Development of Interactive Multimedia Learning Science-Biology Using Macromedia Flash 8 for Class VIII Students of SMPN 34 Padang

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Abstract: The purpose of this research is to produce interactive multimedia using Macromedia Flash 8 for class VIII students at SMPN 34 Padang with material on the respiratory system and human excretory system that is valid, practical and effective. The data collection instruments used were interactive multimedia validation sheets by 3 validator lecturers, interactive multimedia practicality questionnaires by science teachers and students, as well as observation sheets on cognitive, affective, psychomotor aspects and learning activities. The results of the validation assessment by the validator of interactive multimedia on material on the human respiratory system and excretory system showed an average value of 82.33% (very valid). The results of the practicality assessment by science teachers showed an average score of 85.51% (very practical) and the results of the practicality assessment by students showed an average score of 91.64% (very practical). The results of the effectiveness test of interactive multimedia using Macromedia Flash 8 from the cognitive, affective, psychomotor and student activity aspects show that interactive multimedia using Macromedia Flash 8 is very effective. Thus, it can be concluded that the interactive multimedia using Macromedia Flash 8 developed is very valid, very practical and very effective.

Keywords: Excretory system; Interactive multimedia; Respiratory system; Science learning

Introduction

The development of the revolution causes changes in human behavior and behavior from time to time, one of which causes changes in the world of education. Overcoming these changes requires an effort to develop and improve the quality of human resources (HR), because indirectly changes in the economic order also change the order of the education system in a country. The nation's quality of life can improve if it is supported by an education system that is balanced with technological advances, because a good education system allows us to think critically, creatively and productively.

The education system is a strategy or method used in the learning process to achieve goals so that students can actively develop their potential (Anwar, 2018). Students are seen as subjects who have the ability to actively seek, process, construct and use knowledge during the learning process. Learning process aids in conveying material have great benefits and roles in making it easier for students to capture or receive the information provided, one of which is by utilizing computer technology through learning media.

Along with current technological developments, media has become an integral part of the learning process so teachers must utilize learning media to be more effective in building students' thinking patterns in understanding learning material known as interactive multimedia by using school computers. Syafti et al. (2021), the use of technology such as computer-based learning media can make students more motivated to

produce creative ideas so that it is very effective when used in the learning process.

The computer-based learning process can be carried out with various application programs (software), such as Microsoft PowerPoint, Macromedia Flash 8, Microsoft Front Page, PHP, Java Script and so on. The selection of the program is based on the level of need and expertise of the program developer. According to Yaqien (2021), currently learning activities using computer-based media are much needed in schools because the existence of computer-based learning media can make students feel comfortable and enthusiastic, making learning more effective which has a positive effect on their learning outcomes.

The results of the development of CAI (Computer Assisted Instruction) media in Science-Biology subjects need to be developed and utilized as learning media that can support the learning process. The software that will be used for this interactive multimedia development research is Macromedia Flash 8. According to Nasirudin (2017) explains that the use of learning media with Macromedia Flash 8 can provide a positive response because it makes students interested in carrying out the learning process.

Using Macromedia Flash 8 in creating learning media can make it easier for students to carry out interactions such as clicking navigation buttons (next, back, home), clicking menus, choosing alternative answers, writing text, and so on (Surjono, 2017). Apart from that, Macromedia Flash 8 also has command facilities for creating and managing animations such as creating 3D transformation animations, creating decorative animations and so on, and can combine audio and visuals which are capable of producing animated graphics, both objects and text, in a more attractive form.

Based on the results of observations at SMPN 34 Padang, it is known that the science-biology learning carried out has used learning media but has not utilized the school facilities provided such as computers. The learning media that is always used is charts and uses direct objects so that in the end it has an impact on the learning outcomes of students who are not yet able to visualize the material on the human respiratory system and excretory system. The use of learning media that does not follow technological developments will reduce interest and make it difficult for students to understand the material presented (Yaqien, 2021).

The low use of computer-based learning media is caused by several reasons, such as the need for adequate knowledge and skills to create good media that is suitable for use in learning. Apart from that, computer-based learning media that suits your needs is still difficult to obtain because there is no learning media that suits all the required topics.

Material that contains abstract concepts will make it difficult for students to understand the science-biology learning material which will have an impact on student learning outcomes. This is proven by the average daily test score of students which is still below the school's Minimum Completeness Criteria (KKM), namely 60, where KD 3.9 regarding the respiratory system is 56.87 and KD 3.10 regarding the excretory system is 55.48. The impact of this means that some students have to carry out remedial activities so that their grades can reach the predetermined KKM.

