DEVELOPMENT OF CHEMICAL ON HOUSEHOLD INTERACTIVE MULTIMEDIA AND KIT FOR HEARING IMPAIRMENT STUDENTS OF JUNIOR HIGH SCHOOL FOR DISABILITIES

Sukarmin *, S Poedjiastoeti, D Novita, A Lutfi, L B Susanti
Chemistry Department, Faculty of Mathematics and Natural Science
Surabaya State University, Surabaya, Indonesia
sukarmin@unesa.ac.id

Abstract. This study aims to describe the feasibility of interactive multimedia and the developed kits, the activities of students, the understanding of students' concepts, and students' responses. Interactive multimedia and kits were developed with Writing to Learn strategies. Feasibility criteria consist of content, presentation, language, and graphics. This type of research was developed with the Research and Development (R & D) method. The research subjects are interactive multimedia and developed kits. The research instruments consisted of validation sheets, student activity observation sheets, concept understanding test sheets, and student response questionnaire sheets. Data sources were obtained from chemistry lecturers, Special Education lecturers, Special School teachers, and five students from Blitar State Special Junior High School. Data were analyzed descriptively. The results of the study show that interactive multimedia and kits are very feasible to be used as learning media with a percentage of eligibility ≥ 61%. Percentage of students student activities were in range 66,66% - 100% for each activities. Students' score and Students' concept understanding were increased after trial. The results of student responses indicate that interactive multimedia and kits get a positive response because they get a percentage of ≥ 61% for each aspects.

Key Words: interactive multimedia, kits, deaf students, writing to learn

INTRODUCTION

Education is a conscious and planned efforts to create a learning atmosphere and learning process for students so they can actively develop their potential, self-control, personality, intelligence, character, and skills [1] Every children has the same right to obtain high quality education, including children with special need, such as hearing impairment children [2]. Hearing impairment children are children who experience a deficiency or loss of some of their hearing abilities due to damage or malfunction of part or all of the hearing, so they may experienced difficulties in language development [3].The development of hearing impairment children's intelligence is strongly influenced by the development of language, so the language barriers will obstruct the development of intelligence of hearing impairment children [4].Obstructed aspects of intelligence are the verbal ones, for example formulating understanding, understanding correlation and giving conclusions [5].

One of many ways for hearing impairment students to express their experience and achieve significance in the learning process is by writing. The writing-to-learn strategy (WTL) provide hearing impairment students in learning after gaining direct experiences as a learning experiences. The WTL strategy has several activities, and adapted for the needs and characteristics of the material presented, which are: (1) creative piece; (2) Guided Free Writing; (3) End-of-class reflection [6].

Media is everything that can be used to distribute messages from the sender (teacher) to the recipient (student)so it can stimulate recipient' thoughts, feelings, attention and interests[7]. Multimedia is a variety of types of providing information facilities on a computer that uses voice, graphics, animation, and text [8]. Interactive multimedia as a learning medium can support the delivery of knowledge to students, interactive multimedia is also useful in visualizing concepts, and interactive multimedia features can provide a clearer picture after students learn a concept [9]. The media kit is equipment that is produced and packaged in a teaching unit box, which resembles a series of test equipment for process skills in the field of science studies and is equipped with a manual for its use [10].

One of the subjects in the academic field that must be taught to hearing impairment students is natural sciences. Natural science education is can make students learn about themselves and natural surroundings, as well as the prospect of further development in its application in daily life [11]. Interactive multimedia with the strategy of writing-to-learn can be implemented properly and is considered to improve understanding of concepts for hearing impairment students in senior high school[12]. Based on the description above, the researcher conducted a study with the title Development of Chemical on Household Interactive Multimedia and Kit for Hearing Impairment Students of Junior High School for Disabilities.

