Interactive Multimedia and Kit Implementation on Chemistry in Daily Life Topic with Writing-to-Learn Strategy for Hearing Impairment Students

by Sukarmin Sukarmin

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Dian Novita*
Chemistry Department, Faculty of Matematics and Science
Universitas Negeri Surabaya
Surabaya, Indonesia
diannovita@unesa.ac.id

Sri Poedjiastoeti
Chemistry Department, Faculty of Matematics and Science
Universitas Negeri Surabaya
Surabaya, Indonesia
sripoedjiastoeti@unesa.ac.id

Sukarmin
Chemistry Department, Faculty of Matematics and Science
Universitas Negeri Surabaya
Surabaya, Indonesia
sukarmin@unesa.ac.id

Achmad Lutfi
Chemistry Department, Faculty of Matematics and Science
Universitas Negeri Surabaya
Surabaya, Indonesia
achmadlutfi@unesa.ac.id

Abstract*—this research aims to describe the implementation of interactive multimedia and kits on Chemistry in Daily Life Topic. The kit consists of student activity sheet and tools and materials for experiment. Student activity sheet of chemistry on foods and chemistry on household theme each consist of four experiments. The implementations were done in Jember Senior High School State for Disabilities and Blitar Senior High School State for Disabilities. The research instruments consists of implementation of interactive multimedia and kit observation sheets and concept comprehension test sheets. Data was analyzed descriptively quantitatively. This research used one group pretest-posttest design. The results of the research were the implementation of interactive multimedia and kits categorized as good and very good. The usage of interactive multimedia and kits also increased students' understanding of chemistry-on-foods and chemistry-in-household subtopics, and the increasing was categorized in vary category, from low to high category.

Keywords—Interactive Multimedia; Kit; Writing-to-learn; Hearing Impairment Students

I. INTRODUCTION

Education is something important for human life. Education is used as a place for humans to develop the potential from birth. Therefore, every human being has the right to get education, whether it is normal or has a physical disorder. The government has regulated the matter of education in the 1945 Constitution Article 31, paragraph 1, which states, "Every citizen has right to obtain education", then further explained through the RI Law No. 20 of 2003 concerning the National Education system of the union section Article 5, paragraph 1, which states, "Citizens who have physical, emotional, mental, intellectual and/or social rights are entitled to special education". [1] The government has prepared various facilities to support the education of students with disabilities, one of which is by setting up high school for students with disabilities or extraordinary high schools. Middle school for students with disabilities is a school that handles students with various disabilities, without discrimination. Students will be grouped based on their disabilities, such as students who experience hearing impairment [2]. At senior high school, students who experience hearing impairment should have the same skills and abilities as students in general, so education should be taught in high schools for students with disabilities to develop their skills and abilities [3].

Various subjects are taught for hearing impairment students; one of them is natural science. Natural science discusses natural phenomena that are arranged systematically based on the results of experiments and observations made by humans. Natural science education serves as a means for students to learn for themselves and their natural environment and can be the prospect of further development in their applications in daily life. The learning process of natural science prioritizes direct learning experiences through the use and development of scientific process skills and scientific attitudes [4]. Chemical topics that accordance with the natural sciences and suitable to be taught through experiments are chemistry in daily life. This topic was chosen because it is very closely related to students' daily lives. In everyday life, students cannot be separated from the use of chemicals in food, both naturally and artificially.

The chemistry must be taught correctly in order to students can understand the topic. Students with hearing impairment have limitations in their audio or hearing abilities so students experience communication difficulties; while communication is an important aspect of learning so that teachers must use other communication methods that students can understand. Learning media used by teachers to teach and use students to learn must be interesting and visualized [5]. One example of learning media is interactive multimedia. Heinich explained that interactive multimedia is a collection of several media such as writing, images, audio, video, graphics and animation that are combined together and there is interaction between users and computers and vice versa [6]. Interactive Multimedia (MMI) is one solution

to overcome this limitation. MMI must have meaning, namely two-way media interaction from users, then media users. Media interaction with users can be demonstrated through orders, suggestions, and activities provided by MMI, but the form of reciprocal interaction with users with the media will be limited when intended for hearing impairment students. Interactive multimedia can be developed as a solution to facilitate and facilitate the learning process, and can also be used as an active, interactive and fun learning media. This is consistent with research conducted by Caimcross, S & Mannion, which states that using multimedia can provide assistance in learning, because it can provide more information and be interactive so that it can help students to better understand [7]. According to Panselina, adding sign language in video clips to interactive multimedia can improve students' concept understanding [8].

