



Interactive E-book Design Assisted by Heyzine Flipbooks with the Learning Cycle Model: An Analysis of Product Effectiveness Reviewed from Students' Critical Reasoning Ability

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ABSTRACT

The purpose of this study is to describe the effectiveness of the Henzine Flipbooks-assisted Interactive E-book design product with the Learning Cycle Model in improving students' critical reasoning skills. This research method is research and development research with the ADDIE model, but in this study it is focused on the Implementation stage so that the analysis of product effectiveness can be achieved. Product trials were conducted with one group pretest posttest design. The research population was fifth grade students of SDN 200106 Padangsidimpuan. The research sample was fifth grade students of SDN 200106 Padangsidimpuan consisting of 22 students with 8 male students and 14 female students. The research conducted showed the results of learning management during 4 meetings with an average value of 4.35 (good category). Furthermore, the achievement of students' critical reasoning abilities in the pretest with an average value of 59.6 and posttest 75.9 there was an increase in the value from pretest to posttest by 27.32% through inferential statistical analysis obtained a significance value of 0.00 which is smaller than the alpha level (0.05) which indicates there is a significant difference in the average results of the pretest and posttest, as well as the acquisition of the N-gain index of 0.40 which indicates that the achievement of improvement from pretest to posttest in the moderate category. Thus it is concluded that the Interactive E-book Assisted by Henzine Flipbooks with the Learning Cycle Model to improve students' critical reasoning abilities. The results of this study imply that the application of the Learning Cycle Model assisted by the Interactive E-book Heyzine Flipbooks is effective in classroom learning because it is able to increase student engagement, create meaningful learning experiences, and significantly develop critical reasoning abilities through a structured process of exploration, discussion, and reflection.

Keywords: Interactive E-Books; Heyzine Flipbooks; Learning Cycle; Critical Reasoning

ABSTRAK

Tujuan penelitian ini adalah untuk mendeskripsikan keefektifan produk disain E-book Interaktif Berbantuan Henzine Flipbooks dengan Model Learning Cycle dalam meningkatkan kemampuan bernalar kritis siswa. Metode penelitian ini adalah penelitian research and development dengan model *ADDIE*, namun dalam studi ini difokuskan pada tahap Implementasi sehingga analisis keefektifan produk dapat tercapai. Ujicoba produk dilaksanakan dengan one group pretes postes design. Populasi penelitian adalah siswa kelas V SDN 200106 Padangsidempuan. Sampel penelitian adalah siswa kelas V SDN 200106 Padangsidempuan yang terdiri dari 22 siswa tersebut dengan 8 siswa laki laki dan 14 Siswa Perempuan. Penelitian yang dilaksanakan menunjukkan hasil pengelolaan pembelajaran selama 4 kali pertemuan dengan nilai rata-rata 4,35 (kategori baik). Selanjutnya capaian kemampuan bernalar kritis siswa pada pretes dengan nilai rata rata 59,6 dan posttest 75,9 terdapat peningkatan nilai dari pretes kepostes sebesar 27,32% melalui analisis statistik inferensial diperoleh nilai signifikansi 0,00 yang lebih kecil dari taraf alpha (0,05) yang menunjukkan terdapat perbedaan rata rata yang signifikan dari hasil pretes dan postes, serta perolehan indeks N-gain 0,40 yang menunjukkan bahwa capaian peningkatan dari pretes ke postes dalam kategori sedang. Dengan demikian disimpulkan bahwa E-book Interaktif Berbantuan Henzine Flipbooks dengan Model Learning Cycle untuk meningkatkan kemampuan bernalar kritis siswa. Hasil penelitian ini mengimplikasikan bahwa penerapan *Model Learning Cycle* berbantuan *E-book Interaktif Heyzine Flipbooks* efektif digunakan dalam pembelajaran di kelas karena mampu meningkatkan keterlibatan siswa, menciptakan pengalaman belajar yang bermakna, serta secara signifikan mengembangkan kemampuan bernalar kritis melalui proses eksplorasi, diskusi, dan refleksi yang terstruktur.

