Study of effectiveness of Multimedia-Based Interactive Learning at Nila Harapan Deli Serdang Vocational High School

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ABSTRACT

This research aims to produce a viable interactive learning media use and are effective in enhancing energy conversion Machine learning results. The methods used in this research are the development model of the Borg and Gall, adapted into a simple model. Research conducted at Nila Harapan Deli Serdang Vocational High School. The samples consist of alphabets experiment class (36 students) and control classes (34 students). Hypothesis testing results prove that there is a significant difference between the learning outcomes of students who use media interactive learning with student learning results intermediate results that use interactive learning media with results Learning students use print media. It was shown by the results of the analysis $_{to\ calculate}$ T > T $_{table}$ (9.77 > 2.00).

Key Words: Interactive Learning Media; Multimedia; Energy Conversion Machines.

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1. INTRODUCTION

Energy conversion machine learning, emphasizing among other things at grant of experience directly through a variety of activities. On the subject of motor fuel, almost all of the discussion objects are invisible, i.e., cylinder, shaft, shaft, shaft of the pen shaft, crankshaft, suction, and compression. Of course, to do the observations directly against objects is not possible. The difficulty of observing the object invisible it can be minimized by replacing it with the media. The use of simple media perceived is no longer attractive and less effective. This will have an effect on student learning outcomes. Students highly expects the learning medium which allows all the senses to interact, which can visualize the message clearly and in accordance with the characteristics of students, so that students can more easily absorb the message. So, it would be more appropriate if the teacher uses multimedia learning content in motor fuels.

2. LITERATURE SURVEY

According to Sriadhi (2015) Instructional Media interpreted as an introduction to the messages or materials from educators to learners. If more than one form of media of sorts called also with multimedia. According to *Su*, 2009; *Driscoll*, 2005; *Ormod*, 2004 (Sriadhi, 2015) multimedia-based learning refers to the cognitive theory, which developed two approaches namely Objectivism and contructivism and gave birth to the theory of information processing. *Schunk*, 2004 (Sriadhi, 2014) cognitive processes occurring in the brain start reception, processing and storage of information and calling information again from the brain.

According To Mayer (2009), multimedia as the presentation materials with the use of words (*verbal form*) and images (*pictorial form*). Learning -assisted multimedia according to Istiyanto (the Damayanti, 2010) can be defined as application multimedia which used learning process, to transmit messages (knowledge, skills and attitudes) and can stimulate the mind, feelings, attentions, and learning so going on the process of learning that fits the purpose and control. According to Mayer (2009), the underlying assumptions of the theory of cognitive about *multimedia learning*, i.e., *dual-channel* (dual channel), *limited capacity* (limited capacity), and *active-*

processing (active processing). D*ual-channel assumption* stated that human beings have the channels separately for visual material for information processing and auditory material. Information in the form of words accepted by the eyes and ears, while the image received by the eyes that is the memory of sensory. After being selected by memory, sensory information is forwarded to the memory work. In memory of work, information is organized to be integrated that further forwarded to the memory term length. Both these channels are illustrated in Figure 1.
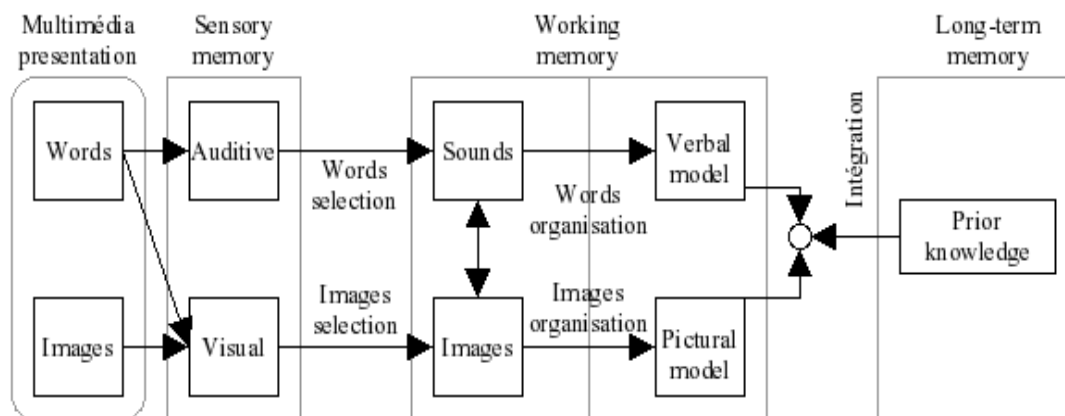
Figure1.1: Cognitive Theory Of Multimedia Learning Scheme

