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The Development of Foodivity Interactive as an Interactive Multimedia to Improve Students' Understanding of Food Nutrition Topic

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ABSTRACT The pandemic of COVID-19 has affected the education sector. All school access is restricted, transforming education into distance learning. This encourages educators to explore alternative methods for improving students' understanding. Interactive multimedia is a method of learning media that can promote efficiency, motivation, and student understanding of subjects. This research aims to measure the students' understanding of nutrition by developing festivity interactive as interactive multimedia. A pre-experimental one-group pretest-post-test design was adopted. Developing multimedia using the instructional design process ADDIE (Analysis, Design, Develop, Implement, and Evaluate). The research subject was 53 junior high school students in West Java, more precisely in two locations, Sukabumi and Kuningan. The instrument consisted of an expert judgment rubric, a student questionnaire, and a multiple-choice objective test with pretest and post-test. The V Aiken index shows an average validation of 0.8125, indicating that the media is valid and can be used. Students responded positively to the questionnaire by a percentage of 93.01 percent. Based on the analysis, the N-gain value on students' understanding is 0.35. This indicates increased students' expert judgments in the moderate improvement category between the pre-and post-tests. The hypothesis test establishes that hypothesis H1 is acceptable, showing a significant difference between pre-and post-tests. These results indicate that using Foodivity Interactive as an Interactive Multimedia can enable students' understanding of nutrition topics.

Keywords Foodivity Interactive, Multimedia Interactive, Students Understanding, Food Nutrition Topic

1. INTRODUCTION

Due to the COVID-19 pandemic, many schools and colleges are closed. According to UNESCO data, nearly 160 countries have implemented national closures, affecting more than half of the world's student population (Abidah, Hidaayatullaah, Simamora, Fehabutar & Mutakinati, 2020). With the restrictions on interaction, the Indonesian Ministry of Education also issued a policy of closing schools. During an outbreak, most students go to school by distance learning. Technology is used to deliver all subjects to students. Educators must explore and apply various theories, approaches, and learning design principles to create an innovative learning environment for their students (Bhavya, Gautam & Sumedha 2021). In line with the rapid development of science and technology in the early 21st century, which demands an increase in the quality of superior human resources. The learning model uses media such as smartphones, desktop PCs, laptops, or other devices connected to the internet. On the other hand, consumers prefer smartphones over other devices because they are easier to carry and offer lower prices than others (Sahlström, Tanner & Valasmo, 2019).

Educators are directly or indirectly required to follow these developments by innovating and creatively modifying learning. However, in reality, certain challenges are faced in the online learning system. For example, when doing online learning activities at home, students still lack the desire and encouragement to take the initiative to learn independently (Godwin, 2012). Therefore, distance learning problems during the Covid-19 pandemic must be addressed immediately to maximize learning outcomes and significantly impact student behavior (Churiyah, Sholikhan, Filianti & Sakdiyyah, 2020).

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The low level of understanding and student learning outcomes is one of the reasons for updates in learning strategies and methods of delivering material (transfer of knowledge) to students (Huryah, Sumarmin & Effendi, 2017). One of the factors that determine the quality of educational outcomes is the approach used by teachers in the learning process. The accuracy in using the learning approach taken by the teacher not only arouses students' motivation, interest, and learning achievement but also increases students' understanding of the material provided by the teacher.

Apparently, in this case, many lessons can be learned from the problems and complaints in Indonesia, and students and teachers will be better prepared to interact with new technologies so that online learning can be improved (Putri et al., 2020). In this era of increasingly sophisticated technological disruption, students and teachers are expected to be equally skilled in learning technology. Students and instructors have various kinds of skills in using learning technology. A good lesson is a lesson the learner has learned, and the multimedia material presented is a method of obtaining answers to the questions posed. It is essential to enhance enjoyment, creativity, willingness, and motivation in the learning process by utilizing digital media (Zheng, Li & Chen, 2018). So, one of the efforts to improve the understanding of science material, especially in biology, is to use interactive multimedia.

Interactive multimedia will present nutrition topics in junior high schools related to health issues. Learning by utilizing interactive multimedia in learning, especially science learning, is expected to be an alternative to improve student learning outcomes. Unfortunately, nutrition material in schools rarely gets the attention it deserves. Because of National Curriculum, the chapter focuses more on the digestive system (Roswati, Rustaman & Nugraha, 2019). While nutrition is an essential component of human existence, it is also necessary for health and well-being during various stages of life. To ensure that students are healthy, they should first have an essential awareness of nutrition and be given a balanced diet with a basic understanding. This conception is essential for proper development into adulthood and the later stages of life (Perera, Frei, Frei, Wong & Bobe, 2015).

Interactive multimedia can be further developed to transfer knowledge to students effectively, focuses students' attention during the learning process, concretizes information, and is an endless learning tool. Therefore, this study aims to develop interactive multimedia, festivity as a learning aid to increase students' understanding of food nutrition in junior high schools.

