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# Development of Edutainment and Problem Solving Based Learning Comics to Enhance Elementary School Students' Understanding of Magnet Concepts

Atik Karlina<sup>1</sup>, Siska Desy Fatmaryanti<sup>2</sup>, Nur Ngazizah<sup>3</sup>

<sup>1,2,3</sup>Pendidikan Guru Sekolah Dasar Universitas Muhammadiyah Purworejo

e-mail: atikkarlina65@gmail.com

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## Abstract

This study aimed to design and develop a comic-based learning medium integrating edutainment and problem-solving approaches for teaching magnet concepts to fifth-grade elementary school students. The development process employed the ADDIE model, which includes Analysis, Design, Development, Implementation, and Evaluation. The participants consisted of 28 Grade 5 students at SD Negeri Sindurjan, five students involved in limited trials, and three expert validators (material, media, and instructional experts). Validation results showed that the developed comic achieved a highly valid category, with average scores exceeding 85 percent. Practicality testing through teacher and student responses also indicated very high practicality, with percentages above 90 percent, demonstrating that the comic is engaging, easy to use, and suitable for elementary learners. Effectiveness was evaluated through pretest and posttest comparisons, which revealed a substantial improvement in students' understanding of magnet concepts, with high N-Gain values. The findings indicate that the developed comic effectively supports conceptual understanding, promotes active learning, and enhances students' thinking skills. Therefore, the edutainment- and problem-solving-based comic is appropriate to be used as an innovative and interactive learning medium aligned with 21st-century learning principles

**Keywords:** Comic Media, Edutainment, Problem Solving, Magnet, Elementary School.

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## 1. Introduction

Education is a systematic endeavor aimed at creating a learning environment that facilitates the optimal development of students potential, including character, intelligence, and skills that are beneficial both for themselves and for society. (Putri et al., 2025) Current educational practices demand innovation in the learning process, particularly in elementary science education, so that

students are not only able to understand concepts theoretically but also capable of applying them in their daily lives. (Rahayu & Nofrianni, 2025). In the context, science learning in elementary school plays a strategic role in developing students understanding of fundamental concepts related to natural phenomena. (Tristaningrat & Ariyana, 2025) In the learning process, students often enter the classroom with preconceived ideas or initial understandings of scientific concepts formed through their interactions with the environment, which may cause misunderstandings to persist even after accurate information has been provided. Informal knowledge gained from personal experience tends to differ from scientifically accepted understandings. (Puriasih & Trisna, 2022). Knowledge that contradicts scientific principles is referred to as a misconception. (Zulfa et al., 2025). The presence of misconceptions can affect students' learning achievement and hinder their ability to comprehend new concepts. (Prahasdita et al., 2025). Essentially, misconceptions are errors in understanding that lead students' interpretations to deviate from scientific or expert-defined concepts. These errors are often perceived as correct by students and repeatedly appear within the structure of their knowledge (Zulfa et al., 2025).

Research and development (R&D) indicate that the creation of context-based teaching aids can enhance students' direct engagement. (Arifah et al., 2014). This study develops a learning medium using the ADDIE model. (Sari et al., 2022) Although many studies emphasize conventional teaching methods, interactive and engaging comic media are utilized to improve students' scientific literacy. (Learning & Sholeha, 2025). Science subjects require creative and flexible learning media to help students better comprehend the material. (Devi & Putra, 2022). Learning media function as communication tools that assist teachers in delivering material effectively, enabling students to understand and apply the knowledge they acquire in daily life. (Wicaksono et al., 2021). The success of instructional delivery is influenced by various supporting components, including the ability to use appropriate learning media to make the learning process more effective and to achieve learning objectives optimally.(Devi & Putra, 2022). According (Suwandinata & Suranata, 2023) Education plays an important role in shaping competent human resources, in which the utilization of creative and innovative digital learning media can enhance students' understanding of the material.