In Sriadhi (2015) multimedia based learning Theory can be distinguished into two levels, namely the low level associated with the theory of psychology which includes system memory and cognitive processes, and high levels are associated with the principle of multimedia form maker which includes text, graphics, audio, video, and animation. Theories relevant to low levels is *a Dual-Coding Theory* by *Paivio* and *Working Memory Model* by *Baddeley*, while relevant to high-level theory is *Cognitive Load Theory* by *Sweller* and *Multimedia Learning Theory* by *Mayer*.

In the theory of working memory (*working memory model*), Beddeley et al., (Sriadhi, 2014) there are four major components that are involved in the process of integrated memory, namely: *visuosspatial sketchpad, episodic buffer, phonological loop* and *the central executive*. *Mayer*, 2014 in (Sriadhi, 2015) *Wouters, Fred & Merriënboer* (Sriadhi, 2014) the learning process will be more effective if either instructional media developed in the form of visual and auditory. *Mayer* (Sriadhi, 2014). This is the principle of multimedia learning that human beings can learn to be easier when learning materials delivered in the form of visual and auditory compared with spoken language. This concept corresponds to *a Dual-Coding Theory* of *Paivio* that learning will be optimal if it involves a sense of sight (visually) with auditory sensory (auditory). The results of the study will be more effective if the learning process multimedia tools.

Mayer says (Sriadhi, 2014) a cognitive theory of multimedia *(Cognitive Theory of Multimedia Learning)* from *Clark & Mayer* is a blend of *Cognitive Load Theory* of *Sweller*, *Dual-Coding Theory* of *Pavio* and *Working Memory* of *Baddeley*. Information processing occurs in three stages importantly, i.e. selecting the appropriate materials, compiling selected materials and with the knowledge that's been owned before.

Material selection process occurs when individuals pay attention to materials submitted through multimedia, and take her entry into working memory. Next do the integration of material that has been compiled with the knowledge already owned before from long-term memory into working memory. Information processing flow stated in the model of cognitive theory of multimedia learning, as shown in Figure 1.1 above.

Humans think, read and understand some of the sentence in time simultaneously. Working memory will be verbal and visual information processing in different channels. The animation enters through the eyes of the cognitive system and processed in visual channels, while the narrative enters through the ear and processed in the auditory channel. But the text also goes through exposure on the eye and processed in a visual channel. cognitive limited resources in a visual channel is divided into information processing, animation and text.

Information processing takes place in three stages, namely (1) Select the appropriate materials; (2) to Compile the selected materials and with the knowledge that it already owned; (3) the process of material selection occurs when individuals pay attention to materials submitted through multimedia, and take her entry into working memory in cognitive systems. The process of preparation of the material that is already selected in the selection is done through working memory which further performed integration with knowledge already owned before from long-term memory into working memory.

Schematic in Figure 1.1. The above set of four research in the cognitive science *of Clark & Mayer* (Sriadhi, 2014) i.e.: *Dual channel,* human beings process information form of visual or auditory or verbal images and in separate channels. *Limited capacity,* human beings can perform active process only on a portion of the information on every channel at a given time. *Active processing,* learning occurs when individuals engage in the process of cognitive, such as paying attention to the relevant materials, organize the material into a coherent structure, and integrating with the knowledge that they already know. *Transfer,* new knowledge and skills must be taken from long-term memory during the process.

