



Development of an E-Comic Learning Media on the Human Digestive System to Improve Learning Outcomes

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ABSTRACT

The limited use of learning media technology based that use storytelling has resulted in low learning outcomes among class V regarding the human digestive system. This project aims to describe the design and development, test the feasibility, and evaluate the effectiveness of an E-Comic learning media on the human digestive system to improve learning outcomes. This is an R&D study using model ADDIE, which includes the stages of analyze, design, development, implementation, and evaluation. The subjects research is 27 class V students. Techniques data collection used non-test methods, including observation, interviews, documentation, and questionnaires, as well as test methods consisting of pre-test and post-test. Data analysis techniques used normality tests, paired sample t-tests, and N-Gain tests. The e-comic design was developed using canva for design, supplemented with stimulation, educational video, and educational games. The feasibility of the e-comic was demonstrated by expert validation results: 90% from content experts and 97.73% from media experts, both categorized as "highly worthy," supported by teacher feedback of 97.73% and student feedback of 90.54%. The effectiveness of the e-comic was demonstrated by a 20.07% increase in learning outcomes. This was supported by the results of the paired-sample t-test, which showed a significance value of $0.000 < 0.05$, and an N-Gain of 0.74, classified as high. The research concluded that the E-Comic learning media was developed successfully, is feasible, and is effective in improved learning outcomes for the human digestive system material for class V students at SD Negeri Karangayu 02 Semarang City.

Keywords: E-Comic; Learning Media; Human Digestive System; Learning Outcomes

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INTRODUCTION

Education is a systematic approach to develop students' full potential in harmony with learning goals. The education is a systematic and planned effort to create a pleasant learning and teaching environment so that students actively develop their potential to possess religious spiritual, self-control, and character, as well as noble moral intelligence and the skills necessary for the individual and society (Rahman et al., 2022). This is in line with Indonesia's national education goals as set forth in Article 6, Paragraph 1 of Government Regulation No. 2022 on National Education Standards, which states: "Graduation competency standards for educational institutions at the elementary level focus on preparing students to become members of society who are faithful, devout to God Almighty, and of noble character; instilling character in accordance with the values of Pancasila; and fostering students' literacy and numeracy competencies to enable them to pursue further education." These competency standards are achieved through challenging and enjoyable learning experiences.

Learning is a process designed by teachers to enhance students' knowledge, skills, and attitudes including critical thinking, creativity, knowledge construction, problem-solving, and mastery of learning media (Rahayu et al., 2022). The purpose of learning is to facilitate students' ability to realize their full potential. In the learning process, there are components that a teacher must pay attention to, namely learning objectives, learning resources, learning strategies, learning media, and learning evaluation (Fadilah, 2021). One of the subjects taught to elementary school students is science.

Science education is one of the subjects taught at the elementary school level (Dasi & Putra, 2022). Science education is considered relevant in shaping students' character to care for their surrounding environment (Laksmi & Suniasih, 2021). The objective of science education in elementary school is to instill curiosity and a

positive attitude toward science, technology, and society, to develop process skills for investigating the natural world, problem-solving, and decision-making, so that students can think critically and objectively (Gerieska, 2022). Science education in elementary school begins in third grade and continues through sixth grade. The scope of science material taught varies significantly from grade to grade.

The range of science material in class V consists of the properties of light, ecosystems, magnets, the earth, the human respiratory system, and the human digestive system. The human digestive system is a topic that covers the various organs of the digestive system, their functions, the flow of the digestive process, and the disorders that can affect the digestive system. The human digestive system is a challenging topic for elementary school students because the organs involved in the digestive process cannot be seen directly with the naked eye, thus requiring learning media to help students better understand the subject (Putra & Wulandari, 2021). To visualize abstract concepts for students, learning media is necessary.