The learning that takes place is still focused on theories or concepts only. Apart from that, teachers do not associate learning with technology-based learning media, due to limited knowledge of teachers in using technology to support the learning process. Based on the results of a questionnaire of 64 students, it shows that students are more interested and enjoy learning that is supported by using learning media because it can help direct students to think critically in accordance with the references in the 2013 Curriculum.

Research conducted by Rahmawati (2020) explains that the use of Macromedia Flash 8-based learning media can increase student interest and learning outcomes. Apart from that, research from Nasirudin (2017) also explains that 85% of students gave positive responses in the learning process using Macromedia Flash 8-based learning media.

Based on the background of this problem, researchers conducted research on the development of interactive multimedia on material on the respiratory system and human excretory system for class VIII students at SMPN 34 Padang.

Method

This type of research is development research which aims to produce interactive multimedia on material on the respiratory system and human excretory system for class VIII students at SMPN 34 Padang that is valid, practical and effective. This research uses the Plomp development model. The procedure for developing interactive multimedia using the Plomp model can be seen in figure 1.

Preliminary Investigation Phase

This stage carries out problem and needs analysis, curriculum analysis, and concept analysis. The instruments used were interview sheets for teachers, problem and needs questionnaire sheets for teachers and students.

Development or Prototyping Phase

At this stage, interactive multimedia design was carried out and validation was carried out by experts, namely 3 lecturers. The instruments used are self-evaluation sheets, interactive multimedia validity test sheets, and one-on-one evaluation questionnaires.

Assessment Phase

This stage was tested on a large group of one class to see the practicality and effectiveness of the prototype. The practicality test was carried out by filling out a practicality test questionnaire by teachers and students regarding the use of interactive multimedia for science-biology learning. The instruments used are practicality test sheets, cognitive, affective, psychomotor and learning activity assessment sheets.

Figure 1. Procedure for developing interactive multimedia learning science-biology

The subjects in this research were students in classes VIII.4 and VIII.5 of SMPN 34 Padang Semester II for the 2021/2022 academic year. The sampling technique used is random sampling technique. Class VIII.4 is an experimental class where in this class learning takes place with Interactive Multimedia using

Macromedia Flash 8, while Class VIII.5 is a control class where in this class learning takes place as usual without using the products developed.

The research method uses quantitative and qualitative methods. The data analysis technique in this research is analysis of the feasibility of interactive multimedia using validity tests and practicality tests in the form of a modified Likert scale. The effectiveness test was carried out using the normality test, homogeneity test and hypothesis test with the t test for assessing cognitive aspects and learning activities and hypothesis testing with the U test for assessing affective and psychomotor aspects.

Result and Discussion

Preliminary Investigation Phase
Problem Analysis

The results of the problem analysis were that there were several obstacles found in science learning, one of which was found to be related to the learning media used so that students had difficulty understanding the lesson material. The learning media used should adapt to current conditions to make it easier for students to understand the subject matter. Surbakti et al. (2023) explained that we cannot avoid current technological developments because technology is a component in various aspects of life that can be utilized in the learning process. Therefore, teachers need attention and skills in using learning media to support optimal learning processes.

Requirements Analysis

Analysis of students' needs for interactive multimedia showed that 100.00% of students agreed that there was learning using interactive multimedia at school. Interactive multimedia which consists of several components and is equipped with pictures, videos and interactive questions is able to stimulate students in learning and make it easier for them to understand the material. Amalia et al. (2016) stated that the use of pictorial media in learning can stimulate students' feelings to understand the material they are studying. In line with Widiasanti et al. (2023) explained that the use of multimedia facilities in the learning process offers its own advantages. Learning that uses multimedia technology can make the learning process more effective, interesting and interactive.
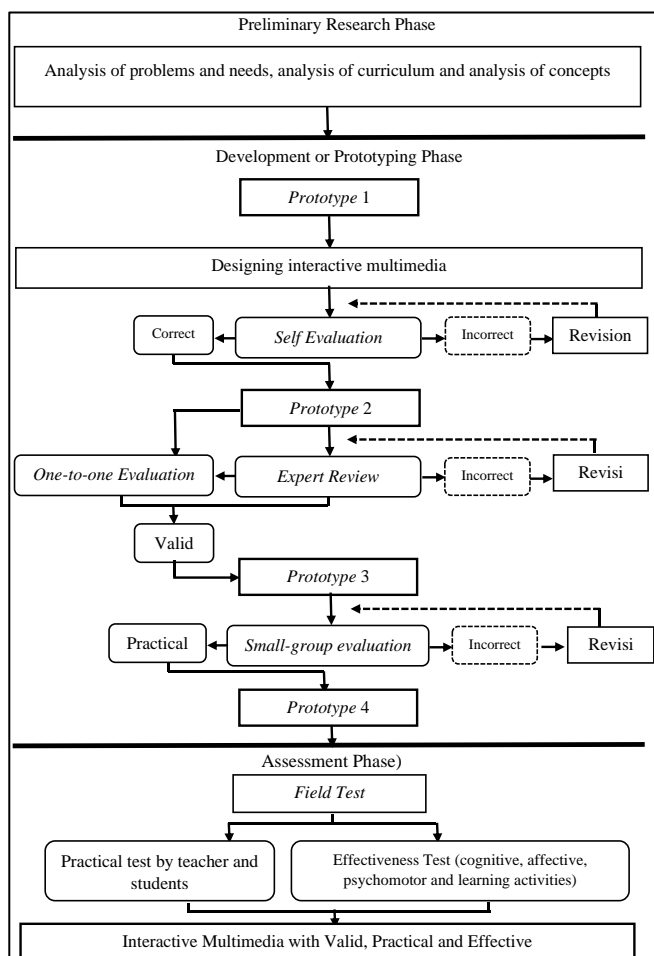
Curriculum Analysis