Kata Kunci: E-Book Interaktif; Heyzine Flipbooks; Learning Cycle; Bernalar Kritis

INTRODUCTION

Significant changes have been brought about in the field of education by the quick growth of digital technology, especially in the area of providing creative and engaging learning materials (Arduyan, 2024). Critical thinking abilities are now one of the most important talents that students need to have in the twenty-first century of education in order to handle the complexity of real-world issues (Arisoy & Aybek, 2021; Lestari et al., 2023). Since elementary school, kids need to be able to think critically (Patimah et al., 2025). This includes being able to reason logically and methodically in order to comprehend the connections between concepts or facts (Yonanda et al., 2025). Additionally, learning is still dominated by the use of traditional learning models, and students tend to engage in less thinking exercises (Sabri, Kholil, & Ahmad, 2023). However, empirical evidence indicates that traditional media continue to dominate the learning process, failing to foster students' capacity for critical thought. Numerous research have demonstrated that Indonesian students continue to struggle with critical thinking (Kurniawati et al., 2025). The mathematics critical thinking abilities of Indonesian students remain inadequate when they are required to answer non-routine issues using reasoning (Muthmainnah, 2022). In order to meet the learning needs of today's students, learning media innovations are required that not only provide information in an informative manner but also dynamically and contextually (Rosalina & Suhardi, 2020). The creation of interactive e-books, made possible by Heyzine Flipbooks, is one example of this innovation. These books enable the presentation of content in an interesting digital format with dynamic multimedia aspects (Usman et al., 2024). This media has the ability to produce engaging and introspective learning experiences when paired with the Learning Cycle model, which will motivate students to maximize their critical thinking abilities.

Despite the development of numerous digital learning media advances, the majority still prioritize one-way information distribution and fall short in meeting students' critical thinking skills. A large number of educational e-books now in use are only digital reading materials; they do not incorporate instructional practices that promote active student participation. As a result, digital technology's potential to enhance pupils' thought processes is underutilized (Cahyono et al., 2024). Additionally, it is uncommon for interactive digital media development to systematically incorporate successful learning models like the Learning Cycle, which prioritizes exploration, concept discovery, and application (Abuhassna, 2024). In addition, no previous research has been found that systematically integrates Heyzine Flipbooks with the Learning Cycle model to develop critical reasoning skills in high school students. As a result, there is a disconnect between the accessibility of aesthetically pleasing digital content and how well it develops pupils' capacity for critical thought. Therefore, in order to generate meaningful learning experiences and encourage higher-order thinking, interactive e-book designs supported by Heyzine Flipbooks that not only show material in an entertaining manner but also support the syntax of the Learning Cycle are required.

The primary idea presented in this study is the creation of interactive e-books with Heyzine Flipbooks' help, which are based on the Learning Cycle learning paradigm and offer a creative way to help students enhance their critical thinking abilities. The 5E Learning Cycle is appropriate for use in educational settings since it has the potential to significantly impact and enhance scientific learning results (Budianti et al., 2023). Additionally, Septinaningrum, (2022) found that the 7e learning cycle can enhance critical thinking abilities since it involves student-centered, active participation through experimental investigation activities that allow students to build their own knowledge. Additionally, Heyzine Flipbooks offers a digital platform that enables the combination of text, graphics, music, video, and animation in a single, visually appealing, and navigable display, making learning more engaging and joyful (Aji et al., 2025; Munajah & Anggraini, 2025). This media's integration with the Learning Cycle model, which consists of the phases of exploration, concept introduction, and application, transforms it from a simple informational tool into an active learning tool that motivates students to use critical thinking to find, comprehend, and apply concepts. Students' need for engaging digital media and educational objectives that prioritize the development of higher-order reasoning skills are anticipated to be met by the combination of interactive technology and a constructivist-based learning method (Diyal, 2025).

This study examines how well interactive e-books that are backed by Heyzine Flipbooks and were created utilizing the Learning Cycle paradigm enhance students' capacity for critical thought. This study examines how well the created media may be used in the educational process as well as how it affects students' ability to think critically and comprehend and apply ideas in a logical and reflective manner. The Learning Cycle technique makes learning more meaningful by guiding students to actively explore problems, independently discover concepts, and apply them to pertinent contexts (Riffert et al., 2021; Sulaiman et al., 2020). Thus, the main goal of this study is to show that integrating interactive e-books based on Heyzine Flipbooks with the Learning Cycle syntax can be a useful teaching tool for developing critical thinking abilities and raising the standard of instruction in secondary schools.

