Development of Comic-Based Biology Learning Materials on the Topic of Motion Systems in Humans

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Abstract: This research aims to develop comic-based learning media that is appropriate, practical and effective to use. This development research used the ADDIE development model, consisting of five stages, namely, Analysis, Design, Development, Implementation, and Evaluation. The data analysis technique used is a combination of qualitative and quantitative. Based on the results of the validation of material experts, the assessment achieved an average of very decent with a percentage of 92.8% in the subject matter expert section 1 while the material expert 2 received a score of 100%. Based on the results of media expert validation, the average rating achieved was very feasible with a percentage of 96.4%. Based on the results of the questionnaire sheet, it gets a practicality value of 90.00% in the very practical category. Moreover, the N-Gain result is 0.60 in the medium category. It can be concluded that comic media is effectively used in the learning process with moderate effectiveness and is considered very practical.

Keywords: learning materials, comics, biology learning.

Abstrak: Penelitian ini bertujuan untuk mengembangkan media pembelajaran berbasis komik yang layak, praktis dan efektif untuk digunakan. Penelitian pengembangan ini menggunakan model pengembangan ADDIE, terdiri dari lima tahapan yaitu, Analysis, Design, Development, Implementation, dan Evaluation. Teknik analisis data yang digunakan adalah kombinasi dari kualitatif dan kuantitatif. Berdasarkan hasil validasi ahli materi penilaian yang dicapai rata-rata sangat layak dengan presentase 92,8% pada bagian ahli materi 1 sedangkan pada ahli materi 2 mendapatkan nilai 100%. Berdasarkan hasil validasi ahli media, penilaian yang dicapai rata-rata sangat layak dengan persentase 96,4% . Berdasarkan hasil dari lembar qusioner mendapatkan nilai kepraktisan sebesar 90,00% dengan kategori sangat praktis. Selanjutnya, hasil N-Gain sebesar 0,60 dengan kategori sedang. Dapat disimpulkan bahwa media komik efektif digunakan dalam proses pembelajaran dengan kategori keefektifan sedang dan dinilai sangat praktis.

Kata kunci: bahan ajar, komik, pembelajaran biologi.

▪ **INTRODUCTION**

Education is an important factor in human resource investment (Anesia, Anggoro, & Gunawan, 2018). Education itself is an important mission in building the nation, nationally, Education is defined as a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual strength, self-control, personality, intelligence, noble character, as well as skills needed by himself (Daulay, Heroes, & Indonesia, 2018). Improving the quality of education is carried out in the form of developing methods for delivering learning materials, developing curricula, and developing various types of learning media. One integral part of the renewal effort is in the form of learning media innovation. Several factors can facilitate better learning, one of which is choosing the right learning media

(Lestari, Ahmadi, & Rochmad, 2021). Learning media is an important part because learning media is a tool used to convey learning material (Gunawan, 2013). In carrying out the learning process, a media is needed. The media itself is an integral part of the teaching and learning process. Media literally means middle or introduction. Then according to Olson in Yusufhadi Miarso defines media as technology for presenting, recording, sharing and distributing symbols through certain sensory stimuli, accompanied by structuring information (Aurora & Effendi, 2019).

Learning media used are usually in the form of print media such as books, magazines, newspapers and one of them is comics, among the existing print media, comics are believed to be a possible means of conveying scientific information which includes a strong appeal (Roswati, Rustaman, & Nugraha, 2019). In accordance with the times and the needs of students, innovations in various learning media continue to be carried out to support the learning process. This applies to all subject areas, including biology (Ariyanto, Priyayi, & Dewi, 2011). Regarding the function of the media, Orey in (Rina, Suminar, Damayani, & Hafiar, 2020) argues that the media functions as a delivery system for educational communication. Thus the media has a function as a communication delivery system in education. Learning media itself is an important component that is interconnected with other components, in order to create the desired learning situation (Widodo, 2018).