METHOD

a. Validation of Interactive Multimedia and Kit

The type of this research is development research, developing interactive multimedia and kits on chemical material in daily life for students of junior high school for disabilities. The research method that used in this research was Research and Development (R & D) [13]. In this research the preliminary study and development stage was carried out, meanwhile the evaluation stage will be carried out next year. Feasibility of interactive multimedia and kit stated from three aspects. They were validity, effectiveness, and practicality [14]. Validity consists of content and construct validity. Validator of this research are teacher of junior high school for disabilities, chemistry lecturers, and special education lecturers. The objects of this research is interactive multimedia and kits. Data sources were obtained from review, validation, and limited trials. The limited trial was conducted in junior high school for disabilities in Blitar. Five students of Blitar State Junior High School were subject of the limited trials. The research instruments consisted of review sheet, validation sheet, concept comprehension test sheet, and student response questionnaire. Data collection techniques used are tests and questionnaires which include review, validation and response. The results of the review were analyzed descriptively. The percentage of validation data analyzed by using Likert score:

Table 1. Likert Score

Criteria	Score
Very infeasible	1
infeasible	2
Less feasible	3
feasible	4
Very feasible	5

[13]

The formula used in this calculation is:

$$K = \frac{F}{N \times I \times R} \times 100\%$$

Details:

K = Score Percentage

F   = Number of Students' Answers
N   = Highest Score that can be obtained
I   = Number of items
R   = Number of Students
                    [13]

The percentage results then interpreted in Table 2.

Table 2. Criteria of Score Interpretation

Percentage	Criteria
0%-20%	Very infeasible
21%-40%	infeasible
41%-60%	Less feasible
61%-80%	Feasible
81%-100%	Veryfeasible

[13]

Based on the criteria of score interpretation, interactive multimedia and the kits developed are said to be feasible if the percentage results is $\geq 61\%$ so it suitable to be used as learning media.

b. Trial of Interactive Multimedia and and Kit

Observation sheets of interactive multimedia and kit usage was made in the form of "yes" and "no" answer options. Data percentage was calculated based on Guttman scale in Table 3:

Table 3. Guttman Scale Criteria

Answer	Score
Yes	1
No	0

[13]

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

Percentage of implementation $=\dfrac{observation\,total\,score}{maximum\,score}$ x 100%

Score of interactive multimedia and kit implementation was interpreted by criteria in Table 2. Data from the pre-test and post-test results was analyzed descriptively. Calculation of the students' understanding concept score using the following formula:

$$score = \frac{\text{obtained score}}{\text{max } score} \times 100$$

Interactive multimedia and kit could increasing students' concepts understanding if students' score increased.

c. Practical Aspect

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The results of student questionnaire responses were analyzed descriptively. The percentage of questionnaire results was obtained based on the Guttman scale score in Table 3.

The formula used in this calculation is:

$$P\,(\%) = \frac{\text{number of obtained score}}{\text{criteria score}} \times 100\%$$

Details:
Criteria score = max score x number of aspects x number of students

Score of students' responses was interpreted by criteria in Table 2. Based on these criteria interactive multimedia and kits are practical for learning media if its score≥ 61%.

RESULT AND DISCUSSION

1. Student Activity Sheets Review

The students activity sheet was reviewed to obtain comments and suggestions from content experts-one chemistry lecturer, one special education lecturer, and one teacher of junior high school for disabilities. The reviewers gave several suggestions; (1) using words that were more simple and easy to understand on the student activity sheets, (2) the experimental stages should be arranged consistently, (3) some spelling needs to be corrected, and (4) some images need to be adjusted. Based on the results of the study obtained comments and suggestions from material experts to do repairs to get an assessment from the validator. Student activity sheets that has been reviewed, then revised and produces Draft I. student activity sheets Draft I is then validated.

2. Student Activity Sheet Validation

Validation is done to determine the feasibility based on the criteria of content, presentation, language, and graphics. If the percentage of feasibility for each criterion is more than 61% then the students activity sheet stated as suitable for learning [14]. Validation was carried out by one chemistry lecturer, one Special needs Education lecturer, and one teacher of junior high school of disabilities.

