Development of Comic Learning Media Based on Critical Thinking for Elementary School Students

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Abstract: *The purpose of education in the twenty-first century is to help students acquire critical thinking abilities, creativity and innovation , communication , dan collaboration however as seen by pupils' poor critical thinking scores, this goal is really beginning to be disregarded. Another reality is that textbooks make learning less effective since they are stiff and boring, which makes pupils less interested in reading them. The goal of this project is to create comics that highlight critical thinking abilities in relation to changes in material form. Utilizing the Borg & Gall paradigm, research and development is the research methodology. According to the feasibility test findings, the practicality test yielded 88.8% of teacher replies and 90% of student responses in the very feasible category, while the feasibility level reached 89.2% from material experts, 92.6% from media experts, and a very viable category. Field test findings indicate that users find the generated comics to be engaging and motivating for learning. Using the N gain score formula, determine how well the product affects students' critical thinking scores. The improvement criterion resulted in a gain score of 0.8 in the High category, with an average pretest score of 63.25 and an average posttest score of 92.2. According to research findings, using comic books that encourage critical thinking on the topic of substance changes as a teaching tool is a very realistic, useful, and successful way to enhance students' understanding of science courses in SD/MI and to highlight the importance of critical thinking.*

INTRODUCTION

The broad definition of thinking is any mental process that produces knowledge. According to Aeni (2014), there are two categories of thinking skills, namely high-level thinking skills and fundamental thinking skills. It turns out that thinking can foster critical thinking skills in various subjects and can be used to meet children's

intellectual needs and potential. quoted from KEMENDIKBUD Regulation No. 64 of 2013 which lists critical thinking as one of the characteristics of 21st century learning. According to the EMENDIKBUD (2019), critical thinking, creativity, teamwork, and communication are four abilities necessary for learning in the twenty-first century. The development of children's critical thinking abilities is indeed a big problem. In the era of globalization, every student can easily access all information. Because incorporating all the information is easy, students must use critical thinking to filter it.

According to Aeni (2014; Adri, 2023), making judgments about what one believes or does as the essence of critical thinking is a form of intelligent and logical reasoning. Despite this, Indonesian students' critical thinking skills are still lacking. The fact that Indonesia is ranked 64th out of 65 countries with a literacy score of 382 further supports this. The questions are arranged into six levels, with level 1 being the lowest level and level 6 being the highest level. For Indonesian students, only level 1 and level 2

answers are appropriate (Al-Anwari, 2014). This shows how inadequate students' use of critical thinking is when responding to questions. Data in the field shows that initial data findings from the critical thinking values questionnaire given to Budisatrya Private Elementary School children regarding their self-values, produced an average percentage of 49%, which is in the medium range. The findings of interviews with science teachers at Budisatrya Private Elementary School which revealed that the teacher's test questions lacked a critical thinking component and learning was presented in an uninteresting way, all of which actually reduced student motivation, support this. In addition, he stated that because each page of a textbook contains rows of writing, sometimes accompanied by confusing graphs or diagrams, students are less interested in learning to read.

Actually, books function as learning resources (Sitepu, 2012; Gultom,2021; Adri, 2020). According to information provided by one of the science teachers at Budisatrya Private Elementary School, the material on changing the shape of objects is more challenging

than the material taught in the previous odd semester because it requires a lot of practice so that students can easily grasp it. According to Harahap & Nasution (2017; Helmi 2019; Makarim, 2018), psychology, parents, biology teachers, courses and the school environment are things that hinder children from learning about changes in the form of substances.

According to Hidayat et al. (2022), a person can engage in critical thinking by looking closely at, analyzing, and assessing every aspect of a situation. According to Wijaya et al. (2021), children may first build critical thinking skills to solve problems before achieving increased learning components. Therefore, teachers must plan the learning process carefully, starting from tools, learning materials, media, techniques and learning strategies. The results of the analysis of the requirements questionnaire show that Budisatrya Private Elementary School has not used books that can develop students' critical thinking skills. Teachers have not implemented learning in accordance with aspects of scientific learning based on problems contained in the 2013 Curriculum, even

though learning has used the 2013 Curriculum. Because the existing comics essentially do not include information based on the core skills to be acquired, teachers have not utilized comics.