According to *Mayer*'s theory cognitive study are presented in Figure 1.1 load theory with cognitive focus cognitive burden on the students. The theory of cognitive load contains three types of processing cognitive during learning. First, the burden of cognitive *intrinsic* (*intrinsic cognitive load*) is a burden the mind experienced by students during the study that caused the demands of content. The second cognitive load, *germane* (*germane cognitive load*) is the burden of the mind experienced by students during the learning that was brought about by the demands of to integrate new information knowledge. Thirdly, the burden of cognitive *extraneous* (*extraneous cognitive load*) is right load the mind that is experienced by students during the instructional of the resulting by the work of a mind that is not in accordance with the purpose of the learning. According to *Sweller* (the Damayanti, 2010), If the capacity of the student's cognitive excess burden (*cognitive overload*) then learning will be compromised. So to partially overcome the difficulty of learning to students between the other through instructional that are effective with Managing the burden of cognitive intrinsic, reducing cognitive load *extraneous* and increase the burden of cognitive *germane*. *Mayer and Moreno* (The Damayanti, 2010) asserts that to realize that learning is effective can be assisted with multimedia, because multimedia effectively to Manage the burden of cognitive *intrinsic*, the cognitive load of *extraneous* and increased burden cognitive *germane*. From the explanation above, it can be concluded that to describe the application of learning based on multimedia based on theory of load cognitive can enhance the ability of problem subject's energy conversion machines, particularly the material of the motor fuel.

3. METHOD AND RESULT DISCUSSION

3.1. Method

This research was conducted at Nila Harapan Deli Serdang Vocational High School at grade X Odd semester academic year 2016/2017. The methods used in this research is the *research and development* because of this research include the development of educational research that is intended to produce a decent learning utilized cost-effective and appropriate needs. Model development is a series of procedures in order to produce an energy conversion machine learning media

In research and development, improved models refers to the *research and development* of a model of *the Borg and Gall* (2005) combined with a model of the development of the *Dick and Carey* (2005) which has a step development as follows:

1. Research introduction, which includes: (a) the identification of the learning needs and determine the competency standard subjects, (b) affect the analysis of the learning, (c) identification characteristics and initial behavior; (d) writing competency basis and charge indicators will, (e) write the reference benchmark test; assembles learning strategies which consists of; A description of the purpose of instructional; Explanation of the relevance of new content; A description of the learning material or concepts, principles, and procedures that will be studied

2. Learn; Formative tests; feedback; follow-up, (f) developing learning materials.
3. Manufacturing design software, which includes: (a) making the manuscript, (b) the making of story boards, (c) the making of the flowchart view.
4. The collection of materials which include (a) the creation and collection of images and animations, (b) and creation of audio recording
5. Review and test products
6. Test effective products

Data analysis in this study uses descriptive quantitative analysis. All data collected were analyzed with descriptive statistical techniques that quantitatively separated by category to sharpen judgment in drawing conclusions. Qualitative data in the form of the statement is very less good, less good, moderate, very good and very well converted into quantitative data with a scale value of 1 to 5. The result is dirata-rata and is used to assess the quality of *software* instruction. Criterion *software* will be converted into a value with a scale of Likert Scale which uses five analyzed in a descriptive percentage (Sugiyono, 2007).

The population in this research is the X grade Nila Harapan Deli Serdang Vocational High School 2016/2017 school year and is divided into two grade, class B and experiments as a control class, each as many as 25 people.

In this study data obtained are the result of learning of students from the class of experiments and classroom control. Data analysis techniques used are descriptive techniques and Inferensial. Descriptive statistical techniques are used to analyze data by way of describing the data that has been collected as-is without intending to make general conclusions applicable to or generalization. For example, the presentation of data using a table, graph, pie charts, pictogram, the calculation mode, median, mean, deciles, percentile, average, standard deviation, person, correlation, and regression testing without significance. And inferensial techniques are statistical techniques to analyze data sample data and results apply to the population. A conclusion from the sample data that will apply to a population that has a chance of error and truth (the trust).