The results of the curriculum analysis that was carried out obtained indicators of competency achievement in learning material on the human respiratory system and the human excretory system.

Suluh et al. (2019) explains that changes and improvements to the curriculum with various improvements made will have an impact on the process of implementing education in schools so that teachers become the main subject in compiling indicators of competency achievement so that learning objectives are achieved according to curriculum demands.

Concept Analysis

Concept analysis shows that the concepts presented in interactive multimedia are for material on the human respiratory system, including respiratory organs, respiratory mechanisms, and disorders that can occur in the human respiratory system. Then the material on the human excretory system includes the organs in the excretory system, the function of the excretory system for the human body and efforts to maintain the excretory system.

Development or Prototyping Phase
Prototype Development I

The design for Prototype I development started from designing an interactive multimedia storyboard. After that, proceed with designing the systematic presentation of the material and the learning objectives to be achieved which are divided into several learning activities and are guided by KD 3.9 and KD 3.10 in the 2013 Curriculum. After the interactive multimedia is designed and results are obtained from prototype I.

Prototype II Development

Prototype II was obtained after prototype I had been revised, then an expert validation stage was carried out (expert review) by three validators who carried out 3 aspects of assessment (didactic, construct and technical). Fortuna et al. (2021) the validity of a product is used to determine the validity criteria based on expert judgment.

Didactic Aspect

Interactive multimedia was declared very valid by validators on the material on the human respiratory system and human excretory system with an average value of 83%. Afriadi et al. (2013) stated that validity shows the appropriateness, meaningfulness and usefulness as well as the conclusions made.

Construction Aspects

The construct aspect of interactive multimedia was declared valid by validators with an average value of 82%. The description of the material presented is considered to be communicative, effective and efficient. This means that the interactive multimedia developed is in accordance with good and correct Indonesian Spelling (EYD). In line with the opinion of Akbar et al. (2019), the

media, in this case, is in the form of interactive multimedia which is adapted to the correct rules of the Indonesian language, so it will be easily understood by students.
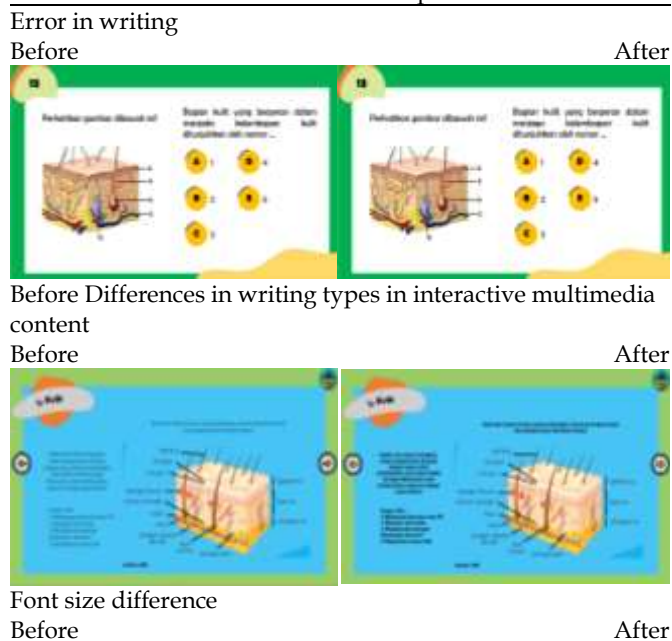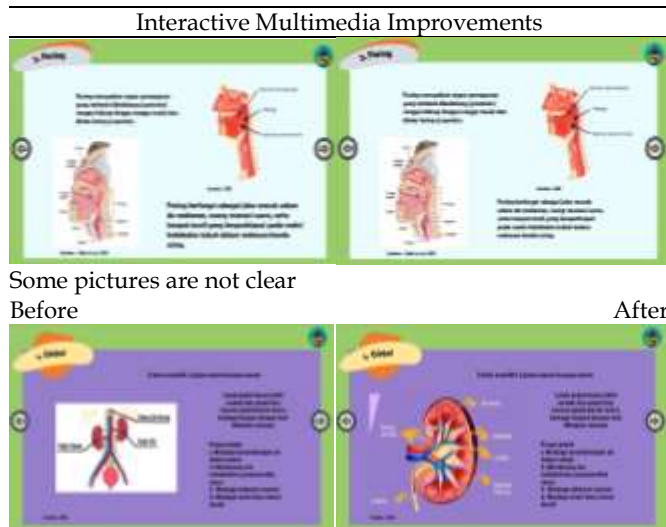
Technical Aspects

