

DEVELOPMENT OF INTERACTIVE MULTIMEDIA USING WRITING TO-LEARN STRATEGY ON ELECTROLYTE AND NONELECTROLYTE SOLUTION TOPIC FOR DEAF SENIOR HIGH AND VOCATIONAL SCHOOL STUDENT IN INCLUSIVE CLASS

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Abstract

The aim of the research is determine the feasibility of Interactive Multimedia (MMI) using writing-to-learn (WTL) strategy on electrolyte solution topic for deaf senior high and vocational school student in inclusive class. The method used is the Research and Development (R & D) with Instructional Development Cycle for the media development. MMI is evaluated and validated by expert in chemistry and inclusive education. The evaluation and validation result of MMI is analyzed descriptively. The research instruments used are evaluation and validation sheet, scoring WTL activity sheet and student response questioner. MMI tested to two students in senior high and two students in vocational school with hearing impairment in inclusive class. The results showed that the MMI with WTL strategy on electrolyte solution topic has been developed very worthy theoretically and empirically to be used as a learning media. It is shown from validation's percentage which in terms of the validity of the theoretically that consist criteria of content, presentation and linguistic gain 82.3%. While the empirical validity of student responses gain 72.5%.

Keywords: MMI, the strategy of writing-to-learn, electrolyte solution and nonelectrolytes topic, inclusive

Abstrak

Penelitian ini bertujuan untuk mengetahui kelayakan Multimedia Interaktif (MMI) menggunakan strategi writing-to-learn (WTL) pada materi pembelajaran larutan elektrolit dan nonelektrolit untuk siswa SMA dan SMK tunarungu di kelas inklusif. Metode yang digunakan adalah Research and Development (R&D) dengan model pengembangan media Instructional Development Cycle. MMI ditelaah dan divalidasi oleh para ahli dibidang pendidikan kimia dan inklusif. Instrumen penelitian yang digunakan meliputi lembar telaah, validasi, penilaian aktivitas WTL dan angket respon siswa. Data hasil telaah dan validasi MMI dianalisis secara deskriptif. MMI diujicobakan secara terbatas pada 2 siswa SMA dan 2 siswa SMK tunarungu di kelas inklusif. Hasil penelitian menunjukkan bahwa MMI dengan strategi WTL pada materi pembelajaran larutan elektrolit dan nonelektrolit yang dikembangkan telah sangat layak secara teoritis dan empiris untuk digunakan sebagai media pembelajaran. Hal ini ditunjukkan dari prosentase hasil penilaian yang ditinjau dari validitas teoritis yaitu pada kriteria isi, penyajian dan kebahasaan mendapatkan presentase sebesar 82,3%. Sedangkan validitas empiris yaitu respon siswa mendapatkan prosentase sebesar 72,5%.

Kata kunci: MMI, strategi writing-to-learn, larutan elektrolit dan nonelektrolit, inklusif.

INTRODUCTION

Education is a fundamental right of every human being, rich, poor, elderly and children. The right to education has been recognized both legally and factually in a national and international scale. Education is not limited to children who are normal. Those with special needs also have the same rights. The education is also regulated constitutional in the Constitution of the Republic of Indonesia Year 1945 (UUD 1945) Article 31, paragraph 1, which states, "Every citizen has the right to education". Then further explained through the Law of the Republic of Indonesia (RI Law) No. 20 of 2003 on National Education System section of unity Article 5, paragraph 1, which states, "Citizens who have physical, emotional, mental, intellectual and/or social are entitled to special education". It is obviously directly related to the rights that they have that special education is able to support learning in everyday life. According to the Ministry of National Education [1]. One of the special education is inclusive education which provides the opportunity for all students with special needs to participate in learning in the same environment and together with the students in general.