Therefore, comics are limited to one subject, for example Indonesian. In addition, the researcher gave a student needs analysis questionnaire to 21 children at Budisatrya Private Elementary School in addition to data needs analysis by the instructor. Data on student needs was collected to determine the value of book texts—especially comics—in encouraging learning and critical thinking. The majority of students like reading comics, but rarely read comics that contain learning information. In addition, 100% of Private Budisatrya students admitted that they were attracted to comics because of their charming images and bright colors. Almost all students want comic book style textbooks.

Comic books are a suitable alternative learning medium because they help readers memorize and remember information that is more accessible and interesting (Riskilah,

2019; Helmi, 2019). This aims to make the use of comics that emphasize critical thinking in the classroom more interesting, stimulate students' interest in reading and encourage learning as well as become a bridge for the development of students' critical thinking ideals.

According to Utariyanti, (2015), there are benefits to using comic books as a teaching tool. For example, when students read comics, they find colorful picture book pages that arouse their interest in reading. Because comics are a special type of media that creatively combine text and visuals and can attract readers of all ages, comics are basically basic, clear, and easy for children to understand when used in educational settings. Apart from that, comic books are usually illustrated simply, light and entertaining. This helps students feel comfortable reading for long periods of time, and teachers can convey ideas visually through comic books because comics are a more informative tool. Kurnia (2019) who created scientific comic media. Research findings show that using scientific comic learning materials to improve critical thinking skills is beneficial.

Much research has been conducted regarding the creation of comic book media; However, the development of comic media is still concentrated on other biological materials. Susilo (2017), for example, made scientific comics in grade V elementary school using light materials. In line with what Kurnia (2019) did, he created scientific comic media to help children improve their critical thinking skills and environmentally conscious character. This creates the possibility of combining the comic book medium with other sources that encourage critical thinking. Therefore, research is needed about the development of comic learning media that contains the ability to think critically in it in the material changes in the form of substances. This can provide a solution to overcome the low ability of students to think critically and attract their interest in learning and can explain information about the process of changing the form of substances critically.

METHODS
A Research and development, or R&D, approach is used in this type of

study. This research uses a procedural development research model, namely a model that explains the flow or process. Ten stages of research are required for a product, according to Sugiyono, who obtained this list from Borg and Gall (2012): Potential and problems, data collection, design and testing, design validation, design revision, use trials, design revision, and mass. production.

This comic stage study follows what Sugiyono (2015) put forward and is modified according to Borg and Gall's guidelines for creating educational resources. The process in this technique is very easy, but thorough. There are ten phases in this process. An overview of the stages of development research is presented in Figure 1.
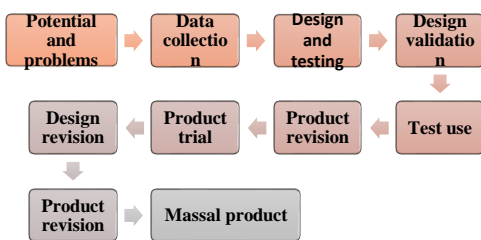

Figure 1 Stages of the Borg and Gall method (Borg & Gall, 2012)

The steps are in line with development research in the education sector. To determine the use and efficacy of the product, tests are carried out by media experts, material experts, teachers/practitioners, and field tests in

order to produce or develop the product. Due to limited funds and the length of time required to move the manufacturing media to mass production, the research and development stage of this research was only completed until the seventh and has not yet reached mass production.
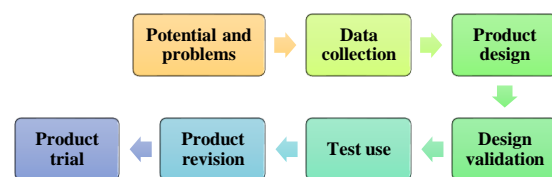

Figure 2 Seven Stages of the Borg and Gall Method (Sugiyono, 2015)