2. METHOD

The method used in this research is pre-experimental. The pre-experimental method has no control or comparison groups (Dawson, 2007). Pre-exHowever, pre-experiments a cos This research has used pretest post-test designs. The research design utilized in this study is one group pretest and post-test, which is a research design that includes a pretest before treatment and a post-test after treatment.

The assessment method in this research is to develop interactive multimedia. The development model used to develop interactive multimedia products is the ADDIE model. ADDIE Model is an instructional design process. This model has five stages: analyze, design, develop, implement and evaluate. This design requires knowing the students' understanding or testing hypotheses about the presence or absence of the effect of the action after implementing the application. After material experts and multimedia experts validate the multimedia, the multimedia is ready to be implemented into the learning process. It is expected that the learning outcomes obtained by students increase after using interactive multimedia, and multimedia can be said to be effective. Then it will distribute the

Table 1 The indicator and aspect for expert judgement

Indicator	Aspect
Content Quality	Accuracy, balanced presentation of ideas, an appropriate level of detail, and reusability in contexts
Learning Goal Alignment	Alignment among learning goals, activities, assessments, and learner characteristics.
Feedback and Adaptation	Adaptive content or feedback is driven by differential learner input or learner modeling.
Motivation	Ability to motivate and interest an identified population of learners.
Presentation Design	Design of visual and auditory information for enhanced learning and efficient mental processing.
Interaction Usability	Ease of navigation, predictability of the user interface, and quality of the interface help features.
Accessibility	Design of controls and presentation formats to accommodate disabled and mobile learners.
Standards Compliance	Adherence to international standards and operability on commonly used technical platforms.

(Source: Nesbit, Giel, Rose & Kiley, 2009)

Table 2 The category and statement of student questionnaire

Category	Statement
Mobile Interface	The interactive media design "Foodivity Interactive" used is attractive.
	The shape, model, and size font of the media used are simple and easy to read.
	The use of interactive media, "Foodivity Interactive" is very easy.
Material content	The video on the interactive media "Foodivity Interactive" supports understanding the nutritional material.
	Animations in this interactive media are easy-to-understand nutrition material.
	Games in this interactive media help to understand nutrition material.
	The material contained in this interactive media is related to everyday life.
Improve Understanding	The material presented in interactive media is easy to understand.
	Presentation of material in this media helps in answering questions
Motivation	The existence of interactive media can motivate to learn nutrition material.

Table 3 Blue print of cognitive test items

Concept	Cognitive Process Dimension and Number of Test Item					Total
	C1	C2	C3	C4	C5	
Nutrition	1	2	14	-	17	4
Diet Balance	-	7	16	-	9	3
Carbohydrate	-	-	20	8	-	2
Fat	-	5	10	13	-	3
Protein	-	4	19	-	-	2
Vitamin	3	-	-	11	18	3
Food Testing	-	6	12	15	-	3
Total	2	5	6	4	3	20

question pretest and post-test, questionnaires, and expert reviews regarding multimedia content.

This research aims to obtain data using the instrument to measure the appropriateness of interactive media and how their designs will affect the student's understanding of food nutrition topics.

Based on Table 1, the instruments will be used on the rubric for expert judgment. The rubric was adopted from LORI (Learning Object Review Instrument). Expert judgment will assess indicators based on predetermined aspects. These aspects have represented the achievement of the media. Media can be feasible if it has been through a judicial process. Some questionnaires are another way to collect interest data, and they should be viewed as one of several options relevant to a given situation (Sinclair, 1975). So that the respondent may create, articulate, and relay the responses effectively, questions must be posted in a clear and understandable.

The questionnaire used a Likert scale of 1 up to 5 for students, shown in Table 2. The questionnaire aims to see students' impression of using interactive foodivity as multimedia. So, the more students agree with the statement, the higher the score. The research instrument in this study is a test item question in the form of an objective test in the form of multiple choice.

This research instrument for test item questions in the form of an objective test used the form of multiple-choice with a total of 20 queries. The question is only used to

Table 4 Validity result

Question Number	Validity Score	Validity Criteria	Decision
1	0.350	Low	Directly used
2	0.566	Enough	Directly used
3	0.471	Enough	Directly used
4	0.545	Enough	Directly used
5	0.500	Enough	Directly used
6	0.391	Low	Directly used
7	0.332	Low	Directly used
8	0.367	Low	Directly used
9	0.373	Low	Directly used
10	0.363	Low	Directly used
11	0.315	Low	Directly used
12	0.308	Low	Directly used
13	0.305	Low	Directly used
14	0.370	Low	Directly used
15	0.463	Enough	Directly used
16	0,328	Low	Directly used
17	0.428	Enough	Directly used
18	0.336	Low	Directly used
19	0.357	Low	Directly used
20	0.313	Low	Directly used