Learning media serve as one of the key components that influence the course of the learning process. (Fitria et al., 2023). Therefore, comic media are considered relevant to the characteristics of today's students and effective in improving learning outcomes(Amali et al., 2023). Comics as the development of learning media can integrate audio, visual, and video elements, enabling students to learn in a more interactive and enjoyable manner. (Merlin et al., 2022). Comics convey messages through illustrations and text that present various themes, often based on children's everyday experiences, making their use conducive to creating a more enjoyable learning environment. (Badeo & Ong Kian Koc, 2022) Generally, children are attracted to illustrative images such as those found in comics. (Dani, 2025). According (Hotimah & Ramadani, 2021) comic media are able to create a distinct and more meaningful learning atmosphere, which in turn contributes to improved learning outcomes. The development of interactive digital comics for science learning in elementary schools can help enhance students' understanding. (Bollinger, 2017). Comic media can function as an effective

learning tool for introducing scientific concepts by presenting sequential and easily comprehensible cartoon visuals. (Aulia & Hidayati, 2023). The use of comic as a media can assist students in gaining a deeper understanding of the material while also improving scientific literacy and academic achievement. (Febriyanti & Mustadi, 2020).

## 2. Methods

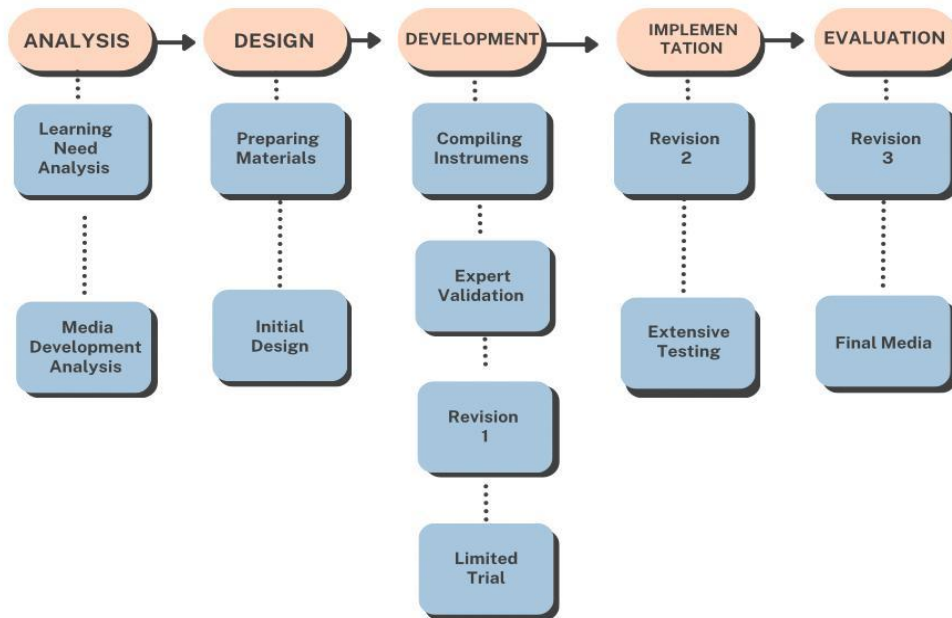
This study employs a research and development (R&D) approach to produce an instructional product in the form of an edutainment and problem solving based comic for the grade V magnet topic in elementary school. The development model in this study is the ADDIE model, which consists of five stage (Analysis, Design, Development, Implementation, and Evaluation) it provides a systematic sequence of development stages ranging from needs analysis to product effectiveness evaluation. This research was conducted at SD Negeri Sindurjan, Purworejo District, Purworejo Regency, from 15 to 20 August 2025. The research subjects focus on 28 fifth grade students of SD Negeri Sindurjan as the primary users of the media, 5 students for the limited trial, and 3 expert validators such as material expert, media expert, and an instructional expert. The selection of subjects was based on specific considerations, namely alignment with the research focus and feasibility of implementation within the school setting. The development procedures based on the ADDIE model are presented in Figure 1.