Each type of disability has specific characteristics and handling and relatively different, including the deaf. Deaf students will find it difficult to capture and understand the material presented verbally by the teacher so that an understanding of abstraction and imagination of students to be blocked. Therefore, according Wasita [2] deaf students require a tool in the learning process, especially that highlight the visual and physical side of the material being taught.

Interactive Multimedia (MMI) is one of the solutions to overcome these

limitations. MMI should have meaning, namely two-way interaction of media to the user, then the user of the media. Media interaction to the user can be shown through commands, advice and activities provided by the MMI, but the form of reciprocal interaction of the user with the media will be limited when it is intended for students who are deaf, especially in the inclusive classroom. For students with special needs who are not necessarily reciprocal verbal can be done directly, but for students with special needs, in this case deaf students in inclusive classrooms should be no other way to express students' interaction with the media about what happened in the learning process.

Lang [3] argue one way for deaf students to express what they are experiencing and reached significance in the learning process is the way to write. Write to learn, or better known as the strategy of writing-to-learn (WTL). According to Kiefer [4], generally, writing-to-learn activities are short, impromptu or otherwise informal writing tasks that help students think through key concepts or ideas presented in a course. Often, these writing tasks are limited to less than five minutes of class time or are assigned as brief, out-of-class assignments. WTL strategy has been proven to help deaf students in learning, especially the concepts of science, but not specific to chemistry concepts. The strategy has several activities that use is tailored to the needs and characteristics of the material presented, namely: (1) Creative piece, students are asked to describe a situation, object, or living things and write things what they noticed in their depiction of the then teachers discussed together with students about what is described by the students; (2) Guided free writing, teachers guide students to write comments in a science activity

with more specific objectives; (3) End-of-class reflection, the end of the lesson the teacher invites students to think and write down some important things that students get in the learning process; (4) Double entry, students are asked to copy a paragraph in the article that they choose. Then they were asked to write a comment in the form of statements agree or not and possibly other comments related articles they choose. WTL strategy with some activity into the solution as well as bridges suitable for deaf students in inclusive classrooms to show the interaction of the MMI.

Problem Formulation

1. How MMI feasibility according to criteria of content, presentation and linguistic?
2. How feasibility in terms of student responses after using the MMI using WTL strategy on learning materials and nonelectrolyte electrolyte solution for deaf students in an inclusive classroom?

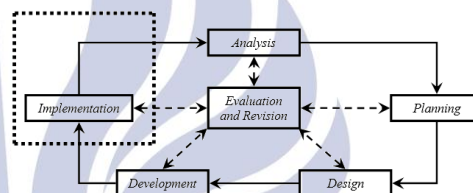
Purpose

1. Describe the MMI feasibility according to criteria of content, presentation and linguistic?
2. Describe the feasibility in terms of student responses after using the MMI using WTL strategy on learning materials and nonelectrolyte electrolyte solution for deaf students in an inclusive classroom?

METHOD

This study is an MMI development for high school and vocational school students with hearing impairment in inclusive classrooms. This type of research is research and development (research and development or R & D) with a model of media development Instructional Development

Cycle (IDC). Research R & D has the form of a preliminary study of the early stages According to Fenrich [5], the model of media development IDC has some stages that must be passed, namely: (1) Analysis; (2) Planning; (3) Design; (4) Development; (5) Implementation. Implementation stage is not done yet. In every part of the cycle there is a phase of evaluation and revision is an ongoing activity throughout the cycle. After the evaluation phase should revised before moving on the next phase. The flow chart of the model development IDC media described as follows



Picture 1. IDC Media Development Model

MMI tested are limited to 4 people deaf students in inclusive classes and derived from several high school and vocational school in East Java with the identity and background are different. The fourth subject of the study TIO initials, EVN, HVY, and RFI.

The instrument used in this study include: (1) sheet study, (2) validation sheet, (3) pieces of student questionnaire responses, and (4) copies of WTL activity assessment. Data were collected by questionnaire. Questionnaire method used to collect information about the comments, criticisms and suggestions from sheet questionnaire study, theoretical feasibility of a sheet questionnaire validation, as well as empirical feasibility of sheet student questionnaire responses. Then the data of the study, validation, and student responses WTL activity were analyzed descriptively.

