

The Development of Web-Based Learning Media on the Chassis and Drive Train Maintenance of Light-Vehicle to Improve Students' Learning Achievement at Vocational High School

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ABSTRACT

The aims of the research are: (1) to know the feasibility of Web-based Learning Media; (2) to know the effectiveness of Web-based Learning Media used on the Chassis and Drive Train Maintenance of Light-Vehicle. The type of the research is development research using of Borg and Gaal development product model combined with Dick and Carrey's Model. The validity test is done through experts' validity (the material experts for Chassis and Drive Train Maintenance of Light-Vehicle, instructional design experts and instructional media experts), and acceptability test given to the learners directly as the users. Meanwhile, the effectiveness test was conducted on the XI grade at the Sekolah Menengah Kejuruan (Vocational High School) Negeri 5 Medan. The method used for validity test is True Experimental Design Method. The validity test sample taken from 60 learners of 30 learners as an experimental class taught using Web-Based Learning Media, and 30 learners as the control class taught using textbook. The hypothesis test result proves that there is a significant difference achievement on learning about Chassis and Drive Train Maintenance of Light-Vehicle between the learners who taught using Web-Based Learning Media, the learners who taught using textbook. This indicates by the acquisition of $t_{count} = 2.39$ and $t_{table} = 1.70$, at a significant level is 0.05. The conclusion is the effectiveness Chassis and Drive Train Maintenance of Light-Vehicle learning using Web-Based Learning Media is higher than using the textbook.

Keywords: E-Learning, Web, Teaching Media, Chassis and Drive Train.

1. INTRODUCTION

The advancement of science and technology in particular information technology has had a positive effect on the advancement of today's educational world. Formal, informal and non-formal education can enjoy information technology facilities from simple to sophisticated ones. Excellence offered lies not only in the speed factors of the acquisition of information but also in multimedia facilities that can make learning become more interesting and dynamic through interactive audio-visual.

Learning is the most important activity in the entire educational process. The success of achieving the goal of education depends on how learning can take place

effectively. That is why learning must have effectiveness, efficiency and attraction (Reigeluth, 1983). Effectiveness is measured by the degree of learners, both quality and quantity. The quality of results learned in everyday life. Whereas quantity indicates the number of variations in what learners can accomplish. Efficiency is measured according to the time limit it takes learners to learn, in that the less time they need to understand the content of the learning materials, the more efficient the results are obtained. While attractiveness is measured by whether or not the tendency of learners is motivated to learn further in the sense of developing insights based on what she/he has been learned.

Initial observations and studies carried out with both teacher and students at Sekolah Menengah Kejuruan (Vocational High School) Negeri 5 Medan about Chassis and Drive Train Maintenance of Light-Vehicle learning indicate that the current learning is still monotonous and that the learning is not entirely centered on learners and the use of learning media has been minimal, so the learning process is less enriching experience of the learners than the textbook-based, and it is rarely to use digital media. While learners fall into Z generation category, where they are very comfortable and highly dependent on technology even addicted on it (Chicca, 2018).

Based on this conditions, it is point out the need to develop a comfortable medium of learning and can touch the learners' hearts to increase their knowledge competence as learning experience through digital media learning.

The media learning that will be developed in this study based on the ability, time and available media that is Web-Based Learning Media. The E-learning approach combined several components, such as: (1) E-Learning content. Learning sources are interactive and some are not, like power point, documents videos and audios. Un-interactive means the learners can only read and watch without doing other activities, while interactive learning source, activity there are questions and learners' feedback. Another learning source is in form of simulation, which can bring the learners into the real world; (2). E-tutoring, e-coaching, e-mentoring. E-tutoring, e-coaching and e-mentoring provide support and feedback to each learner online so that the learner gets his/her learning experience; (3). Collaborative Learning. Here the learners collaborate with other learners online by using discussion and chat boards, both at synchronous learning and asynchronous learning. (4). Virtual Learning. Here the teacher teaching in real time, such like the traditional, which is the teacher have to prepare his/her presentation to be informed in virtual class. (A guide for designing and developing e-learning courses, 2011: 13).

