

Interactive Multimedia-Based Learning Media: Improving Mandarin Learning Outcomes

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Abstract: This research is motivated by the lack of variety in learning media and low learning outcomes in Mandarin subjects. The purpose of this study was to produce appropriate and effective interactive multimedia-based learning media for improving student learning outcomes at SMA Santo Thomas 1 Medan. The type of research used is the development model of Borg and Gall. The research instruments used were initial needs questionnaires, material expert validation questionnaires, media expert questionnaires, and student response questionnaires. This study also uses quantitative data analysis techniques (data on the feasibility and effectiveness questionnaire assessment) and qualitative data (observation data and documentation). Product validation results show a score percentage of 88.23% for material expert validation, 89.41% for media expert validation, 90% for design expert validation, and 94.31% for student responses. The results of the normality and homogeneity tests show that the research data has been declared normal and homogeneous. The results of the hypothesis test show that the value of t count is 1.89 and the value of t table is 1.66, where t count > t table. The results of this study indicate that this interactive multimedia-based learning medium is effective in improving student learning outcomes at SMA Santo Thomas 1 Medan.

Keywords: learning media, interactive multimedia, Mandarin

1. INTRODUCTION

Mandarin is a foreign language that is difficult to learn and understand. So learning Mandarin is not enough to read and memorize exact subjects but also requires a strong understanding of the basic material of Mandarin [1]. This is because the delivery of basic Chinese material requires audio as a demonstration of examples of pronunciation in Mandarin, especially in phonetic material and tones. Meanwhile, in the stroke material, an animated display is needed to display the direction of strokes in Chinese characters. In other words, learning Mandarin using learning methods without assistive media is less effective when applied to Mandarin subjects.

Language has a very important role in human life. Language is a communication tool in the form of a sound symbol system and is used as a unifying tool for humans. Language is a verbal tool used to communicate. Aside from being a means of communication, language also acts as a means of showing self-identity. Through language, everyone can show their point of view, understanding of something, the origin of their nation and country, education, and even a person's character.

Mandarin is one of the local content subjects that is mandatory for students from class X to class XII at SMA Santo Thomas 1 Medan. The material taught starts at elementary, intermediate, and advanced levels, so the delivery of basic Mandarin introduction teaching materials must really be absorbed and understood by students. Based on observations at SMA Santo Thomas 1 Medan, researchers found problems experienced by students, namely: (1) students still had difficulty mastering Chinese vocabulary and writing sentences in Mandarin; (2) not all students had smartphone applications that made it easier to learn languages like Mandarin; (3) when the teacher teaches, some students are still not paying attention and many are still chatting alone, sleepy, and some are not paying attention; (4)

when given homework, students often do not work on it; and (5) students are more active and enthusiastic when learning nuanced games.

Changes and shifts in the educational paradigm because learning in schools has begun to be adapted to developments in information technology through the use of learning media. Media development is expected to assist students in improving learning outcomes by utilizing the media. Utilization of media such as interactive multimedia is a solution to making it easier for students to learn the material [3]. Interactive multimedia is a medium consisting of images, sounds, and video materials that are presented under computer control for students so that they not only see images and hear sounds but also make active responses. This response affects the speed and sequence of the presentation of learning material [4].

The use of interactive media is more effective in improving student learning outcomes. Interactive learning media can significantly increase students' interest and reading activity. In addition, learning media can also provide positive stimulation for students' curiosity to learn more deeply [5]. Interactive media has been declared effective and can help students in the process of learning Mandarin [6]. However, until now, no one has published a test of interactive multimedia-based learning media to improve Mandarin learning outcomes in the competency of carrying out conversations by asking people during celebrations.

1.1 The Nature of Learning and Learning Outcomes of Mandarin

According to Smith and Ragan [7], interpreting the concept of learning as a relatively permanent change in one's knowledge and behavior resulting from experience. Furthermore, Smith and Ragan [8] suggest three important factors that mark the

occurrence of learning events in individuals, namely: (1) the duration of a relatively permanent change in behavior; (2) the locus or place of change in the knowledge structure and memory of the learner; and (3) the cause of the change is the experience factor contained in the environment.