Table 5 Reliability statistic result

Cronbach's Alpha	N of Items
0.70	20

Table 6 Strength and weaknesses of existing interactive media

No	Weaknesses	Strengthness
1	The text is too long which makes it difficult for the reader to understand	Content material about nutrition consists of guidelines for balanced nutrition, energy requirement, and facts about nutrition.
2	Quiz questions are still too easy and not very deep	The placement of each composition is neat
3	Some symbols or images are more petite HD and unclear so that it makes the reader confused and difficult to read	There is a glossary about the scientific vocabulary.
4	There are still features that are not running	The language is relatively easy to understand
5	There are only one or two hierarchies in the media	There are simulations and mini games so that users do not get bored

measure the cognitive domain using Bloom's taxonomy measurement indicators C1 to C5. Based on Table 3, the test items are grouped into several concepts according to the cognitive level adopted by the revised bloom taxonomy. The idea includes nutrition, diet balance, carbohydrates, fat, protein, vitamins, and food testing.

A trial was conducted on students who had learned about food nutrition before the data collection began. Instrument testing was conducted to establish the instrument's validity and reliability in retrieving the relevant data. The validity of each item can be determined through the validity interpretation. By looking at the correlation coefficient, we can determine the validity category.

Table 4 states the results of the validity of 20 multiple choice questions, and it turns out that all of them can be said to be valid, and the questions can be used. The instrument reliability test in this study was carried out with the help of the SPSS version 23 application. The results of the reliability of the test item instrument can be seen in Table 5. Based on the results of data analysis using SPSS 23, the instrument was obtained with Cronbach's Alpha coefficient, and it is known that r count = 0.70, so the instrument is said to be reliable in the high category and can be used for data collection. This instrument can be used several times to measure the same object at different times and produce similar data.

3. RESULT AND DISCUSSION

The development of this research resulted in the application of Foodivity Interactive as Interactive multimedia to increase students' understanding. This product can be accessed via an android-based application and HTML5. Explanation of the results of each stage of development is as follows:

3.1 The Development of Interactive Multimedia

The results describe the research findings on data collection and analysis procedures. The development of this application uses the ADDIE as instructional design, which includes analysis, design, development, implementation, and evaluation stages.

3.1.1 Analysis Stage

At this stage, the researcher analyzes the existing interactive media applications implemented for students at school. The analysis is carried out to gather the strengths and weaknesses of each existing application. Using instructional media can not only raise students' interest and motivation, but it can also make data presentation more appealing and reliable, help data interpretation, summarize information, and improve students' knowledge (Priyanto, 2009). Many interactive media models are used for learning purposes, including tutorials, drills, practice, simulations, instructional games, inquiry, and information. There were eight applications regarding interactive multimedia that have been analyzed. Most of these applications discuss the topic of the digestive system, and only a few cover the issue of food nutrition. Also, most of the interactive media on nutrition topics already exist through information and tutorials. Only a few interactive media are available in the form of instructional games and simulations. Based on each of the weaknesses and strengths of the analyzed application, it can be seen in general in Table 6.

The weaknesses of existing applications include application design images that are not clear and not HD images. Besides that, the font selection and font size must be adjusted. Although the parts of the interactive multimedia layout have a harmonious color composition, clarity, and contrast, interactive multimedia has become an excellent medium. A visually appealing display with clear and bright pictures might help students focus on learning to grasp topics (Puspitasari, Indriyanti & Nugrahaningsih, 2019). This was consistent with the belief that the essential aspect of creating visual design goods was the use of color. Maharani & Asyhari (2020) said that multimedia presentations increase students' interest in a subject and improve students' comprehension, excitement, and satisfaction.

According to Bennett & Brennan (1996), assessment emphasizes self-evaluation. The media maintains a record of their chosen response, and thorough feedback is provided on each topic following the quiz's completion. The quiz requires students to self-assess and holds them accountable for their learning. This is contrary to the

existing media that has already been used. Thus, if it is just a single quiz will be insufficient to assess students' understanding. Besides that, to better understand the phenomenon of Interactive Multimedia, Novianto, Degeng & Wedi (2018) discovered that Interactive Multimedia is multimedia equipped with a controller and may be managed by the user, which gives the user the power to determine exactly what subsequent processing steps should be used.

There are several weaknesses that researchers must reduce by considering the strengths of each application. According to Ahmizar (2008), the more senses are involved in the learning process, and the more successful the learning process will be. Explicitly, this idea implies the utilization of many human senses. Therefore, researchers can develop better interactive media applications by analyzing their strengths and weaknesses.

3.1.2 Design Stage

The second stage of developing the ADDIE model is the design stage. In making the design, flowcharts and storyboards produce a visual representation of the media to be created. The design is essential before writing code because media takes much time to create information, links, and organize content to create visual appeal and test media in its appearance and features.

In designing this interactive foodivity application, the design structure used is a composite, free navigation structure. The advantage of this navigation structure is that an application can provide a better linkage of information.

