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Development of *Manga* comic learning media "Immunity at Work" for high school students

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Abstract

The development of the educational era that is growing very quickly certainly requires the provision of relevant learning resources, especially the availability of additional teaching media that can have a positive influence on the motivation and learning outcomes of students. The goal of this research is to create a *Manga* "Immunity at Work" learning media that fits the criteria of validity, practicality, and effectiveness. Using the ADDIE approach, this study conducts R&D (Research and Development) research. The development product was evaluated using validity, practicality, and effectiveness tests. The research subjects were validators (validation experts), biology educators (practitioners), and students from grade XI MIA II at MA Madani Alauddin Pao-pao. The research instruments were in the form of media validation sheets, educators and students' response questionnaires, and learning outcomes test items. The results showed that the developed media had a validity level of 3.56 (very valid), the level of practicality based on the response assessment of educators was 97.5% (very practical) and students 85.31 (very practical). The learning outcomes test has a percentage of classical effectiveness level of 85% reaching the minimum value for the effective category. Based on the findings of this research, the development of the *Manga* learning media "Immunity at Work" is recommended to be optimized in dissemination, similar development, and application.

Abstrak. *Perkembangan era pendidikan yang berkembang dengan sangat cepat tentunya memerlukan penyediaan sumber belajar yang relevan, terutama ketersediaan media ajar yang tambahan yang mampu memberikan pengaruh positif terhadap motivasi dan hasil belajar peserta didik. Penelitian ini bertujuan untuk mengembangkan media pembelajaran Komik Manga "Immunity at Work" yang memenuhi kriteria kevalidan, kepraktisan dan keefektifan. Penelitian ini menggunakan jenis penelitian R&D (Research and Development) dengan model ADDIE. Produk pengembangan diuji melalui uji validitas, uji kepraktisan dan uji keefektifan. Subjek penelitian adalah validator (ahli validasi), pendidik mata pelajaran Biologi (praktisi), dan peserta didik kelas XI MIA II di MA Madani Alauddin Pao-pao. Instrumen penelitian berupa lembar validasi media, angket respon pendidik dan peserta didik, serta butir-butir tes hasil belajar. Hasil penelitian menunjukkan bahwa media yang dikembangkan memiliki tingkat validitas yaitu 3.56 (sangat valid), tingkat kepraktisan berdasarkan penilaian respon pendidik yaitu 97.5% (sangat praktis) dan peserta didik 85.31 (sangat praktis). Tes hasil belajar memiliki persentase tingkat keefektifan secara klasikal 85% mencapai nilai minimum untuk kategori efektif. Berdasarkan temuan dari penelitian ini, pengembangan media pembelajaran Komik Manga "Immunity at Work" direkomendasikan untuk dioptimalkan dalam penyebarluasan, pengembangan serupa, maupun penerapannya.*

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A. Introduction

The progress and improvement of education is one of the elements of a nation's welfare (Munirah, 2015). According to Taufiq et al. (2024) and Yulianti et al. (2023), education is one of the most important aspects to shape or improve the character and human resources in a country. Teaching and learning activities in the classroom are a form of organizing education that involves those who teach (educators) and those who are taught (students) (Hanafi et al., 2018). The learning process cannot take place well if it does not use strategic and appropriate teaching methods and learning media. As a means in the learning process, the media is one of the educator's tools to support the delivery of material to students (Rivai, 2019).

The presence of learning media can enhance and inspire students to more easily understand learning concepts (Anas et al., 2021). Certainly, incorporating educational resources will motivate students to persist in their reading, discussions, and creative thinking by aiding their comprehension of the content at a deeper level. A perfect educational setting will be created, fostering a constructive connection between teachers and students through various learning media (Tafonao, 2018). The use of media can enhance students' enthusiasm and drive to learn, making it simpler for them to comprehend and gain proficiency in the subject matter. Engaging media will encourage students during their educational experience (Nurrita, 2018). From this explanation, one can infer that teaching media plays a crucial role in enhancing and diversifying the educational process to meet suitable, effective, and efficient learning goals (Alamsyah et al., 2022).