The use of the Engage, Explore, Explain, Elaboration, & Evaluate learning cycle model is more capable of improving students' critical thinking skills than using the STAD type

cooperative learning model (Latifa et al., 2017). Furthermore, the use of the 7E learning cycle model is better at improving students' conceptual understanding abilities than conventional learning models (Sa'diyah et al., 2024). The Learning Cycle in mathematics learning involves a thinking process that involves exploration, concept introduction, and application. So that in learning students are always active in making observations, asking questions, and identifying initial phenomena or patterns, thereby triggering critical thinking indicators such as analyzing and identifying problems. In addition, students are also active in evaluating evidence, revising initial understandings, and linking findings to scientific concepts, thus developing the ability to evaluate evidence, construct reasoning, and clarify assumptions. Furthermore, students are able to apply concepts in new contexts, solve problems, and assess the validity of solutions, which strengthens indicators of drawing conclusions, logical judgment, and problem solving. By applying the learning cycle model, students can observe, reflect, interpret, and plan their learning experiences or events according to the material, so that students' critical thinking levels will emerge optimally (Andriani & Jatmiko, 2018). The learning cycle model greatly influences and can improve scientific learning outcomes, making it suitable for application in educational environments (Budianti et al., 2023). This makes the learning cycle model a structured activity for students to conduct investigations and formulate their own concepts discovered. With this layered and progressive sequence of thinking, the learning cycle is more effective in building critical reasoning skills systematically, stably, and in accordance with students' cognitive readiness compared to other learning models.

This research has high urgency in the context of improving the quality of 21st-century education that demands the integration of technology and the development of students' critical mathematical reasoning skills. The use of interactive e-books assisted by Heyzine Flipbooks combined with the Learning Cycle learning model is expected to be able to provide a real contribution to the transformation of digital learning that is more meaningful, active, and oriented towards the development of students' critical reasoning. Theoretically, this research enriches the study of the effectiveness of digital learning media based on the constructivist model in developing critical reasoning skills. Meanwhile, practically, the results of this study can be a reference for teachers and media developers in designing digital teaching materials that are interactive, innovative, and in accordance with the learning characteristics of today's students. Thus, this research not only provides solutions to the limitations of conventional learning media, but also contributes to efforts to improve the quality of learning processes and outcomes in educational units.

METHODS

Type and Design

This research is a research and development with the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) (Lee & Owen, 2004; Rangkuti, 2013; Sabri et al., 2023). However, this study focuses on the implementation stage in describing the effectiveness of the Interactive E-book Design Assisted by Henzine Flipbooks with the Learning Cycle Model to improve students' critical reasoning skills. The main objective of this study is to describe the effectiveness of the Interactive E-book Design Assisted by Henzine Flipbooks with the Learning Cycle Model to improve students' critical reasoning skills. To achieve this

objective, a product trial was conducted in the implementation stage involving the design of one group pretest posttest design (Arikunto, 2009; Fraenkel et al., 1932; Triansyah et al., 2023).

Data and Data Sources

Research in the context of product trials was conducted using a quantitative descriptive approach involving elementary school students. The data collected involved observations of learning management and students' mathematical reasoning abilities in mathematics lessons with number and calculation materials. Analysis of effectiveness in product development is carried out by involving analysis of learning management and student cognitive ability tests (Mutiarra et al., 2025; Sabri et al., 2023). The product trial was conducted on fifth-grade students of SDN 200106 Padangsidimpuan. The research population was all fifth-grade students of SDN Padangsidimpuan involving 22 students. With total sampling, all students consisting of 22 students were selected with 8 male students and 14 female students.

Data collection technique

The data collection process in this study was carried out through a test of students' critical reasoning abilities involving pretests and posttests. In addition, an analysis was also conducted on the learning management of the learning treatment using Interactive E-books Assisted by Henzine Flipbooks with the Learning Cycle Model to improve students' critical reasoning abilities. The learning activities involved: Initial activities, core activities, final activities, time management, observation of the classroom atmosphere. The learning was carried out during 4 meetings, each of which was accompanied by observations. Learning activities were assessed through observation sheets by observers in each meeting (Ahmad et al., 2025; Harahap & Ahmad, 2023; Mutiarra et al., 2025). Observations were made on various aspects of learning activities with a rating range of 1-5. Furthermore, students' critical reasoning abilities were measured through pretests and posttests, each consisting of 4 items. The indicators of critical reasoning abilities involved include: Interpretation, Analysis, Evaluation, Inference. These items are mathematical critical reasoning ability items that have been tested for validity and reliability. The results of the validity of the items can be seen in the following table 1.