Development research follows seven processes, the first of which is Potential and challenges. Before creating comic media, interviews conducted at Budisatrya Private Elementary School during learning activities were used as the main research tool. (2) Data collection. After obtaining potential and problem data, various information must be collected regarding the creation of learning materials in the form of comics (story books) that encourage critical thinking in science classes, as well as information on changes in circumstances. substances that can be used to inform product planning efforts aimed at solving these

problems. (3) Product design. Collecting references for developing and creating comic media is an important step in the planning stage of creating an initial product design. (4) Design verification is the process of evaluating the design of a product to determine its advantages and disadvantages and whether the new product will be more successful than the previous product. (5) Design revision After many experts validate the design, product deficiencies can be found, so that researchers can improve the design. (6) Product trials are not intended to be tested directly; they need to be developed into finished products. as well as the object being assessed, (7) Product is revised. Product testing results, if educators or students express satisfaction with the readability and quality of the product.

a. The product trial design is carried out in two stages: (1) Supervisors, media and material expert lecturers, and class IV teachers carry out this step. (2) If a revision has been carried out at this stage, a field test will be carried out including comic learning. Through surveys and pretest-posttests after learning with comics, we can assess how much students' critical thinking abilities have improved.

b. To evaluate the situation before and after the use of comic media, a product trial was carried out using an experimental design (Before-after).

This research was conducted in July-August Academic Year 2023-2024. The research subject totaled 20 students conducted at the Budisatrya Private Elementary School in Medan Tembung District, Deli Serdang Regency. The instruments used are questionnaires and questions. Data collection techniques in the form of tests and non - tests: (1) Survey, (2) Examination (3) comments from students. When conducting research with examinations and questionnaires, researchers use data analysis tools. The data under study consisted of two parts: (1) the feasibility study of comic media and (2) statistical analysis of students' critical thinking results.

RESULT & DISCUSSION
Result

Based on the Borg & Gall method, the findings of a study on the development of digital-based comic media as a learning tool in Natural

Sciences (IPA) learning are presented as follows:

1. Prospects and Issues This research's promise lies in digital comics which function as a teaching tool for critical thinking of fifth grade elementary school students during science class. The lack of interesting learning materials for students is the main weakness of this research.

2. Information Collection The method for collecting data for this research is through additional study of teaching materials for making comics.

3. Product Design The researcher used an A4 sized sketchbook for the sketching process at the product design stage, which was first done in a notebook as a scribble.

4. Product Design Validation will be evaluated by one person, namely one material expert, one media expert, and one educator—before the comic media is tested in the field. The following are the results of tests carried out by experts:

    a. Expert verification (material and media experts) Evaluating the way comedy media is presented is the aim of the

material and media expert validation procedure. Table 1 presents material expert validation data regarding content suitability. Table 2, language and media, and the following table provide validation data from media experts :

Table 1 Material Expert Validation Results

Aspect	Number of Aspects	Score Max	%	Category
Fill	42	48	87,5%	very worthy
Presentation	8	8	100%	very worthy
Total		50		
Score Max		56		
%		89,2%		
Category		very worthy		

Table 2 Media Expert Validation Results

Aspect	Number of Aspects	Score Max	%	Category
graphics	27	28	96,4%	very worthy
presentation	36	40	90%	very worthy
Total		63		
Score Max		68		
%		92,6%		
Category		very worthy		

A score of 48 with a maximum score of 42 was achieved based on the findings of an assessment of the suitability of the content and presentation components by experts in content material aspects; So, the percentage value is 87.5%. With a

maximum score of 8, the overall material expert validation score for the presentation element is 8, meaning the percentage value is 100%. With a total score of 50 out of 56 possible points, materials specialists covered 89.2% of the sample, placing them in the highly competent group. Meanwhile, data collected by media experts presenting visual features and graphic components obtained a score of 27, with a maximum score of 28, meaning the resulting percentage was 96.4%. With a maximum score of 40, the media expert validation for presentation elements has a total score of 36, meaning the percentage value is 90%. Media experts received an overall score of 63 out of a possible 68, which places them in a very respectable group with an overall percentage of 92.6%.

b. Verification by Experts Both lecturers and 5th grade students validate practitioners. Tables 3 and 4 present data from practitioner validation results, including content suitability, critical thinking values, visuals, and presentation :

Table 3 Teacher Response Results

Aspect	Number of Aspects	Score Max	%	Category
Material	33	36	91,6%	very worthy
Critical thinking	12	12	100%	very worthy
Graphics	24	28	85,7%	very worthy
presentation	34	40	85%	very worthy
Total		103		
Score Max		116		
%		88,8 %		
Category		very worthy		

The material element received a score of 33 out of a possible 36 in the practitioner validation findings, meaning the percentage value was 91.6%. With a maximum score of 12, the overall teacher response score on the Islamic values aspect is 12, meaning the percentage value is 100%. With a maximum score of 28 and a total score of 24, the percentage of instructor reply scores on the graphic component is 85.7%. The percentage score is 85% because the overall score of the instructor's answer to the presentation component is 34, with a maximum score of 40. With a total score of 103 out of a possible 116, the teacher's response is considered very

appropriate with an overall percentage score of 88.8%.