Jayawardana, Sugiarti, & Gita (2020) said that based on observations from several schools, the fact was obtained that some students considered biology lessons to be quite difficult because the material was very dense, and there were foreign terms that were difficult to understand. As in the subject matter "Motion Systems" in this material there are many pictures and scientific terms which are a scourge for students and become a burden for students to memorize. In addition, another opinion states that students are lazy in reading biology material. They only read books when they get assignments or quizzes. In addition, biology teachers say students don't like to read because the books provided by the government and schools tend to be boring (Chamisijatin et al., 2020). Therefore, learning media are needed that can increase students' desire to learn the material, for example, learning media in the form of comics.

Comics are a series of pictures included in a box that contains a whole series of stories. The pictures are accompanied by sayings and accompanied by explanatory narration (Buchori & Setyawati, 2015). According to research conducted by Thorndike in (Widyastuti, Mardiyana, & Saputro, 2017) one of the benefits of comics is reading comics intensively (for example one comic in one month) is the same as reading textbooks in a year. This is the reason why researchers make comic-based teaching materials. According to its function, comics are divided into commercial comics and educational comics. Commercial comics are much needed in the market because of their personal nature. Whereas Educational comics present Educational stories in a series of images made to entertain and educate readers (Maharani et al., 2019).

Comics also have aspects that are influential, impressive, and can attract students' attention with colorful pages, character appearances and also easy to remember. In addition, comics also have the ability to meet the needs of students in various academic abilities (Arini, Choiri, & Sunardi, 2017). Besides that, comics were made as a literary medium in the 18th century, apart from being entertainment, comics also functioned as a promotional field for philosophy and political revolution (Mendelson et al., 2017).

Comics as a learning medium also function as a tool to convey learning messages that can function properly (Ntobuo, Arbie, & Amali, 2018). Data obtained from previous studies stated that the effectiveness of comic media was 86.11% of the entire class. If 75% of students who study using comics complete with KKM scores, the product is said to be effective and suitable for use as a learning medium. In addition, it was stated that comics have great potential for use in education, because they help students with problems of lack of interest in reading. With interesting pictures and dialogue in comics, students are motivated to read comics and are younger in understanding material concepts (Zuhrowati, Abdurrahman, & Suyatna, 2018).

The canva app is an online design program that offers a variety of tools, including presentations, resumes, posters, flyers, brochures, charts, infographics, banners, and more. According to Tanjung, 2019 in (Ritonga & Arsyad, 2022). There are several benefits in the Canva application, including making it easier for someone to make designs, Canva provides access to several templates, utilizes practical learning media to save time and many more. The results of interviews with biology teachers and YP Raudhatul Akmal students found that the learning media used were textbooks from teachers, learning videos and power points, students did not have their own learning media so additional material was sought via the internet. Based on the results of the conservation carried out, it was stated that students had never used comic media as learning material. referring to this background it is felt necessary to conduct research related to comic-based teaching materials at YP Raudhatul Akmal, it is hoped that the development of comic-based teaching materials can become an additional source of learning for students.

▪ **METHOD**

This study use Research and Development design which is a process to develop a new product or improve existing products, which can be accounted for. The model used is the ADDIE development model, which is a development model consisting of five stages, namely, Analysis, Design, Development, Implementation, and Evaluation (Setiawan, Rakhmadi, & Raisal, 2021). The research was conducted at YP Raudhatul Akmal, Kabupaten Deli Serdang, North Sumatra with a population of all students of class XI YP Raudhatul Akmal with a sample of class XI IPA 1 Plus, XI IPA 2 Plus and XI IPA 3 Regular. This research was conducted in the even semester of 2022/2023 from 16 to 26 January 2022.

Instrument

This development research uses several instruments, including interviews, documentation, observation and questionnaires. Observations are made to make direct observations of the learning process to analyze the learning media used in the learning process. Interviews are used when you want to know the information you want to take from students and biology teachers. Questionnaire is a way of collecting data by giving a series of questions or written statements to respondents. The questionnaire was given to students to get the desired data.

