

Development Of Interactive Multimedia Learning Of Human Digestive Systems And Additive Materials And Addictive Based Scientific Approach For Class VIII SMPN 1 Kec. Mungka

Nadya Khairiyah Syafti¹ and Linda Advinda²

¹Student of Master Degree Program of Biology Education, Faculty of Matematics and Sciences. Universitas Negeri Padang

Jl. Prof Dr. Hamka Air Tawar Barat Padang – 25131, Indonesia

²Lecturer of Biology Department, Faculty of Mathematics and Science. Universitas Negeri Padang

Jl. Prof Dr. Hamka Air Tawar Barat Padang – 25131, Indonesia



Abstract – The purpose of this research is to produce interactive multimedia on the material of the human digestive system and additives and additives that are valid, practical and effective. Interactive multimedia research and development uses the plomp model. This research method is carried out formative evaluation of interactive multimedia validation testing by 3 validator lecturers, interactive multimedia practicality by biology teachers and students, effectiveness in the experimental class and the control class. The results of the validation assessment by the validator on interactive multimedia material on the human digestive system show the average value 90.56% (very valid) and the validation assessment by the validator on interactive multimedia on additive and addictive material shows the average value 88.68% (very valid). The results of the practicality assessment by the biology teacher showed an average value 86.51% (very practical) and the results of the practicality assessment by students obtained an average value 89.31% (very practical). The results of the interactive multimedia effectiveness test from the cognitive, affective, and psychomotor aspects of students showed that interactive multimedia was very effective. Thus, it can be concluded that the developed interactive multimedia is very valid, very practical, and very effective.

Keywords – Interactive multimedia, Science learning

I. INTRODUCTION

The development of science and technology brings people in global competition. The way that a country can take in order to survive in global competition is by increasing the quality of human resources such as education.

Education aims to develop children's potential to have religious spirituality, self-control, personality, intelligence, noble character, and to have the skills needed as members of society and citizens in learning (*Undang-undang Pendidikan Nasional No. 20: 2003*). Learning is a process of interaction between teachers and students at school. Messages will be more easily captured by

students when presented through empirical learning media. By using learning media, students are expected to be more motivated to come up with ideas in the learning process in the classroom.

The use of instructional media is needed in relation to improving the quality of education, especially in Biology subjects. According to Sudjana and Rivai (2002) the purpose of using learning media is (1) teaching will attract students' attention so that it can generate motivation, (2) the meaning of the lesson material will be clearer so that it can be better understood, (3) teaching methods will be more varied, and (4) students will do more learning activities.

There is learning media that is two-way communication, meaning that the media provides opportunities for students to respond and carry out various activities which in the end can also be responded to by the program. This is known as interactive multimedia.

Interactive multimedia is an individual learning medium designed for the independent learning process because students are given the flexibility to operate their learning media tools (Novianto et al, 2018). The practicality and ease of use of this multimedia can help students learn according to learning objectives and can bring students from their original learning situation, namely "learning with effort" to "learning with fun" (Niken and Haryanto, 2010).

Based on observations at SMPN 1 Kec. Mungka on March 20, 2020, for the science teacher, Mrs. Syukraini, SP, it was discovered that the science learning that was carried out had used learning media but was still limited, such as powerpoints downloaded from YouTube, chapters available at school, or using direct objects. The difficulty of students to understand science subject matter on abstract concepts has an impact on student learning outcomes. This is evidenced by the average value of daily tests of students at KD 3.5 regarding the human digestive system is 56.52 and KD 3.6 regarding additives and addictive substances is 55.57 which is still below the minimum completeness criteria for school, namely 60. As a result, some students have to do activities. remedial in order to achieve the school KKM value that has been set.

The learning carried out by the teacher is still focused on theories or concepts and does not link learning with technology-based learning media, due to the limited knowledge of teachers about today's technology. This is in accordance with the results of a student questionnaire which states that 52 students show that students are more interested in and like learning conducted using learning media. Learning is still focused on theories or concepts and does not link learning with technology-based learning media, because limited knowledge of teachers about today's technology.

The purpose of this study is to produce interactive multimedia on the material of the human digestive system and additives and additives based on a scientific approach for Class VIII. valid, practical and effective.