According to Gagne [9], learning is a set of internal processes for each individual as a result of the transformation of stimuli originating from external events in the individual's environment (conditions). In order for the external conditions to be more meaningful, they should be organized in a sequence of learning events (method or treatment). In addition, in an effort to regulate external conditions, various stimuli that can be received by the five senses are needed, which are known as media and learning resources [10].

Furthermore, Gagne & Briggs [11] explained that learning is the result of pairs of stimuli and responses that are then continuously reinforced. This reinforcement is intended to strengthen the behavior that is internalized in the learning process. Each person's learning process will produce different learning outcomes, so it needs continuous reinforcement to experience changes in behavior for the better.

Learning is a translation of the word instruction," which in Greek is called *instructus* or *intruere*," which means conveying thoughts; thus, the meaning of instructional is conveying thoughts or ideas that have been processed in a meaningful way through learning [12]. The word learning contains a meaning that is more pro-active in carrying out learning activities because, in it, it is not only educators or instructors who are active, but students are active subjects in learning [13].

In the process of learning and acquiring language, there are several skills that must be mastered by students. According to Tarigan [14], language skills have four components: (1) listening skills; (2) speaking skills; (3) reading skills (reading skills); and (4) writing skills (writing skills). Writing is a skill that is more complex than other skills. Writing is used as indirect communication.

Mandarin is a language that uses pictograph writing, namely letters derived from images or symbols used in ancient times [15], so special skills are needed to write vocabulary and sentences in Mandarin. This is what often makes learning Mandarin very difficult in Indonesia. The basic competencies of learning materials in research can be seen in Table 1 below:

Table 1. Basic Material Competency

Basic competencies	Achievement Indicator	Learning objectives	Learning Material Topics
Have a conversation by asking someone in celebration	Demonstrates how to write mandarin characters	Students can write Mandari characters	庆祝 (celebrate) 建议 (suggestion) 开 (open, hold) 晚会 (party)

1.2 The Nature of Learning Media

According to Gagne [16], media are various types of components in the student environment that can provide stimulation for learning. According to Heinich [17], the media

is a communication channel tool that delivers information between message sources and message recipients. Exemplified by Heinich, these media include television, films, printed materials, diagrams, instructors, and computers. If these media carry messages to achieve learning objectives, then they can be considered learning media. Heinich also connects the media with methods and messages.

Learning media are all forms of communication tools that can be used to convey information from sources to students in a planned manner so as to create a conducive learning environment where recipients can carry out the learning process efficiently and effectively [18]. Learning media is a channel or intermediary that can be used to convey messages (learning materials) so that it can stimulate the attention, interest, thoughts, and feelings of learners (students) in learning activities to achieve certain learning goals. Learning media is a means of communication in print as well as sight and hearing, including hardware technology [19].

Hamzah [20] suggests that the use of learning media in the learning process can generate new desires and interests, generate motivation and stimulate learning activities, and even have psychological influences on students. Levie and Lentz [21] suggest four functions of learning media, especially visual media, namely: (1) The attentional function of visual media is the core, namely attracting and directing students' attention to concentrate on lessons related to the meaning displayed or accompanying the text of the subject matter; (2) The affective function of visual media can be seen from the enjoyment of students when learning (or reading) pictorial texts; (3) The cognitive function of visual media can be seen from research findings which reveal that visual symbols or images facilitate the attainment of the goal of understanding and remembering or the message contained in the image; and (4) The compensatory function of learning media can be seen from the results of research that visual media that provide context for understanding texts helps students who are weak in reading to organize information in texts and recall them.

1.3 The Nature of Interactive Learning Multimedia

According to Sanaky [22], multimedia in the learning process is the use of various types of media together, such as text, video, images, and others, with all media uniting to achieve the learning objectives that have been formulated. Based on the definitions given by several experts, it can be concluded that multimedia is a combination of various kinds of interactive text, audio, graphic, animation, and video media that will be delivered using a computer or electronic equipment to convey information and can be used to assist the learning process.

According to Munir [23], interactive multimedia is multimedia that is made with a display that fulfills the function of conveying information or messages and has interactivity for its users. While learning multimedia is the application of multimedia use in the learning process, it can be said that in the process of communication or channeling messages, the use of various media is used to stimulate students to pay attention and have the will so that the learning process can occur.