Based on Table, it was found that student's activity sheet had a percentage above 61% so it was stated that it was very suitable to be used in the learning process. The criteria for the contents of the student's activity sheet obtained a percentage range of 86.6% - 100.00% and categorized as very valid. In the aspect of suitability of learning objectives with indicators, the material description contained important concepts, conformity with the Writing to Learn strategy (creative

piece and the end of class reflection). The Guided Free Writing aspect got a percentage of 100.00%. Based on the presentation criteria, the results of students activity sheet validation ranged from 86.6% - 100.00% which included in the criteria were very feasible.

Based on linguistic criteria, the results of students activity sheet validation are in the percentage range of 86.6% - 100.00% included in the criteria of very feasible. The aspect of the use of SIBI in students activity sheet supports the development of the language of hearing impairment students to get a percentage of 93.4%. Based on grammatical criteria, the results of students activity sheet validation obtain a percentage range of 86.6% - 100.00% included in the criteria as very feasible. The usage of fonts (type and size) made reading easier, the suitability of the layout of the text, photos, and tables gets a percentage of 100.00%.

Feasibility of content in terms of material suitability with Competency Standards and Basic Competencies in chemistry in households gets a percentage of 93.4%. This is because in the selection of material adapted to the 2006 curriculum class VIII for hearing impairment students, with topic chemical material in daily life. Based on the suitability of the contents, the suitability of learning objectives with indicators, the material description contains important concepts in accordance with (MONE, 2008). Conformity with the Writing To Learn strategy, which are Guided Free Writing, is in accordance with the development of hearing impairment students because the content of students activity sheet guides students to write by completing practical work methods, observation tables, analysis and conclusions. The inhibition of language development causes hearing impairment students to arrange a sentence so that guided free writing aspects make it easier for students to write. Lang states that writing activities in science activities are very important [6]. Writing in science activities will make it easier for hearing impairment students conveying their mind. For example, the observation table and analysis of Solid Soap student activity sheet are shown in the following Figure 1.
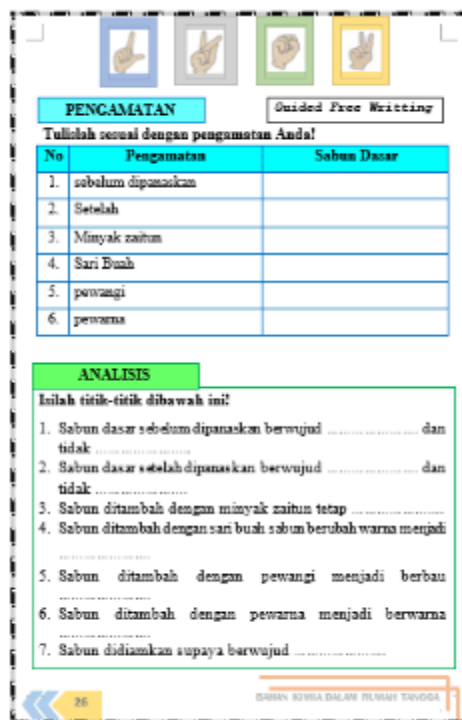

Figure 1. *Guided Free Writing* **Component in Student Activity Sheets**

Creative piece component got a percentage of 100.00%. Students trained to write down what's on their mind. For example, in student activity sheets 1, students asked to make solid molds with extracts, dyes, and perfumes that have been determined. Students asked to show the shape to be made, for example the shape of a flower or leaf as in figure 2.
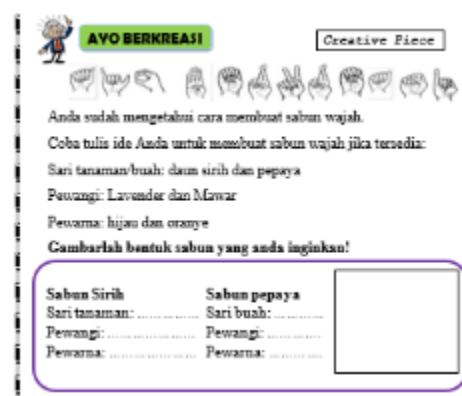