5. Design Revision Researchers make design changes to the product design that will be made in response to suggestions and input from practitioners and experts. The following are recommendations for improving Komi products:

a) Material expert's revision of the design. The content feasibility component includes design modifications from the material expert along with ideas for improvements, such as providing clarification regarding material changes and critical thinking skills.

b) Revision of design by media experts. The cover design component includes design revisions from media experts with recommendations for improving the appearance of the cover as well as the positioning and expression of the characters in the comic.

6. Product Testing Comic products will be tested to determine the vital skills of fifth grade elementary school students after being refined

and approved by knowledgeable lecturers. Table 4 displays information on product trial results in the form of a questionnaire which is filled out after using the questionnaire, and Table 5 displays information on product trial results in the form of tests :

Table 4 Student Response Results

Uji Coba	number of subjects	number of score	Score Max	%	Category
large group	12	566	624	90,7%	very worthy
small group	20	930	1040	89,4%	very worthy
Total			1496		
Score Max			1664		
%			90%		
Category		very worthy			

Table 5 Data on Critical Thinking Ability Results through Tests

No	information	Scores obtained by students		Gain Score
		Pre-Test	Post-Test	
1	Total	1265	1844	0,8
2	Rerata	63,25	92,2	
Criteria for advancement within a category				High

By using the essay question instrument that was developed, students' critical thinking abilities were evaluated based on indications of critical thinking abilities derived from Ennis in Susanto (2013: 125). There are five strategies for assessing critical

thinking skills: providing clear explanations, developing foundational knowledge, making reasoned judgments, providing additional explanations, and developing a systematic approach. Next, sub-indications of critical thinking skills are given for each of the five indicators. The pretest produced a number of 1265, while the posttest produced a number of 1844. The average pretest score was 63.25, but the average posttest score was 92.2, according to data from the critical thinking skills test results. Because 0.8 (Effective) N-gain > 0.7 (High), the gain score achieved is in the high category.

Discussion
1. Comic feasibility
a. Assessment by Material Experts

Researchers developed comic media based on critical thinking which has gone through a series of tests to obtain input and recommendations so that it can be used in the classroom. The tests carried out include expert lecturers validating the media and content, class 5 teachers validating it, and students testing it. There are two questions that must be answered by the material expert and twelve statements about the suitability of the content in material validation. Data material experts confirmed the results regarding comic presentation and content suitability. A total of 50 points were obtained with very suitable (SL) criteria. Then, by including a more thorough discussion of information about how chemicals change and the need for critical thinking in comics, improvements were made.

b. Assessment by media experts

Data from media validation results contained 7 questions on the graphic component and 10 questions on the presentation component. The total score obtained was 63 with very appropriate (SL) criteria, with each graphic and presentation component getting a score of 27 and 36. Meanwhile, aspects that were improved were in the media. comics developed include cover design and use of images.

c. Assessment by the teacher

Data from validation by the teacher contained 9 questions on the content component, 3 questions on the critical thinking value component, 7 questions on the graphic component and 10 questions on the components so that the presentation of the total score obtained was 103 with very feasible (SL) criteria. Meanwhile, the aspects carried out Improvements to the comic media developed include, among other things, the use of sentences, the use of spelling, and the use of writing.
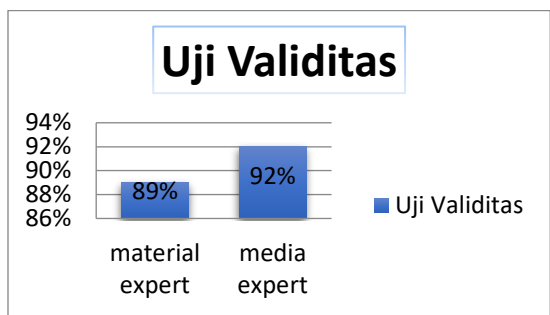

Figure 3 Diagram of assessment results by material experts, media and teachers

2. Learning outcomes and student responses

a. Learning outcomes

Student learning outcomes are to determine the extent of their ability to think critically about learning material by taking tests. In this study, researchers used an essay test question instrument that refers to Bloom's taxonomy (between C1 – C6) with a total of 5 questions.