According to Surjono [24], interactive learning multimedia is a learning program that combines text, images, videos, animations, etc. with the help of a computer to achieve learning objectives, and users can actively interact with the program. According to Munir [25], multimedia is the use of various kinds

of media, such as text, graphics, sound, animation, and video, which are then coupled with interactive components to convey information.

Learning media must consider design quality as a technical aspect, the four goals of visual design or screen design are very good from Heinich [26], namely: readability aspects, the effort required to interpret the message conveyed must be reduced, the user's active involvement with the message conveyed must be enhanced, and the user's attention is focused on the most important parts of the message.

According to Sutopo [27], to make a good visual design, it must also include clear visuals, consistency, aesthetics, and download speed. Heinich [28] provides advice that when making verbal or visual displays, it is best to pay attention to visual principles, namely the elements (visual and verbal), pattern (pattern), and arrangement (arrangement). The visual and verbal components referred to include: letter style, number of lettering styles, capitals, color of lettering, size of lettering, and spacing between lines. Elements that can add to the attraction include surprise, texture, and interaction. Patterns include equipment, shape, balance, style, scheme, color, and color appeal. Meanwhile, what includes the arrangement is the scale of proximity (proximity), direction (directionals), contrast of the image with the background, and combinations.

According to Nielsen [29], there are three aspects of learning media assessment, namely aspects of interface design, aspects of instructional design, and aspects of content: (1) Interface Design Aspects: a) Visibility of information to the user about what is going on when needed through feedback; b) Natural and logical Based on the facts, the language used is a natural and logical analogy; c) Control Users can use the control to exit the display, and errors can be undone. d) Stable consistency and general standard; e) Prevent errors Errors by users can be prevented. f) Easily identifiable Information can be understood easily and accessed at any time; g) Flexible and efficient Shortcuts are easy for users to use. h) Aesthetic and simple The application is attractive, and the information is relevant. i) Error messages Users can diagnose and fix errors. Error messages are

displayed in easy-to-understand language, and there are recommended solutions. j) Help and documentation Availability of easily accessible online help and documentation; (2) Instructional Design Aspects: a) Goals and Objectives Clear goals and objectives, so that users can easily understand; b) context based on the educational domain; c) Content and navigation of single meaningful information, clear and unambiguous; d) Scaffolding Students can learn material according to their level of knowledge. Students must be able to understand the material conceptually. f) Formative evaluation Students must be able to provide feedback. g) Criteria-referenced The results of the application must be clear and measurable so that they can be evaluated. h) Independent learning Applications help students learn without the help of others. i) Collaborative learning Applications must support interaction with others. (3) Content Aspect: a) Context Must be based on facts; b) Realistic Relevance and Relevance; c) Issue There is an alternative solution to the problem. d) References There are references: e) Videos Videos must be accessible. f) Assistance There is assistance that makes it easier for users; g) Presentation Presentation of interesting material.

The development of interactive learning media requires applications in the form of programming that can be designed according to user needs. Among the many pieces of software that are often used to create animation is Macromedia Flash. Macromedia Flash is a web animation graphics program produced by MCorp.media Corp, which is a software vendor engaged in web animation. At the start of production, the program was software for creating simple GIF-based animations [30]. Macromedia Flash has several versions, one of which is Macromedia Flash 8.

Macromedia Flash 8 is used to process images, animations, imported bitmap images, and sound objects. Besides that, it can be used for the development of learning media because it can display interesting text, images, and animations simultaneously [31]. According to Sucipta [32], there are several advantages to making learning media using Macromedia Flash Professional 8.



Figure 1. Display of interactive multimedia-based learning media in Mandarin

The research problem is formulated as follows: (1) Is the developed interactive multimedia-based learning media suitable for use in Mandarin language skills in class XI SMA Santo Thomas 1 Medan? and (2) Is the developed interactive multimedia-based learning media effectively used to improve

learning outcomes in Mandarin in class XI SMA Santo Thomas 1 Medan?

2. METHOD

This type of research is a type of development research, commonly called development (Research and Development). Research development is research that aims to produce a product through the development process [33].