Figure 2. *Creative Piece* **Component in Student Activity Sheets**

The end of class reflection component trained students to practice recalling what has been learned in each student activity sheets. For example students asked to rewrite how to make solid soap (Figure 3).
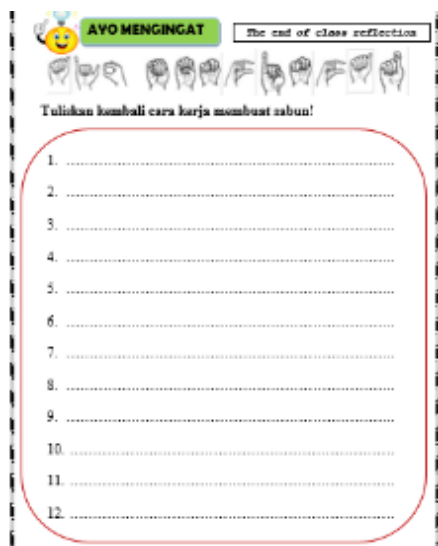
Figure 3.*The End of Class Reflection* **Component in Student Activity Sheets**

The feasibility of student activity sheets presentation got percentage of 100.00% which included in the criteria of Very feasible. Cover contained images that related to the contents of student activity sheets such as turmeric, carrots, solid soap, insect repellent, etc. The covered student activity sheets cover was presented in Figure 4.

Figure 4. Student Activity Sheets Cover

The development of hearing students' vocabulary were faster than hearing impairment student. Hearing impairment students had limited hearing so they didn't had a lot of vocabulary. The feasibility of language usage in student activity sheets got percentage ranged from 86.6% - 93.4% for long/short sentence, in accordance to the ability of hearing impairment students and the usage of SIBI in student activity sheets. Hearing impairment students had difficulty reading long-compiled sentences due to the difficulty of regulating breath and the lack of vocabulary. Hearing impairment students were easier to understand short and convoluted sentences. The lack of vocabulary made students difficult to interpret figurative words or abstract ones. Student activity sheets didn't had abbreviated or didn't used molecular formula. Examples of writing chemicals in toothpaste products are written magnesium carbonate, to make it easier for students to understand and read the chemical ingredients in packaging products.

The feasibility criteria for grammar in student activity sheets ranged of 93.4% - 100.00% categorized as very feasible. The usage of fonts (type and size) made easier to read and got 100.00% categorized as very feasible. This were appropriate because the type of letters used can be read well and the font size was 16 and 18. The fonts used in the student activity sheets were consistent by using Times New Roman. The suitability of the layout of the text, photos, and tables in the worksheet of the tasks made as detailed as possible to optimize the sense of sight, so hearing impairment students could easily understand it because they had advantages in visual sensory. This was suitable with guidance on developing teaching materials by Ministry of National Education, stated that developing of student activity sheets should pay attention to the type of letters, the order of texts to be easier and more convenient to read.

3. Students' Activities

Student activities in limited trials can be seen by observing several aspects of the WTL strategy. The WTL strategy aspects are Free Writing Guide, Creative Piece and The End of Class. Guided Free Writing aspects include knowledge of experimental tools and materials, as well as experimental procedures. The Creative Piece aspect includes giving ideas and images. Whereas the aspects of The End of Class include reflecting student activities in rewriting the experimental procedure. The percentage of the effectiveness of each aspect is presented in the following table 4 and 5:

Table 4. Students' Activities during Interactive Multimedia usage

No	Aspect	Percentage (%)
1	Navigation	100
2	Concept	100
3	Examples	100
4	Guided Free Writing	100
5	Creative Piece	100
6	The End of Class Reflection	100
7	Video	100
8	Writing in box	100
9	Matching picture	100
10	Quiz	100

Based on table 4, student did all activities during trial. They had used navigation in interactive multimedia, read concept in material, saw example of material, wrote answer for each aspect in writing to learn strategy, watched the videos, wrote in box, matched the pictures and did quiz foe evaluation. All activities got 100%.