Through discussions and assessments with biology teachers and students from class XI MIA II at MA Madani Alauddin Pao-pao, who utilized student worksheets, textbooks, learning modules, and PowerPoint presentations, several challenges were identified in the educational process, particularly regarding the immune system content. These challenges arise due to the fact that the immune system topic is among the most theoretical subjects and demands numerous illustrations to aid students in grasping the material, especially material related to the mechanism of the immune system. This aligns with the study performed by Syamsurizal & Ardianti (2021), which portrays the immune system as a subject that is challenging to grasp. Due to its abstract nature, it necessitates comprehension that relies on students' visualization of the concepts covered, particularly concerning the immune system's mechanisms.

Educational materials like teaching modules or textbooks used in schools generally provide information primarily through written content, which often has significantly more text than visual illustrations, particularly for abstract subjects like immune systems (Sarip et al., 2022). Therefore, teachers occasionally struggle with creating or delivering learning materials that are both effective and efficient to convey information about the immune system within a relatively brief and limited time frame (Damayanti & Jayanti, 2024). Consequently, students tend to rely more on others and struggle to comprehend the content they are studying. When learners fail to grasp the information, it leads to unsatisfactory educational results. Therefore, scholars chose to undertake a study aimed at developing educational resources that utilize comics.

Numerous scholars have developed educational learning media using comics, including *Manga* content that emphasizes topics related to the endocrine system (Haka & Suhanda, 2018), digital comic learning media on alternative energy sources (Adnyani & Wibawa, 2021), and the development of educational comics for social studies history (Daulay, 2017). Although several studies have developed comic learning media, the literature that develops teaching materials in the form of *Manga* is still quite limited, particularly concerning the immune system material. Earlier research has primarily concentrated on creating comics that feature visuals related to actual events or educational activities found in our surroundings, which are subsequently transformed into comic form.

The distinction between this research and previous research lies in the adaptation of *Manga* (Japanese comics) with immersive characteristics, unique and interesting character designs, character expressions depicted through facial expressions or body postures, and more detailed images with unique storylines (Astiningrum & Prawitasari, 2007). One more aspect that sets apart the *Manga* created by the researcher is that during its creation, the illustrations and narratives are entirely original concepts crafted by the researcher, without relying on external help for the artwork or storyline development.

Based on data obtained from the field and literature sources, researchers discovered that components of the immune system represent one of the biology topics that students struggle with. The complexity of the immune system, characterized by its abstract nature, poses a significant challenge for students in their effort to grasp it. Therefore, researchers developed a learning media that was implemented in the title "Development of *Manga* 'Immunity at Work' Learning Media in Grade XI MA Madani Alauddin Pao-pao". The objective of this study is to develop *Manga* learning media on immune system material that meets the criteria of validity, practicality, and effectiveness. In addition, the study will determine the feasibility of using the *Manga* as additional teaching material in the learning process. It is hypothesized that the *Manga* developed will

facilitate student understanding of immune system material in biology subjects.

B. Material and method

The development of the *Manga* learning media "Immunity at Work" applies the Research and Development (R&D) research method, with the ADDIE development model. The ADDIE model is characterized by its systematic structure, which is predicated on the sequence of solving learning problems that are relevant to learning resources. This model is frequently applied in the domain of learning media development, as it is iterative and accompanied by an evaluation at each stage (Hanafi et al., 2020). This model consists of five stages: Analyze, Design, Development, Implementation, and Evaluation (Branch, 2009) as Figure 1.

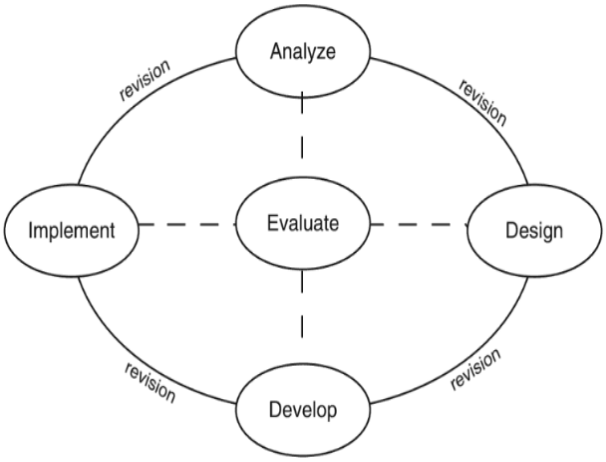

Figure 1 The ADDIE concept (Source: Branch, 2009)

This research was conducted at MA Madani Alauddin Pao-pao in class XI MIA II on May 06-17, 2024. This research begins with the analysis stage. At this stage an assessment of the curriculum used, the basic competencies to be achieved, analyzing biological materials, analyzing the learning process, determining the objectives to be achieved, and determining the media to be developed. At the design stage, the product is developed into a prototype or initial design of learning media design in the form of a *Manga* story board.