Research Design and Procedures

The five stages of the ADDIE model are described as follows. (1) analysis, analyzing needs through observation and interviews. (2) design, product design in the

form of a story line with attention to dialogue and material. (3) development, development of storylines into actual products by adding images according to the characters that have been designed. Then, the product is validated by media experts and material experts to assess its feasibility.

The validation sheet is used to assess the feasibility of comic media by expert validators (4) The implementation stage, the application of the product in the assessment process by trying the product out to students in the learning process, this product is assessed by the teacher and students by giving pretest questions then give time to students to read comics, after finishing then students are given posttest questions to see the results of students' understanding of comic media. (5) evaluation, evaluate the results of the application (implementation) products developed to determine the practicality of the product in the learning process using a questionnaire sheet.

Data Analysis

Data analysis techniques using a Likert scale namely changing qualitative to be quantitative with the provisions of the score. Likert scale consist of five levels, namely 1 (very poor), 2 (poor), 3 (enough), 4 (good) and finally 5 (very good). The percentage value obtained is converted with the eligibility level criteria according to (Sinambela & Sinaga, 2020) is very inappropriate Percentage 0% -20% with the description "revised", not feasible Percentage 21% -40% with the description "revised", less feasible Percentage 41% -60% with the statement "revised", the appropriate percentage is 61% - 80% with the statement "no revision needed" and the last percentage is 81% -100% with the description "no revision needed".

The criteria for the practicality level of comic media (Samitra & Harmoko, 2021) states that if a percentage of 0%-59% the assessment is considered impractical, if the percentage is 60%-79% the assessment is considered quite practical, if the percentage is 80%-89% it is considered practical, and if the percentage 90%-99% of ratings are considered very practical.

Validation and practicality test of Science Process Skills-Based Student Worksheets To describe the effectiveness of comic media, it was tested with the average normalized gain calculation (N-Gain). The increase that occurs before and after the use of comic media is calculated using N-Gain. The clarification of the effectiveness of the use of comic media is informed by its category based on the high or low of the acquisition of the N-Gain value. Criteria for the Level of Effectiveness of Comic Media Based on the N-Gain Retara value (Hake in Hastiana, Siroj, & Irma, 2021) states that if the N-Gain ≥ 0.7 is classified as high it is said to be effective, $0.3 \leq$ N-Gain <0.7 classified it is said to be quite effective, and N-Gain < 0.3 is classified as low it is said to be less effective.

▪ **RESULT AND DISSCUSSION**

This research is a development of teaching materials in the form of products, namely comic-based teaching materials. The results of this study obtained comic media as a feasible, practical and effective learning resource for use in the teaching and learning process. Analysis stage, at this stage what is being done is looking for needs that need to be analyzed through interviews with biology teachers, observations of teaching and learning activities and interviews of students. The results obtained in conducting observations and interviews are that students learn still using the teacher's

textbook, learning videos and power point. Students do not have their own learning resources. Books that are used at school after studying they return to the library. So it is important to procure other learning resources to support the learning process of students.

Next is the design stage, the initial product design is in the form of a storyline which is then developed into comic media by looking at the material content and design. Comic media design is done to see what images will be displayed in the comic. While the village material uses guidelines from the basic competencies that have been determined by the Minister of Education and Culture regarding motion system material, after that it is assisted by using a storyline to make it easier to make comic media. Entering the development stage, the comic media developed is validated by media experts and material experts. This Development stage is a product design in the form of a storyline that is developed into a comic media product that is actually made through the Canva application. However, the lack of image elements in the Canva application makes the appearance of comic media look monotonous, due to the limited expression and style provided by the application. Then validate the product being developed to test its feasibility. Testing the feasibility of this learning resource in the form of comic media is carried out through an assessment by an expert validator. Assessment is done to get suggestions and criticisms as a guide in the improvement of the comic media further.