Besides interactive multimedia other learning media that can be used are student activity sheets. Student activity sheets can help the teaching and learning process and can be used as a medium of communication between students and teachers. According to the Ministry of National Education, student activity sheets are sheets consisting of tasks that must be done by students [9]. According to Lang the learning strategy that can be applied to hearing impairment students is a writing to learn (WTL) strategy, because this strategy can provide facilities for hearing impairment students in learning by helping to explore, clarify, and think to express ideas from a reading. The strategy has several activities whose use is adapted to the needs a characteristics of the material presented, namely: (1) creative-piece; (2) Guided-free-writing ; (3) End-of-class reflection; and (4) Double entry [10]. Writing activities can help students learn to understand concepts, develop skills, and practice communication.

The theoretical feasibility of MMI developed has a percentage range of 80% - 100% with criteria that are feasible and very feasible [11]. The feasibility of MI empirically can be seen from the positive response of students with a percentage range of 80% -100%, which is supported by student activities in the range of 87.17% - 97.43%, and the results of evaluation of students with a range of values 66.7 - 93.3.

Based on this explanation, to help hearing impairment students in understanding the topic of chemistry in science learning, especially on chemical topics in daily life, one of the media that can be used is interactive multimedia and kits. The formulation of the problem in this study is "How to implement learning using interactive multimedia and kits, and understanding students' concepts after implementation?"

II. METHOD

The research done in Blitar Senior High School State for Disabilities. Implementation research was the type of this research with One Group Pre-test Post-test research design. The research design can be presented as:

O_1	X	O_2

[12]

Explanations:
O_1 : Pre-test
X : Treatment
O_2 :Post-test

Observation sheets of multimedia interactive and kit implementation and students' concept understanding test were used as instruments of this research. Observation, test and questionnaire were used as data collecting method in this research. Data of interactive multimedia and kit implementation were collected by using observation methods. Data of students' concepts undertanding were collected by using test methods. Data of students' responses were collected by using questionnaire method.

Observation sheets of interactive multimedia and kit implementation consists of answer "no" and "yes. Guttman scale as in Table I was used for calculating percentage score.

TABLE I. GUTTMAN SCALE

Score	Answer
0	No
1	Yes

[13]

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

$$\text{Precentage of implementation} = \frac{\text{observation total score}}{\text{maximum score}} \times 100\%$$

Interactive multimedia and kit implementation score interpreted by criteria in Table II.

TABLE II. INTERPRETATION OF INTERACTIVE MULTIMEDIA AND KIT IMPLEMENTATION SCORE

Percentage	Criteria
81%—100%	Very Good
61%—80%	Good
41%—60%	Average
21%—40%	Bad
0%—20%	Very Bad

[13]

Based on criteria, the implementation of interactive multimedia and kit categorized as good if the score is more than 61%. Test was done to obtain data of students' concept understanding. Test were done 2 times, pre-test (before learning activity) and post-test (after learning activity). Data result were used to find out students' concept understanding. The formula that used for calculating student's concept understanding was:

$$\text{Student's concept understanding score} = \frac{\Sigma \text{Student's Score}}{\Sigma \text{Maximum Score}} \times 100$$

The difference between students' concept understanding at the pre-test and post-test analyzed by using Gain score. The Gain score formulation according to Hake is:

$$g = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum score} - \text{pretest score}}$$

[14]

Gain score was interpreted by criteria in Table III.