Table 1. Results of calculating the validity of pre-test and post-test items

No	Pretest			Posttest		
	T-Hitung	Alpha Level	Conclusion	T-Hitung	Alpha Level	Conclusion
1	.608**	.000	Valid	.757**	.000	Valid
2	.776**	.000	Valid	.713**	.000	Valid
3	.878**	.000	Valid	.789**	.000	Valid
4	.853**	.000	Valid	.717**	.000	Valid

The reliability of the test items was then tested by determining the Cronbach's Alpha index for all pretest and posttest items. The Cronbach's Alpha index for the pretest was 0.778, and for the posttest 0.760, These reliability indexes, based on Guilford's reliability criteria, are considered good for the pretest and good for the posttest (Juliani & Erita, 2023).

Data analysis

Learning management analysis was conducted statistically descriptively by determining the average value of learning management results. The results of the average value of critical reasoning ability achievement were interpreted with the assessment criteria of $0 < \text{score} \leq 1.5$: Very Poor; $1.5 < \text{score} \leq 2.5$: Poor; $2.5 < \text{score} \leq 3.5$: Sufficient; $3.5 < \text{score} \leq 4.5$: Good; $4.5 < \text{score} \leq 5.0$: Very Good (Ahmad et al., 2018). Furthermore, the data on students' critical reasoning ability before and after learning were analyzed using a scoring rubric by paying attention to the achievement of students' mathematical problem solving abilities processed in the form of a normal reference assessment with a scale of 0-100. The data were analyzed for measures of data centralization which include mean, median, mode, etc. Furthermore, the pretest and posttest data were tested with inferential statistics to determine their significance value which aims to answer the hypothesis proposed in the study. The hypothesis raised in this study involves the initial hypothesis H_0 = there is no significant influence of the use of Interactive E-books Assisted by Henzine Flipbooks with the Learning Cycle Model to improve students' critical reasoning skills. And the alternative hypothesis (H_a) There is a significant influence of the use of Interactive E-books Assisted by Henzine Flipbooks with the Learning Cycle Model to improve students' critical reasoning skills. With the criteria of accepting H_0 if the significance is greater than the alpha level (0.05) otherwise accept H_a if the significance is smaller than the alpha level (0.05). Normalized N-gain effectiveness level criteria (Meltzer, 2002) with Effectiveness Interpretation $N - \text{gain} < 0.3$ (Low), $0.3 \leq N - \text{gain} < 0.7$ (Medium), $N - \text{gain} \geq 0.7$ (High) (Hake, 1999).

RESULTS AND DISCUSSION

Trial use of e-Comics products based on Local Wisdom using the CTL Approach was carried out involving an initial test, learning activities using e-comics, and a final test. Learning activities were carried out in 4 meetings involving research sample group students. Learning activities involving observers to provide assessments of learning management. Below are presented the results of learning management using the CTL approach from each learning meeting carried out using the e-comic product developed.

Table 2. Learning Management Results

Aspects observed	Learning Activities				Average Value Meeting
	Meeting-I	Meeting-II	Meeting-III	Meeting-IV	
Initial Activities	4.40	4.20	4.60	4.80	4.50
Main Activities	4.29	4.29	4.43	4.71	4.43
Closing Activities	4.40	4.40	4.40	4.60	4.45
Time Management	4.00	4.00	5.00	5.00	4.50
Classroom Observation	3.50	3.50	4.00	4.50	3.88
Average Score	4.12	4.08	4.49	4.72	4.35

From the results of learning observations, it can be observed that at meeting I, an average score of 4.12 was obtained (good category). Furthermore, at meeting II, an average score of 4.08 was obtained (good category), then at meeting III, an average score of 4.49 (good category), then at meeting IV, an average score of 4.72 (very good category) was obtained. From the achievements of the meetings carried out, the dominant or most frequently appearing average

score is in the good category. Furthermore, the average achievement of learning management in 4 meetings was a score of 4.35 which is in the good category. This successful achievement is supported by the progress of the stages contained in the core activities. The achievements of each indicator in the core activities can be seen in the following diagram.

