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Development of Interactive Animated Multimedia-Based Learning Tools in Improving Student Learning Outcomes Healthy Food Materials

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Abstract: This study aims to produce interactive animated multimedia learning tools that are valid, practical, and effective in improving student learning outcomes of healthy food materials. This method used research and development with the ADDIE model and designed quasi-experiments. The population of this study was the teacher council along with grade V students of SDN Tamanbaru, SDN Kebalenan, SDN Sobo, SDN Kertosari 1, SDN Kertosari 2, and SDN Model. With samples of SDN Kebalenan (N = 28) as the experimental class and SDN Sobo (N = 28) as the control class. Assessment instruments were in the form of questionnaires, written tests, and observations. The data analysis techniques used were validity, reliability, normality, pair sample t-test, homogeneity, and independent t-test. The results showed: 1) Interactive animated multimedia devices, very feasible to use and valid with a value of 93.33%. The average reliability of 92.6 in the Excellent Reliability category; 2) Interactive animated multimedia devices, very practical with the ability to manage learning in experimental classes by 94.5% and student responses by 91.2%; 3) Interactive animated multimedia devices, very effective based on independent t-test data, with the significance value of Levene's test 0.189 > 0.05. The value of significance equality of means 0.002 < 0.05. While the statistically independent t-test group in the experimental class was 75.61 and the control class 64.86. Thus, interactive animated multimedia learning tools are valid, practical, and effective to be used in the learning process of healthy food materials.

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Introduction

The digitalization system in education is considered the most potent means of promoting or improving learning (Wekerle et al., 2022). Because it can accelerate and stabilize in improving (Bao et al., 2021) Teaching and learning process (Ajlouni & Jaradat, 2020). Therefore, in any setting, several factors still influence teaching and learning. Includes professional development and teacher confidence through several training and teaching styles (Dos Santos, 2019).

The role of teachers in producing comprehensive education can be observed from how they prepare, implement, and evaluate the learning process (Afandi et al., 2021). For learning objectives to be achieved (Al-Fraihat et al., 2020). they strengthened students' understanding and abilities (Boysen et al., 2022). However, the number of tasks can also affect learning difficulties due to cognitive demands (Haataja et al., 2023), causing student burnout (Paloș et al., 2019). Teachers deliver more learning materials orally (Zainuddin et al., 2019), lack teacher skills in the IT field, and learning resources are only centered on books

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(Rochmattulloh et al., 2022). One contributing factor is that the national education program has not been able to answer the challenges and expectations in the future. Making student absorption decrease and affect their learning outcomes.

The results of pre-research that researchers in several schools have carried out School Cluster 05 Banyuwangi District, consisting of SDN Tamanbaru, SDN Kebalenan, SDN Sobo, SDN Kertosari 1, SDN Kertosari 2 and SDN Model. The research found problems, namely:

1) Lack of understanding of healthy food.
2) At least slogans about healthy food are displayed on school walls.
3) Many students buy food without washing their hands first after playing on the school grounds.
4) Students have been unable to choose and sort out foods suitable for consumption.

This problem is miserable because we have been in the 21st century with various technological advances that ushered in the era of revolution 4.0. For this reason, the right learning tools are needed to achieve the teaching and learning process.

Interactive multimedia animation is a suitable device for teachers to use in learning (Sukmawati et al., 2021). Using such devices is effective (Widodo et al., 2019) in assisting and facilitating the improvement of material mastery (Husein et al., 2019). Because of its development, it includes animation elements that match the character of elementary school students (Kus Eddy Sartono, Ambarsari, et al., 2022). So they don't get tired of learning it (Kus Eddy Sartono, Sekarwangi, et al., 2022). This study aims to test interactive animated multimedia-based learning tools' validity, practicality, and effectiveness in improving student learning outcomes of healthy food materials.

Research Method

This research method used research and development with the ADDIE model and designed quasi-experiments to produce valid, practical, and effective interactive animated multimedia devices and healthy food materials. The population of this study was the teacher council along with grade V students at school cluster 05, namely: SDN Tamanbaru, SDN Kebalenan, SDN Sobo, SDN KertosarI 1, SDN Kertosari 2, and SDN Model. The sample of this study was grade V students of SDN kebalenan (N=28) and grade V students of SDN Sobo (N=28). It consists of five stages. That is:

Analysis

The research analyzed the problems that occur by conducting literature studies and preliminary studies to find out (a) Student characteristics, (b) Problems or obstacles that occur in the learning process, and (c) Need for expected learning tools. Product development needs were analyzed through field studies and literature studies (Kus Eddy Sartono, Ambarsari, et al., 2022) for researchers to obtain several references in considering the right learning tools for dealing with problems that occur (Salas-Rueda et al., 2020).

Design

This activity is a systematic process of designing interactive animation multimedia-based learning tools, with the following steps: a) choosing a learning strategy; b) selecting the evaluation tools used; c) disseminating questionnaires on learning device needs; d) designing and assembling interactive animation multimedia-based learning tools. Incorporating technology into learning is essential in all areas (Padilla-Carmona et al., 2022) in increasing learner engagement and collaboration because these devices are available to all and are attractive, simple, easy, and valuable (Salas-Rueda et al., 2020).