The technical aspects of interactive multimedia were declared valid by validators with an average value of 82%. The presentation of images in interactive multimedia has dimensions and explanations that can be read clearly and are in accordance with the concept being discussed. With easy-to-read writing and attractive design, interactive multimedia can be delivered quickly and easily remembered by students, as well as fostering student interest and learning outcomes. In line with Lufri et al. (2020) presenting pictures can make it easier for students to understand the material so that they can clarify students' concepts of the material they are studying. Rahma et al. (2023) explains that all forms of changing times, such as the emergence of various technologies, can now be utilized to create learning media that are faster and more practical to use in the learning process.

Table 1. Interactive Multimedia Validity Test Results

Assessment Aspects	Value (%)	Category
Didactic	83	Very Valid
Construct	82	Very Valid
Technical	82	Very Valid
Total	247	Very Valid
Average Value Validity	82.33	Very Valid

Table 2. Revised Validity Test Results from Validators

Interactive Multimedia Improvements
Error in writing

Before	After

Before Differences in writing types in interactive multimedia content

Before	After

Font size difference

Before	After

Interactive Multimedia Improvements

Some pictures are not clear
Before　　　　　　　　　　　　　　　　　　After

Protype Development III

The next stage is to carry out a practicality test by a small group. At this stage, tests were carried out on 6 (six) students of SMPN 34 Padang class VIII with different levels of ability (high, medium and low). Practicality can be seen from the implementation time which should be short, fast and precise.

Table 3. Average Results of Interactive Multimedia Practicality Test Analysis in Small Groups

Assessment Aspects	Average (%)	Criteria
Ease of Use	81.54	Very Practical
Learning Time Efficiency	87.5	Very Practical
Benefits	86.3	Very Practical
Total	255.34	Very Practical
Average (%)	85.11	

Figure 2. Filling out the interactive multimedia practicality test questionnaire in small groups

Protype Development IV

The product in prototype IV is the same as prototype III, because at the practicality test stage (small group) there were no revisions and the practicality test results show that interactive multimedia is very practical so that it can be directly used for the large group practicality test stage (field test).

Assessment Stage
Results of Interactive Multimedia Practicality Test by Large Group Students (Field Test)

The results of the large group practicality assessment (Field Test) carried out by 30 students received an overall average score of (very practical). Practicality aspects include ease of use, efficiency of learning time and benefits. Interactive multimedia really helps students understand the subject matter well and makes the learning atmosphere more enjoyable. Results of practicality test analysis.

Table 4. Average Results of Interactive Multimedia Practicality Test Analysis in Large Groups (Field test)

Assessment Aspects	Average (%)	Criteria
Ease of Use	89.88	Very Practical
Learning Time Efficiency	94.41	Very Practical
Benefits	89.64	Very Practical
Total	274.93	Very Practical
Average (%)	91.64	

Figure 3. Filling out the interactive multimedia practicality test questionnaire in large groups

Test the Practicality of Interactive Multimedia on Teachers

The results of the teacher's assessment of the practicality of interactive multimedia show that the overall average score is (very practical).

The aspects assessed include ease of use, efficiency of learning time and benefits. From all these aspects, it has met the practicality criteria in accordance with the aim of achieving the practicality of interactive multimedia for teachers. Interactive multimedia is practical and can be used by teachers in carrying out learning process activities. According to Plomp (2013) stated that what is stated in the practical category is that the product being developed can be used, used, is easy to use and is in accordance with the research objectives.