The next stage is the development stage, at this stage the prototype will be developed into a *Manga* learning media. This comic is then validated by material experts and media experts to measure the feasibility of the *Manga* "Immunity at Work" as a learning media. During this stage, research instruments were also prepared, such as research instrument validation sheets, educator and learner response questionnaires, and learning outcome test sheets consisting of 25 multiple choice questions. The validation sheet was used to measure and assess the validity of the *Manga* learning media. The questionnaire consists of several questions or statements that will be answered by educators and students, which will later become a means of measuring the level of practicality of the *Manga* learning media. The last instrument is a learning outcome test distributed to students after using *Manga* as additional teaching materials. This learning outcome test aims to measure the effectiveness of the learning media developed by the researcher.

The level of validity of learning media and the validity of the instruments used by researchers is based on the assessment of material and media validators. The validators will provide an assessment of each instrument or learning media based on various aspects of the assessment on the questionnaire presented. The formula used to calculate the validators' assessment of the validity of the instrument is Formula 1 and Formula 2 by Riduwan (2008).

$$A_i = \frac{\sum K_i}{n} \ldots\ldots\ldots\ldots\ldots\ldots \text{Formula 1}$$

$$\text{V} = \frac{\sum A_i}{n} \ldots\ldots\ldots\ldots\ldots\ldots \text{Formula 2}$$

Description:
V = Value of the level of validity
A_i = Average value of all *i* aspects
K_i = Average value of the *i* criterion
n = Number of criteria/aspects

The validation of the *Manga* was assessed based on the experts' (validators) assessment of each item in the instrument, which was then categorized based on Table 1.

Table 1 Criteria for validity level

Value	Categories
V > 3.4	Highly valid
2.8 < V ≤ 3.4	Valid
2.2 < V ≤ 2.8	Moderately valid
1.6 < V ≤ 1.2	Less valid
V ≤ 1.6	Not valid

(Source: Hartanto, 2020)

Description:
V = Represents the level of validity score from the validators.

The *Manga* "Immunity at Work" learning media that has met the minimum criteria of "valid" will be tested in the real learning process in the classroom to measure the practicality and effectiveness of the media. This stage is also known as the implementation stage. After the learning media is tested on students, then the level of practicality of the media is analyzed using a questionnaire for teachers and students. The measurement of the level of practicality of the *Manga* "Immunity at Work" learning media obtained is then categorized based on Table 2.

Table 2 Criteria for practicality level

Value	Categories
85% < *P* > 100%	Highly practically
70% < *P* ≤ 85%	Practically
50% < *P* ≤ 70%	Moderately practically
1% < *P* ≤ 50%	Less practically

(Source: Leonardy, 2023)

Description:
P = Represents the level of practicality value from the average response questionnaire.

At this stage, the level of effectiveness of the *Manga* "Immunity at Work" learning media is also measured from the learning outcomes test. The learning outcomes test was carried out after students used the learning media in the learning process directly in the classroom. The classification of effectiveness data is presented in Table. 3.

Table 3 Criteria for effectiveness level

Value	Categories
91% - 100%	Highly effective
75% - 90%	Effective
60% - 74%	Moderately effective
0% - 59%	Less effective

(Source: Nur & Masita, 2022)

The last stage of the ADDIE model development is the evaluation stage. Evaluation has indeed been implemented at every stage of the ADDIE process. Notably, the information gathered during the assessment of validity, practicality, and effectiveness serves as a metric for identifying the strengths and weaknesses of learning media, as well as providing input or suggestions for further research.

C. Results and discussion

The development of the *Manga* "Immunity at Work" learning media as additional teaching material for students at MA Madani Alauddin Pao-pao class XI in the 2023/2024 school year, described by the researcher based on the stages of the ADDIE development model (Branch, 2009).