RESULT AND DISCUSSION

Validation

Validation MMI is based on the feasibility of content, presentation and linguistic. MMI is feasible if a percentage feasibility of $\geq 61\%$ (Riduwan, 2013). MMI validation results on several aspects of the criteria indicated by Table 1.

Table 1. Validation result

Aspect	Percentage	Criteria
Content Criteria	83.3%	Very Feasible
Presentation Criteria	79.6%	Feasible
Linguistic Criteria	81.2%	Very Feasible
Average	82.3%	Very Feasible

The results of the overall validation get a percentage of 82.3% with a very decent criteria.

WTL Activity

Subjects were asked to perform some activity WTL which has been integrated in the MMI when done limited testing. Judging is based on a rubric WTL activity.

Table 2. WTL Activity data

Activity	Rubric Score			
	TIO	EVN	HVY	RFI
<i>Creative Piece</i>	3	3	3	3
<i>Guided Free Writing (1st)</i>	3	3	3	3
<i>Guided Free Writing (2nd)</i>	1	1	1	2
<i>End-of-Class Reflection</i>	1	1	1	2
Score	8	8	8	10
Max Score	12	12	12	12
Final Score	66	66	66	83

The three activities used in the MMI is divided into four sections and activities

of the subjects obtained value as shown in Table 2.

Pretest and Posttest

Before the trial MMI, research subjects were given about the pretest to determine the ability of the student early on the material of the electrolyte solution. Pretest consisted of 10 multiple choice questions. After testing the MMI, research subjects were given 10 multiple choice questions as a posttest. It aims to determine mastery of the material after studying with the help of MMI.

Table 3. Pretest and posttest result

Subject	Score	
	Pretest	Posttest
TIO	90	80
EVN	70	70
HVY	70	70
RFI	90	100

Significant changes in the value is not found in the pre and posttest. This is because the subject has gained a mature cognitive knowledge in previous studies. While the interval between studies to within a few minutes. However, the development of MMI who do still have the benefits of individual student learning materials. This is in line with the opinions Heinich [6] that MMI can make students learn individually according to his ability, and choose the things they want to learn.

Student Response

After the test, research subjects were asked to complete a questionnaire responses of students to determine the feasibility of MMI empirically. Feasibility MMI indicated by respondents in several aspects such as that shown in Table 4.

Table 4. Student response result

Aspect	Percentage	Criteria
Interest	83.3%	Very Feasible
Technical suitability views	67.8%	Feasible Enough
Average	72.5%	Feasible

The results of student questionnaire responses overall percentage of 72.5% gain with very feasible criteria.

Discussion of Each Subject

TIO

Subject has a level of intelligence (IQ) worth 96 and hearing loss level 1. History of education of the subject shows that the relevant TIO has been getting special education since elementary school, although not specifically on inclusive education. Elementary school and junior high school reached the exceptional category B (*tuanarungu*). By the time the students began to move from special education to inclusive education, they will have little problem. Constraints faced by the TIO over the language and understanding of the terms in science, especially the abstract for example ion. Subject TIO was not able to understand what is called the ion and its position in this learning material.

Subject TIO scored 66 in WTL activities. On a piece of creative activities subject not get difficulty and able to understand well the command of MMI. The writing style TIO also assessed subjects easy to understand at first activity. Subject TIO can work well because the first activity in the next activity is guided free writing, precisely the first part of the subject is able to fill in the table and then answer four analysis questions properly. The second part of this activity is to fill the table the

difference between strong and weak electrolyte solution guided by the aspects that have been determined. Subject TIO can address only one aspect of a differentiator in the second part that is the difference of strong and weak electrolyte solution in terms of electrical conductivity properties where strong electrolyte solutions possess good electrical conductivity while a weak electrolyte solution has the properties of electrical conductivity is less good. The third activity is the end-of-class reflection. Subject TIO could name only two statement in accordance with the assessment rubric WTL activity. Subject look very difficult to reflect the learning outcomes or make a conclusion. This is in line with the statement Wasita [2] that some aspects of deaf students are hampered intelligence is the verbal aspect, for example, to formulate terms of relationships, draw conclusions and predict events.