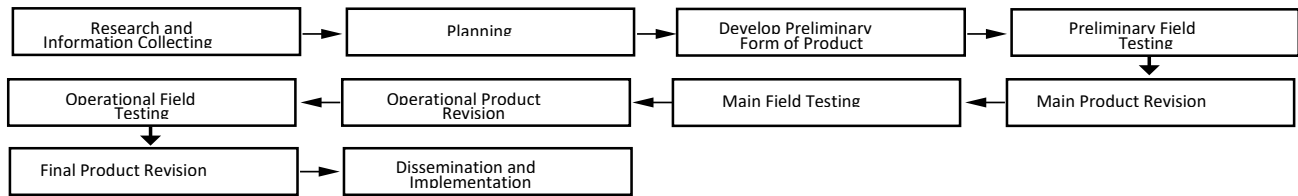


Figure 2. Borg and Gall Procedure (Source: Borg & Gall, 1983: 775)

This research was conducted at SMA Santo Thomas 1 Medan, which is located at Jalan S Parman No. 109 Medan, for class XI students in the 2022–2023 academic year. The subjects of this study were students in class XI at SMA Santo Thomas 1 Medan. As for class X IPS 1 as the experimental class and class X IPS 2 as the control class, The selection of subjects in this study used a purposive sampling technique, namely the determination of the research sample based on the considerations of the researcher, who considered that the desired research elements already existed in the members of the sample taken and based on suggestions from the Chinese language study teacher at school.

The practicality of the learning model developed in this study was measured using a questionnaire assessing its use in the learning process. The practicality value can be calculated using the formula in Table 3 below:

Table 3. Criteria for the Practicality of the Learning Model

Score Interval	Criterion
3,5 – 4,00	Very Practical
3,00 – 3,49	Practically Without Repair
2,50 – 2,99	Practically Needs Improvement
2,00 – 2,49	Less Practical
1,00 – 1,99	Impractical

The effectiveness of the learning model developed depends on having two types of data, namely qualitative and quantitative. Qualitative data is generated from preliminary or feasibility studies, either in literature studies or field studies. Quantitative data were obtained from student learning outcomes using quasi-experiments, namely comparing the pre-test and post-test scores of students using interactive multimedia-based learning media. In this study, the data obtained were student learning outcomes from the experimental and control classes with the assessment criteria as seen in Table 4 below:

Table 4. Assessment Criteria

Value	Criteria	Percentage (%)
A	Very Good	81-100%
B	Good	61-80%
C	Enough	41-60%
D	Less Good	21-40%
E	Very Poor	0-20%

Data collection was carried out using a questionnaire by distributing questionnaires to the respondents, namely material

According to Borg and Gall [34], development research is a process used to develop and validate products. The purpose of development research is not only to develop products, but more than that, to find new knowledge or answer specific questions about practical problems (through applied research).

experts, media experts, design experts, and students. The respondents gave an assessment of the quality of interactive multimedia-based learning media with the following research criteria:

Table 5. Scoring Rules

No	Category	Score
1	Very good	5
2	Good	4
3	Pretty good	3
4	Not good	2
5	Not good	1

(Source: Arikunto [35])

The research results of each respondent were used to calculate the average score obtained. The average score obtained is then converted into a qualitative value using the formula and basic guidelines to determine the level of validity as follows:

$$P = \frac{\sum x}{\sum x^1} \times 100\%$$

Information:

P = Large Percentage

$\sum x$ = Number of Validator Answer Scores

$\sum x^1$ = Total Highest Answer Score

Table 6. Product Validation Criteria

Percentage %	Validity Level	Information
80 – 100	Very valid	Not Revised
60 – 79	Valid	Not Revised
40 – 59	Invalid	Some Revisions
20 – 39	Invalid	Revision
0 - 19	Very invalid	Revision

(Source: Arikunto [36])

Data analysis of the effectiveness of interactive multimedia-based learning media

Normality test.

To determine the average value, the formula is used, namely:

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

To calculate the standard deviation (s), the formula is used, namely:

$$s = \sqrt{\frac{n \sum x_i^2 - (\sum x_i)^2}{n(n-1)}}$$

By testing criteria:

If $L_0 < L$ then the sample is normally distributed and if $L_0 > L$ then the sample is not normally distributed

Homogeneity Test.