Analyze

The first stage of this research is the analysis stage, which is divided into several steps: 1) Validation of learning problems, where at this stage observations and interviews with students and educators are carried out regarding the difficulties or obstacles experienced when carrying out learning related to the immune system. The problems found are that educators lack learning media with many illustrative images related to the material, immune system material is classified as one of the materials that is quite abstract and difficult for students to understand, lecture and note-taking methods are considered less effective for learning, there are several foreign terms that are quite difficult for students to understand, and lack of illustrations of material as examples in everyday life. 2) Learner analysis, students at MA Madani Pao-pao also prefer a visual learning style, which is more interested in learning media with lots of illustrative images and accompanied by explanations that are easy to understand, especially explanations of foreign terms. 3) Material analysis, at this stage the researcher analyzes the material that is difficult for students to understand, and finds that the material of the immune system in humans, especially in the sub-material of the function and mechanism of action of the immune system is material that is difficult for students to understand because of the lack of illustrations (visual images) and the material is very abstract.

Design

The design stage is the stage of applying the results of the analysis to become the basis for developing learning media and research instruments. This stage is divided into three stages, namely: media selection, media format selection, and making initial media designs. Based on the results of observations made by researchers at MA Madani Alauddin Pao-pao, most students prefer learning media that has many illustrations accompanied by the use of language that is easy to understand, such as comic media.

The comic media chosen by the researcher is a media that resembles comic books from Japan (*Manga*) in general, which is made through traditional methods (hand drawing). *Manga* media is designed with the aim of making it easier for students to understand the material on the immune system, especially its functions and mechanism of action. The *Manga* designed by researchers focuses on visualization or images, accompanied by text that uses colloquial language models, with the aim of making it easier for students to receive the material presented.

Development

The third stage is development, the development stage consists of the realization of prototypes or media designs along with assessment instruments that are ready to be implemented. Making the initial design is based on the characteristics of visual media, consists of elements of illustration, color, and text.

The creation of the *Manga* "Immunity at Work" is described as follows: 1) Designing the *Manga* media as outlined in the Story Board as a reference or foundation for the development of *Manga*. 2) Character creation based on the Story Board in the form of manual drawings (hand drawings) on A4 paper. The manual character drawing stage consists of: making Rought Sketch; initial sketch or basic sketch on a new sheet of paper; inking; then ending with detailing and shading stages. 3) The resulting image has grayscale coloring as a characteristic of *Manga*. This image is then scanned using an Epson

L3110 Printer. 4) The background on the scans is removed one by one with the *PhotoRoom Premium* application. 5) Arranging each image based on the *Manga* layout (A5) with the help of Microsoft Word 2021. 6) Adding conversation balloons, conversation text and background to the Comic panel. 7) Creating the front and back covers of the comic in Microsoft Word 2021 with character images created with the assist of the *IbisPaint X* application (Figure 2).

After all the comics were neatly arranged (Figure 3), the final stage was to print the *Manga* in A5 comic book format. In this second stage, researchers also made research instruments with the aim of making a means or reference to obtain research data. The research instruments consisted of instrument validation sheets, educator response questionnaires, student response questionnaires, and learning outcome test instruments.