Learning media refers to anything used as an intermediary or bridge between the information provider the teacher and the information recipient the student with the aim of stimulating students to become motivated and able to fully and meaningfully engage in the learning process (Hasan et al., 2021). Learning media can serve as a tool to convey material to students. By using learning media, students will be able to understand the material presented by the teacher more easily (Dwiasih & Agung, 2021). Additionally, the use of learning media must be tailored to the learning material. One of learning media that can be used in science education at the elementary school level is story-based learning media. Story-based learning media include comics, picture books, and so on. This type of story-based learning media can be presented in digital form via documents or links and can also be presented in physical form.

Based on the results of preliminary research conducted through interviews and the distribution of questionnaires to teachers and students at SD Negeri Karangayu 02 on Friday, December 12, 2025, several issues were identified in the IPAS teaching process in the classroom. Teachers have not been optimal in developing learning media based technology that use storytelling. In instruction, teachers only use audiovisual media sourced from YouTube displayed on a projector screen. The suboptimal design of these learning media can reduce students' motivation to learn. Students should be able to enjoy the learning process through varied and engaging methods. Ultimately, this can lead to low learning outcomes (Ananda et al., 2025).

Student learning outcomes remain relatively low. 60% or 15 out of 27 students scored below the school's established minimum passing score (KKTP) of 80. Meanwhile, 14% or 12 out of 27 students achieved the set KKTP. Student learning outcomes are still relatively low because students have difficulty understanding the names, functions, pathways, and disorders of the human digestive system. By using E-Comic learning media, which is narrative in nature, students will remember the information presented for a longer time (Khotimah & Ratnawuri, 2021).

Students face difficulties with the material on the human digestive system. Some class V students struggle to identify the names and functions of the human digestive system organs. Additionally, students also have trouble identifying the flow of the human digestive system as well as its disorders. This is because the human digestive system is a subject that cannot be observed directly and is abstract in nature (Putra & Wulandari, 2021). Therefore, there is a need for learning media technology based that use storytelling.

One type learning media technology based that use storytelling that can be used in science education regarding the human digestive system is the e-comic. E-comic presented in simpler, clearer language can help students understand abstract concepts related to the digestive system. E-comics presented through illustrations can reinforce students understanding of the material, making the learning process more engaging and enjoyable (Nengsih et al., 2023).

Another study titled Development of a Comic System for Human Digestive Education to Improve Critical Thinking Abilities. Concluded that educational comics are suitable for use in learning and effective in enhancing students' critical thinking skills in science education. This is evidenced by a 90% rating (highly suitable) from each media expert and content expert, 96.67% from teacher feedback, 98.56% from small-group testing results, and 90.55% from large-group testing results (Pangesti & Andriani, 2024). Based on past research, the researchers incorporated new elements into their product by adding stimulus, educational videos, and educational games to each section of the e-comic.

Based on the problem identification above, a solution is needed to address the challenges faced by teachers and students through the use of learning media technology based that use storytelling. Therefore, the researcher aims to develop an E-Comic learning media. This development is expected to enhance students' cognitive abilities and learning outcomes regarding the human digestive system. This study was conducted to describe the design of the E-Comic learning media, test its feasibility, and evaluate its effectiveness in improving learning outcomes regarding the human digestive system for class V students at SD Negeri Karangayu 02 Semarang City.

METHOD

This research is classified as R&D, or research and development. Research and development serves to verify and develop products. Verifying a product means that the product has already been created, and researchers are simply testing its effectiveness or validity. Developing a product, in a broad sense, can involve updating an existing product (to make it practical, effective, and efficient) or developing a new product (one that did not previously exist) (Sugiyono, 2023).

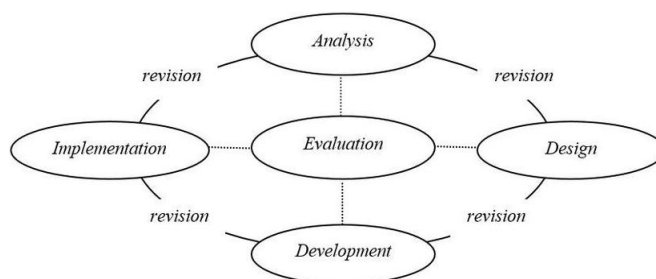


Figure 1. Steps of the ADDIE R&D model (Sugiyono, 2023)

Image1 illustrates the step R&D of the model ADDIE based on (Sugiyono, 2023). The ADDIE development model has the following stages: (1) Analyze, (2) Design, (3) Development, (4) Implementation, (5) Evaluation. The analysis phase involves analyzing the issues, needs, and existing solutions within a given environment. The design phase involves designing the product to be developed. The development phase involves testing the product to be developed with material expert and media experts. The implementation phase involves using the developed product. The evaluation phase involves assessing whether the product is suitable for use and can be held accountable.