In the analysis phase, a systematic assessment of learning needs a conducted and a review of learning media appropriate for the characteristics of elementary school students was conducted. Subsequently, the design stage focused on developing the initial draft of the comic by preparing instructional materials and designing the edutainment and problem solving based comic. In the development stage, research instruments were prepared, validation was carried out by material and media experts, initial revisions were made, and a limited trial was conducted. The implementation stage involved a broader trial to assess the effectiveness and usability of the comic, followed by final revisions. Finally, in the evaluation stage, an assessment was conducted regarding the outcomes of the comic's application and its has an impact on students' understanding of magnet concepts.

To evaluate the effectiveness of the edutainment and problem solving based comic media, pretests and posttests were administered. The pretest was given prior to the use of the comic media to measure students' initial knowledge of magnet concepts, while the posttest was conducted after instruction to assess improvements in learning outcomes. A comparison of pretest and posttest scores was conducted to determine the increase in conceptual understanding as well as students' engagement within the instructional context, and the analysis was conducted by calculating the average score improvement and observing changes in students' learning behavior. The research instruments consisted of product validation sheets, student response questionnaires, and test instruments used to measure students' conceptual understanding and thinking skills related to the magnet topic. These instruments were used to evaluate the feasibility, practicality, and effectiveness of the developed media, as well as to identify

improvements in students' conceptual understanding and thinking abilities through the edutainment and problem solving approach.

**Figure 1.**  
*Flowchart of the ADDIE Model*



The research instruments employed in this study consisted of product validation sheets, student response questionnaires, and test instruments designed to measure students' conceptual understanding and thinking skills related to magnet material. These instruments were intended to assess the feasibility, practicality, and effectiveness of the developed comic media, as well as to identify improvements in students conceptual understanding and thinking skills through the implementation of the edutainment and problem solving approach. Data on these competencies were collected through pretests and posttests administered before and after the use of the comic media during the instructional process. The instruments used to measure students conceptual understanding and thinking skills on the magnet topic are presented in Table 1.

**Table 1.**  
*Instruments*

<b>Indicator Pretest Posttest</b>	<b>Indicator Student Response Questionnaire</b>
Explaining	The comic learning material makes the lessons more interesting
Analyzing	The use of comic media facilitates my understanding of the learning material.
Applying	This comic learning material is easy to use
Evaluating	I feel more active when learning with this comic
Concluding	I want to use this comic again in future lessons
	I enjoy it when the teacher uses comic learning material during teaching
	The comic learning material helps me learn directly
	I want the teacher to use this comic more often in learning activities

**Table 2.**  
*Validity Analysis*

<b>Percentage</b>	<b>Category</b>
81%-100%	Highly valid
61%-80%	Valid
41%-60%	Moderately valid
21%-40%	Invalid
0%-20%	Highly invalid

**Table 3.**  
*Practicality Analysis*

<b>Percentage</b>	<b>Category</b>
81% - 100%	Highly practical
61% - 80%	Practical
41% - 60%	Moderately practical
21% - 40%	Not practical
0% - 20%	Highly impractical

The effectiveness of the comic media was measured by comparing students' pretest and posttest scores. The pretest scores served as a baseline of students' abilities prior to using the comic media, while the posttest scores reflected the improvement in their abilities after participating in the learning activities using the media. The comparison results were then analyzed using the N-Gain test to determine the extent of improvement in students' conceptual understanding and thinking skills. This analysis provides an overview of the effectiveness of the comic media in enhancing learning outcomes and serves as a basis for further development and refinement of the product in the future.