Table 5. Students' Activities during Kit usage

No	Aspects	Percenterge (%)
1	Students read the title of experiments	100
2	Students read the objectives of experiments	88.88
3	*Guided Free Writing*	
	a. Students wrote tools and materials	100
	b. Students wroteProcedures of experiments	100
4	*Creative Piece*	
	a. Students giving ideas	100
	c. Students giving pictures	66.66
5	*The End of Class Reflection*	
	a. Students finished the task	75
	b. Students partly finished the task	25
	c. Students didn't finish the task	-

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Based on table 5, 100% students read the title of experiments, meaning that all students understood the title of the student activity sheets. In the aspect of the students read the objectives of experiments got a percentage of 88.88%, there are some students still didn't understand the objectives of the experiments used.

The Guided Free Writing aspects got percentage of 100% which shows that students understood the aspects of Guided Free Writing, writing tools and materials and experimental procedures. On the aspect of Creative Piece 100% students abled to express ideas, while 83.33% of students abled to draw pictures. 66.66% of students have been able to rewrite all trial procedures while as many as 25% of students are able to write partially on aspects of The End of Class.

4. Result of Students' Conceptual Understanding *Pre-test* and *Post-test*

Pretest of Students' Conceptual Understanding was done before limited trial of Multimedia interactive and student worksheet. Pretest and posttest consist of ten items multiple choices and five items of essays. Results of pretest and posttest were shown on table 6.

Table 6. *Pretest* and *posttest score*

No	Student Initial Name	*Pretest Score*	*Posttest Score*
1	SPMP	25	70
2	AS	5	80
3	AEM	20	80
4	LCN	10	85
5	EWP	5	75

Table 6 showed that the average students' pretest score was very low. That might be influenced by several factors. One of them was because of the lack of students' understanding of the concepts. Meanwhile the students' posttest score increased than before. That was because students had understood the concept that has been taught.

The Guided Free Writing component gets average percentage of 100%, students could write down the tools

and materials and procedures on the student activity sheets. The Creative Piece aspect of students had been able to express ideas and images with an average percentage of 91.6%. 75% of students had been able to re-explain all the experimental procedures that have been carried out before on aspects of The End of Class.

Overall students had been able to follow the learning process with a writing-to-learn strategy. Through students' understanding, students had been able to solve the problems. Interactive multimedia and kit with writing-to-learn strategies in hearing impairment students' can be well implemented and assessed to improve concept understanding [12].

5. Students' Responses

After participating in the trial, the students were given a questionnaire response. Student questionnaire responses used to determine student responses to the interactive multimedia and kit that have been used. There are 11 aspects to the student response questionnaire. Student questionnaire response data were analyzed descriptively. In general, the student questionnaire responses were in the very feasible category.

Table 7.Students' Responses

No	Aspect	%
1.	Do you feel happy using the interactive multimedia and kit?	100
2.	Is the prensentation of interactive multimedia and kit good?	100
3.	Are the sentences easy to understand?	100
4.	Are the tasks easy to do?	80
5.	Are the experiment procedures easy to do?	100
6.	Are the font types and font size ease you to read?	100
7.	Are the pictures help you to understand the concepts?	100
8.	Are the pictures help you to completing the experiment procedures?	100
9.	Are the pictures help you to making some product ideas?	100
10.	Are the interactive multimedia and kit ease you to do group activity?	100
11.	Do you want to redo the experiments in home?	80

Based on table 7, it every aspect got positive response because it got a percentage ≥ 61%. In the question of "is Are the sentences easy to understand?" got 100%, that was in accordance to the results of validation on linguistic criteria which got percentage in the range 86.8% -100%. In the question "Are the font types and font size ease you to read?" got 100% percentage. That was in accordance with the validation results on the presentation criteria which got a percentage in the range 86.6% -100%.

The question "Are the pictures help you to understand the concepts?" got a percentage of 100% which in accordance with the results of the validation on the graphics criteria that got a percentage in the range of 86.6% -100%. In the aspect of "Are the pictures help you to making some product ideas?" Gets a percentage of 100%, this is in line with the results of validation on the content criteria which gets a percentage in the range 86.6% -100%.

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CONCLUSION

The interactive multimedia and kit categorized as very feasible with a percentage of feasibility ≥ 61%. The students' learning outcomes were increased after the trial.

The results of students' responses indicate that the interactive multimedia and kit response were positive because more than 61% gave positive responses.

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