The product is carried out by media experts and material experts, the evaluation by media experts gets a score of 95% in the appearance section, while the material section gets a score of 100%. If it is calculated using a likers scale, it gets a percentage of 96.4% with the "very decent" criteria. The advice given by media experts is that it needs a little improvement on the image so that it is representative of the concept being discussed. The following is the result of the repair and before it was repaired. In line with research (Sarastia, 2021) getting a 90% result indicates a very decent qualification. This is because the products developed have met the criteria of good learning media, according to the needs of students, practical and durable.
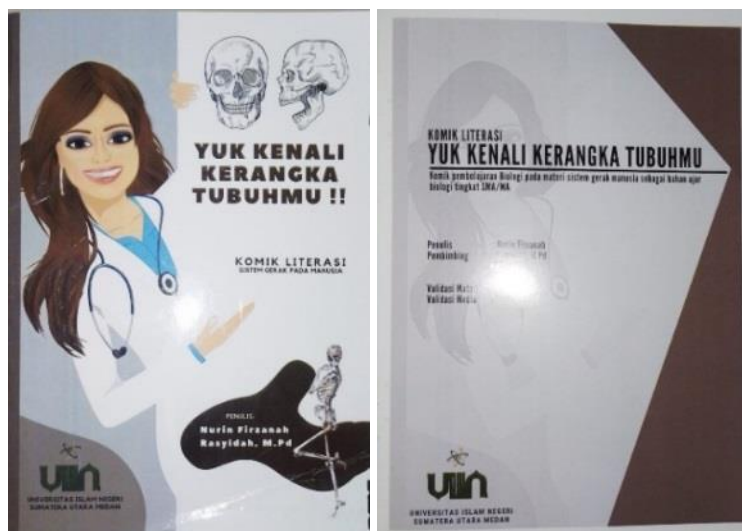
Figure 1. Cover of the developed comics-based learning media

The assessment obtained from the material expert one gets a score of 91.42% in the learning section, while the material section gets a score of 88.57%. If calculated using the likes scale, it gets a score of 92.8% with the criteria of "very feasible" with the advice given is to add material, especially in parts that are still not appropriate. whereas from the material expert 2, the score in the learning and material section is 100%, without any suggestions. If it is calculated using a Likers scale, it gets a value of 100% with the "very decent" criteria. The following is a picture after the revision with before the revision.
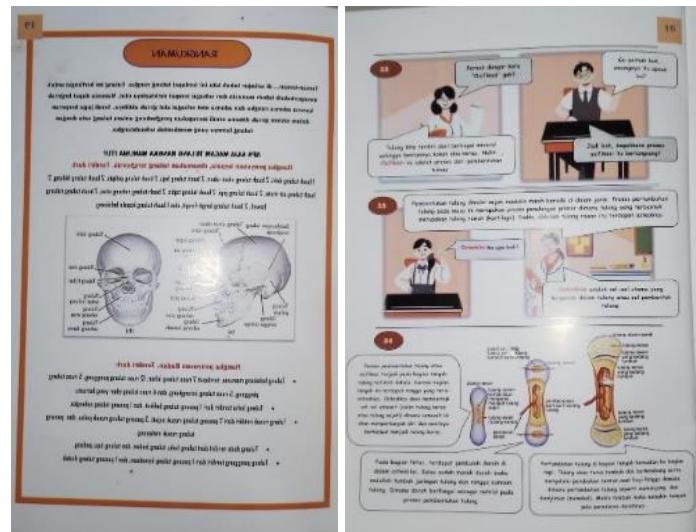

Figure 2. Content of the media after revision

Comic media that are considered appropriate by media experts and material experts are then implemented on students in the learning process to see their practical value. The following are the results of the practicality test through a response questionnaire by teachers and students. After the comic media is considered feasible and revision has been carried out, it enters the implementation stage, at this stage a practicality test is carried out to see the level of practicality of using comic media by teachers and students. From the teacher's response, a score of 83.63% was obtained with the "practical" criterion. While the practicality obtained from students is 90.00% with the criteria of "very practical" from all classes.

Teachers and students showed a positive response to the comic media that was developed. In the process of developing comic media, there are several things that need attention. One of them is presenting material with an attractive appearance. The positive response shown by these students is in line with (Murti, Gunarhadi, & Winarno, 2020) which states that design and appearance are the main attraction for students. students want a cartoon design as the main character in the development of educational comics.