**Table 4.**  
*Effectiveness Analysis*

Limit	Criteria
N-Gain Score $\geq 0.7$	High
$0.3 \leq$ N-Gain Score $\leq 0.7$	Medium
N-Gain Score $\leq 0.3$	Low

### 3. Result and Discussion

The findings from the development of the instructional media, conducted through the systematic implementation of the ADDIE model encompassing the stages of Analysis, Design, Development, Implementation, and Evaluation demonstrate that the resulting comic-based media effectively enhances the quality of science learning, specifically in the context of the magnet topic.

#### 1. *Analysis*

The initial stage, namely the analysis stage, was carried out to identify various needs and challenges encountered by students in learning magnet concepts. The analysis revealed that instruction still relied heavily on conventional, one-way teaching methods, resulting in limited active student engagement in the learning process (Candra et al., 2024). This condition contributed to students' lack of familiarity with independently solving problems. Several misconceptions were identified among students, such as misunderstandings regarding magnetic properties, the direction of magnetic poles, and objects that can or cannot be attracted by magnets. These misconceptions hindered students' accurate comprehension of magnet concepts (Prahasdita et al., 2025). In addition, the researcher explored various other sources necessary for developing educational comic media based on edutainment and problem solving that can help students learn in a more engaging and interactive manner, while also promoting active participation in the learning process. (Gde et al., 2019)

#### 2. *Design*

In the design stage, activities were focused on preparing the initial draft and references for the comic media by considering the alignment of learning materials, storyline, characters, and visual appearance. The design process was carried out using Canva, with several pages drawn manually, while emphasizing appealing layout arrangements, harmonious color selection, and illustrations that help students easily understand magnet concepts. The material was structured systematically and contextualized with everyday life (Sumiati & Nafitupulu, 2022). This stage also included the integration of edutainment elements, namely the combination of entertainment and educational aspects to create an enjoyable learning experience, as well as problem solving components to train students' analytical and reasoning skills in addressing issues related to magnetic phenomena.

**Figure 2.**  
*Comic Display*



In figure (a), the comic cover was designed using Canva and then adjusted to match the characters appearing within the comic content. Figure (b) presents a practice quiz intended to determine whether students have understood the material. Meanwhile, figure (c) displays comic content that features animal characters in the dialogue, with the illustrations drawn manually.

### 3. Development

Subsequently, in the development stage, the comic design was realized into a tangible product. The comic was reviewed and validated by experts, including a material expert, a media expert, and a classroom teacher. The aspects assessed included content alignment with the curriculum, conceptual accuracy, language clarity, visual attractiveness, and the coherence of the storyline with the learning scenario. The validation results indicated that the comic received excellent evaluations from all validators. The experts stated that the comic is suitable for use in instruction, as it meets the standards of learning content appropriate for the characteristics of elementary school students (Sumiati & Nafitupulu, 2022).

**Table 5.**  
*Expert Validation Results*

Validation	Indicator	Validation Result	Category
Media Expert	Visual Appearance Information Presentation	85.8%	Highly Valid
	Content Feasibility		Highly Valid

Material Expert 1	Material Alignment	88.5%	
	Language Clarity		
Material Expert 2	Content Feasibility		Highly Valid
	Material Alignment	88.5%	
	Language Clarity		

The validation conducted by the media expert, material expert, and classroom teacher indicated that the edutainment and problem solving based comic was highly valid (Table 5). The validation process aimed to ensure that the comic met the required criteria in terms of visual appearance, storyline presentation, conceptual accuracy, linguistic clarity, and alignment with the learning objectives of science instruction. In addition, the development stage also involved iterative revisions and refinements based on feedback from the validators, thereby improving the quality of the comic in terms of content, illustration design, and its applicability in elementary school learning activities.