TABLE III. GAIN SCORE CRITERIA

Gain Score	Criteria
$g \geq 0,7$	High
$0,3 \leq g < 0,7$	Average
$g < 0,3$	Low

[14].

III. RESULT AND DISCUSSIONS

A. Implementation of Interactive Multimedia and Kit

The implementation of interactive multimedia data obtained by observing interactive multimedia aspects that were done during learning acitivity. Data collected by one observer for each group. The results of the implementation are presented in Tables IV and V.

TABLE IV. INTERACTIVE MULTIMEDIA IMPLEMENTATION PERCENTAGE SCORE

Number	Interactive Multimedia Aspect	Percentage of Implementation	
		Chemistry in the Household	***Chemistry on Foods***
1.	Navigation	100%	100%
2.	Topic		
	a. Concept	100%	100%
	b. Example	100%	100%
3.	Writing-to-learn Strategy		
	a. Guided free writing	66,67%	100%
	b. Creative piece	100%	100%
	c. The end of class reflection	100%	100%
4.	Video	100%	100%
5.	Interactivity		
	a. Writing	66,67%	100%
	b. Matching pair	100%	100%
	c. Answering Questions	66,67%	100%

Observation of media usage was done during learning activity to know interactive multimedia practicality. Interactive multimedia implementation observed for six aspects. The aspects were navigation, topic, WTL strategy, analysis, video and interactivity. At first the students guided by the teacher to use the interactive multimedia. After the students understood how to operate, the teacher let the students to used the media independently. Students could read to the presented material in multimedia. Students used various navigation buttons to read the materials and view the presented video. Students asked to answer evaluation questions at the end section. There are various question forms in interactive multimedia, which are *matching pair, fill in the blank sentences, classify the product of chemical in daily life and questions in the form of multiple choice questions.*

Based on Table IV, the percentage of the implementation of interactive multimedia in chemistry-in-household subtopic gets a percentage between 66.67% - 100%. Guided-free-writing , writing, and answering questions aspects got 66,67% and those were lowest percentage among all aspects

The percentage score were 100% for interactive multimedia implementation for chemistry on food topic. These results could be interpreted that interactive multimedia implementation was categorized as very good because the results were more than 61%. All aspects in chemistry on food topic got score 100%.

Fig 1. Students working on multimedia

Figure 1 shows the implementation of interactive multimedia by students. The group consist of four student and they work together to use interactive multimedia. Students observe the video and answer the question on it.

TABLE V. KIT IMPLEMENTATION PERCENTAGE SCORE

Number	Aspect of Student Activity Sheet	Percentage of Implementation (%)	
		Chemistry in the Household	***Chemistry on Foods***
1.	Titles	100	100
2.	Purpose	100	100
	Guided-free-writing		
3.	Tools and Materials	100	100
4.	Procedures	66,67	100
	Creative-piece		
5.	Idea	100	100
6.	Picture	100	100
	The-end-of-class-reflection		
7.	All finished	66,67	66,67
8.	Partly finished	33,33	33,33
9.	Unfinished	0	0

According to table V, kit implementation percentage for each aspects in chemistry in household subtopic ranged from 66,67% until 100%. These results interpreted that the implementation of kit was categorized as good because the assessment results was more than 61%. The aspects that received the lowest score (66,67%) were procedure aspect in guided-free-writing aspect and the-end-of-class-reflection aspect.

The percentage of kit implementation in sub-material in the chemistry on foods gets a percentage between 66,67-100%. These results could be interpreted the implementation of kit was categorized as good because the assessment

sults ≥ 61%. The aspect that received the lowest score was the-end-of-class-reflection aspect with a percentage 66,67%.

Fig 2. Students conducting experiment using kit

Students conducted experiments after using interactive multimedia. Students provided with kit that consist of student activity sheets, tools and materials for experiments. Figure 2 showed the students conducted experiments with kit. Teacher guided students in groups to conduct experiments carefully. Students did two experiment in chemistry-in-household subtopic which were making soap and identifiying fish life capability. Meanwhile, in the chemistry-on-foods subtopic, the students did three experiments which were making food colouring from *Dracaena angustifolia,* making dawet, and Es dawet (Indonesian traditional beverage).