II. RESEARCH METHODS

The research method used is qualitative and quantitative methods. The type of research used is development research (R&D). This research was conducted at SMPN 1 Kec. Mungka. The research subjects were science teachers and students of Class VIII SMPN 1 Kec. Maybe. Collecting data by conducting preliminary investigative instruments in the form of interviews, teacher questionnaires and giving questionnaires to students, prototyping instruments in the form of self-evaluation and validity of experts, and instruments for the assessment stage in the form of interactive multimedia practical instruments and interactive multimedia effectiveness instruments.

III. RESULTS AND DISCUSSION

A. Research result

1. Preliminary Investigation Phase (Preliminary Research Phase)

The initial investigation stage is carried out in several stages. These stages are problem analysis, needs analysis, curriculum analysis, and concept analysis.

a. Analysis of the problems and needs of students

Analysis of the needs of students is carried out to obtain the characteristics of interactive multimedia that are of interest and preference to students who are the target users of interactive multimedia to be developed, and determine interactive multimedia needed by the teacher as a tool in the learning process. Based on the results of interviews with biology teachers at the UPTD at SMPN 1, Mungka Subdistrict (attachment 9), it is known that the teaching materials used are printed books and LKPD and sources

from the internet. By using these teaching materials, it is still not possible to visualize the material of the human digestive system and additives and addictive substances. So that we need teaching materials in the form of interactive multimedia that are able to visualize the human digestive system material and additives and addictive substances.

Analysis of problems and needs is carried out to identify and determine the problems faced by teachers and students in biology material, so it is necessary to develop learning materials that focus on KD 3.5 (human digestive system) and KD 3.6 (additives and addictive substances).

b. Curriculum analysis

Analyzing the curriculum aims to understand the sequence and scope of the required material according to existing core competencies (KI) and basic competencies (KD), as well as formulate indicators of competency achievement and learning objectives. Curriculum analysis is focused on the analysis of KI and KD on the digestive system material with references used in the development process, namely the 2013 curriculum.

c. Result of Concept Analysis

Concept analysis is presented in interactive multimedia based on a scientific approach that aims to signify, detail, and systematically arrange the concepts needed and used as a reference in interactive multimedia development. The material developed is the material for the human digestive system including nutrition in food and its functions, the digestive glands, the digestive tract and disorders / diseases of the human digestive system. Additives and additives include additives consisting of dyes, sweeteners, preservatives, flavorings, thickeners and emulsifiers, while addictive substances consist of narcotics, psychotropic substances and psycho-active substances.

2. Development or Prototyping Phase

a. Result of prototype development I

The design for Prototype I development starts from designing an interactive multimedia storyboard that has been designed by the researcher.

After interactive multimedia was designed and the results of prototype I were obtained, the researcher conducted a self-evaluation. The results of the self-evaluation can be seen in Table 1.

Table 1. Self Evaluation Results

No .	Repair	Follow-up
1.	There are differences in the size of the writing in the description of the material.	In the description of the material, all writings are equated, namely 14 pt.
2.	There are different types of writing in the description of the material.	The type of writing in the description of the material is equated, namely "Times New Roman".
3.	There are several errors in writing the word.	Correct word errors.
4.	There are images with broken or unclear textures.	Fix the image.

No.	Repair	Follow-up
5.	There are several misuse of punctuation marks	Correct word errors.
6	There was an error playing the learning video	Fixed learning video errors

b. Prototype development II

Prototype II was obtained after prototype I had been revised, then an interactive multimedia validity assessment was carried out by three validators.

The results of interactive multimedia validation of human digestive system material and additives and additives can be seen in Table 2 and Table 3.

Table 2. Results of the Interactive Multimedia Validity Test for Human Digestive System.

No.	Rated aspect	Validity Value (%)	Criteria
1.	Didactic	90.00	Very Valid
2.	Construct	90.00	Very Valid
3.	Technical	91.67	Very Valid
Total		271.67	Very Valid
Average		90.56	

Table 3. Results of the Interactive Multimedia Validity Test for Additives and Addictives

No.	Rated aspect	Validity Value (%)	Criteria
1.	Didactic	90.00	Very Valid
2.	Construct	87.50	Very Valid
3.	Technical	88.54	Very Valid
total		266.04	Very Valid
Average		88.68	

This can be seen from the overall average value of interactive multimedia validation on human digestive system material is 90.56% (very valid) and the overall average value of interactive multimedia validation on additive and addictive substances is 88.68% (very valid).

c. Prototype Development III

The next step is to do a practicality test by a small group. At this stage an evaluation was carried out from nine students of SMPN 1 Kec. Maybe grade VIII with different ability levels (high, medium, and low).

