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The Implementation of Interactive Multimedia and Kits on Food Topic to Facilitate Chemical Students with Hearing Impairment

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***Abstract*—The research aimed to describe the implementation of interactive multimedia and kits to facilitate students with hearing impairment. The kit consists of student activity sheet, tools, and materials for experiment. Student activity sheet of chemistry on foods consists of five experimental titles. The implementations were done in Jember Senior High School State for Disabilities and Bayangkari Gresik Senior High School for Disabilities. This research used one group pretest-posttest design which completed by an interactive multimedia observation, kit observation sheets, and concept comprehension test sheets as instruments of research. Data were analyzed descriptively. The results showed that the implementation of interactive multimedia and kits categorized as good and very good. The usage of interactive multimedia and kits can also increase students' understanding of food topic with varies in category from low to high.**

Keywords—interactive multimedia; kit; writing-to-learn; hearing impairment students

I. INTRODUCTION

Every student has rights for education, as well as the students who have disability such as hearing impairment [1]. The government has provided various facilities for the disability students' education by establishing senior high school for disabilities students. Senior high school for disabilities handles all students with various disabilities, without any discrimination. Every disability student will get education that suits their abilities. Disability students will be grouped with students who have same disability, such as hearing impairment [2]. Hearing impairment students should have same skills and abilities with normal students in general, so education should be taught for them at senior high school for disabilities students in order to develop their skills and abilities [3].

One of the subjects in the academic that should be taught to hearing impairment students is natural science. Natural science is related to how to find out about nature systematically. Learning natural science means mastering knowledge about products, processes, and attitudes based on observation and experimentation. Natural science education is expected to be media for hearing impairment students to learn about themselves and the natural surroundings, as well as the prospect of further development in its application in daily life. Natural sciences learning process emphasizes the direct learning experiences through the utilization and development of scientific process skills and scientific attitudes [4]. Chemistry topic that suits to be taught through experiments is chemicals on food. This topic is chosen because it is very close with students' daily life. Students cannot be separated from the usage of chemicals on foods, both in natural and artificial way in daily life.

Chemistry topic should be explained correctly, so the students could understand the topic. Hearing impairment students have limitations on audio or their hearing ability, so when explaining the topic, the teacher should use the other communication methods that students can understand. Clopping stated that various studies had proved the excellence combination methods for educating hearing impairment students. In addition, learning media that used for teaching and learning should be interesting and visualized [5]. One of the examples is interactive multimedia. Heinich illustrates that interactive multimedia is a collection of several media such as writings, images, audios, videos, graphics and animations that blended together and there are interactions between the users and the computers and vice versa [6]. Interactive multimedia can be developed as a solution to facilitating and easing the learning process, and also it can be used as an active, interactive and fun learning media. This is suitable with the research that conducted by Cairncross, S & Mannion, which stated that using multimedia can provide assistance in learning, because it can provide more information and interactive so it can help the students for better understanding [7]. According to Panselina, additions of sign language in video clips on interactive multimedia can improve students' understanding of the concepts [8].

The other learning media that can be used is student activity sheet. Student activity sheet can ease the teaching and learning process and can be used as communication media between students and teacher. According to Depdiknas, student activity sheet is sheets which are contain tasks that should be done by students [9]. Student activity sheet is usually in form of instructions and steps to finish a task. Student activity sheet is printed visual media that can guide hearing impairment students to write. Writing activity for learning can be stated as writing-to-learn. According to Lang and Lewis, writing-to-

learn strategy or WTL strategy, is suitable for improving hearing impairment students' literacy [10]. By writing, the students learn to understand the concepts, develop skills, and practice communication.

Based on the explanation, to help hearing impairment students for understanding chemistry topic, especially chemical on foods topic, one of the ways that can be done is using interactive multimedia and kit. Previous development research for interactive multimedia and kit showed these media can be used as learning media [11]. The problem formulation in this research is "How are the implementations of learning using interactive multimedia and kit, also students' understandings concept after the implementations?"

II. METHOD

The type of this research is implementation research. The research was done in Jember Senior High School State for Disabilities and Bayangkari Gresik Senior High School for Disabilities by using One Group Pre-test Post-test research design that can be presented as:

$$O_1 \rightarrow X \rightarrow O_2 \quad [12]$$

Explanations:
O_1 : Pre-test result (students' concept understanding score)
X : Treatment by using interactive multimedia and kit
O_2 : Post-test result (students' concept understanding score)

Research instruments that used in this research were implementation of multimedia interactive and kit observation sheets and students' concept understanding test. Data collecting method in this research were observation and test methods. Observation methods was used for collecting data of implementation of interactive multimedia usage, meanwhile test method was used for knowing students' concepts understanding. Learning activity was observed to know the implementation of interactive multimedia and kit. Observation sheets of interactive multimedia and kit implementation was made in the form of "yes" and "no" answer options. Data percentage was calculated based on Guttman scale in Table 1

TABLE I. GUTTMAN SCALE CRITERIA [13]

Answer	Score
Yes	1
No	0

Percentage of interactive multimedia and kit implementation was calculated by the formula:

$$\text{Percentage of Implementation} = \frac{\text{Observation Total Score}}{\text{Maximum Score}} \times 100\% \quad (1)$$

Score of interactive multimedia and kit implementation was interpreted by criteria in Table II.