EVN

Subject has a level of intelligence (IQ) worth 96 and hearing loss level 1. History of education of the subject concerned STV shows that have earned special education since elementary school, although not specifically on inclusive education. Elementary school and junior high school reached the exceptional category B (*tuanarungu*). Emerging norms and deviated from special education according Alimin [6] is student focused only on matters relating to skills and little disregard scientific fields other. By the time students begin change from exceptional education to inclusive education, they will have little problem. Obstacles faced by STV more to language and understanding of the term-term or terms in science, especially the abstract.

Subject STV scored 66 in WTL activities. On a piece of creative

activities subject not get difficulty and able to understand well the command of MMI. The writing style STV also assessed subjects easy to understand at first activity. In the next activity is guided free writing, precisely the first part of the subject is able to fill in the table and then answer four analysis questions properly though had received aid the understanding of the given problem. The second part of this activity is to fill the table the difference between strong and weak electrolyte solution guided by the aspects that have been determined. STV subject only able to answer one distinguishing aspect in the second part that is the difference of strong and weak electrolyte solution in terms of electrical conductivity properties where strong electrolyte solutions possess good electrical conductivity while a weak electrolyte solution has the properties of electrical conductivity is less good. The third activity is the end-of-class reflection. Subject TIO could name only two statement in accordance with the assessment rubric WTL activity. Subject look very difficult to reflect the learning outcomes or make a conclusion. This is in line with the statement Wasita [2] that some aspects of deaf students are hampered intelligence is the verbal aspect, for example, to formulate terms of relationships, draw conclusions and predict events. General writing style of the subject STV considered good although there are some words that are always wrong when in write for example the word "weak". Subject STV always use the word "valley" when will write a "weak". It continues to do so many times even though the subject has been taught proper writing. The role of educators in understanding the students' writing is expected. This is consistent with the statement of Lang [3] that teachers in particular in learning using

WTL strategy is required to interpret and understand the students' well.

HVY

Subject has an IQ of 96 and worth hearing loss level 1. History HVY education of the subject indicates that the subject is not fully follow the special schools and inclusive. Elementary school, taken on an integrated school, which means the subject as a child with special needs (ABK) to school with the children of non-crew in regular schools. This has made HVY not get attention, especially in the development of learning. Junior high school lived in as remarkable then proceed to inclusive schools at upper secondary level. History of education as well as the period of hearing loss has made the ability to speak is not so good. Even for lip reading or speech reading HVY still often have difficulty making needs help with sign language. However, cognitive ability is still quite good HVY.

Subject HVY scored 66 in WTL activities. On a piece of creative activities subject not get difficulty and able to understand well the command of MMI. The writing style is also assessed HVY subject easy to understand at first activity. In the next activity is guided free writing, precisely the first part of the subject is able to fill in the table and then answer four analysis questions properly. The second part of this activity is to fill the table the difference between strong and weak electrolyte solution guided by the aspects that have been determined. HVY subject only able to answer one distinguishing aspect in the second part that is the difference of strong and weak electrolyte solution in terms of the number of ionized ionic electrolyte solution which is more powerful than the ionized weak electrolyte solution. The third activity is the end-of-class reflection. HVY subject

only able to mention two statement in accordance with the assessment rubric WTL activity. Subject look very difficult to reflect the learning outcomes or make a conclusion. This is in line with the statement Wasita [2] that some aspects of deaf students are hampered intelligence is the verbal aspect, for example, to formulate terms of relationships, draw conclusions and predict events. Writing style and sentence structure in general of the subject HVY not so good. Subjects are less able to put it word for word in order to have the right structure so easy to understand. This is evident in the last activity when write reflections. Subject write "lights", which actually has a purpose lights on. The subject then write "no light on" who actually has a mean light is not on. The role of educators in understanding the students' writing is expected. This is consistent with the statement of Lang [3] that teachers in particular in learning using WTL strategy is required to interpret and understand the students' well.