Table 5. Average Results of Interactive Multimedia Practicality Test Analysis by Teachers

Assessment Aspects	Average (%)	Criteria
Ease of Use	85.71	Very Practical
Learning Time Efficiency	75	Practical
Benefits	95.83	Very Practical
Total	256.54	Very Practical
Average (%)	85.51	

Test the Effectiveness of Interactive Multimedia
Cognitive Domain

Student learning outcomes in the knowledge (cognitive) aspect are obtained through carrying out daily tests in the form of objective questions that have been tested.

Table 6. Average Learning Outcomes for Knowledge Aspects of Students in the Control Class and Experimental Class

Materi	Class	Amount	Average (%)
Human Excretory	Experiment	2345	78.17
System	Control	2065	68.83

Looking at the comparison of interactive multimedia with students' cognitive learning outcomes, several tests were carried out including normality tests, homogeneity tests and hypothesis tests. The results of the t test hypothesis carried out on scores in the cognitive domain of the experimental class and control class showed that there was a significant difference between the learning outcomes (cognitive domain) of experimental class students and control class students. This has a positive influence on the learning outcomes (cognitive domain) obtained by students. Wulandari (2022) explains that the use of interactive multimedia can help teachers convey material well to their students. Advinda (2020) stated that the development of interactive multimedia whose operation does not require an internet network is very much needed in learning. This is in accordance with research by Ariesandi et al. (2013) and Ali et al. (2022), that teachers use various types of teaching materials in the classroom learning process to facilitate students' understanding of the lesson material.

Affective Domain

Observers make observations and fill out questionnaires assessing attitudes towards students' affective competence.

Table 7. Average Results of Analysis of Students' Attitude (Affective) Domain

Material	Amount	Average (%)	Category
Human Excretory	2368.7	78.95	Affective
System	2237.5	74.58	Affective

Assessment of learning outcomes (affective domain) of students shows that the use of interactive multimedia in the learning process has an effect on improving student learning outcomes (affective domain). Furthermore, the affective domain assessment is strengthened with statistical tests to determine the differences between interactive multimedia and affective domain learning outcomes using the Mann Whitney test. The data obtained where H_1 is accepted is that there is a significant influence of the use of interactive multimedia on learning outcomes (affective domain).

Psychomotor Domain

Skills (psychomotor) aspects are assessed by filling out an assessment questionnaire and observing students' activities during the learning process.

Table 8. Average Results of Analysis of Students' Skills (Psychomotor) Aspects

Class	Material	Amount	Average (%)	Category
Experiment	Human	2391.6	79.72	Effective
Control	Excretory System	2260	75.34	Effective

Assessment of learning outcomes (psychomotor domain) of students shows that the use of interactive multimedia is better than the control class which does not use interactive multimedia.

According to Asyhari (2015), to develop products in the form of interactive multimedia that can train students' skills, they must have an interest in presenting images, videos and attractive designs so that they can influence students' learning outcomes (psychomotor domain). Djamen et al. (2023), building interesting and interactive multimedia requires special skills and an established framework, so the importance of teacher skills in its application is for effectiveness in the learning process.

Learning Activity

Assessment of learning activities is carried out by observers by filling out assessment questionnaires and observing students' activities during the learning process.

Table 9. Average Results of Analysis of Student Learning Activities

Class	Material	Amount	Average (%)	Category
Experiment	Human	451	90.24	Very active
Control	Excretory System	404.88	80.97	Active

The results of observations of students' learning activities were carried out by observers in the experimental class and control class during 4 meetings

in each class. Observations of learning activities observed during the learning process include visual activities, oral activities, listening activities, motor activities and emotional activities.

Based on observations of students' learning activities, the results showed that the experimental class which used interactive multimedia was better and was categorized as very active, while the control class which did not use interactive multimedia was categorized as active. According to Mastang et al. (2018) stated that the development of learning activities needs to be interspersed with learning activities that attract interest and are fun for students so that students do not feel bored.

Conclusion

Based on the research results, it can be concluded that the interactive multimedia using Macromedia Flash 8 which was developed has validity in the very valid category based on the assessment by the validator lecturer, has practicality in the very practical category based on the assessment by teachers and students, and has effectiveness from the cognitive, affective, and emotional aspects. psychomotor and student learning activities in the very effective category. Thus, interactive multimedia using Macromedia Flash 8 developed is very valid, very practical and very effective.

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