Examination of the variance homogeneity test aims to determine whether the sample data has a homogeneous variance or not. Test the homogeneity of variance using the F test, with the following hypotheses:

$H_0 : \sigma_1^2 = \sigma_2^2$ the two populations have the same variance.

$H_a : \sigma_1^2 \neq \sigma_2^2$ the two populations have different variances.

To test the hypothesis above, the following formula is used:

$$F_{hit} = \frac{\text{varians terbesar}}{\text{varians terkecil}}$$

Test Criteria are:

$F_{hit} < F_{\text{tab}1/2 \alpha(v1, v2)}$, H_0 accepted

$F_{hit} > F_{\text{tab}1/2 \alpha(v1, v2)}$, H_0 is rejected

Under the condition:

real level $\alpha = 0,05$

$v_1 = n_1 - 1$ dan $n_1 =$ size of the largest variance

$v_2 = n_2 - 1$ dan $n_2 =$ smallest variance size

Data processing shows that if $F_{count} < F_{table}$, then H_0 is accepted. It can be concluded that the two samples have a homogeneous variance. If data processing shows that $F_{count} > F_{table}$, then H_0 is rejected and H_a is accepted, then it can be concluded that the two samples do not have a homogeneous variance.

Research Hypothesis Test Testing the hypothesis in this study was carried out using the one-party t-test formula, where the statistical hypothesis being tested can be formulated as follows:

H_a : There are differences in the learning outcomes of students who study using interactive multimedia-based learning media and students who study with printed books.

H_0 : There is no difference in the learning outcomes of students who study using interactive multimedia-based learning media and students who study with printed books.

To find out if there are significant differences in student learning outcomes, the t-test formula is as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where S is the combined variance calculated by the formula:

$$S^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

Information::

t = calculated t value obtained

\bar{X}_1 = Average score of the experimental class sample

\bar{X}_2 = Average score of the control class sample

n_1 = the number of subjects in the experimental group

n_2 = number of control group subjects

S_1^2 = standard deviation of the experimental group

S_2^2 = standard deviation of the control group

S = combined variance

The test criteria are that H_a is accepted if $t_{count} < t_{table}$ and H_0 is rejected if $t_{count} > t_{table}$, which is obtained from the t distribution list with $dk = (n - 1)$ and level $\alpha = 0.05$. To see the value of the effectiveness of interactive multimedia-based learning media that is being experimented with, the effectiveness calculation formula is used as follows:

$$X = \frac{\text{number of students who completed}}{\text{total number of students}} \times 100\%$$

3. RESULTS AND DISCUSSION

3.1 RESULTS

The results of the assessment by media experts, material experts, individual trials, small group trials, and limited field trials for all aspects of the assessment are determined by the average score. The results of the assessment are then analyzed and determined to determine whether or not it is appropriate to develop interactive multimedia-based learning media. The average percentage of the results of the assessment of media experts, material experts, individual trials, small group trials, and field trials is shown in Table 7 below:

Table 7. Feasibility of interactive multimedia-based learning media

No	Categorization	Percentage of average score%	Criteria
1.	Material Expert Validation	88,23	Is very feasible
2.	Media Expert Validation	89,41	Is very feasible
3.	Learning Design Validation	90,00	Is very feasible
4.	Preliminary Field Test	90,00	Is very feasible
5.	Main Trial	93,80	Is very feasible
6.	Operational Trial	94,31	Is very feasible
Average		90,96	Is very feasible

Based on Table 7, it can be concluded that the scoring intervals for material expert validation, media expert validation, learning design validation, initial field trials, main trials, and operational trials show an average of 4.56 with very feasible criteria. So the application of interactive multimedia-based learning media is very feasible and appropriate for learning.

Based on the learning outcomes of students who were taught using interactive multimedia-based learning media, the lowest score was 70 and the highest score was 98. The average score was 84,313, mode 83, median 84, and standard deviation 7.601. To see student scores, an interval class is used, namely the score between absolute frequency (the number of students who have learning achievement scores) and relative frequency (the number of percent of learning achievement scores). A complete description of learning outcomes using interactive multimedia-based learning media is shown in Table 8.