The research was carried out at SD Negeri Karangayu 02 Semarang City during the second semester of the 2025–2026 academic year. This research includes 27 students in class V, with 6 students comprising of 2 students with low level cognitive capability, 2 students who have moderate cognitive capability, and 2 students who have high cognitive capability selected for the small scale trial, and 21 students for the large scale trial.

The data collection method used was a test consisting of pre-test and post-test questions, as well as non-test methods, including observation, interviews, documentation, and questionnaires. The data analysis methods used to evaluate product feasibility included expert validation sheets, teacher response questionnaires, and student response questionnaires. Meanwhile, to test the product's effectiveness, normality tests were conducted using the test Shapiro-Wilk, paired sample t-test, and test N-gain.

RESULT DAN DISCUSSION

Design of E-Comic Learning Media Development

This study is a development research project aimed at creating an learning media E-Comic in response to existing challenges in the field. The researcher seeks solutions through alternatives deemed effective and innovative. To develop the E-Comic learning media, the researcher employs the model development ADDIE. The initial stage in the ADDIE development model is analysis. The primary stage of development research using the model ADDIE, aimed at identifying the gap between current learning conditions and the ideal conditions expected, so that a solution in the form of an appropriate learning product can be formulated (Cahyadi, 2019).

Based on the data from the results of the pre-research, The problem identified in the V class at SD Negeri Karangayu 02 is that teachers have not been fully effective in developing type learning media technology based that use storytelling. In their lessons, teachers only use audiovisual materials taken from YouTube and displayed

on a projector screen. Student learning outcomes remain low. 60 % or 16 out of 28 students still scored lower than the minimum competency standard (KKTP). Students struggled with the material on the human digestive organs. Some class V students have difficulty identifying the names and functions of the organs in the human digestive system. Additionally, students struggle to identifying the flow of the human digestive system and the disorders that can affect it.

The facilities available at SD Negeri Karangayu 02 include LCD projectors that can be used in the classroom, and the WiFi network is also sufficient for teachers to use in learning media technology based. In addition, to support learning, there are also loudspeakers available for use. Given the current issues, improving the IPAS learning process. Specifically, teachers need to provide more varied learning materials that support student learning and understanding (Ayu & Putra, 2022). Teachers can present technology-based learning materials. Technology-based learning media are those that utilize information and communication technology to deliver content, facilitate interaction, and enable collaboration between teachers and students, using electronic devices, software, applications, online platforms, and other digital resource (Diniyah et al., 2025). The use of technology-based learning materials can make learning more active, enjoyable, and creative, and cover a broader range of knowledge (Serevina et al., 2021). One type of digital learning resource that can be used in IPAS learning is the e-comic.

An e-comic is defined as a comic accessed using technology. Comics are a unique media that combine text and images in a creative way; simple illustrations paired with everyday language make comics easier to understand (Christyowati et al., 2024). E An E-Comic is essentially the same as a regular comic. However, the key difference is that while traditional comics are in book form, e-comics are in the form of files or links accessed via a smartphone, laptop, or computer (Afriana & Prastowo, 2022). The benefits of e-comics as a learning medium include: they are more effective at visually engaging students, can improve student learning outcomes, help visualize abstract concepts, and boost student motivation to learn (Mauludyah, 2020). An ideal e-comic must include several key components. An ideal e-comic must contain these components. The components that must be present in the creation of an e-comic are: 1) cover, 2) gutter, 3) speech bubbles, 4) sound effects, 5) panels, 6) credits or information about the author (Lelyani & Erman, 2021).