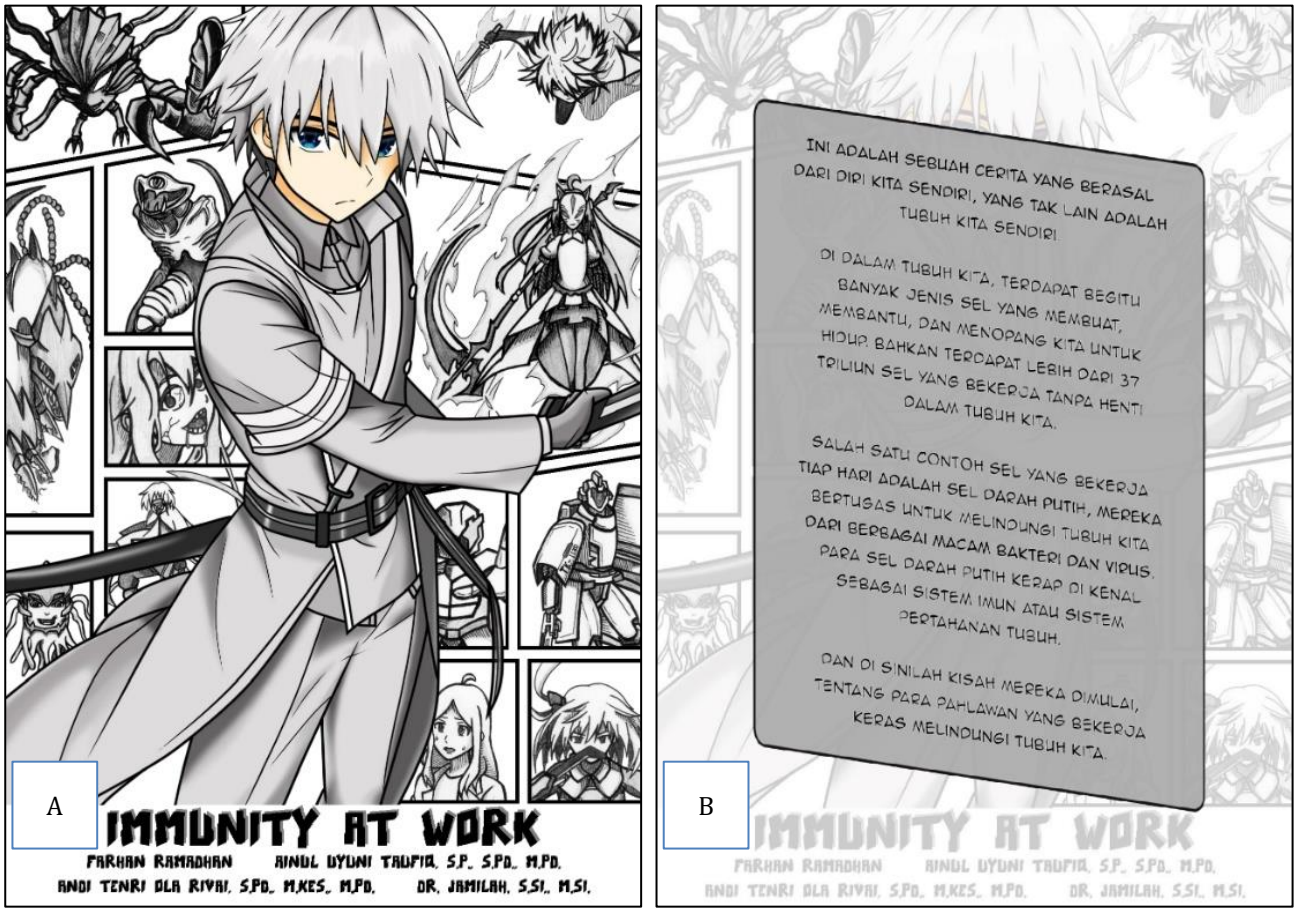

Figure 2 *Manga* cover of "Immunity at Work": (A) front cover and (B) back cover (in Indonesian)

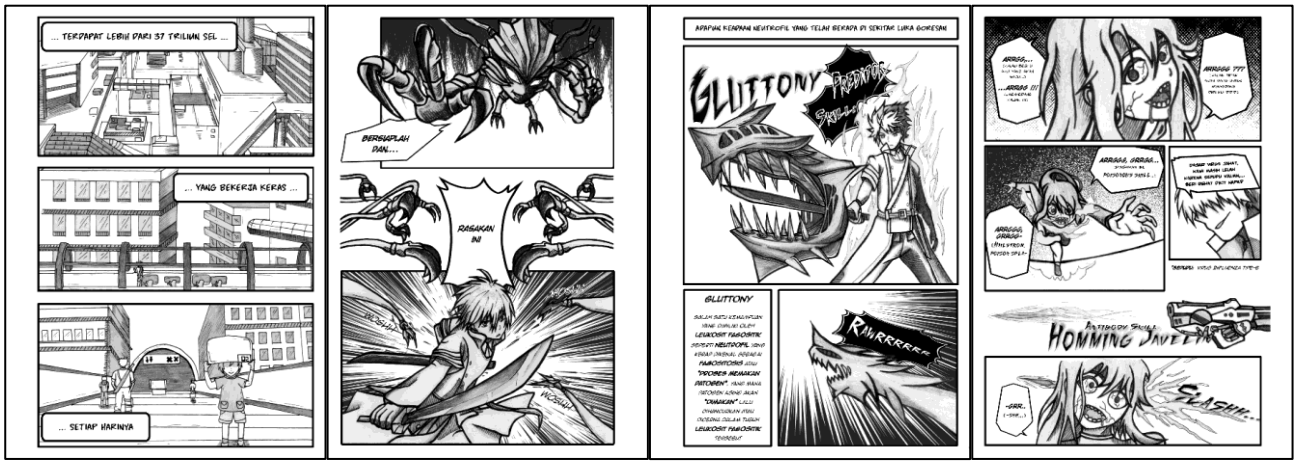

Figure 3 *Manga* "Immunity at Work" contents (in Indonesian)