3.1.3 Development

This is the design stage of media development after making flowcharts and storyboards. At the foodivity interactive development stage, construct two software is used because various kinds of behavior have been provided, which can be applied to objects in the media that we create and do not need to understand programming languages. However, they still require knowledge of programming algorithms.

When developing the media, Inserting objects that will be included in the application, adding action, giving button effects, making navigation, adding games, inserting music and video, creating animation, and showing pop up are all part of the application development process. This aligns with Munir (2020), who stated that multimedia is utilized with supporting features, such as buttons, to make it easier for students to select which section to study for themselves to encourage students to learn independently.

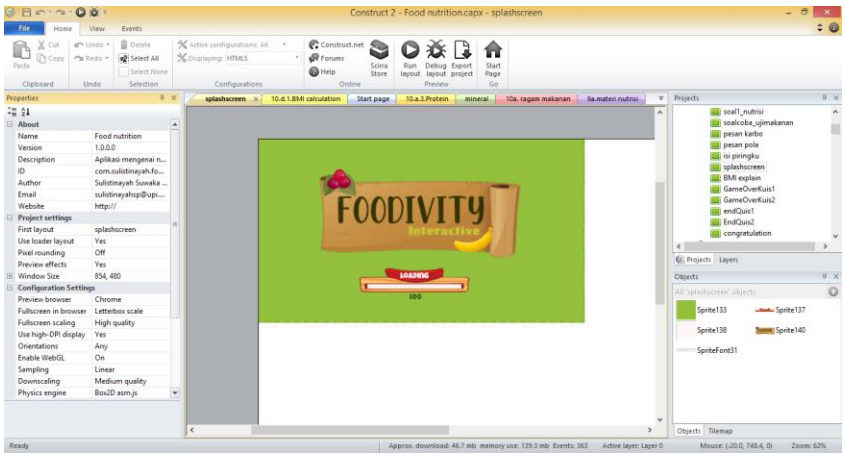

Figure 1 Splashscreen view

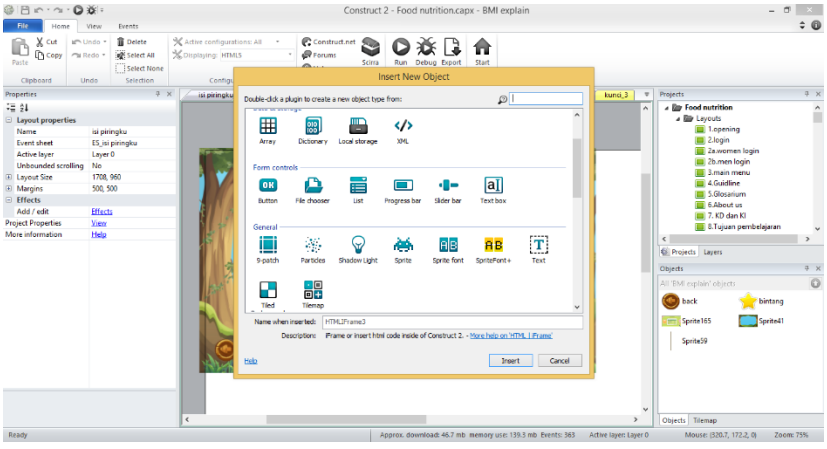

Figure 2 Plugin object

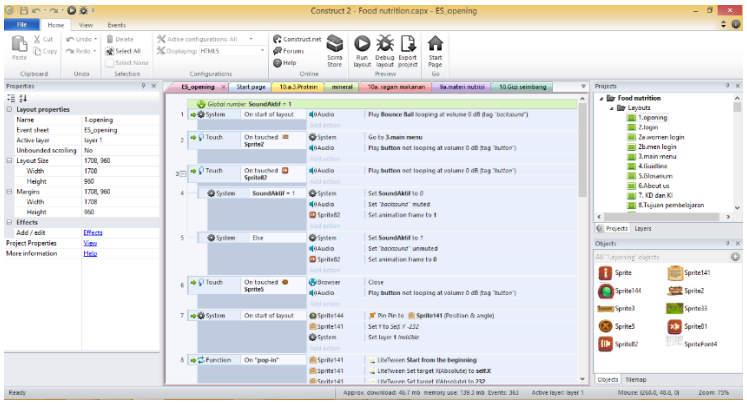

Figure 3 Event sheet view

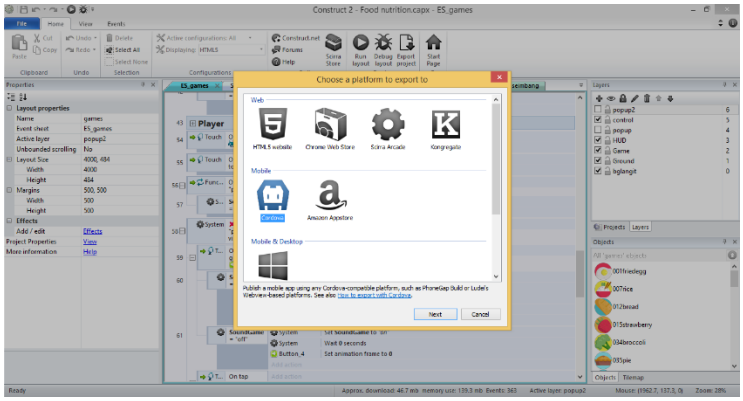

Figure 4 Export Project View

In Construct 2, when we first open construct two, we will find the Start Page. The start page is the main page or page where the page will appear when we open complete 2. On this page, there are commands for creating and opening projects. The next thing to do is change the project name, description, and window size. This is shown in Figure 1 on the left of the screen. Next, we put the objects that are needed. These objects do not require placement in the layout because they are hidden and can automatically be used later. Now all layouts in our project can use mouse and keyboard input.

For all of these objects, we will use sprite objects. Sprite objects only display textures or images that can be moved, rotated, or resized. For example, we can see the sprite button in Figure 2. All objects, such as text, videos, images, etc., can be accessed on that page.

Furthermore, the Event consists of conditions that test whether a criterion is met. If all needs are met, the action event will be executed. Once the action is executed, all of the sub-events will be executed, testing other conditions, then running another action, another sub-event, and so on. Such a system allows us to create functional or sophisticated capabilities for media and apps. We can see an example of an even sheet from Figure 3, which contains conditions and functions so that they can run according to the command. The event sheet is where we create simple code to run the objects we have created in the layout.