Research hypotheses to be tested was:

$$HO: \mu \, \mu \leq A1 \, A2$$

$$H1: \mu \, \mu > A1 \, A2$$

Description:

$\mu A1$: the average of the results of learning students are taught interactive learning media use.

$\mu A2$: the average of the results of learning students are taught with the media printed books.

Ho   : average of the results of the learning of students who are taught by using a computer-based interactive learning media is

           lower or equal to students who were taught with the media printed books.

H1   : the average of the results of the learning of students who are taught by using a computer-based interactive learning

           Media higher than students who were taught with the media printed books.

To test the hypothesis test used the formula the two sides. The test criteria receive Ha if t count > t table obtained from the t distribution list with dk = (n-1) and level = 5%. To see the value of the effectiveness of interactive learning media that experiment used the formula calculation of effectiveness.

3.2. Result discussion

Product development media interactive learning material motor fuel is a product that has been developed with attention to the aspects of learning, so that generated a decent product is used in accordance with the characteristics and field of study students. Product development research undertaken is directed to produce a product in the form of interactive learning media energy conversion machine learning for students of class X Nila Harapan Deli Serdang Vocational High School, used to improve the process learning and improve student learning outcomes.

The results of the validation of interactive learning media from the validator, namely (1) the total Results for the assessment by the expert material from the aspect of the look, presentation, as well as the structure of the learning media content is 87% by criteria of "very good". (2) total Results for the assessment by expert instructional design against media interactive learning energy conversion machine developed indicates that the quality of the instructional design earn a percentage score a total of 84% of the criteria "is very Good ". (3) the total Results for the assessment by media expert learning against the media interactive learning energy conversion machine learning developed indicates that the display, rendering, as well as the graphics got a percentage of the total score of 83% criteria " Very Good ".

Whereas the calculation of the student's response is obtained, namely (1) the student response against media interactive learning on the learning aspects of display media, generally expressed very well with the results of the rating of 82%. (2) the response of the students against the media presentation on interactive learning generally expressed either by the results of rating 80% (3) Response of students towards learning media on the benefits of interactive learning media, generally expressed very well with 81% rating results
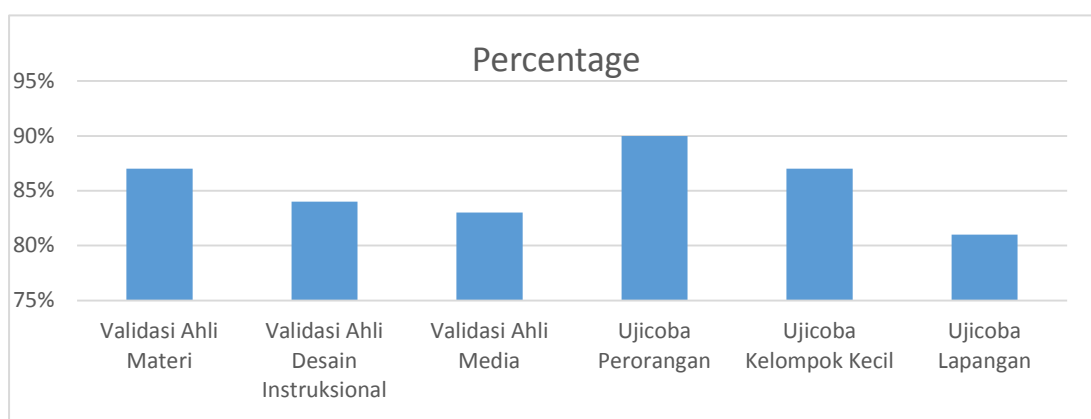
4. FIGURE AND TABLES

4.1. Figure

Figure 4.1. Summary Percentage Of Expert Validation & Respon Students Towards Interactive Learning Media

The above diagram is the result of the discussion about the feasibility test of the interactive learning media of energy conversion subjects. Product development of interactive learning media of motor fuel material is a product that has been developed with attention to the aspects of learning, so as to produce a decent product used in accordance with the characteristics of the field of study and students. This product development research is directed to produce a product in the form of interactive learning media of Energy Conversion Machine learning for class X students of Nila Harapan Deli Serdang Vocational High School, used to improve the learning process and improve student learning outcomes.