#### 4. Implementation

The subsequent stage was implementation, which involved applying the comic in a fifth grade classroom to examine its effectiveness in learning activities. The implementation was conducted at SD Negeri Sindurjan through two phases a limited trial and an extensive trial carried out over several meetings. The limited trial involved five fifth grade students, while the extensive trial included twenty-eight students. The purpose of these trials was to determine the practicality and comprehensibility of the comic, as well as the extent to which the medium could attract students' interest and enhance their active engagement during learning activities. To evaluate the effectiveness of the comic, product testing was conducted through pre-test and post-test assessments, as presented in Table 8. The results showed a significant improvement in student learning outcomes in each trial phase. This improvement indicates that the use of the edutainment and problem solving based comic had a positive effect on students' conceptual understanding. The comic not only facilitated students' comprehension of magnetism concepts but also increased their active participation in the learning process through the combination of an engaging storyline and contextual problem solving activities. Thus, the developed comic was proven to be valid, practical, and effective for use in science learning at the elementary school level (M. Arif Rahman & Nirwana Anas, 2024).

**Table 6.**  
*Student Responses*

Stages	Average	Percentage	Category
Limited Student Response 1	3.8	91.21%	Highly Practical
Extended Student Response 1	3.81	95.38%	Highly Practical
Limited Student Response 2	3.86	94.4%	Highly Practical

Extended Student Response 2	3.75	95.75%	Highly Practical
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**Table 7.**  
*Product Trial*

Stages	Amount	Average
Limited Trial 1	822	88.3%
Expanded Trial 1	1772	88.75%
Limited Trial 2	824	94.4%
Expanded Trial 2	1861	95.59%

**Table 8.**  
*Pretest–Posttest Results*

Stages	Average		Percentage	Criteria
	Pretest	Posttest		
Limited Trial 1	43.4	90.9	83.53%	High
Expanded Trial 1	41.76	86.61	76.08%	High
Limited Trial 2	51.8	94	87.81%	High
Expanded Trial 2	48.59	89.63	80.08%	High

The results of the validation tests and student responses to the edutainment and problem solving based comic are presented in Table 5 and Table 6. Based on the validation outcomes, the media expert provided a score of 85.8%, categorized as highly valid, while the two material experts each assigned a score of 88.5%, also categorized as highly valid. These findings indicate that the comic meets the eligibility criteria in terms of visual presentation, clarity of information delivery, accuracy of content, alignment of material with learning objectives, and linguistic clarity. The validation process also included revisions based on suggestions from the validators to ensure that the comic becomes more engaging, communicative, and effective for use in science learning at the elementary school level. Thus, the comic was deemed suitable for pilot testing in the implementation stage

Furthermore, the results of student responses to the comic media, as presented in Table 6, indicate consistently positive evaluations. In the first meeting of the limited trial, the average response score reached 3.8 with a percentage of 91.21%, while in the first meeting of the extended trial, the average score was 3.81 with a percentage of 95.38%. In the subsequent sessions, the limited trial in the second meeting obtained an average score of 3.86 with a percentage of 94.4%, and the extended trial in the second meeting resulted in an average score of 3.75 with a percentage of 95.75%. All of these results fall within the category of highly practical. These data indicate that students perceived the developed comic media as engaging, easy to use, and supportive in facilitating their understanding of magnetic concepts through a simple narrative structure and appealing visuals.

In addition to student responses, the practicality of the comic media was also examined through classroom implementation trials, as presented in Table 7. The findings indicate that during the first session of the limited trial, the average percentage reached 88.3%, while the first session of the extended trial obtained 88.75%. Furthermore, the second session of the limited trial

resulted in 94.4%, and the second session of the extended trial achieved 95.59%. Based on these results, the comic media is classified as practical for use by both teachers and students, as it can be implemented effectively in learning activities without causing significant difficulties. These findings further reinforce the conclusion that the comic media enhances student engagement and contributes to creating a more enjoyable learning environment.

To evaluate the effectiveness of the comic-based learning media, product testing was conducted through pretests and posttests, as presented in Table 8. The results indicate a significant improvement in student learning outcomes across all trial stages. In the first session of the limited trial, the average score increased from 43.4 to 90.9, yielding an N-Gain of 83.53% (high category). In the first session of the extended trial, the score rose from 41.76 to 86.61, with an N-Gain of 76.08%. Subsequently, in the second session of the limited trial, the score improved from 51.8 to 94, achieving an N-Gain of 87.81%, while in the second session of the extended trial, the score increased from 48.59 to 89.63 with an N-Gain of 80.08%.