In line with the opinion (Putri, Fida, & Wasis, 2018) said that educational comics received a strong and positive response with a response percentage of 70% to 100%. This is because educational comics make learning more interesting, especially in understanding material that is long and difficult for students to understand. This evaluation stage was carried out with the aim of perfecting the comic media that was developed and then followed by testing the effectiveness of the use of comic media. The

following are the results obtained from the Pretest and Posttest scores. The effectiveness of the use of comic media is tested by calculating the average N-Gain. students' pretest scores are lower than posttest scores. The results were obtained from three different classes, according to existing data in class XI IPA 1 Plus the overall pretest score was 1245 and the posttest score was 1925 the total N-Gain score was 0.50, class XI IPA 2 Plus overall got a pretest score of 920 and the posttest score of 1680 the total N-Gain score is 0.60 and lastly class XI IPA 3 Regular gets the pretest result of 1225 and the posttest score is 2705 the total N-Gain score is 0.70. The overall N-Gain value, if an average score is 0.60. This result is supported by research conducted by Watia (2022) comic books get good appreciation from children with more than 50.0% giving highest rating and 66.4% stated that they learned a lot from comic books.
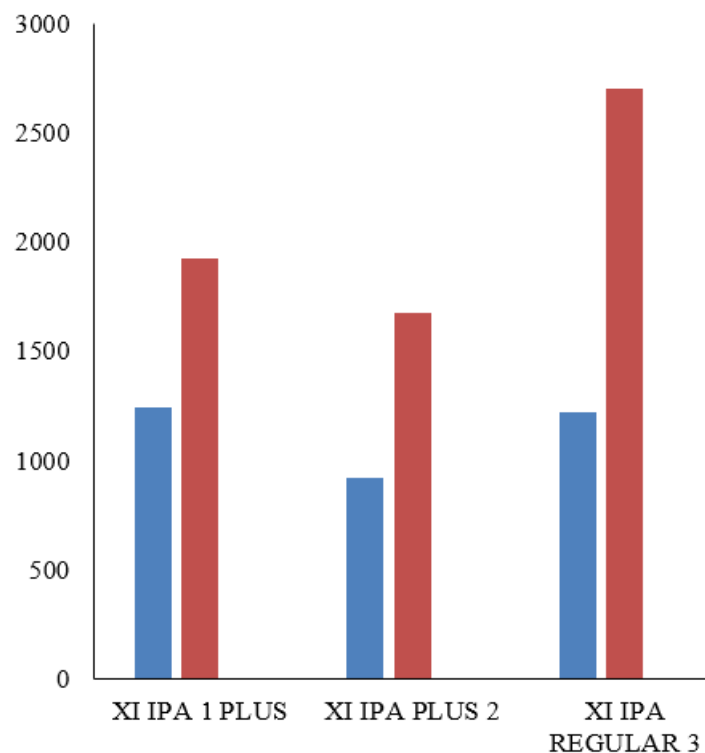
Figure 3. Pretest and postest score of control (blue) and experimental (red) group

Research by Udayani, Wibawa, & Rati (2021) states that digital comic users can increase learning effectiveness, besides that comics can also be used by teachers in learning to help students learn independently. Research by Serevina, Astra, & Syahida (2021) states that comics can convey information in an interesting, concise and easy-to-understand way. Besides that, comics don't need long sentences to convey information, so comics have a light character. In research Widiyastuti, Slamet, & Kurniawan (2021) stated that comic media can involve all students to take part in learning in a fun way and make learning efficient and effective.

▪ **CONCLUSION**

Research confirmed that comic media was appropriate for use in classroom learning. These data were obtained from validation by material experts and media experts as well as data from observations and questionnaires. The expert judgement and effectivity analysis showed that comic-based teaching materials is appropriate for learning biology especially in the topics of motion systems in humans. The developed media is expected to be used by teachers and students to support the biology learning process in the classroom.

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