The material presented is as easy as possible for users to understand so that they can learn independently (Wiana, Barliana & Riyanto, 2018). Because interactive multimedia is designed for self-learning, the user maintains complete control throughout its application. Interactive multimedia built employing the drill and practice method is meant to teach users new skills or to reinforce their understanding of a concept. This quiz must be done quickly because there is a countdown timer. The quiz has a countdown to test students' understanding of each material. According to Sun, Hsieh, Sun & Hsieh (2018), when highly interactive, challenging, and competitive tools are used, the students will be more focused. That way, having a countdown on the quiz can make students more prepared and engaged in each material. The system working on this quiz is a knockout system. If we answer the question incorrectly, the game will be over, and we will repeat it. Therefore, it is required that users study the material seriously.

Additionally, this quiz gives some questions that are often displayed randomly, ensuring that each time it is used, the questions shown will always be unique, or at least in unique combinations. Because Pujawan's (2018) study indicates that drill and practice is essentially a learning strategy that aims to provide a more concrete learning experience through the provision of exercise questions to assess students' performance skills and understanding as measured by their complete the learning questions provided. Quizzes are an essential aspect of mobile

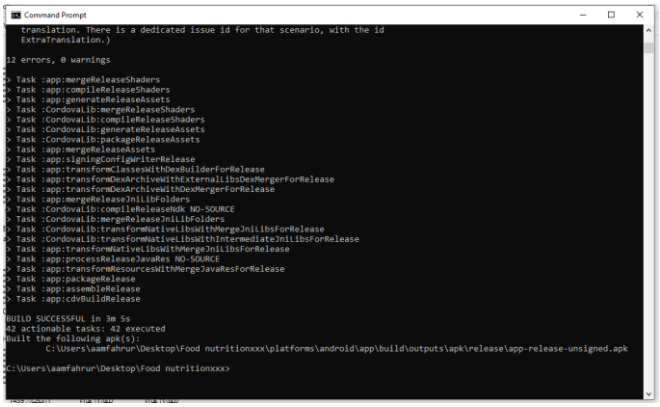

Figure 5 Export the android based application

applications since they can assist students in understanding more about the topics.

Construct two saves every project as a file with the extension.capx. The application will be exported into HTML 5 and Android applications if it is felt that the application has been completed. There are many more Android users than IOS users among the youth population. The HTML5 Export project lets bring the game to many platforms.

When exporting via Apk, we have the option to wait for the game to compile while exporting. These programs will be installed next, with other programs that must be installed. It can be seen in Figure 4. As the compilation process for the game is finished, the game has been successfully built into an android-based application file. To return to the first, make the second platform HTML5 by clicking export and selecting HTML5 as the export destination. Wait for the program to finish, then launch it via the web by opening the index format.

3.1.4 Implementation Stage

Foodivity Interactive as an interactive media is implemented in several schools in West Java. The data collection process involved 53 students at 8th-grade junior high school. The method of collecting data online through WhatsApp groups is due to pandemic conditions that do not allow face-to-face meetings. This research targets 8th-grade students who have not studied the digestive system chapter and only focus on a nutrition topic. This research aims to implement the Foodivity interactive application as an interactive media learning.