These improvements demonstrate that the edutainment and problem solving based comic media positively influences students' conceptual understanding. The comic not only facilitates comprehension of magnetism concepts but also enhances active student engagement through a combination of compelling storytelling and contextual problem solving activities. Thus, the developed comic media is proven to be valid, practical, and effective for use in science learning at the elementary school level (M. Arif Rahman & Nirwana Anas, 2024).

### *5. Evaluation*

The purpose of the evaluation phase was to determine students' overall responses to the use of the comic, including their reactions to the material, activities, and modes of presentation embedded within it. Accordingly, this evaluation aimed to assess the extent to which the comic could effectively support students in engaging in enjoyable and meaningful classroom learning (Jarlis et al., 2023). The practicality test results revealed that students' responses to the comic based media were highly positive. Students reported increased interest in learning because the material was presented through humorous and relatable illustrated narratives that were easy to understand and connected to everyday life. Furthermore, the problem solving activities integrated into the storyline assisted students in deepening their understanding of magnetism concepts. Overall, the findings indicate that the comic media is highly practical and effective for use in science learning activities.

From the perspective of effectiveness, the findings indicate a significant improvement in students' learning outcomes following the implementation of the comic based media, as evidenced by the pretest posttest results. This demonstrates that the comic serves not only as an engaging instructional aid but also as a productive and effective learning tool. These results are supported by other experimental and quasi experimental studies on science comic media, which similarly reported substantial increases in students' learning outcomes after the integration of comics into instruction (Pembelajaran et al., 2025).

In addition to demonstrating the effectiveness of the media, this study also encountered several challenges during the development and trial stages of the edutainment- and problem-solving-based comic media. During the development phase, the primary obstacles included aligning the magnet concept with the comic storyline, simplifying scientific concepts to match the cognitive characteristics of elementary school students, and designing visualizations capable of

representing abstract concepts in a concrete and easily understandable manner. (Bramianto S et al., 2025)

To overcome these challenges in the development and trial process, a series of strategic and structured steps were implemented. For the alignment of the magnet concept with the comic storyline, a gradual concept mapping was conducted. Subsequently, in an effort to simplify scientific concepts while accommodating the cognitive characteristics of elementary school students, simple, communicative, and contextual language was employed without compromising the scientific essence of the material (Balqis, Khairuna, et al., 2025). Furthermore, the expert validation process was carried out continuously and systematically through multiple revision stages, including material evaluation, media evaluation, and language evaluation. Each input from the validators was analyzed comprehensively, classified according to scientific content, pedagogical aspects, and visual-technical aspects, and subsequently used as the basis for iterative improvements, ensuring that the developed media met academic feasibility standards.

Overall, the evaluation confirms that the developed comic media meets three essential criteria: validity (content accuracy and presentation quality), practicality (ease of use for both teachers and students), and effectiveness (improvement in conceptual understanding and learning achievement). These findings reinforce the conclusion that comic media particularly those based on edutainment and problem-solving approaches are feasible and appropriate to be utilized as alternative instructional media for science learning in elementary schools.

#### **4. Conclusion**

Based on the findings, it can be concluded that the edutainment- and problem-solving-based comic developed for Grade 5 magnet topics is highly valid, practical, and effective. Expert validation results showed high validity, while student and teacher responses demonstrated very high practicality. Pretest–posttest comparisons revealed significant improvements in students' conceptual understanding, with high N-Gain values. These results indicate that the comic media effectively supports interactive and meaningful science learning. Therefore, the developed comic can be adopted as an innovative alternative learning medium for elementary science education and has the potential to be applied to other science topics.

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