TABLE II. INTERPRETATION OF INTERACTIVE MULTIMEDIA AND KIT IMPLEMENTATION SCORE [16]

Percentage (%)	Criteria
0 – 20	Very Bad
21 – 40	Bad
41 – 60	Average
61 – 80	Good
81 – 100	Very good

According to the criteria, interactive multimedia and kit implementation stated as good if the score passed ≥ 61%. Students' concept understanding data was obtained from test. Test were done for 2 times; initial test, before teaching and learning process (pre-test) and test after teaching and learning process. Data that obtained from pre-test and post-test were used to find out students' concept understanding. Each student's concept understanding was calculated by using the formula:

$$\text{Student's Concept Understanding Score} = \frac{\sum \text{Student's Score}}{\sum \text{Maximum Score}} \times 100 \quad (2)$$

The difference between students' concept understanding at the pre-test and post-test were analyzed by using N-gain Score. N-gain score is student's improvement score divided by maximum improvement score that can be achieved by student. Student's improvement score is post-test score reduced by pretest score. Maximum improvement is maximum score reduced by pre-test score. According to Hake, the formulation of N-gain score is:

$$g = \frac{\text{Posttest Score - Pretest Score}}{\text{Maximum Score - Pretest Score}} \quad (3)$$

N-gain score was interpreted by Student's concept understanding criteria in Table III.

TABLE III. N-GAIN SCORE CRITERIA [14]

N-gain Score	Criteria
$g < 0,3$	Low
$0,3 \leq g < 0,7$	Average
$g \geq 0,7$	High

III. RESULT AND DISCUSSIONS

A. Implementation of Interactive Multimedia and Kit

The aspects of implementation include student activities in using interactive multimedia and student activity sheet. The data was obtained from the assessment of two observers for each group using the observation sheet. The results of the assessment of learning effectiveness are presented in Tables IV and V.

TABLE IV. PERCENTAGE OF INTERACTIVE MULTIMEDIA IMPLEMENTATION

No.	Aspect of Interactive Multimedia	Percentage of Implementation (%)	
		Jember Senior High School	Gresik Senior High School
1.	Navigation	100	100
2.	Topic		
	a. Chart	100	100
	b. Concept	97	97
	c. Example	100	100
3.	WTL Strategy		
	a. Guided Free Writing	100	100

No.	Aspect of Interactive Multimedia	Percentage of Implementation (%)	
		Jember Senior High School	Gresik Senior High School
	b. Creative Piece	81	92
	c. The End of Class Reflection	88	89
4.	Analysis	84	100
5.	Video	100	100
6.	Interactivity		
	a. Writing	88	89
	b. Matching	91	100
	c. Answering Questions	94	100

Based on Table IV, the percentage of implementation of interactive multimedia in Jember Senior High School state for disabilities for each aspects were in range 81 – 100%. These results could be interpreted the implementation of interactive multimedia was categorized as very good because the assessment results ≥ 61%. The aspect that received the lowest score was creative piece with a percentage 81%.

The percentage of implementation of interactive multimedia in Gresik Senior High School state for disabilities for each aspects were in range 89–100%. These results could be interpreted the implementation of interactive multimedia was categorized as very good because the assessment results ≥ 61%. The aspect that received the lowest score was the end of class reflection with a percentage 89%.

Fig 1. Student using Interactive Multimedia

Figure 1 shows the implementation of interactive multimedia by students. Students, in a group that consist of four people, used one interactive multimedia in learning activity. They worked as team for using interactive multimedia and answering questions in multimedia.

Observation of media use was done during students used the interactive multimedia. This observation aims to find out practicality of interactive multimedia. Interactive multimedia implementation assessed by six aspects. They were navigation, topic, WTL strategy, analysis, and interactive video. At first the students confused about what they should do in opening section of the media. After some guidance from teacher, students could use interactive multimedia without guidance for teacher. At the material section, students could read to the material presented. Students used various navigation buttons to read the materials and view the video that presented. At the end section, students answering evaluation questions in groups. There are various questions that are contained in interactive multimedia, which are *fill in blank sentences*, *match between drawings and names of chemicals that have been studied*, *and questions in the form of multiple choice questions*.