The second phase is the design phase. The design phase aims to systematically formulate learning specifications as the basis for product development, including the determination of learning objectives, content structure, delivery strategies, media to be used, and the form of assessment to be implemented (Cahyadi, 2019). At this stage, the conceptual design is developed based on the requirements analysis (Sedana et al., 2022). At this stage, the researcher creates a prototype. The prototype involves developing the framework for the e-comic design such as the cover page, establishing the characters in the story, defining the learning objectives to be used, and beginning to outline the overall structure of the e-comic to be developed. The learning objectives established represent the goals to be achieved through the learning activities (Nadilah et al., 2025). In addition, the researchers have also started preparing the content to be included in the E-Comic they are developing.

The third stage is development, this stage realizes the plans formulated during the design stage into concrete, ready to use learning products through the creation of materials, the development of media, the integration of visual and interactive components, and the conduct of formative assessments to ensure the quality and suitability of the products before implementation (Cahyadi, 2019). After creating a prototype, the researchers designed the E-Comic using the app canva. Canva is an design online app that can be used to create educational materials. This app is an design program online that offers a variety of tools, including templates for presentations, resumes, posters, pamphlets, brochures, graphics, infographics, banners, and other types of materials (Resmini et al., 2021). Every page is designed using the canva app, which offers a wide variety of templates and interesting tools such as colors, images, icons, symbols, and others (A. Putri et al., 2021). In addition, the researchers have incorporated instructional videos and educational games into the E-Comic learning platform as an innovative feature of the product.

The layout of the E-Comic educational media product consists of the following components: front cover, synopsis, foreword, table of contents, character introductions, instructions for reading the e-comic, the e-comic content, educational videos, educational games, bibliography, developer profile, and back cover.



Figure 2. Stimulus in the E-Comic learning media

Figure 1 shows an E-Comic page that begins with a stimulus. A stimulus is a concept used in psychology to describe anything that elicits a reaction (Manoi & Soesanto, 2022). A stimulus is information that can be perceived by the five senses. The stimulus in Lesson 1 raises questions about what happens to food once it enters the human body. Meanwhile, the stimulus in Lesson 2 contains images illustrating how food that is not properly sanitized can affect the human body. These stimuli aim to stimulate the five senses and help students focus their attention. The content pages of the E-Comic are presented in a four panel format. Panels are used to organize the material or the unfolding storyline (Lelyani & Erman, 2021). The content within the panels is designed to make the abstract concepts of the human digestive system more concrete, so that students can understand them more easily. In addition, the panels also feature speech bubbles. Speech bubbles are used to display dialogue between characters in the e-comic. The text within the speech bubbles is tailored to each character, so that it shows the dialogue between them (Lelyani & Erman, 2021).



Figure 3. Educational video design

Figure 3. Features educational videos as a novelty in the product development. Videos as a learning media have several advantages, including the ability to be viewed and listened to repeatedly, providing simultaneous stimulation to various senses (sight and hearing), and helping to clarify information and improve memory (Alwi & Agustia, 2024). Educational videos are available at the end of each section of the E-Comic.



Figure 4. Educational game design

Figure 4 shows an educational game as an innovative feature in product development. By using educational games, learning can become more interactive, engaging, and enjoyable (Wulandasi et al., 2022). This educational game can also improve students' skills and help them understand science concepts, thereby improving their learning outcomes. The educational game used in the learning media E-Comic is wordwall. wordwall is a web based application designed to create or enhance learning media for students. wordwall offers quizzes to students to boost their motivation and interest in learning, as well as to reduce boredom during the learning process (Hasanah & Gudnanto, 2023). The wordwall educational game offers a variety of game templates, such as anagrams, spin the wheel, quizzes, match-ups, and more.