Table 8. Frequency Distribution of Experiment Class Student Learning Outcomes

Class	Interval Class	Absolute Frequency	Relative Frequency
1	70 – 74	4	12,5%
2	75 - 79	3	9,375%
3	80 - 84	10	31,25%
4	85 - 89	8	25%
5	90 - 94	3	9,375%

6	95 - 99	4	12,5%
Total		32	100%

Based on the learning outcomes of students who were taught using textbooks at SMA Santo Thomas 1 Medan, the lowest score was 70 and the highest score was 96. The mean score was 80,813, mode 75, median 81.5, and standard deviation 7.195. A complete description of learning outcomes using printed books is shown in Table 9.

Table 9 Frequency Distribution of Control Class Student Learning Outcomes

Class	Interval Class	Absolute Frequency	Relative Frequency
1	70 - 74	5	15,625%
2	75 - 79	6	18,75%
3	80 - 84	11	34,375%
4	85 - 89	6	18,75%
5	90 - 94	2	6,25%
6	95 - 99	2	6,25%
Total		32	100%

The data normality test uses the Liliefors test with the null hypothesis (H0), which states that the sample comes from a normally distributed population. Acceptance and rejection (H0) are based on a comparison of the price of Lcount with the price of Ltable at a significant level $\alpha = 0.05$. If Lcount < Ltable, then the data is normally distributed. A summary of data normality test results in the experimental class and control class can be seen in Table 10.

Table 10. Summary of the Data Normality Test with the Liliefors Test

No.	Data	No	Class	L count	L table
1	Pretest	Experiment	0,083	0,157	Normal
2	Pretest	Control	0,069	0,157	Normal
3	Posttest	Experiment	0,119	0,157	Normal
4	Posttest	Control	0,088	0,157	Normal

Based on table 10, it can be seen that the results of the pretest data normality test in the experimental class obtained Lcount < Ltable (0.083 < 0.157) and in the control class also obtained Lcount < Ltable (0.069 < 0.157). The same thing also happened to the posttest data normality test results for the experimental class with Lcount < Ltable (0.119 < 0.157) and the control class with Lcount < Ltable (0.088 < 0.157). Thus, it can be concluded that the pretest and posttest data in the experimental and control classes were normally distributed at the significance level.

A homogeneity test was carried out to find out whether the data was homogeneous or not. To carry out the homogeneity test, Fisher's test is used, The sample has a homogeneous variance if Fcount < Ftable at a significant level $\alpha = 0.05$. The summary of the results of the data homogeneity test in the experimental class and control class can be seen in Table 11.

Table 11. Summary of Data Homogeneity Test with Fisher's Test

No.	Data	Class	F count	F table	Conclusion
1	Pretest	Experiment	0,52	1,83	Homogeneous

2	Pretest	Control			
3	Posttest	Experiment	1,11	1,83	Homogeneous
4	Posttest	Control			

Based on table 11, it can be seen that the results of the calculation of the pretest data homogeneity test in the experimental class and control class at a significant level $\alpha = 0.05$ obtained Fcount < Ftable (0.52 < 1.83), and it can be concluded that the pretest data in the two classes have the same or homogeneous variance. Then, in the posttest data homogeneity test in the experimental class and control class at a significant level $\alpha = 0.05$ obtained Fcount < Ftable (1.11 < 1.83), it can be concluded that the posttest data in the two classes have the same or homogeneous variance.

Hypothesis testing in this study was carried out using the t test formula. The t-test was conducted to find out whether there were significant differences between learning outcomes in classes taught using interactive multimedia-based learning media (the experimental class) and learning outcomes taught using printed books (the control class). The calculation results obtained tcount = 1.89 and ttable = 1.66, so that tcount > ttable at a significant level $\alpha = 0.05$. Based on these results, H0 is rejected and Ha is accepted, or, in other words, there is a significant difference between student learning outcomes in the experimental and control classes at a significance level of 5%. Thus, the learning outcomes of students who are taught using interactive multimedia-based learning media differ from those of students who are taught with printed books.