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Development

Contains realization activities for the design of interactive animation multimedia-based learning tools that are still conceptual, then realized into products that are ready to be implemented. So, it requires an assessment of validity from experts/practitioners. This is per the statement (Budiarto et al., 2021) that various learning products must undergo an expert assessment process to ensure their feasibility.

Implementation

At this stage, the product was tested in a learning process designed using quasi-experimental treatment and measurement. However, assignments were not done randomly while maintaining classes or groups in the learning process. A quasi-experimental approach using two groups (experimental and control) can provide information about the phenomenon under study (Ajlouni, 2021) to know the practicality and effectiveness of the learning tools developed (Dwijayani, 2019).

Evaluation

This stage is the last phase of the ADDIE model, which is carried out to determine the effectiveness of learning tools being developed in the form of input, suggestions, or constructive criticism from the teacher council and students, as well as revising the learning tools that researchers develop (Suprapto et al., 2021). The evaluation stage is used to determine the effectiveness of the developed product. The data analysis techniques used were validity, reliability, normality, pair sample t-test, homogeneity, and independent t-test.

Results and Discussion

Device validity

Figure 1. Opening Cover

The opening cover is made as attractive as possible so that it becomes the attraction of students learning.

Figure 2. Main Menu

The main menu displays the various options that students can choose from

Figure 3. RPP

Learning implementation plan that will be implemented into the research process.

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Figure 4. Learning materials

Learning materials that will be implemented during the research process

Figure 5. Learning Videos

Learning videos that are tailored to the material to be able to improve student learning outcomes

Figure 6. Problem Description

Some description questions in measuring their level of understanding

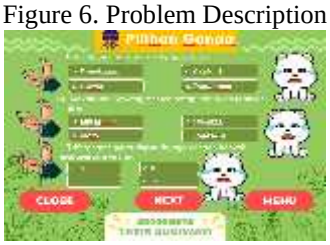

Figure 7. Multiple choice

Multiple choice questions in measuring student comprehension

The results obtained from the validity of the three experts are:

Table 1. Valid Results of Multimedia Interactive Animation.

N0	Validators	Modus	Value (%)	Category
1	Education Aspects	4	92,5	Very decent
2	Program Display Aspects	4	95	Very decent
3	Technical Quality Aspects	4	92,5	Very decent
Average			93,3333	Very decent

These results showed that the developed device was very decent to use and valid, with a value of 93.33% based on criteria (Sugiyono, 2017). According to the statement (Syawaludin et al., 2019), interactive multimedia devices are worth using, according to the expert's view.

Table 2. Validity Criteria (Adapted from Sugiyono, 2017)

Interval %	Validity Criteria
81,25 < score ≤ 100	Very Decent
62,5 < score ≤ 81,25	Decent
43,75 < score ≤ 62,5	Less Decent
25 < score ≤ 43,75	Not Decent

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Reliability

Reliability tests are used to measure the stability of the learning tools developed. Based on reliability test results with ten indicators. We obtained an average mark of 92.6, a category of excellent reliability based on (Budiastuti & Bandur, 2018). This result corresponds to the statement (Nasution et al., 2020). The result of this study was 0.970. Indicates that the resulting product is excellent because it is more significant than 0.67.

Table 3. Alpha Coefficient Category

Alpha's Cronbach	Quality Category
1	Perfect reliability
90	Excellent reliability
> 80	Good reliability
> 70	Acceptable reliability
0	No reliability

Source: (Budiastuti & Bandur, 2018)

The practicality of the device

The device's practicality was measured by the ability to manage learning and student responses after education was completed using the distributed questionnaire. The ability to manage to learn showed a positive response with a score of in the experimental class of 94.5% with very good criteria based on (Sugiyono, 2017). The students' responses obtained an average score in the experimental class of 91.2% with very good indicators based on criteria (Sugiyono, 2017).

The effectiveness of the device.

Learning tools developed that are already valid and practical, then tested for effectiveness to measure the success of the device using implementation tests:

Implementation Test.

The implementation test used two classes, namely, the experimental and control classes, that have undergone homogeneity tests in six schools to find similarities in variants with sig results of 0.761 > 0.05 so that researchers are free to choose experimental classes and control classes. The experimental class was SDN Kebalenan, and the control class was SDN Sobo. Researchers also tested the normality of the two classes, with the results of the significance of SDN Kebalenan 0.071 > 0.05 and SDN Sobo 0.129 > 0.05 so the two schools are normally distributed. To determine the effectiveness of the developed device, researchers used an independent t-test. Several things must be done before doing the test. That is:

Normality test

The results obtained based on the Shapiro Wilk normality test were the significance of the experimental pretest 0.063>0.05, the experimental posttest sig 0.171>0.05, the control pretest sig 0.129>0.05, and the control posttest sig 0.253>0.05. These four points result in a signification of > 0.05. Then, it is usually distributed to proceed to the next test.