There is an increase in student learning outcomes when using digital comics based on critical thinking compared to when not using digital comics. The capacity of comic books to depict content that changes the physical properties of an object. can be communicated effectively to students through comics that encourage critical thinking. It is easier for students to understand a subject if it is presented in an interesting way and with simple terminology. One of the things that helps students' understanding so that their learning outcomes improve is the benefits of comedy media. Based on calculations and data analysis, the average student pretest score increased overall to 63.25, while the average posttest score increased to 92.2. improving learning outcomes using the gain

score method which produces results of 0.8 with high criteria based on the average pretest and posttest scores.
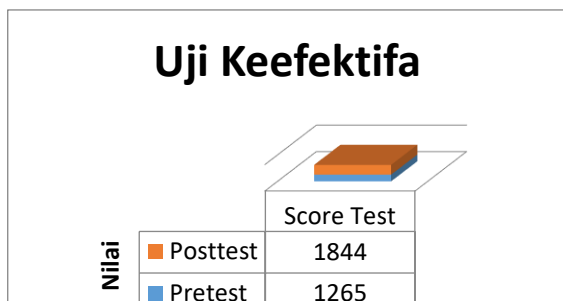

Figure 4 Diagrams for Improving Learning Outcomes

According to research conducted in 2014 by F. Fatimah and A. Widiyatmoko, "science comic media can be a tool for conveying science learning to students in a fun way." According to Arroio, children can more easily learn and remember science content and develop their critical thinking skills by using comic books. Therefore, comic-based media can improve student learning outcomes on the subject of changes in the shape of objects.

b. Teacher and student responses

If the media created has been tested on students, it can be considered suitable for use. Researchers invited students to fill out a questionnaire about the suitability of comic media for students after they completed the posttest. The quality of each component is determined by researchers using a Likert scale. Individual attitudes are measured by this scale. Each response on the form ranges from very positive to very negative. The results are shown in Figure 4.
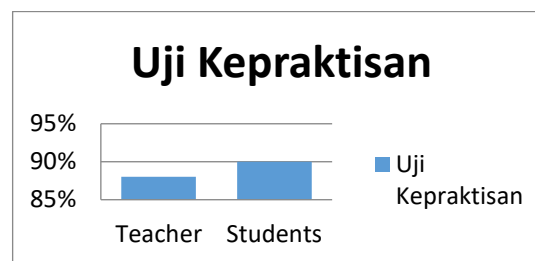

Figure 5 Percentage Diagram of Teacher and Student Responses

Seen in the picture, the total score for the teacher and student response assessment components is 88.8% with very appropriate criteria, based on the assessment of the comic suitability component. The total score of the student response assessment components was 90% with very appropriate criteria. Therefore, teacher and student comments with score interpretation criteria are quite acceptable in terms of media appropriateness.

CONCLUSION

This research can be concluded as

follows based on the findings, discussions, and explanations given in the formulation of the problem in the previous chapter: The effectiveness of comic books as a means of teaching critical thinking is determined by the findings of validation and field tests. Based on the findings of comic feasibility tests, the practice test produced 88.8% of the teacher's answers and 90% of students' responses with a very decent category, while the validity test reached 89.2% of the material expert, 92.6% of the media experts, and the category was very feasible . Field test findings show that users consider comics produced to be interesting and motivating to learn. By using the formula n gain score, determine how well the product affects students' critical thinking scores. The effectiveness test produced a score of 0.8 with a high category, with an average pretest score of 63.25 and an average posttest score of 92.2. According to research findings, the use of comic books that encourage critical thinking in comics changes in the form of substances as teaching tools is a very realistic, useful, and successful way to increase students' understanding of science subjects in SD/MI and to highlight the importance of critical thinking.

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