Students read student activity sheet before conduct an experiment. Student activity sheets also consist of three aspects WTL strategies, which were guided-free-writing, creative-piece and the-end-of class-reflection.

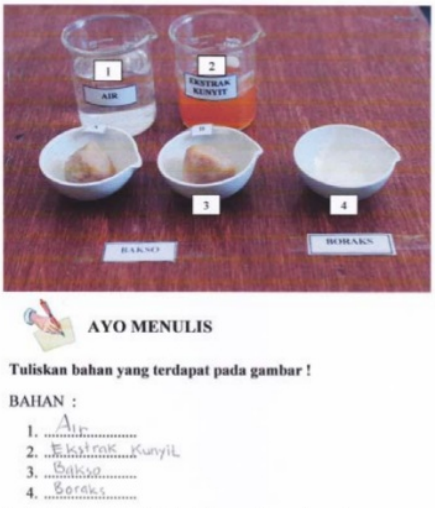

Fig. 3. Student's Answer in Guided-free-writing Aspect

Figure 3 is one of student's answer in guided-free-writing aspect. Guided-free-writing aspect were in the form of *writing tools and materials, steps experiment, observation results, analysis*, and *conclusions*. Students wrote the answer based on the presented pictures in the student activity sheets. Hearing impairment students could expressed the ideas through a writing. The WTL strategy trained hearing impairment students to write sentences or essay from their observations. Students wrote about what they observed in their experiments. Students analyzed and draw conclusion from their experiments. This was similar to Lang's study that students were asked to write observations from a demonstration, observation, science experiment with the aim of training students to write ideas from an observation [10].

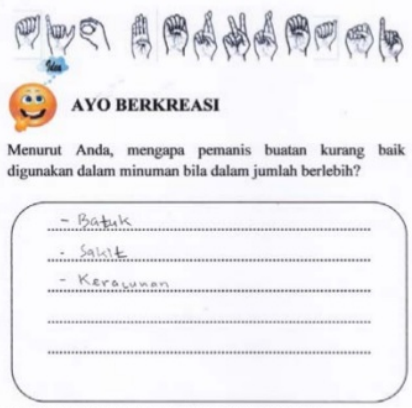

Fig. 4. Student's Answer in Creative-piece Aspect

Figure 4 was one of student's answer in creative-piece aspect. This aspect allowed students to write their ideas following what they had learned from experiment. In figure 4, students were asked to make soap with another shape or another extract.

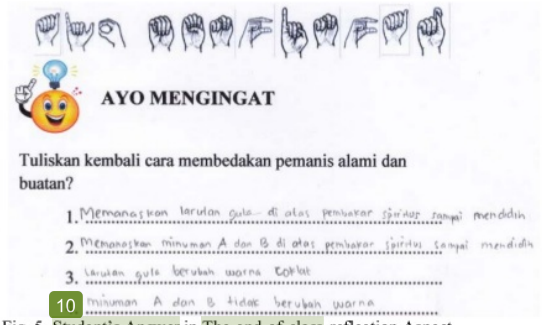

Fig. 5. Student's Answer in The-end-of-class-reflection Aspect

Figure 5 was example of student's answer in the-end-of-class-reflection aspect. Students trained to reflect back on what they had learned. Students rewrote the experiment steps they did in experiment according to their memories.

Overall, the highest score of WTL strategy in multimedia interactive and kit implementation was creative-piece. The highest score was 100% because all students wrote their creative ideas in the creative-piece aspect. Guided-free-writing aspect and the-end-of-class-reflection aspect got lower score due to uncompleted answer of experiment procedure. Student did the-end-of-class-reflection aspect partly due to student boredom for long time working on student activity sheets.