The results of data analysis on the practicality of small groups can be seen in Table 4.

Table 4. Results of Interactive Multimedia Practicality Test in a Small Group

No.	Assessment Aspects	Average Score (%)	Category
1.	Ease of Use	88.10	Very Practical
2.	Efficiency of Learning Time	86.11	Very Practical
3.	Benefits	87.70	Very Practical
total		261.91	Very Practical
Total		87.30	

Based on the results of the assessment of the small group practicality test in Table 23, it can be concluded that the overall average number is 87.30% (very practical).

d. Prototype IV Development

The product in prototype IV is the same as prototype III. This is because at the small group stage there were no revisions and the practicality test results showed interactive multimedia was very practical so that it could be directly used for the field test stage.

3. Assessment Phase (Assessment Phase)

The results of the assessment phase are data obtained from the practicality test results of interactive multimedia for large group students (field tests) and practicality for teachers. In addition, data on the effectiveness test was also obtained which included data on the domains of knowledge, attitudes and skills of students.

a. Results of Interactive Multimedia Practicality Test by Large Group Students (Field Test)

This large group practicality test activity (field test) aims to see the practicality of interactive multimedia by students. In this study, the practicality test of interactive multimedia was carried out in the experimental class, which amounted to 25 students. The practicality test results in the field test can be seen in Table 5.

Table 5. The average results of the Practicality Test Analysis Interactive Multimedia on the Field Test

No.	The assessment aspect	Average (%)	Kreteria
1	Ease of use	92.11	Very Practical
2	Efficiency of learning time	84.90	Very Practical
3	Benefits	90.9	Very Practical
Total		267.93	Very Practical
Average		89.31	

Based on the results of the practicality test by students in Table 5, it can be concluded that the practicality test of large group students (field test) with an overall average number of 89.31 (very practical).

b. Interactive Multimedia Practicality Test for the Teacher

Pepractical value carried out by one of the science teachers who teaches at SMPN 1 Mungka District. The results of the interactive multimedia practicality analysis were obtained from the practicality questionnaire given to the teacher. The results of the analysis of the practicality of interactive multimedia by the teacher can be seen in Table 6.

Table 6. Results of the Interactive Multimedia Practicality Test by the Teacher

No.	Assessment Aspects	Average (%)	Kreteria
1	Ease of use	92.86	Very Practical
2	Efficiency of learning time	75.00	Practical
3	Benefits	91.67	Very Practical
Total		259.52	Very Practical
Average		86.51	

Based on the results of the practicality of the teacher in Table 6, it can be seen that the practicality assessment given by the teacher for interactive multimedia shows an average result of 86.51% (very practical).

c. Interactive Multimedia Effectiveness Test

The interactive multimedia effectiveness test was carried out in two classes, namely class VIII2 as the experimental class and VIII3 as the control class. Effectiveness data obtained by assessing student learning outcomes which include aspects of knowledge (cognitive), attitudes (affective) and skills (psychomotor).

1) Aspects of Knowledge (Cognitive)

The results of the average analysis of the aspects of students' knowledge can be seen in Table 7.

Table 7. The Average Learning Outcomes of Students' Knowledge Aspects in the Experiment Class and Control Class.

No.	Theory	Class	total	Average
1.	Human Digestive System	Control	1720	68.8
2.		Experiment	1948	74.92

Based on the data in Table 7 above, it is known that the average aspect of knowledge in the experimental class is 74.92 and the control class is 68.8. Step sFurthermore, doing a normality test, homogeneity test, and hypothesis testing to determine whether the problemnormally distributed and has a homogeneous variance or not.

a) Normality Test Results

The results of the normality test for the experimental class and control class can be seen in Table 8.

Table 8. Results of the Normality Test for the Knowledge Aspects of Students

Class	N	$\bar{X}$	Standard Deviation	L0	Ltabel	Conclusion N
Experiment	26	74.92	8.66	0.147	0.161	Normal
Control	25	68.8	10.13	0.135	0.173	Normal

The data in the table shows the experimental class of L value $L_0 < L_{table}$ namely $0.147 < 0.161$ and the control class value $L_0 < L_{table}$ namely $0.135 < 0.173$ at the 0.05 level. These results state that the normality test of students' cognitive competencies is normally distributed

b) Homogeneity Test Results

Test results homogeneity the experimental class and control class can be seen in Table 9.