Once the learning media were fully developed, they were validated by a team of validators consisting of expert media and experts subject material (Pinatih & Putra, 2021). The results of the content and media expert surveys were then analyzed to determine the suitability of the E-Comic learning media. The content validation phase was conducted to assess the quality of the content and the conceptual alignment of the material within the E-Comic learning media. Once the content validation phase was complete, the next step was media expert validation. Expert media validation is a process conducted by experts in the field of learning media. The purpose of media expert validation is to determine the suitability of every aspect of the learning media that has been created. Next, a feedback questionnaire was distributed to students and teachers regarding the development product that had been tried out in class V at SD Negeri Karangayu 02. The purpose of collecting this feedback questionnaire was to compare whether the results of the content and expert validations aligned with the feedback from students and teachers regarding the learning media E-Comic development product that had been designed and implemented in the classroom.

Fourth stage is implementation. The stage implementation in the model ADDIE aims to apply the developed learning product in real-world learning situations to test its effectiveness, feasibility, and user acceptance before making final refinements (Cahyadi, 2019). This step is taken after the E-Comic product has been deemed appropriate by the validator. At this stage, the material is tested on small and large groups. Before conducting the product development trial, the researcher tested the questions that would later be used for the pre-test and post-test. The researcher conducted a test on the questions in the class 6 at SD Negeri Ngalayan 05, which has 29 students, by administering 40 test questions that would later be evaluated to identify valid questions through validity testing, reliability testing, and tests of item difficulty and discriminative power. Of the 40 questions tested in the class 6, 27 were found to be valid and reliable, with difficulty levels ranging from easy to moderate to difficult. From these 27 valid questions, 20 were selected to be used as pre-test and post-test questions to measure student learning outcomes. The administration of the pre-test and post-test aims to determine the difference in student learning outcomes before and after using the learning media E-Comic (Juneli et al., 2022).

The fifth stage is the stage evaluation. In the ADDIE instructional design model, the evaluation stage serves to determine the product's quality, effectiveness, and success of the instructional product in achieving

instructional objectives, both during the development process and after it has been implemented in the field (Cahyadi, 2019). During this fifth stage, the researcher will test the effectiveness of e-comics in learning (Meilani et al., 2022). At this stage, the researcher apply a test normality, a t-test for two dependent samples, and test N-Gain.

A test normality is an important step in data analysis because it serves as a prerequisite for determining whether parametric statistical methods can be applied (Sianturi, 2025). The test normality allows the researcher to identify the data analysis technique to use according to the data acquired. When the data are distributed normally, the author uses techniq parametric statistical, when they are not normally distributed, the author uses techniq nonparametric statistical. The choice of test was based on the relatively small sample size, namely fewer than 50 students in the research class. The test normality was computed using the test Shapiro-Wilk formula with the assistance of SPSS software. The decisive criteria for this test normality are as follows, if the significance value (Sig) is > 0.05 , the data is considered distributing normally, whereas if the significance value (Sig) is < 0.05 , the data is not distributed normally.

In this research, the researcher used the paired-sample t-test. The paired-sample t-test is a type of statistical test designed to compare the means of two paired groups (Hidayat & Taufiqurrahman, 2022). This test is used to examine differences in the means of samples consisting of the same subjects but subjected to different treatments, specifically before and after the treatment. The following hypotheses are tested in the mean difference test: $H_0: \mu_1 > \mu_2$ = the development of the E-Comic learning media on the human digestive system is not effective when used in IPAS instruction regarding learning outcomes student. $H_a: \mu_1 < \mu_2$ = the development of the E-Comic learning media on the human digestive system is effective when used in IPAS instruction regarding learning outcomes student.

The test N-Gain is a generally used method for analyzing the effectiveness of a learning program or intervention in improving learning outcomes student (Nabila et al., 2024). The test N-Gain is used to measure the difference in scores between pre-test and post-test, serving to demonstrate improvements in learning outcomes student between those who have not yet used E-Comic learning media and those who have. The classification of N-Gain test results is as follows if $N\text{-Gain} > 0.70$, the criterion is high, if $0.30 < N\text{-Gain} < 0.70$, the criterion is moderate, and if $N\text{-Gain} < 0.30$, the criterion is low (Kibari et al., 2023).

Feasibility of the E-Comic Learning Media

The suitability of the E-Comic learning media on the human digestive system was determined based on the validation assessments of material and media experts, as well as feedback from teachers and students regarding the developed learning media E-Comic.