To test the effectiveness of the developed interactive multimedia-based learning media, the following calculations are carried out:

$$X = \frac{\text{number of students who complete}}{\text{total number of students}} \times 100\%$$

$$= \frac{28}{32} \times 100\%$$

$$= 87,50\%$$

The value of the effectiveness of printed books can be seen as follows:

$$X = \frac{\text{number of students who complete}}{\text{total number of students}} \times 100\%$$

$$= \frac{23}{32} \times 100\%$$

$$= 71,87\%$$

Based on the calculation of the effectiveness test on both, the result is that the learning outcomes of students who are taught with interactive multimedia-based learning media are higher than the learning outcomes of students with printed books (87.50% > 71.87%). Thus, it can be concluded that interactive multimedia-based learning media are more effective in learning Mandarin than printed books.

3.2 DISCUSSION

Based on the results of the validation that has been carried out, interactive multimedia-based learning media products are declared feasible to continue in field trials. The developed interactive multimedia-based learning media has met the standards based on the design of the development of learning materials and learning media. For the assessment of learning material experts, a score of 88.23% was obtained, which was categorized as very feasible; for the assessment of learning media experts, a score of 89.41% was obtained, which was categorized as very feasible; and for the assessment of learning design experts, a score of 90% was obtained, which was categorized as very feasible.

After the experts stated that this interactive multimedia-based learning media product was very feasible to be tested in the field, field trials were carried out according to the procedure, namely individual trials, small group trials, and field trials. The score of student responses in individual trials was 90% (Very Eligible), small group trials were 93.80% (Very Eligible), and field trials were 94.31% (Very Eligible). Based on the results of the questionnaire, which were validated by material and media experts and then continued with product trials, it can be concluded that interactive multimedia-based learning media in Mandarin are declared very suitable for use as learning media.

Testing the effectiveness of the product on the developed interactive multimedia-based learning media has been carried out by comparing the average value of student learning outcomes taught using interactive multimedia-based learning media with those using printed books. From the results of research data processing, there were differences in learning outcomes between students who were taught using interactive multimedia-based learning media and those who used printed books (87.50% > 71.87%).

This is in line with Munir [37]. Interactive multimedia is multimedia that is made with a display that fulfills the function of conveying information or messages and has interactivity for its users. While learning multimedia is the application of multimedia use in the learning process, it can be said that in the process of communication or channeling messages, the use of various media is used to stimulate students to pay attention and have the will so that the learning process can occur. According to Sanaky [38], multimedia in the learning process is the use of various types of media together, such as text, video, images, and others, with all media uniting to achieve the learning objectives that have been formulated.

Furthermore, according to Daryanto [39], interactive multimedia is multimedia that is equipped with a controller for user use, so it is up to the user to decide or choose the process of running the multimedia. While learning is defined as a process of creating an environment in which the learning process occurs. According to Surjono [40], interactive learning multimedia is a learning program that combines text, images, videos, animations, etc. with the help of a computer to achieve learning objectives, and users can actively interact with the program.

Interactive multimedia-based learning media can help students learn Mandarin [41]. The effectiveness of using interactive multimedia learning media shows higher student learning outcomes when using interactive multimedia learning media compared to conventional media such as books [42]. According to Putri [43], interactive multimedia-based learning media can be called a good learning media if the learning media can improve student learning outcomes. The use of interactive multimedia-based learning media allows students to more easily understand and master learning material.

This is also in accordance with the results of the development of interactive multimedia-based learning media, which obtain feasible results in terms of product development and are effective in improving student learning outcomes in Mandarin subjects. In addition to the use of this medium, the ability of the teacher also plays an important role as a motivator, which greatly influences student learning outcomes.

4. CONCLUSION

Based on the formulation of the problem, objectives, results and discussion of research on the development of interactive multimedia-based learning media that have been described previously, the following conclusions can be drawn:

1. Learning media products based on interactive multimedia developed for SMA Santo Thomas 1 Medan students have met the requirements and are suitable for use as learning media.
2. The effectiveness of the developed interactive multimedia-based learning media is considered more effective than printed books. The results of testing the hypothesis prove that there is a significant difference between the learning outcomes of students who are taught using interactive multimedia-based learning media and the learning outcomes of students who are taught using printed books.

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