Table 9. The results of the homogeneity test for the aspects of students' knowledge

Class	N	$\bar{X}$	S	s ²	Fcount	Ftable	Conclusion
Experiment	26	74.92	8.66	74.95	1.36	1.89	Homogeneous
Control	25	68.8	10.13	102, 67			

Based on the data in Table 9, the motion material in living things shows the value of $F_{count} < F_{table}$, namely $1.36 < 1.89$ lines (25, 24) at the 0.05 level. This states that the homogeneity test of students' cognitive domains in both classes has a homogeneous variant which is relatively the same.

c) Hypothesis Test Results

The results of the analysis of the hypothesis test of learning outcomes in the aspects of knowledge in the experimental class and control class can be seen in Table 10.

Table 10. Results of the Analysis of the Hypothesis Test for the Knowledge Aspects of Students

Class	N	$\bar{X}$	S	S ²	Thitung	Ttable	Conclusion
Experiment	26	74.92	8.66	74.95	2.32	1,671	Hypothesis Be accepted
Control	25	68.8	10.13	102, 67			

Based on Table 10, it can be seen that the results of the analysis of the hypothesis test are the value of $T_{count} > T_{table}$, namely $2.32 > 1.671$, the hypothesis is accepted, meaning that there is a significant difference between the learning outcomes of the experimental class students' knowledge aspects and the control class students' knowledge aspects.

2) Attitude Aspect (Affective)

Assessment of student learning outcomes in the attitude aspect is carried out by an observer.

The average learning outcomes of students in the attitude aspect during the learning process can be seen in Table 11.

Table 11. Average Learning Outcomes of Attitude Aspects of Students in the Experiment Class and Control Class.

No.	Class	Theory	total	Average	Category
1	Experiment	System digestion	2057.5	79.13	Effective
2	Control		1787.5	71.50	Effective

Based on the table, it can be seen that the average value of the attitude aspects of the experimental class and control class students. That the average score of the experimental class is 79.13, which is greater than the mean value of the control class, which is 71.50 which does not use interactive multimedia. The next analysis was carried out by testing the hypothesis using the Mann Whitney test or U test. The results of the calculation of the Mann Whitney test on learning outcomes aspects of students' attitudes are $3.33 > 1.96$ which means $Z_{count} > Z_{table}$, then H_0 rejected. So, there is a difference between the affective domain learning outcomes of students who use interactive multimedia and control group students who do not use interactive multimedia.

3) Skills Aspect (Psychomotor)

The results of research on the aspects of the skills of students can be seen in Table 12.

Table 12. The Average Learning Outcomes of the Skills Aspects of Students in the Experiment Class and Control Class.

N o	Class	Theory	total	Average	Category
1	Experiment	Human digestive system	2083.3	80.13	Very effective
2	Control		1854.17	74.17	Effective

Furthermore, to analyze the data, a hypothesis test was carried out using the Mann Whittney test or U test. The results of the calculation of the Mann Whitney test on student learning outcomes in the psychomotor domain are $2.90 > 1.96$ which means $Z_{hitung} > Z_{tabel}$, then H_0 is rejected and H_1 is accepted.

B. Discussion

During this interactive multimedia development process, several revisions have been made, in order to obtain a valid, practical and effective interactive multimedia. The discussion regarding each stage of interactive multimedia development research can be described as follows.

1. Interactive Multimedia Validation

The validity of interactive multimedia carried out by the validator in terms of three aspects, namely didactic, construct and technical with very valid criteria, both on the human digestive system (90.56%) and additive and addictive substances (88.68%). Interactive multimedia said to be very valid because it has fulfilled the three aspects, namely didactic, construct and technical. Data analysis from the interactive multimedia validation assessment sheet was reviewed from didactic, construct and technical aspects. This is supported by the statement of Afriadi et al. (2013), a product that is very valid shows the suitability, meaning and usefulness of the product.

a. Didactic aspect

Interactive multimedia was stated to be very valid by the validator on the material of the human digestive system with an average value of 90.00% and for additive and addictive substances with an average value of 90.00%.

b. Construct aspects

In the construct aspect, interactive multimedia was declared valid by the validator on the material of the human digestive system with an average value of 90.00% and for additive and addictive substances with an average value of 87.50% declared very valid by the validator. This means that the interactive multimedia that has been developed is good and correct in accordance with the Indonesian Spelling (EBI). This is in accordance with the opinion of the Ministry of National Education (2008: 28), that a teaching media must have clear and easy to understand language delivery, as well as clear and concise sentences according to the understanding of students.

c. Technical aspects

In the technical aspect, interactive multimedia was declared valid by the validator on the material of the human digestive system with an average value of 91.67% and for additive and addictive substances with an average value of 88.68% declared very valid by the validator. Terms or criteria for technical aspects related to writing, images, and appearance in the manufacture of a product (Trianto. 2012).