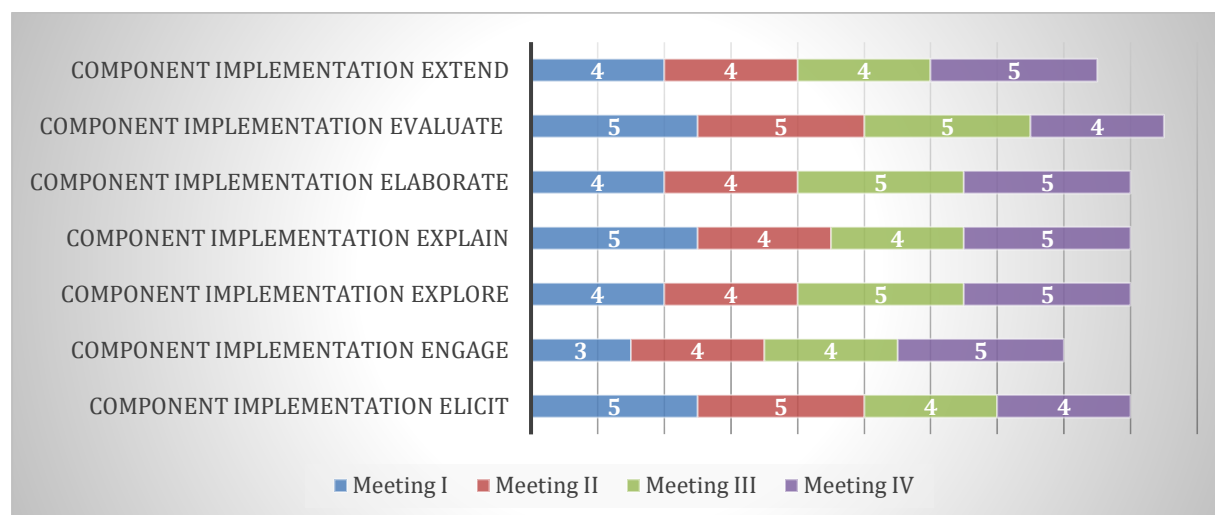


Figure 1. Bar chart of learning management in core activities

The graph shows that the average score for learning management across the seven aspects observed in the core activities across the four learning sessions was 4 and 5. This indicates that the learning management in the core activities involving the learning cycle components was running well to very well. This achievement demonstrates that the implementation of the evaluation component was the highest-scoring component, receiving an average score of 4.75 (very good). This was followed by the implementation of the elaborate, explain, explore, and elicit components, each with an average score of 4.5 (good). The next component, the extend assessment component, received a score of 4.25 (good). The lowest-scoring component, the engage component, received an average score of 4.00 (good). The average scores for the core activity components derived from the learning cycle were in the good and very good categories. This indicates that the learning process was effective. Therefore, it can be concluded that the learning management.

Furthermore, reviewing students' critical reasoning skills, using pre-test and post-test data, the following descriptive statistical analysis was obtained.

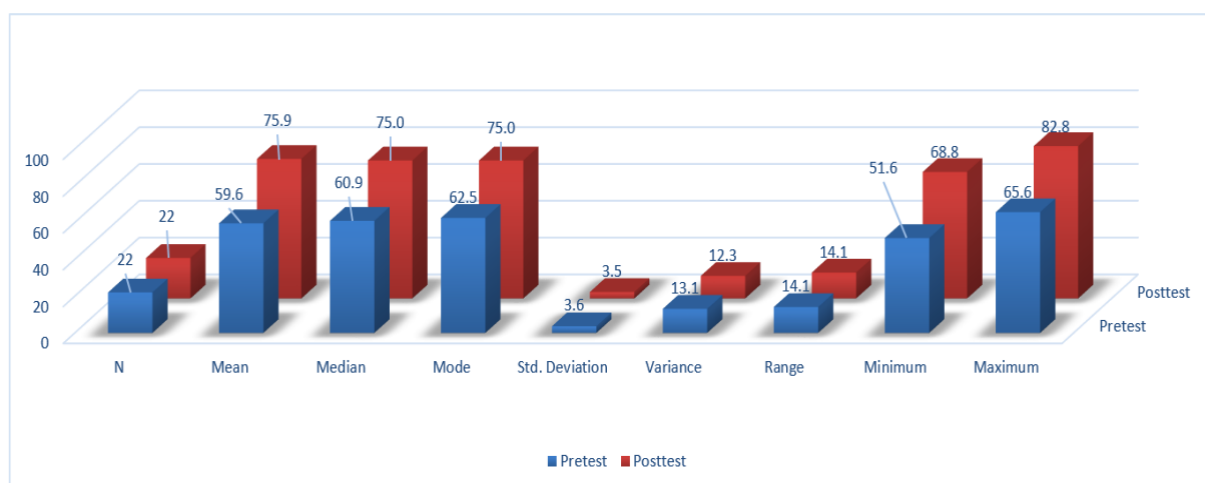


Figure 2. Results of Descriptive Statistical Analysis of Students' Critical Reasoning