RFI

Subject has an IQ of 94 and worth hearing loss education level 1. History shows that the subject RFI inclusive education since elementary school level, junior high school to high school. This makes the ability RFI more prominent than the other subjects. Subject RFI already familiar atmosphere premises inclusive education so that his ability to understand the material and language and communicate with others not experience significant problems.

Subject RFI get the highest value than other subjects in WTL activity that is equal to 83. On the subject piece of creative activity does not get any difficulty and is able to understand with good command of MMI. The writing style RFI also assessed subjects easy to

understand at first activity. In the next activity is guided free writing, precisely the first part of the subject is able to fill in the table and then answer four analysis questions properly. The second part of this activity is to fill the table the difference between strong and weak electrolyte solution guided by the aspects that have been determined. Subject RFI able to answer three distinguishing aspect in the second part that is the difference of strong and weak electrolyte solution in terms of the number of ions, electrical conductivity properties and the value of the degree of ionization. The third activity is the end-of-class reflection. Subject RFI able to mention three statement in accordance with the assessment rubric WTL activity is understanding the electrolyte solution and Non-electrolytes, differences strong and weak electrolyte solution, understanding the degree of ionization. Although not as hard as the other subjects but RFI still looks quite difficult to reflect the learning outcomes or make a conclusion that is allegedly from the length of the subject to think. This is in line with the statement Wasita [2] that some aspects of deaf students are hampered intelligence is the verbal aspect, for example, to formulate terms of relationships, draw conclusions and predict events.

CONCLUSION

Based on the results of research and discussion concluded that the MMI eligibility criteria in terms of the precision of the content, language and presentation is very feasible that MMI can be used as a media of learning. Students' response to the MMI get decent criteria so that MMI can be used as a media of learning.

BIBLIOGRAPHY

1. Depdiknas. 2009. *Salinan Peraturan Menteri Pendidikan Nasional Nomor 70 Tahun 2009 Tentang Tentang Pendidikan Inklusif Bagi Peserta Didik Yang Memiliki Kelainan Dan Memiliki Potensi Kecerdasan Dan/Atau Bakat Istimewa*. Jakarta.
2. Wasita, Ahmad. 2012. *Seluk-Beluk Tunarungu & Tunawicara Serta Strategi Pembelajarannya*. Jogjakarta: Javalitera.
3. Lang, Harry. G. dan Albertini, John. A. 2001. "Construction of Meaning in the Aithentic Science Writing". *Journal of Deaf Study and Deaf Education*, 6 (4) 258-284.
4. Kiefer, Kate. 2015. *The WAC Clearinghouse: What is writing-to-learn?*, (online), (<http://wac.colostate.edu/intro/pop2d.cfm>, accessed 3 October 2014)
5. Fenrich, Peter. 1997. *Practical Guidelines for Creating Instructional Multimedia Applications*. Orlando: The Dryden Press Harcourt Brace Collage Publishers.
6. Heinich, R. et al. (2002). *Instructional media and technology for learning, 7th edition*. New Jersey: Prentice Hall, Inc.
7. Alimin, Zaenal. 2004. "Reorientasi Pemahaman Konsep Pendidikan Khusus Ke Pendidikan Kebutuhan Khusus dan Implikasinya terhadap Layanan Pendidikan". *Jurnal Asesmen dan Intervensi Anak Berkebutuhan Khusus*. Vol.3 No 1 (52-63)