Paired sample t-test

They were used to test the effectiveness of treatment by comparing the average value of two variables in one group. The results obtained based on the results of pair 1, it is known that the sig value is 0.000<0.05. In pair 2, the sig obtained is 0.000<0.05. So, it can be concluded that there is a difference in the average learning outcomes of the experimental and control classes.

Homogeneity test

The result obtained is that the sig based on the mean value is 0.189 > 0.05. So, it can be concluded that the experimental and control posttest class data are the same, so the absolute requirements in conducting an *independent t-test* have been met.

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Independent t-test

An independent t-test was conducted to see whether there was a difference in the results of the experimental class posttest and the control class.

Table 4. Independent Samples t-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Multimedia_Animasi	Equal variances assumed	1.769	.189	3.215	54	.002	10.750	3.343	4.047	17.453
	Equal variances not assumed			3.215	50.962	.002	10.750	3.343	4.038	17.462

Based on the independent t-test data above, it is known that the significance value of Lavene's test is 0.189 > 0.05, so the experimental and control data are the same. While inequality of means, obtaining a significance of 0.002 < 0.05, it can be concluded that there is a difference in the average learning outcomes using interactive animated multimedia-based learning devices with conventional learning. The average results of the learning process of the two classes can be seen in the table below:

Table 5. Group Statistics

	Kelas	N	Mean	Std. Deviation	Std. Error Mean
Multimedia_Animasi	Posttest_eksp	28	75.61	13.953	2.637
	Posttest_Kontr	28	64.86	10.875	2.055

Based on the statistically independent t-test group, it is known that the average experimental class is 75.61, and the control class is 64.86. So, it was concluded that interactive animation-based multimedia learning is more effective than conventional learning.

Discussion

This research aims to develop valid, practical and effective interactive animation-based multimedia learning tools that refer to the ADDIE model. These learning tools are very useful for improving student learning outcomes. Because 1) researchers have coordinated with experts in achieving device validity, amounting to 93.33% and average reliability of 92.6; 2) Researchers have tested the practicality of the device in real classes, with very good results, namely, the ability to manage learning in experimental classes by 94.5% and student responses by 91.2%; 3) Researchers have tested the effectiveness of interactive animation multimedia-based learning tools with very effective results. The independent t-test evidences this, obtaining the signification value of Lavene's test 0.189 > 0.05. equality of means 0.002 < 0.05. While the statistically independent t-test group in the experimental class was 75.61 and the control class 64.86.

The description, in line with the statement (Nugroho et al., 2022), The results of interactive multimedia development show valid, practical and effective criteria. The same is stated (Budiarto et al., 2021) so that it is suitable for use in the learning process. There are several things that researchers have found in implementing interactive animation multimedia-

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based learning tools, namely: 1) able to increase student activeness in learning; 2) able to improve student learning outcomes and motivation; 3) make it easier for teachers to explain the subject matter; 4) The learning process becomes two-way, where learning is student-centred.

Interactive animated multimedia-based learning can create a shift in teacher-centered learning shifting to students (Budiarto et al., 2021). Thus encouraging the creation of student involvement in constructive and interactive learning activities (Wekerle et al., 2022). This happens because the use of interactive animated multimedia in learning emphasizes the experience and learning ability of various nonverbal representations, such as images, animations, and narratives (Suryanti et al., 2021). Making students who are actively engaged in learning will get greater benefits. Conversely, if students are passive, they will feel challenged to engage in learning (Sholikah & Harsono, 2021). Meaningful learning in the use of interactive animated multimedia will be realized when students acquire relevant information, coherent principles, modalities, individual differences, and others.

Conclusion

Based on the results of the study, it can be concluded:

1) Interactive animation multimedia device, very decent to use and valid with a value of 93.33%. With an average reliability of 92.6 in the excellent reliability category.
2) Interactive animated multimedia devices are very practical, with the ability to manage learning in experimental classes by 94.5% and student responses by 91.2%.
3) Interactive animated multimedia devices, highly effective based on independent t-test, with a signification value of Lavene's test 0.189 > 0.05. The value of significance equality of means 0.002 < 0.05. While the statistically independent t-test group in the experimental class was 75.61 and the control class 64.86.

Recommendation

These results are expected to be able to contribute scientifically to interactive animation multimedia-based learning tools so that they can be a reference and source of study for other research. Especially research that uses a quasi-experiment approach with the ADDIE model. The results of this study can improve learning outcomes on an ongoing basis. The school should facilitate facilities and infrastructure in the form of Wi-Fi, laptops, and projectors to facilitate interactive animation-based multimedia learning that teachers apply on an ongoing basis. In order to accelerate student understanding, teachers should share the developed products with their students with the address: https://www.slideshare.net/TatikSugiwati1/pentingnya-makanan-sehat-bagi-tubuhtatik-sugiwatipptx-257599775

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