From Figure 3, the problem-solving ability presented can be observed that the mean pretest achievement (59.6) is lower than the mean posttest achievement (75.9). In other words, there is an increase in the value from the pretest to the posttest of 27.32% of the critical reasoning ability test conducted. The findings of this study are in line with the findings of the research of Hartono, (2013); Widana et al., (2023) revealed that the application of the Learning Cycle 5E learning model is able to improve students' critical thinking skills in mathematics. Furthermore, the research results Safitri et al., (2024) revealed that the application of the 7E learning cycle model can improve the scientific literacy skills of 5th grade elementary school students. Furthermore, this achievement was further analyzed through an inferential statistical analysis test assisted by SPSS 22. The inferential statistical test was carried out by first conducting a prerequisite test which includes normality and homogeneity tests. The results of the normality test were analyzed using the Shapiro-Wilk test as follows.

Table 3. Results of the Analysis of Students' Critical Reasoning Normality Test

Test	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Critical Reasoning Pretest	.191	22	.036	.936	22	.162
Critical Reasoning Posttest	.233	22	.003	.946	22	.264

The normality test showed a significance value of 0.162 for the pretest and 0.264 for the posttest. This indicates that the pretest and posttest data for critical reasoning ability were normally distributed. Next, a normality test was performed. The results of the Levene statistic test can be seen in the following table 4.

Table 4. Results of the Analysis of Students' Critical Reasoning Homogeneity Test

Levene Statistic	df1	df2	Sig.
.176	1	42	.677

From the SPSS output through the Levene Statistic test, a significance value of 0.677 was obtained, which means that the achievement is above the alpha level (0.05), which means that the pretest and posttest data on critical reasoning ability are distributed homogeneously. Thus, based on the tests carried out, the data on students' critical reasoning ability are distributed normally and homogeneously. This finding means that hypothesis testing can be carried out using parametric statistical tests using paired t-tests. Through paired t-tests on pretest and posttest data on mathematical problem-solving ability with SPSS, the output obtained is as in table 5.

Table 5. Output of Paired Samples Test of Students' Critical Reasoning

Students' Critical Reasoning	Paired Differences						t	f	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
				Lower	Upper				
Pair 1 Pretest-Posttest	16.26	5.14	1.10	18.54	13.98	14.84	21	.000	

Based on the paired t-test results, a significance level of 0.000 was obtained. This result indicates that the initial hypothesis (H_0) is rejected and the alternative hypothesis (H_a) is accepted. In other words, it can be concluded that the use of Henzine Flipbooks-assisted interactive e-books with the Learning Cycle model significantly improves students' critical reasoning skills. This research finding aligns with the research findings of Andriani & Jatmiko, (2018); Latifa et al., (2017), which revealed a significant effect of implementing the 5E learning cycle model on students' critical thinking skills. Furthermore, research Sa'diyah et al., (2024) revealed that the use of the Puzzle-Assisted 7E Learning Cycle model can improve the Understanding of Mathematical Concepts.

Next, an N-gain analysis was conducted on the pretest and posttest data for critical reasoning skills, reviewed from each indicator, as shown in Figure 4.

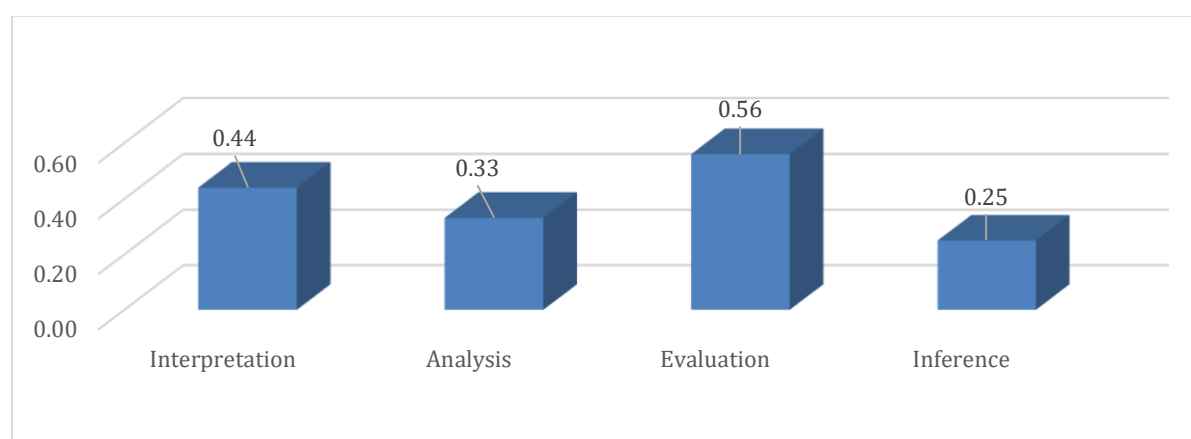


Figure 3. N-gain Achievement of Students' Critical Reasoning Ability

From the N-Gain achievement of each indicator, it can be observed that students' critical reasoning ability in the evaluation indicator is the highest achievement, namely N-gain = 0.56