Table 1. Results of the Validation Test by Material Experts and Media Experts

Validation	Presentage	Criteria
Material Expert	90 %	Highly worthy
Media Expert	97,73	Highly worthy

Table 1 shows that the development product tested by expert material received a score of 90% (highly worthy). The expert material validation questionnaire included 15 questions across 4 aspects: alignment with learning components, suitability for students cognitive levels, support for the content of the E-Comic learning media, and appropriateness for supporting learning content. It achieved a total score of 54, corresponding to a 90% score in the “highly worthy” category. In the material expert validation, the aspect of alignment with learning components received the highest rating. This is because the material presented is consistent with the learning outcomes and objectives, so the developed learning media is considered capable of supporting the learning process (Kasih & Hariyadi, 2022).

Meanwhile, the validation by expert media received a score of 97.73% (highly worthy). The media expert validation covered 11 questions across 3 aspects: media practicality, media presentation, and feasibility. In the media expert validation, the media practicality aspect received the highest score. The fact that the media practicality aspect received the highest score indicates that the developed media is easy to operate, has a clear design, and helps students understand the learning material (Pinatih & Putra, 2021). Practicality is one of the

important indicators in determining the quality of teaching materials, as practical materials make the learning process easier for both teachers and students, thereby enabling learning objectives to be achieved more effectively.

The learning media E-Comic on the human digestive system is also consistent with Piaget's learning theory, as the developed learning media features realistic images of the organs in the human digestive system, along with descriptions presented in the form of a story, so that students will be more interested and will not find it boring (Udayani et al., 2021). As a result, students will gain a clear understanding of the material presented because they are provided with realistic and concrete illustrations. Moreover, the E-Comic learning medium aligns with Ausubel's learning theory; by reading E-Comics that contain engaging stories, images, and narratives related to the digestive system, students can achieve meaningful learning through stories connected to the human digestive system. In addition, students also gain meaningful learning by carefully reading the stories in the E-Comic repeatedly, so that they will understand the material on the human digestive system (Rasmet et al., 2025).

Table 2. Result of teacher and student responses

Response	Percentage	Criteria
Teacher	97,73 %	Highly worthy
Students	90,54 %	Highly worthy

Table 2 shows that teacher responses to the use of E-Comic learning media in the trial use scored 97.73%, meeting the "highly worthy" criterion, and that the 27 students achieved an average score of 90.54%, also meeting the "highly worthy" criterion. These results indicate that the learning media E-Comic received a very positive response from both teachers and students. The highest-rated aspect of media quality indicates that the developed E-Comic learning media has an attractive appearance, is easy to use, and is capable of effectively supporting the delivery of content (S. K. Putri et al., 2024). In addition, the positive feedback from teachers and students suggest that the learning media fulfills the criteria for practicality and feasible. Thus it could be assumed that the learning media E-Comic developed is highly worthy for use in teaching the human digestive system as part of the IPAS in class V.

The Effectiveness of E-Comic Learning Media

The effectiveness of the learning media E-Comic was assessed using a normality test, a paired-sample t-test, and test N-Gain on the pre-test and post-test administered to class V students at SD Negeri Karangayu 02 Semarang City.

Table 3. Results of the Normality Test

	Significance	Category
Pre-test	0,201	Normal
Post-test	0,059	Normal

In table 3 presents the outcome of the test normality for the pre-test and post-test. According to the above table, the results of the Shapiro-Wilk test of normality indicate that the p-value for the pre-test is $0.201 > 0.05$, which means so the data are normally distributed. The results of the normality test using the Shapiro-Wilk test show that the significance of the post-test is $0.059 > 0.05$, so the data distribution meets the assumptions of normality. Thus it can be assumed that both the data pre-test and post-test from the large-group trial have significance levels greater than 0.05, so both datasets are normally distributed.