Next the results of the assessment of one to one evaluation (one-on-one evaluation) on 3 students. The results of the one-on-one evaluation show that the developed interactive multimedia can be well received by students. This is because students feel interactive multimedia that has developed material is complete and clear, language is in accordance with EYD and is easy to understand, the presentation of the material is complete, basic competencies are adjusted to the 2013 curriculum, graphics are very attractive because

the colors, images and videos are very good and clear can be easily understood and increase interest in reading and learning of students.

2. Interactive Multimedia Practices

a. Small group evaluation (small group assessment)

Small group assessment was carried out on 9 students with high, medium and low ability levels, the score was 87.30% which was classified as very practical. From the results of this assessment, it can be seen that the positive response of students in using interactive multimedia, and able to increase students' understanding in learning. Interactive multimedia that has been developed can be used and is very practical and does not need to be revised.

b. Practical assessment of the field test (large group) by students

Practicality is a form of measurement that is easy to use according to the desired purpose. In the large group assessment test students (field test) by 26 students got overall results with an average value of 89.31% (very practical). Practical aspects include ease of use, efficiency of learning time, and benefits. This is in accordance with the opinion of Sukardi (2011) which states that one of the practical considerations is that the time needed for the process of use should be short, fast, and precise. Students can take advantage of free time to be able to learn using interactive multimedia anytime and anywhere easily. Sadiman et al. (2009) stated that one of the uses of electronic learning materials is that it can overcome the limitations of space, time, and sensory power.

c. Interactive multimedia practicality assessment for teachers

Based on the practicality test assessment by the teacher, it gets overall results with an average value of 86.51% (very practical). The practical aspects assessed include ease of use, efficiency of learning time, and benefits. According to Plomp and Nieven (2013), what is meant by the practical category is that the product developed is usable, usable, easy to use and in accordance with the research objectives.

3. Interactive multimedia effectiveness

a. Cognitive realm

Based on the results of product trials, the average value of learning outcomes (cognitive domain) in the experimental class is higher than the control class. When viewed classically the results of the final evaluation in the experimental class and the control class of students' learning outcomes in the cognitive domain with an average value of 74.92% (experiment) and a value of 68.8% (control).

This shows that the use of interactive multimedia in the learning process has a positive impact on improving learning outcomes (cognitive domains) of students because interactive multimedia is equipped with pictures, learning videos and interactive evaluations that can make students easily understand learning. This corresponds to Arda et al. (2015) which states that learning science with interactive learning materials is better than using conventional learning strategies, and is able to increase understanding of concepts as well as making the learning process more interesting.

b. Affective Domain

The results of the assessment of students' affective domains through observations made by observers found that the experimental class that used interactive multimedia was better than the control class that did not use interactive multimedia. In the opinion of Asyhar (2012) that learning media can arouse feelings, emotions, and the level of acceptance or rejection of students towards something so that attitudes and interests of students will arise towards the subject matter.

c. Psychomotor realm

The psychomotor domain of students is in the form of students' assessment in communicating, discussing, and percentage. From the results of the psychomotor domain of the experimental class students who use interactive multimedia is better than the control class who does not use interactive multimedia. This is because the learning process using interactive multimedia guide and direct students in carrying out a discussion task or an experiment so that students easily develop their psychomotor skills. Use of interactive multimedia can be used individually so that students are more focused on understanding the subject matter and improving skills such as communicating, discussing, and presentingasi in the learning process. This is in accordance with Hanafi and Samsudin (2012) who state that interactive skills, easy access, and fun are some of the advantages provided by electronic learning materials.

IV. CONCLUSION

This research is a development research that produces a product, namely interactive multimedia. This interactive multimedia contains material on the human digestive system for students at the UPTD SMPN Kec. Mungka. Based on the results of the research, it can be concluded that the developed interactive multimedia has validity with a very valid category based on the assessment by the validator lecturer, has practicality with a very practical category based on assessments by teachers and students, and has effectiveness with a very effective category through the assessment of learning outcomes of cognitive competence. and affective competence and psychomotor competence

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