity, effectiveness, and practicality. The findings confirm that the Interactive E-Book Design supported by Heyzine Flipbooks with the Learning Cycle Model approach is suitable to be used as a teaching material for fifth grade elementary school students in number material to improve their learning creativity. This finding has practical implications that the Interactive E-Book Design assisted by Heyzine Flipbooks with the Learning Cycle Model can be used as a digital teaching material that is ready to be implemented to support student-focused learning and strengthen creative attitudes. Other teachers can utilize this e-book design by adjusting the material content at each Learning Cycle phase, maximizing Heyzine's interactive features such as videos, quizzes, and exploratory links at the exploration and elaboration stages, and using it flexibly in both face-to-face and bold learning. The development of e-books in this study is still in the limited trial stage in one class, so to gain a deeper understanding of its influence on student learning outcomes, it is recommended that researchers conduct further research involving a larger number of subjects or using a control class as a comparison in the analysis. In addition, considering that digital media sometimes only provides a novelty effect at the time it is necessary to develop e-books by utilizing other platforms or applications to enrich teachers' insights regarding digital learning media and, at the same time, improve teachers' competence in following developments in information technology in the field of education, so that the learning media accessed by students becomes more diverse.

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