4.2. Table

Table 4.2. The Percentage Of The Total Score Results Validation Experts and Interactive Media Test

No.	RESPONDENTS	The PERCENTAGE of	CRITERIA
1	Expert Validation Materials	87%	Very Good
2	Validation Of Instructional Design Expert	84%	Very Good
3	Validation Of Media Experts	83%	Very Good
4	Individual Tests	90%	Very Good
5	Small Group Trial	87%	Very Good
6	Field Trial	81%	Very Good
	AVERAGE	**85%**	**Very Good**

The validation result of the interactive learning media from the validators, namely (1) The total result for the assessment by the material experts from the aspect of display, presentation, and the structure of learning media content is 87% with the criteria of "Very Good". (2) The total results for the assessment by the instructional design expert on the interactive learning medium of energy conversion engine developed showed that the quality of instructional design obtained the percentage of total score of 84% with the criteria of "Very Good". (3) The total result for the assessment by the learning media expert on the interactive learning media of energy conversion machine developed shows that the display, presentation, and chart get the percentage score of 83% with the criteria of "Very Good".

While the student response calculation is obtained, namely (4) Student response to the interactive learning media on the display aspects of instructional media, generally stated very well with the results of 90% rating. (5) Student response to interactive learning media on presentation aspect is generally stated good with rating result 87% (6) Student response to instructional media on benefit aspect of interactive learning media, generally stated very good with result of rating 81%

5. CONCLUSION

First, The results of the validation of a material against the media interactive learning energy conversion machine learning developed shows that views of the display medium, presentation materials, and media content, score a total assessment of expert material against interactive learning media energy conversion machine learning is 87% and overall categories include "very good".

Second, The validation results and expert instructional design against media interactive learning energy conversion machine learning developed indicates that the quality of the instructional design earn a percentage score a total of 84% including the category "Very Good ".

Third, According to the responses of students of class X Nila Harapan Deli Serdang Vocational High School on Expectations of individual trial stated that interactive learning media includes the category "very good" with an average percentage of 90%

Fourth, According to the responses of students of class X Nila Harapan Deli Serdang Vocational High School pad small group testing revealed that the interactive learning media includes the category "very good" with an average percentage of 87%

Sixst, According to the responses of students of class X Nila Harapan Deli Serdang Vocational High School on field trials stated that interactive learning media categories include: very good "with an average percentage of 81%.

Seventh, There is a significant difference between the learning outcomes of students who use media interactive learning with the learning outcomes of students who use print media. Hail was demonstrated by the results of the analysis of the Tcount > Ttable (9.77 > 2.00).

REFERENCES

[1]   Akerkar, R. A.; Lingras, P. An Intelligent Web: Theory and Practice, 1st edn. 2008, John's and Bartlett, Boston.
[2]   Borg. R. Walter, Gall. D. Meredith, & Gall. P. Joyce: Educational Research An Introduction 8th, 2003, MA: Pearon Education, Boston.
[3]   Dick, W., Carey, L., & Carey, J. O: The Systematic Design of Instruction. 2009, Person, New Jersey.

[4]   Gredler, E. M: Learning and Instruction,2011, Kencana Prenada Media Group. Jakarta 30(1–7), pp. 107–117.

[5]   Heinich, Robert: Instructional Media And Technologies for Learning. 2002. Prentice Hall. New Jersey, 33(1–6), pp. 309–320.

[6]   Molenda, Russel: Instructional Media and the New Technologies of Instruction. 1996. MacMilan.

[7]   Smaldino. Lowther. Russell: Instructional Technology and Media for Learning. 2007. Merrill Prentice Hall. Ohio: Person.