3.1.5 Evaluation Stage

At this stage, the researcher evaluates interactive media products. The first evaluation was performed by material and media experts to determine the product's validity. After the evaluation, the researcher revised till the product was declared valid by media and material experts. The next stage is for the researcher to evaluate the confined interactive learning media products in schools. After utilizing the foodivity interactive application, students were invited to complete a student response form.

3.2 The Experts' Judgment media

Three experts and one practitioner validated this application. Expert validation is an expert of material contained in science and an expert of media. The practitioner is a science teacher working at a junior high school. This validation is regarding the weakness of the media and learning materials. The data were analyzed and used to revise the material in the learning media to improve the quality of the learning media used in the research. The scale from 1 to 5 has categories and definitions for each indicator. Thus, the expert can choose the most suitable point based on media conditions and perspectives. The results of four experts, media background, and teachers were selected to assess based on the indicator criteria as tabled in Table 7:

Based on Table 7, the expert recapitulation results can determine whether or not an application is feasible. Learning media before being widely used needs to be evaluated and validated first, in terms of material content, educative aspects, and technical aspects of media, so that when used, media meet the requirements of excellent educational media. This is important to note and ensure

Table 7 Recapitulation of expert judgement

Indicator	Judges Rating				V
	Expert 1 (Science)	Expert 2 (Science)	Expert 3(Media)	Expert 4 (Teacher)	
Content Quality	4	5	4	4	0.8125
Learning Goal Alignment	5	4	5	4	0.875
Feedback and Adaptation	4	5	4	4	0.8125
Motivation	4	5	4	4	0.8125
Presentation and Design	4	5	5	3	0.8125
Interaction Usability	4	5	5	3	0.8125
Accessibility	4	5	4	4	0.8125
Standard Compliance	3	5	3	5	0.75
Average V index					0.8125

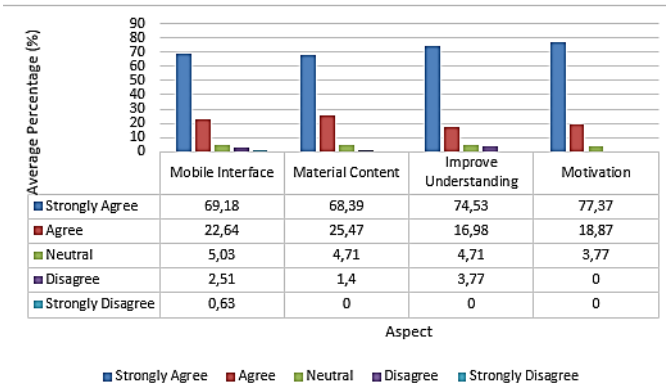

Figure 6 Students Questionnaire Result

that what is conveyed to students is correct and reasonable. The average value given by the expert is 3 to 5 on a scale of 5. The aspects assessed are Content Quality, Learning Goal Alignment, Feedback and Adaptation, Motivation, Presentation and Design, Interaction Usability, Accessibility, and Standard Compliance. According to Bolger & Wright (1992), expert judgment is an essential input for decision support. If the judgment obtained from the experts is poor in some respects, then the results of any decision support system will also be flawed. Ideally, we want to know whether the judgment is correct or valid. Therefore, it is necessary to have objective external criteria to assess validity.

3.3 Students Response

Data on student responses to interactive media were obtained from the questionnaire results. The scale consists of 5 scales, including strongly disagree, disagree, neutral, agree, and strongly agree. A score of 5 has a strongly agree, while a score of 1 has a strongly disagree meaning. They used these five scales to find out the context of respondents' impressions and judged by students of the response item (Joshi, Kale, Chandel & Pal, 2015). These aspects are in the form of the mobile interface, content material, improved understanding, and motivation

Students give a positive response to the interactive foodivity application. Because students who responded strongly agreed reached 70.75%. In addition, 22.26% gave a coordinated response; the rest, only a few percent, stated that the reaction was less agree or negative. However, those who gave disagreed opinions did not exceed 5%. Suppose it is translated into graphic form.

Based on Figure 6, it can be seen that the percentage is high in each aspect. First, the aspect of motivation has the highest rate, 77.37%. This shows that the interactive foodivity application can motivate almost all students. This is supported by the absence of students who gave a response that did not agree with the motivational aspect. This motivation can be the initial foundation of students' interest in studying the material to understand the topic. Then in the second position, there is an aspect of improving understanding, reaching 74.53% of students strongly agree. This certainly has a positive impact on interactive media. This shows that using interactive multimedia is to increase awareness of the material. Primamukti & Farozin's (2018) research on using interactive multimedia on learning interest shows a significant difference in students' learning interest when taught with interactive multimedia.

Then there is the mobile interface aspect. This aspect focuses more on the design and appearance of an application, such as video, audio, text, and animation, that can support understanding concepts in learning materials. In addition, the display can mean attractive, clear, and easy-to-read text, images, and other media accessible, and the last aspect is material content. As many as 68.39 strongly agree, and 25.47 choose to agree. The content material relates to the materials presented in the application. Videos or other elements such as simulations can be used to explain the content so that students can understand the content independently.