This design is then submitted to the validator to obtain an assessment and suggestions based on several aspects on the media validation sheet. These suggestions and assessments will serve as the basis for making revisions when the validator's assessment of the media is "not yet valid". This media revision is carried out until it gets a "valid" assessment from the validator and is ready to be used in the learning process. The results of the analysis of the validity level of the *Manga* learning media are presented in Table 4.

The *Manga* "Immunity at Work" media made by the researcher underwent one revision before it was declared valid by the validator. According to Riduwan (2008), developed product is said to be valid if there are no more revisions that need to be made and it gets a minimum score of 2.9 out of 4. Based on Table 4, it can be concluded that the *Manga* "Immunity at Work" learning media, is in the very valid category and can be used in the learning process.

Implementation & Evaluation

In this implementation stage, the *Manga* "Immunity at Work" is used directly in the learning process in the classroom with a real situation, to be precise in class XI MIA II MA Madani Alauddin Pao-pao. Students are first given directions for using the *Manga* media. At the end of the learning process, the practicality and effectiveness of the developed media were measured. The final results at this stage are in the form of practicality level data (Table 5) obtained from questionnaires distributed to two educators and 20 students. Then, the level of effectiveness of the *Manga* "Immunity at Work" was obtained from the learning outcomes test distributed to 20 students, the level of effectiveness of this media is presented in Table 6.

The last stage of this media development is evaluation. The evaluation stage aims to assess each phase of product development, especially at the validation and product testing stages in the field, as well as evaluating learning outcomes. This evaluation stage consists of three stages: 1) determining evaluation criteria related to testing validity, practicality and effectiveness criteria. 2) Determining the means or tools to evaluate. The questionnaire instrument is used to test the validity and practicality, while the multiple choice-based learning outcomes test consisting of 25 questions is used as a means to measure the effectiveness of the product. This evaluation instrument has gone through the validation stage before being used. 3) Evaluation was conducted flexibly with several stages. The validity and practicality of the product were assessed when the product was still in the development phase discussed earlier, while the effectiveness was tested after the implementation stage of the *Manga* "Immunity at Work" as a learning media.

Table 4 Validation result of *Manga* 'Immunity at Work'

No.	Assessment aspect	Average score	Categories
1	Viewing aspect	3.63	Highly valid
2	Material content	3.5	Highly valid
3	Picture quality	3.25	Valid
4	Quality of the storyline	3	Valid
5	Language	4	Highly valid
6	Ease of use	4	Highly valid
Average Total Validity		**3.56**	Highly valid

Table 5 Results and analysis of practicality test

No.	Assessment subject	Average score	Categories
1	Educator	97.5%	Highly practical
2	Students	85.31%	Highly practical
Average Total Practicality		**91.41%**	**Highly practical**

Table 6 Results and analysis of effectiveness test

Interval	Categories	Frequency	Percentage
91% - 100%	Highly effective	1	5%
75% - 90%	Effective	18	90%
60% - 74%	Moderately effective	1	5%
0% - 59%	effective	0	0%

The validity of the *Manga* "Immunity at Work" learning media was obtained at the development stage based on the validator's assessment, as listed in Table 4. The *Manga* developed has five chapters: 1) Getting to know the immune system. 2) Chapter Non-Specific Defense: Inflammation. 3) Side Story: Parasites. 4) Specific/Adaptive Defense Chapter I: Influenza. 5) Specific/Adaptive Defense Chapter II: Cancer. Based on the results of the analysis in Table 4, the level of media validity reached an overall average value of 3.56 aspects, based on the validity criteria stated by Putro & Irwansyah (2021), The learning

media developed can be used and is said to be valid if it obtains a minimum category of good or valid. The *Manga* "Immunity at Work" learning media has met several factors, including having a unique and attractive design display, using language that is easy to understand, not double meaning, and presenting material that is in accordance with the indicators and basic competencies. This is also reinforced by the theory put forward by (Nurseto, 2012), which states that the criteria for media that are suitable for use must meet the "*VISUALS*" principle. This principle consists of *Visible*, *Interesting*, *Simple*, *Useful*, *Accurate*, *Legitimate*, and *Structured*.