B. Learning Outcomes

Students were given a pretest to determine students' initial knowledge in chemistry-in-daily-life topic before learning activity. Pretest consists of multiple choices

questions and fill in the blanks questions. Students were given a posttest with the same questions as the pretest. Pre test and post test were used for determine students' learning outcomes after learning activity using 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 IN CHEMISTRY IN HOUSHOLD SUBTOPIC

Num	Student's Initial Name	Score		N-gain	Category
		Pretest	*Postest*		
1	P	5,26	73,68	0.72	High
2	MTO	21,05	78,94	0.73	High
3	RN	26,31	73,68	0.64	High

Based on Table VI, the n-gain score obtained by Blitar Senior High School students in chemistry in the household ranges from 0.64 to 0.72 and categorized as high categories. All of the students include on high category. From the data above, known that the students have had high ability to receive the information.

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 IN CHEMISTRY ON FOODS SUBTOPIC

Num	Student's Initial Name	Score		N-gain	Category
		Pretest	*Postest*		
1	AMT	11,11	83.33	0.81	High
2	H	11,11	83.33	0.81	High
3	DA	11,11	77.77	0.75	High
4	JC	11,11	88,88	0.87	High

Based on table VII the n-gain score obtained in chemistry in food matter had score from 0.75 - 0.87 with high categories. All of the students had increase their concept understanding to high category. The reason was the deaf students had high intelligent and high ability to absorb information.

The development of language influenced the cognitive development of hearing impairment students and it could affect the development of intelligence. In addition, hearing impairment level and age also affect the level of hearing impairment student's intelligence. Arum stated that children who had hearing impairment after 3 years old would have higher achievements than children who had hearing impairment in earlier age, and the children with mild hearing impairment level would have greater achievement than children with hard hearing impairment [15]. Overall, all students improved their concept understanding after learning by using interactive multimedia and the kit. Thus, learning bu using interactive multimedia and Kit could be stated as successful.

C. Students' Responses

The aspects of students responses in using interactive multimedia and student activity sheet. The data was obtained from student using the responses sheet. The results of the responses of student are presented in Tables VII and IX.

TABLE VIII. RESPONSES IN INTERACTIVE MULTIMEDIA

Number	Aspect	Percentage of Responses (%)
1.	Botom easy to be used	71,4
2.	The text was readable	85,7
3.	Font colour was good	85,7
4.	Example easy to understaind	85,7
5.	Video was interesting	57,1
6.	Video was clear	57,1
7.	Writing test was easy	85,7
8.	Interactive multimedia was good to be used for learning media	85,7
9.	Students had fun used interactive multimedia	100

Based on Table VIII, students gave positive responses for implementation of interractive multimedia. The students had fun used interactive multimedia got a percentage of 100% is in the very good category. Students feel happy because the interactive multimedia is easy to used. The lowest percentage is in the aspect of video was interesting and video was clear got a percentage of 57,1 % is in the average category.

TABLE IX. RESPONSES IN STUDENTS ACTIVITY SHEET

Number	Aspect	Percentage of Responses (%)
1.	Students had fun used student activity sheed	100
2.	The layout was interesting	71,4
3.	Sentence easy to understain	100
4.	He task was easy	85,7
5.	Procedure was easy	57,1
6.	Font tipe and font size was readably	85,7
7.	The pictures were helpfull to understain the concepts	100
8.	The pictures were helpfull to copmleted the procedure	71,4
9.	The pictures were helpfull to make a product	85,7
10.	Student activity sheed were helpfull to team work	100
11.	Student wont to redo the experiment in a home	71,4

Based on Table IX, students gave positive responses to student activities sheed. The students have fun used student activity sheed has a percentage of 100% is in the very good category. Sentence is easy to

understain, the picture was helpful to understand the concepts and student activity was helpful to team work had a percentage of 100%. Students feel happy because the student activity sheed is easy to use. and were help full to team work. The lowest percentage is in the aspect procedure was easy was 57.1% is in the average category.

IV. CONCLUSION

Based on the research results and discussion, it can be concluded that implementation of interactive multimedia and kit can increased students' learning outcome.

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