Hadibin, Purnama & Kristianto (2012) discovered that learning through interactive multimedia-based media increases students' attention and responsiveness to the subject matter. That corresponds to the author's development findings. This is consistent with the findings of studies Wang (2008) conducted that resulted in

Table 8 Students understanding result

	Component	Pretest	Post Test
Descriptive Test Analysis	N	53	53
	Average Score	46.23	66.04
	Standard Deviation	16.696	12.262
	Highest Score	80	90
	Lowest Score	15	40
	N- Gain	0.35	
	Score Percentage (%)	35.49	
Normality Test	Signification (Sig α = 0.05)	0.200	0.066
	Information	Normality Distribute (Sig. > 0.05)	
Hypothesis Test (Paired Sample T-Test)	Signification (Sig < 0.05)	0.000	
	Information	H_0 is rejected	
	Conclusion	There is a significant difference	

Table 9 The result of N-gain based on each topic aspects

Topic Aspects	Average Score of Pre-test	Average Score of Post test	N-Gain Score	Category
Nutrition	50	70.75	0.71	High
Balanced Nutrition	44.02	70.44	0.89	High
Carbohydrate	35.84	63.20	0.74	High
Fat	47.80	64.15	0.46	Medium
Protein	54.70	54.71	0.02	Low
Vitamin	54.70	71.06	0.57	Medium
Food Testing	34.60	61.63	0.70	Medium

Table 10 The result of N-gain score

Cognitive Aspects	Average Score of Pre-Test	Average Score of Post-Test	N-Gain Score	Category
C1 (Remembering)	37.74	66.04	0.45	Medium
C2 (Understanding)	49.43	66.42	0.34	Medium
C3 (Applying)	41.51	63.52	0.38	Medium
C4 (Analyzing)	48.58	69.81	0.41	Medium
C5 (Evaluating)	52.83	64.41	0.27	Low

developing multimedia-enabled learning programs. The findings indicate that the programs are effective in student learning outcomes and recommend that instructors consider incorporating them into their student learning. According to Lee & Tseng (2008), using digital content instruments resulted in substantial variations in student accomplishment compared to traditional learning.

3.4 Students' Understanding Skills

Student's cognitive abilities were analyzed through an objective test of 20 questions. The question aims to explore students' understanding of the topic of nutrition. The questions are categorized into Bloom's taxonomy, which is C1 (remembering), C2 (Understanding), C3 (Applying), C4 (Analyzing), and C5 (Evaluating). The questions that will be tested on students are in the form of pretest and post-test. Before being tested, this test was tested, and the results were processed using SPSS Version 23 to see the validity and reliability results.

From the table, it can be seen that the number of students for pretest and postest is 53 students. The results of the score between the pretest and post-test showed an increase after the interactive media application. The mean score of the pretest was 46.23, and the mean score of the post-test was 66.04. The post-test value is higher than the pretest value. It means the mean score of the pretest indicates that the students have less prior knowledge about the material. Although some students had difficulty answering the questions, some got high scores from the pretest. Therefore, it can be shown that students with high pretest scores have good prior knowledge about the material.

Data distribution can be normal if the data has met the minimum normality threshold. Meanwhile, it cannot be normal if the data does not meet the normality limit. When referring to the assumption of normality, it states that the sample is drawn from a normally distributed population. Kolmogorov Smirnov is used when the sample size is less than 100. Meanwhile, Shapiro Wilk can be used when the sample size is less than 50 (Joshi, Kale, Chandel & Pal, 2015). This can be seen in the significance level of two test instruments is more than 0.05 (0.200 for pretest and 0.066 for post-test). The data examined using Kolmogorov-Smirnova may be determined that it is regularly distributed, with a 0.05 significance level. The table shows that the significance value for normality is greater than 0.05 (sig. > 0.05). As a result, the data appears to be distributed normally. It suggests that parametric analysis can be used to analyze the data. Because the data were analyzed using parametric analysis, the data will be assessed using a paired sample t-test. Paired T-Test is a parametric test and the test used to compare the difference between two means of two paired samples with the assumption that the data is normally distributed (Potochnik, Colombo & Wright, 2018). Suppose the significance value of 2 tailed is less than 0.05 (sig. (2 tailed) < 0.05), it can be said that there is a significant difference. This test requires that the data be normally distributed (Mishra et al., 2019). The Paired Samples T-Test table is the output's main table showing the results of the tests. This can be seen from the significant value (2-tailed) from the table 4.8 can be seen that, from pretest (M= 46.23 , SD= 16.69) to postest (M= 66.04, SD= 12.26), t (52)= -11.666 , p< 0.05 (two-tailed). The mean increase in students' understanding was 19.81 ranging from 23.21 to 16.40. These results show the significant value of Sig. (2-tailed) is 0.000, it means the significance value for the simple test pair is less than 0.05 (.000 < 0.05). So the results of the initial and final tests experienced a significant change. Based on descriptive statistics, the initial and final tests proved to be higher in the final test. It can be said that there is a significant difference in students'

understanding of nutrition topics by using Foodivity Interactive as an interactive media. After that, a normalized gain test was carried out to analyze the increase in cognitive abilities. The N-Gain value is 0.35, which is categorized as a medium increase. Suppose the score is $0.30 < g \leq 0.70$, it is categorized as a moderate improvement (Hake, 1999). It means a moderate increase from the pretest to the post-test, and the score percentage is 35.49%.