(High criteria) followed by the Interpretation indicator with N-gain = 0.44 and analysis with N-gain 0.33. The n-gain achievement in these three indicators is in the medium criteria. Furthermore, the lowest indicator achievement is inference with N-gain 0.25 (Low criteria). However, overall, the average N-gain is 0.40 (medium criteria), this shows that the effectiveness of students' critical reasoning abilities is in the medium criteria. Based on the inferential statistical analysis and N-gain test, it is concluded that the Interactive E-book Design Assisted by Henzine Flipbooks with the Learning Cycle Model is significantly effective with medium criteria in improving students' critical reasoning abilities. Furthermore, the results of research by Anisa et al., (2025); Runisah et al., (2017) revealed that students who received the 5E Learning Cycle achieved better mathematical critical thinking skills than those who received conventional learning.

The findings demonstrated that the Learning Cycle Model was successfully applied to learning through interactive e-books based on Heyzine Flipbooks. The evaluate component had the best achievement, receiving an average score of 4.75, which is considered very good. This result suggests that the Learning Cycle's evaluation phase might give students the opportunity to reflect on and critically evaluate their learning objectives. Additionally, with an average score of 4.5, which is considered good, the elaborate, explain, investigate, and elicit components demonstrated that the learning process effectively produced collaborative and active learning activities. In line with constructivist learning methods, students were given the chance to investigate ideas, justify their conclusions, and deepen their comprehension through contextual activities at this point. The extend component, on the other hand, had a good score of 4.25, meaning that students could apply concepts they had learned to novel settings, albeit not to their full potential. The engage component had the lowest average score of 4.00, which is still regarded as good but suggests that the first learning phase needs to be improved in terms of inspiring students and more engagingly connecting the content to their experiences. All things considered, these results demonstrate that every element of the Learning Cycle Model has been functioning efficiently and favorably enhancing students' critical thinking abilities, particularly through reflection, exploration, and elaboration exercises that promote higher-order cognitive processes. The improvement in critical thinking skills demonstrated by the N-gain value's achievement is consistent with research Mufidah & Efendi, (2018) that found that the indicator of "focusing questions" had the lowest N-gain value of 0.167 and the highest N-gain score of 0.8 for students' critical thinking skills achieved through the learning cycle model of critical thinking skills "determining action."

Heyzine Flipbooks' interactive e-book media significantly contributes to the efficacy of the Learning Cycle Model-based learning process, especially when it comes to enhancing students' critical thinking abilities. According to research, using e-books can draw students in, boost their drive to learn, and enable deeper connections between them and the course materials. Using a combination of text, photos, videos, animations, and user-friendly navigation, Heyzine Flipbooks' primary advantage is its capacity to graphically, dynamically, and interactively communicate educational content (Munajah & Anggraini, 2025). The look, which mimics a physical book but is in digital format, makes studying more interesting and relevant. By combining verbal and visual channels that promote in-depth thought processes, multimedia-based material presentation can improve conceptual understanding (Aji et al., 2025; Supianti et al., 2022). Therefore, using interactive e-books aids students in understanding

the material and encourages the process of information analysis, evaluation, and synthesis — all crucial elements of critical thinking abilities. Additionally, because students have flexible access to and study materials both within and outside of the classroom, this media promotes autonomous learning. The tenets of student-centered learning, in which students actively participate in creating their own knowledge, are in line with these traits. Thus, it can be said that interactive e-books, which Heyzine Flipbooks supports, are essential to fostering a flexible, imaginative, and introspective learning environment, which in turn supports the efficacy of the applied learning model.