Two educators who teach Biology subjects from MA Madani Alauddin Pao-pao became the subject of evaluating the level of practicality of this media. The assessment of the practicality level of this media is divided into several aspects, namely: benefits, language suitability, appearance, material content, and use. In addition to educators, students from MA Madani also became the subject of assessing the practicality of this media with the results of the practicality analysis presented in Table 5.

The results of the analysis on the validity level test of the media by the validators, the average value of the validity of the *Manga* "Immunity at Work" learning media is 3.67 (highly valid). Therefore, it can be concluded that the *Manga* "Immunity at Work" learning media on the material of the immune system is feasible to be applied in learning. This is also in line with several supporting theories. First, *Manga* obtained a total validity score that exceeded the minimum value of media validity from (V> 3.4), so the media is in a highly valid category for use in the learning process (Gunawan & Sujarwo, 2022).

Second, the feasibility of the immune system material with the function and mechanism of action of the immune system presented in *Manga* is relevant to the indicators and the needs of students, which is indicated by the suitability of this media with writing rules, basic competencies, and has a clear division of material, and contains content that is presented clearly and according to the existing topics (Leacock & Nesbit, 2007). Thirdly, *Manga* are narrative art and have visual effects, so they must be composed of many clear images, not monotonous, immersive, and interesting for readers (Putro & Irwansyah, 2021). Grammar must follow the applicable regulations, namely by using the General Guidelines for Indonesian Spelling (PUEBI) (Sarah & Hindun, 2021). However, even though *Manga* is bound by this (PUEBI), the language used in it adapts its own characteristics, because *Manga* emphasizes its imaginative stories and uses colloquial (non-formal) language so that the storyline is easier for readers to understand (Cohn et al., 2012).

The level of media effectiveness is obtained at the implementation stage through the administration of learning outcomes tests. Based on the results and analysis of the effectiveness level in table 6, there were 20 students as observation subjects, and 18 of them (90%) received scores classified as "effective" criteria. These results indicate that *Manga* is effective to use, these results are also in line with the theory Nur & Masita (2022), that the learning media is used well (effective) if this learning media provides the results of the total completeness of students more than 74% of the total number of students. Classically, 85% of all learners reach or exceed the minimum completeness value from the school with the category "effective". This result is also in line with the theory of Haviz (2013), which suggests that an effective development product is a product that is in line with the purpose of making it which can be seen from the learning outcomes test which is identified by the number of students who reach or exceed the minimum completeness value.

The effectiveness of learning media is determined by several factors, which are: quality, suitability, intensity, and time. The quality in question relates to the suitability of the available media to the learning process (Junaidi, 2019). Suitability relates to the level of alignment between the content and assessment presented and the learning objectives to be achieved (Pakudu & Rizal, 2024). Intensity means the influence given by learning media with the motivation or enthusiasm of students in the learning process (Andriani, 2016). Time refers to the allocation or estimate of the time required for students to master the material obtained in the learning process (Zubaidi, 2015). As an interesting and non-monotonous learning media that uses language that is easy for students to understand, *Manga* can be used flexibly, both in the learning process in the classroom and outside the classroom. Therefore, as a unique, interesting, and flexible medium, the use of *Manga* learning media can be said to be an effective media.

The development of *Manga* "Immunity at Work" learning media for Class XI at MA Madani Alauddin Pao-Pao identified a very significant potential or opportunity to improve learning methods. The use of *Manga* also contributes to students' understanding of the immune system, especially the functions, types and mechanisms of action of the human immune system. In addition, the development of the *Manga* "Immunity at Work" learning media can open up opportunities or become a foundation for researchers and educators to create similar media on immune system materials or other materials.