Data were also analyzed using a normalized gain test based on Hake's Rule. This test analyzes the level of improvement in students' understanding.

Based on the analysis of each topic in Table 9, balanced nutrition and carbohydrates increase in the high category on the topic of food. This indicates that the increase in student understanding is good and that students understand the material concept in interactive multimedia. Meanwhile, on the topic of fat, vitamins, and food testing, it has a medium improvement category. On the topic of content in multimedia, some simulations can encourage students to understand more quickly and motivate students to learn more deeply. This is in line with Wilkinson, Dafoulas, Garelick & Huyck (2020) stated that if quiz games improve memory of fundamental facts through visual stimuli and repetition, this may allocate more classroom time for application and thus comprehension of the subject. But on, the topic of protein has a low category. It means that there is no improvement in that topic for understanding. Therefore, there may be a need for a more in-depth study of this topic.

To analyze the overall results of student understanding, each aspect of understanding is based on the bloom taxonomy, especially in C1 (Remembering), C2 (Understanding), C3 (Applying), C4 (Analyzing), and C5 (Evaluating) is also analyzed. Table 10 shows the average pretest and post-test scores of each aspect of understanding depicted in the table:

Based on Table 10, almost all aspects show the category of medium improvement. The increase in the medium and low categories indicates that more effort is needed to increase understanding. The results of the students' average pretest in each aspect varied. The pretest results show that the C1 (remembering) aspect has the lowest average score compared to other aspects. This can happen due to several factors, one of which is remembering. Some students do not know the material, and the topics have never been given before. However, at C5 (evaluating), the average score obtained has the highest. This shows that some students already understand the concept of the material. After that, the average pretest and post-test scores were compared. The N-gain of each aspect can be seen in the table. In the aspect of C5 (evaluating) has the lowest improvement category. This is because, in bloom's taxonomy, C5 is a high level of high-order thinking. In addition, students are required to be able to judge from an event or activity. So, students need a deep understanding. Hoque (2016) said that teachers and students must comprehend the cognitive domain's hierarchy of processes and abilities to grasp prerequisite skills for learning and how these skills must be modified to master more sophisticated aspects of discipline-specific concept inventories. In teaching or learning new content, the development of learning skills should never be taken for granted.

While the C1-C4 aspects have a medium improvement category, comparing the pretest and post-test, the C1 (remembering) aspect has the highest N-gain score among other aspects. This is because C1 is the most basic level in the taxonomy bloom. C1 is also low-order thinking, so it is often categorized as an accessible item question and only requires the ability to remember without understanding the material.

In aspects C2, C3 and C4 have almost identical N-gain scores. The C4 aspect also has a fairly high N-gain, so it can be said that the use of interactive media can affect students' understanding of the material. However, the level of N-Gain scores in students' overall understanding has a medium category, meaning that efforts are still needed to improve students' understanding to get a high category.

4. CONCLUSION

This research was conducted using a pre-experimental method and the ADDIE learning design (Analysis, Design, Develop, Implement and Evaluate). This research was conducted in public schools in West Java, in two locations, Sukabumi and Kuningan Junior High School, in grade 8th. The results of this research are the development of Foodivity Interactive, which is used to assess students' understanding. The findings of this study indicate that students' understanding increases as a result of using Foodivity Interactive as interactive multimedia on food nutrition topics. The development of Foodivity Interactive as Interactive Multimedia has been carried out using software construct 2. ADDIE instructional design is used in developing Foodivity Interactive and exported as HTML 5 and Android-based applications.

The expert assessment of interactive foodivity is based on the results of index V which was carried out using a Likert scale. The mean value found for index V is 0.8125. This shows that the media is valid and can be used as a learning medium. The data questionnaire data is used to determine the results of student responses. 70.07 percent of students strongly agree, while 22.26 percent agree. Based on these findings, it can be concluded that more than half of the students stated positive opinions about the application.

So, it can be concluded that Developing Foodivity Interactive multimedia can help students better understand nutrition topics. This can be proven by the N-gain results, which show a moderate increase between the pre-and post-treatment tests. The hypothesis test stated that hypothesis

H1 was accepted, which indicated that significant difference between the pretest and post-test

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