TABLE V. PERCENTAGE OF KIT IMPLEMENTATION

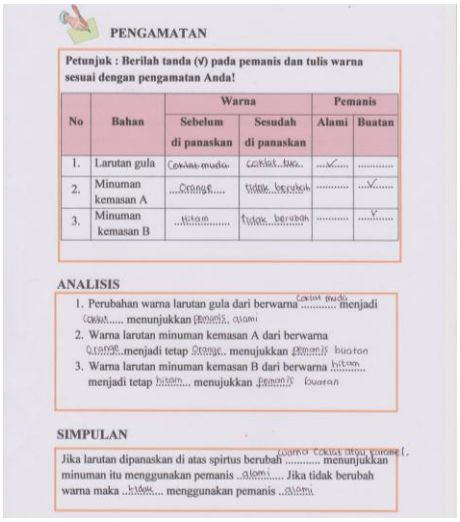
No.	Aspect of Student Activity Sheet	Percentage of Implementation (%)	
		Jember Senior High School	Gresik Senior High School
1.	Chemistry Information	100	100
2.	Concept Maps	91	93
3.	Titles	97	100
4.	Aims	88	93
5.	Descriptions	100	100
	Guided Free Writing		
6.	Tools and Materials	88	100
7.	Procedures	100	100
8.	Observations	97	100
9	Analysis	91	100
10.	Conclusions	97	100
	Creative Piece		
11	Let's be creative	81	89
	The End of Class Reflection		
12	Let's Memorize	81	86

Based on Table V, the percentage of implementation of kit in Jember Senior High School state for disabilities for each aspects were in range 81 – 100%. These results could be interpreted the implementation of kit was categorized as very good because the assessment results ≥ 61%. The aspects that received the lowest score were creative piece and the end of class reflection with percentage 81%.

The percentage of implementation of kit in Gresik Senior High School state for disabilities for each aspects were in range 86–100%. These results could be interpreted the implementation of kit was categorized as very good because the assessment results ≥ 61%. The aspect that received the lowest score was the end of class reflection with a percentage 86%.

Fig 2. Students using Kit

After using interactive multimedia, students were conducted experiments. Students were provided with kit that consists of student activity sheets, tools and materials for experiments. Figure 2 showed the implementation of the kit by students. Students in groups conducted experiments carefully. Students conducted three experiments, which were food coloring, food sweetener, and food preservatives. Before conducting an experiment, students read the student activity sheet first. Students used student activity sheets with three aspects of WTL strategies, namely *guided free writing, creative piece* and *the end of class reflection*.



PENGAMATAN

Petunjuk : Berilah tanda (√) pada pemanis dan tulis warna sesuai dengan pengamatan Anda!

No	Bahan	Warna		Pemanis	
		Sebelum di panaskan	Sesudah di panaskan	Alami	Buatan
1.	Larutan gula	Coklat muda	coklat tua	√	
2.	Minuman kemasan A	Orange	tidak berubah		√
3.	Minuman kemasan B	hitam	tidak berubah		√

ANALISIS

1. Perubahan warna larutan gula dari berwarna coklat muda menjadi coklat menunjukkan pemanis alami
2. Warna larutan minuman kemasan A dari berwarna orange menjadi tetap orange menunjukkan pemanis buatan
3. Warna larutan minuman kemasan B dari berwarna hitam menjadi tetap hitam menunjukkan pemanis buatan

SIMPULAN

Jika larutan dipanaskan di atas spirtus berubah warna coklat atau karamel menunjukkan minuman itu menggunakan pemanis alami Jika tidak berubah warna maka hitam menggunakan pemanis alami

Fig. 3. Student's Answer for Guided Free Writing Aspect

Figure 3 was example of student's answer for guided free writing aspect. Guided free writing included student activity sheet in the form of writing the tools and materials, experiments step, observations results, analysis, and conclusions. Students wrote based on the images that presented in the student activity sheets. Through a picture hearing impairment student expressed the ideas through writing. The WTL strategy trained hearing impairment students to make a sentence from what they observed. Students wrote about what they observed in their experiments. Students answered questions in analysis and gave conclusion from their experiments. This was similar to Lang's study, which stated that students were asked to write observations from a demonstration, observation, and science experiment with the aim of training students to write ideas from an observation [10].

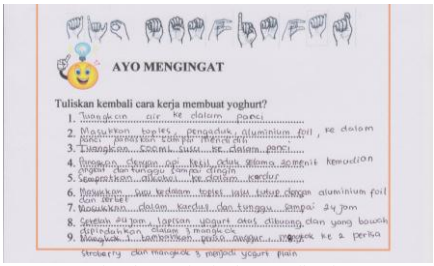
AYO BERKREASI

Apa saja jenis makanan atau minuman yang menggunakan yoghurt?