The key to successful and efficient learning in this study is the synergistic interaction between the Learning Cycle Model and the interactive e-book powered by Heyzine Flipbooks. Flipbooks and the learning model work together to provide a learning process that stresses active student participation in developing understanding through meaningful learning experiences rather than just imparting knowledge (Manzil et al., 2022). As an educational framework, the Learning Cycle Model leads students through the steps of scientific thought, including engage, investigate, explain, elaborate, expand, and evaluate. According to Amalia et al., (2025), interactive e-books are a tool that makes each step easier by providing interesting and easily available digital content. Through interactive links and visual simulations that reinforce the concepts being learnt, interactive e-books allow students to explore autonomously (Batoon et al., 2018). This feature is included at the explore stage. With rich, contextual multimedia components, which are present in the explain and elaborate stages, these e-books give students a place to review ideas and connect them to actual circumstances (Harjono et al., 2020).

Effective learning happens when students are given the chance to actively engage with the material, create knowledge, and independently reflect on their comprehension, as demonstrated by the combination of a constructivist learning method and digital technological support (Opre et al., 2024). In this study, Heyzine Flipbooks and the Learning Cycle Model combine to produce an adaptive learning cycle in which the interactive elements of the e-book support critical, analytical, and reflective thinking at each learning step. A learning cycle that facilitates the accomplishment of learning objectives will be produced by combining learning models with the right technology (Effendi & Wahidy, 2019; Mohebi, 2021). As a result, the two work in concert to give students a thorough, entertaining, and relevant learning experience in addition to enhancing the caliber of learning exchanges.

According to the study's findings, using the Learning Cycle Model in conjunction with interactive e-books made possible by Heyzine Flipbooks significantly enhances students' capacity for critical thought. This is classified as effective and is demonstrated by the steadily improving learning outcomes. While interactive e-book media enhances the learning experience through contextual digital visualizations and interactions, the Learning Cycle-based learning process gives students the chance to actively participate in exploration, concept discovery, and knowledge application (Muthmainnah, 2022; Sulaiman et al., 2020; Yanti & Susilo, 2023). This demonstrates that students' critical thinking abilities grow best when they are involved in a demanding, introspective, and problem-solving learning process (Rahmawati & Mursid, 2020). As a result, the Learning Cycle approach and interactive e-books enhance students' conceptual knowledge while also fortifying their capacity for reasoning, argument evaluation, and evidence-based and logical decision-making. These results show that a

favorable learning environment for the development of critical thinking abilities – a crucial component of 21st-century learning – can be produced by combining digital technology and learning methodologies.

When compared to earlier research, our findings support a number of earlier studies that highlight the value of creative teaching strategies in enhancing students' critical thinking abilities (Latifa et al., 2017; Muthmainnah, 2022; Septiani, 2014). These results also support earlier research that suggests the use of interactive digital media or the learning cycle model, which integrates learning technology, improves critical thinking abilities by posing difficult problems that call for innovative solutions. Therefore, by incorporating contextual approaches and local wisdom values into contemporary learning designs – which have been shown to be more successful in fostering students' critical thinking abilities in the digital age – these findings not only validate the applicability of earlier research but also offer a fresh perspective.

These results have significant ramifications for raising the standard of instruction in classrooms. It has been demonstrated that the use of the Learning Cycle model, aided by interactive e-books, develops students' critical thinking abilities through methodical, introspective, and learner-centered learning phases. Implications for practice: Teachers can use this approach and media as a creative substitute to make learning more dynamic, interesting, and purposeful. Theoretically, these results support the idea that combining digital tools like Heyzine Flipbooks with the Learning Cycle technique might create a learning environment that encourages students to analyze, synthesize, and evaluate. Consequently, the findings of this study are a valuable resource for academics and educators creating learning models that are responsive to the needs of the twenty-first century.

CONCLUSION

Based on the research results and discussions that have been conducted, it can be concluded that the implementation of the Learning Cycle Model using Interactive E-books assisted by Heyzine Flipbooks has proven effective in improving students' critical reasoning skills. This effectiveness is reflected in the achievement of learning outcomes that show significant improvements in critical thinking indicators, such as the ability to interpret, analyze, evaluate, and draw logical conclusions. Each component in the Learning Cycle model contributes synergistically to students' thinking processes, where the stages form a learning cycle that encourages active involvement and in-depth reflection. Meanwhile, the use of Interactive E-books based on Heyzine Flipbooks provides a more interesting, interactive, and flexible learning experience so that it can strengthen students' conceptual understanding and learning motivation. Thus, the results of this study confirm that the integration between the Learning Cycle model and interactive digital media is an effective learning strategy to foster students' critical reasoning skills and is relevant to be applied in the context of 21st-century learning.

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