Table 4. Result of the Paired Sample t-test

Treatment	N	Mean	T	Sign.(2 Tailed)
Pre-test	21	71.19	-10,473	0,000
Post-test	21	92.14		

Table 4 shows that the score pre-test average was 71.19 and the score post-test average was 92.14, representing an increase of 20.95. Thus, there was an improvement in learning outcomes after using the E-Comic learning medium. Furthermore, based on the paired sample t-test, the significance value (two-tailed) is $0.000 < 0.05$; therefore, H_0 is rejected and H_1 is accepted. Consequently, it can be assumed that there is a statistically significant difference or improvement in learning outcomes between before and after using the learning media E-Comic.

Table 5. N-Gain Test Results

Aspect	Mean	Percentage	Description
N-Gain Score	0,74	74 %	High

In Table 5, the results of the N-Gain test for the large group show a mean of 0,74. This value falls into the high category, indicating that the improvement in scores from the pre-test to the post-test in the large-scale group trial was significant. Therefore, it can be concludes that the E-Comic learning media developed is effective in improve student learning outcomes in the IPAS subject, particularly regarding the human digestive system material in class V at SD Negeri Karangayu 02 Semarang City. The average improvement in learning outcomes student during the trial of the learning media E-Comic is shown in the diagram below:

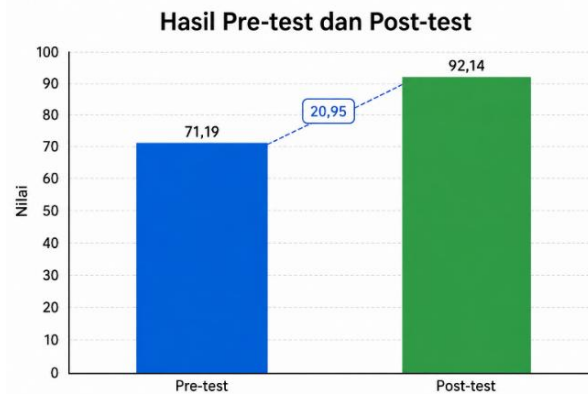


Diagram 1. Average score Pre-test and Post-test of class V students at SD Negeri Karangayu 02 in Semarang City

Based on diagram 1, there was an improvement in pre-test and post-test scores, with an average pre-test score of 71,19 and an average post-test score of 92,14, representing an increase of 20.95 points between the pre-test to the post-test. The rise in the score N-Gain to the high category was impacted by the comprehensive components of the E-Comic, such as stimulus, educational videos, and educational game (Sukma & Setyasto, 2024). This is similar to with previous analysis (Oktaviana & Ramadhani, 2023) which indicates an improvement in learning outcomes through the use of e-comic learning media, as evidenced by the pre-test and post-test scores, with a pre-test average of 66.64 and a post-test average of 86.19.

Using the Canva app to create learning media e-comic makes it possible to visualize material that students might initially find abstract. By presenting the material in the form of a illustrated stories with engaging visuals, students can understand or grasp the information in a more engaging and enjoyable way than they would with text alone (Yuliani & Setiawan, 2024). In addition, enhancing the visual appeal of each E-Comic panel with attractive designs and illustrations can boost students motivation to learn. The inclusion of educational videos in the E-Comic learning medium also serves as a bridge for students to boost their learning outcomes. The E-Comic learning medium is equipped with components that support students understanding of the presented material. In addition, the clear and communicative language used makes the material in the learning media E-Comic easier for students to understanding (Ismiyanti et al., 2024).

CONCLUSION

According to the results of the research and data analysis conducted, it can be concluded that the E-Comic learning media on the human digestive system was successfully developed using the Canva application, which includes stimulus, educational videos, and educational games in each section of the E-Comic. Validation results from material and media experts, as well as teacher and student response surveys, indicated that the developed learning media E-Comic falls into the “Highly worthy” category. The effectiveness of the E-Comic learning medium is shown by improvements in pre-test and post-test scores. This is also supported by the results of a paired t-test, which showed a significant difference before and after using the developed product, as well as the results of the test N-Gain, which fell into the “high” category. Thus, the E-Comic learning media has been successfully developed and is suitable and effective for improving learning outcomes student on the topic of the human digestive system for class V students at SD Negeri Karangayu 02 in Semarang City.

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