Salad buah, Jus Buah, Es buah, Ice cream yoghurt, Agar - Agar

Fig. 4. Student's Answer for Creative Piece Aspect

Figure 4 was example of student's answer for creative piece aspect. Students wrote their ideas that match what they have learned from interactive multimedia and experiment. In figure 4, students were asked to mention the type of food or drink that uses yogurt. This aspect trained students to give their creative ideas on the products they have produced before, in this case, was yogurt.



AYO MENGINGAT

Tuliskan kembali cara kerja membuat yoghurt?

Fig. 5. Student's Answer for the End of Class Reflection Aspect

Figure 3 was example of student's answer for *the end of class reflection* aspect. At this aspect students are trained to reflect back on what they had learned. Students rewrote the experiment steps they had done according to their memory.

Overall, the highest score of WTL strategy in multimedia interactive and kit implementation was of guided free writing aspect. The highest score of 100% because students answered the questions both in interactive multimedia and student activity sheets correctly. Creative piece and the end of class reflection aspects got a lower score. This was because students didn't give their ideas, either in the form of writing or drawing on the creative piece aspect. The end of class reflection aspect also gets the same score because students couldn't rewrite the experimental procedure. The reflection of activities was the only part of students could do. This was because at this aspect students got bored in working on student activity sheets for a long time.

B. Learning Outcomes

Before learning using interactive multimedia and kit, students were given a pretest to determine students' initial knowledge in chemistry on foods topic. Pretest consists of questions in the form of multiple choices and descriptions by completing the blanks. After learning process, students were given post-test with the same questions as the pretest. Pre-test and post-test aimed to determine students' learning outcomes after learning with interactive multimedia and kit. The following Table VI and VII are the results of the students' pretest and posttest from both respective schools.

TABLE VI. PRETEST AND POSTTEST RESULTS AT JEMBER SENIOR HIGH SCHOOL STATE FOR DISABILITIES

Number	Subject	Score		N-gain	Category
		Pretest	Postest		
1	P	16.67	66.67	0.60	Medium
2	D	27.78	77.78	0.69	Medium
3	W	22.22	77.78	0.71	High
4	AR	5.26	33.33	0.30	Medium
5	Z	22.22	72.22	0.64	Medium
6	SNL	22.22	84.21	0.80	High
7	BS	15.79	72.22	0.67	Medium
8	MF	15.79	42.11	0.31	Medium

Based on Table VI, the n-gain score obtained by Jember Senior High School students ranges from 0.30 to 0.80 and categorized as medium and high categories. Six students increased their conceptual understanding in the medium category and 2 other increased their conceptual understanding

in the high category. This were due to each student has different intelligence and ability to absorb informations. Students who increased with high criteria have higher ability to absorb information so they got good grades at the posttest. The level of hearing impairment and intelligence of students also affects the level of memory of students. Some students repeated some parts that have not been understood so mistakes in answering questions are reduced. Overall, the n-gain score obtained by students showed that students' understanding of concepts after learning with the help of interactive multimedia and kits has increased. Thus, learning with the help of interactive multimedia and kit could stated is successful.

TABLE VII. PRETEST AND POSTTEST RESULTS AT Bayangkari Gresik SENIOR HIGH SCHOOL FOR DISABILITIES

Number	Subject	Score		N-gain	Category
		Pretest	Postest		
1	AD	16.67	33.33	0.20	Low
2	U	27.78	33.33	0.08	Low
3	F	22.22	27.78	0.07	Low
4	FP	5.56	50.00	0.47	Medium
5	GN	33.33	84.21	0.76	High
6	E	50.00	72.22	0.44	Medium
7	AIA	33.33	66.67	0.50	Medium

Based on Table VII the n-gain score obtained by Bhayangkari Gresik students ranging from 0.07 - 0.76 with low, medium and high categories. A total of 3 students increased their conceptual understanding in the low and medium categories while the remaining 1 student increased his conceptual understanding in the high category. This was because each student has different intelligence and ability to absorb information. Students who increased their conceptual understanding in low criteria were unable to absorb information so that they got less good grades at the posttest. The cognitive development of hearing impairment students is more influenced by the development of language, so that it could affect the development of intelligence.

In addition, age and level of hearing impairment also affect the level of intelligence of hearing impairment students. Arum stated that children who had hearing impairment after 3 years old will be higher achievements than children who experience in earlier age, and children with mild hearing impairment have greater achievement than children with massive hearing impairment [15]. Overall, all students had improvement in concept understanding after learning with the help of interactive multimedia and the kit. Thus, learning with the help of interactive multimedia and Kit could be stated as successful.

IV. CONCLUSION

Based on the results and discussion, it can be concluded that after doing learning using interactive multimedia and kit, student's learning outcome have increased with low to high criteria.

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