Comic-based media was also researched by Daulay (2017), this study provides the final result that Comic media can increase students' reading interest. In addition, Comic media can also overcome the problem of lack of illustrative images and examples of material realization in everyday life which will make it easier for students to understand abstract material. While research conducted by Sartika et al. (2022), in

the form of Comic media comparison material provides positive results, where the Comic media developed can explain material that is classified as difficult for students to understand through narrative stories and language that is easy to understand because the media has met the criteria of valid, practical, and effective.

Other research relevant to this study, namely research conducted by Khusniyah (2021), indicates that the use of interesting, illustrated, and non-textual *Manga* can increase learning motivation and improve student learning outcomes, because *Manga* can provide a different and comfortable learning atmosphere for students. This research is also supported by research conducted by Aini & Indah (2023), which found that in addition to increasing learning and reading motivation, *Manga* also offers an effective solution for educators to explain material through innovative and adaptive media.

The research conducted by the researcher has a slightly different approach from previous research related to Comic product development. The previous research focused on making Comics that applied American designs or types of depictions and Comic flow, while the focus of this research is on developing *Manga*, which is known as Japanese-style Comics. In addition, the scope of content adapted in this comic focuses on the understanding, functions, types, and mechanisms of action of the immune system in humans.

The images in *Manga* "Immunity at Work" are manual drawings (hand-drawn), the storyline, character inspiration, and content order are original from the researcher, without using third-party assistance in the process of drawing and determining the storyline, even until this comic is finished. The research developed by researchers also has several advantages, such as being able to overcome the difficulty of students understanding immune system material which is classified as abstract material. The storyline and images presented in the form of immersive make this media more interesting and not monotonous (boring) when used. In addition to its use in the classroom, this media can be used outside the classroom (learning outside school) because it is in the form of *Manga* which can be read casually like other comics.

The use of *Manga* "Immunity at Work" learning media can be an important foundation for developing more interesting and innovative learning media. This is because students in the class liked the *Manga* "Immunity at Work" media because it contained learning materials with short, clear explanations, interesting illustrations, and was easy to understand. Mardatillah et al. (2023), argues that learning media that have the ability to improve student learning outcomes are considered quality learning media. In addition to increasing learning motivation, the use of learning media that is suitable for students will make learning more interesting, easy to understand, and help students master the learning objectives to be achieved (Husna & Supriyadi, 2023). The effect of using learning media that is in accordance with the learning habits of students can facilitate the learning process between teachers and students (Moto, 2019).

The process of developing and implementing the *Manga* "Immunity at Work" learning media is expected to be a teaching media that is liked by students, which will have an impact on their motivation and learning outcomes. For educators, it is hoped that it can facilitate the delivery or description of Biology teaching materials, especially in class XI Immune System material. In addition, *Manga* "Immunity at Work" is also expected to be an example of teaching material for Biology or other subjects at MA Madani Alauddin Pao-pao, or in other schools, both at the primary, secondary, and higher education levels as well as at the University level. This initiative is expected to have a positive impact on the significance of the quality of education by presenting learning materials as additional reading materials in the form of other fictional and non-fictional comics as an integral part of the learning process.

D. Conclusion

The *Manga* "Immunity at Work" learning media on the material of the immune system which focuses on the function and mechanism of action of the immune system in class XI MA Madani Alauddin Pao-pao was developed by applying the ADDIE development model which consists of five stages, namely: analyze, design, development, implementation, and evaluation. The validity level of the *Manga* "Immunity at Work" reached a score of 3.56, which indicates that it is in the "highly valid" criteria for use. Meanwhile, the practicality level of this media is at an average value of 91.41%, which is categorized as "highly practical", and the effectiveness level of the *Manga* "Immunity at Work" media consists of 5% in the "highly effective" category, 90% as "effective" and 5% "less effective". Classically, 85% of all students reached or exceeded the minimum completeness score with the "effective" category. Therefore, based on the criteria of validity, practicality, and effectiveness, *Manga* "Immunity at Work" is considered feasible and very suitable for use in the learning process. This research is expected to contribute to developing additional teaching materials, especially on human immune system material. Future researchers are expected to develop this *Manga* into the next chapter (material on factors that affect and diseases of the immune system) or improve this *Manga* to be presented in color (RGB coloring scale) and no longer grayscale coloring (gray scale). The researcher also hopes that future researchers can develop *Anime* (a type of cartoon from Japan) from this *Manga*.

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