The Web-Based Learning Media will make the teaching and learning process become more interesting, increase the students' interest, and can improve the students' learning process thus increase the students' learning result. It is because Web-Based Learning Media requires the learners interact with the internet, which produces the students' activity due to the challenges and a availability of the material for teaching. The research tested the using of Web-Based Learning that is used as the teaching source at Sekolah Menengah Kejuruan (Vocational High School) Negeri 5 Medan is to increase students' learning result. Besides, the students' participation is more concerned while applying the Web-

Based Learning because teaching procedures are given systematically so that the learning climate require the learners to be independent, increase the students' comprehension toward the teaching material, and finally it can increase the students' result.

The teaching material about the Chassis and Drive Train Maintenance of Light-Vehicle which is discussed in this research is for XI grade that is differential maintenance, is the component of the Power Train system of Light-Vehicle on the car so that these components are indispensable. (1) Differential functionality as a differential turn of the left the left wheel and the right wheel. (2) differential as the return of power engine to the driving shaft; (3) differential changed course 90 degrees; (4) increase torque/moment.

The purposes of the research are: (1) to know the feasibility of Web-based Learning Media; (2) to know the effectiveness of Web-based Learning Media use on the Chassis and Drive Train Maintenance of Light-Vehicle.

2. RESEARCH METHOD

This research was done using research and development method. The type of the research is development research using of Borg and Gaal development product model, but since the product developed is the learning media, the Borg and Gaal recommends to combine it with Dick and Carrey's Model (Borg and Gaal, 1983, 2007). Borg and Gaal development model consists of ten steps, they are 1. Research and Information collection; 2. Planning; 3. Develop Preliminary form of Product; 4. Preliminary Field Testing; 5. Main Product Revision; 6. Main Field Testing; 7. Operational Product Revision; 8. Operational Field Testing; 9. Final Product Revision; 10. Dissemination and implementation. Due to the limitation, this research is stopped at the sixth step. Even if it is only on the sixth step, we can test whether the learning media is developed effectively or not.

The feasibility test was done through the experts' validity. Such as the differential maintenance material experts, the teaching designers and learning media experts. Acceptability test given to the learners directly as the users, by doing the first one-by-one test which consist of three learners, the evaluation of the first test are used to fix the learning media, then the test given for a small group that consist of 8 students.

This research emphasizes on how far the effectiveness of Web-Based Learning in teaching process of the Chassis Maintenance and Light-Vehicle Power to increas the students' learning achievement. The method used to the effectiveness test is True Experimental Design Method. The validity test sample taken from 60 learners of 30 learners as an experimental class that taught using Web-Based Learning Media, and

30 learners as the control class that taught using textbook.

3. RESULT AND DISCUSSION

3.1. The Research Feasibility Test

The Results of the feasibility done by the material experts, teaching designer and learning media expert for each aspect are determined by the average value of each category. The test results are then analyzed to determine whether the development learning media developed is eligible or not.

Table 1. The Experts Product Feasibility Test Result

No	Categorization	Average Percentage Score	Criteria
1	The Design Expert Validity	92,93 %	Most Feasible
2	The Media Expert Validity	89,99 %	Most Feasible
3	The Material Expert Validity	92 %	Most Feasible

From Table 1 above we can see the average percentage of assessment given by the expert of the material of the Web-Based Learning is 92%, thereby the Web-Based Learning Media is in the "very feasible" category so as to be accepted and worthy of being used in the learning process. The results of the study of media experts learning to the Web-Based learning media provide an average percentage of 89.99% thus the learning media is in the "most feasible" category so as to be accepted and feasible to be used for linked material and submission criteria eligible to the message delivery. Meanwhile, the learning design experts provide an average percentage of 92.93% that the Web-Based Learning is very feasible for being designed in such a way as well as meeting the learning standard design by viewing the guidelines and indicators of assessment.

Table 2. The User Acceptance Test Result (The Learners)

No	Categorization	Average Percentage Score	Criteria
1	One by One Trial	87,71 %	Very High
2	Small Group Trial	86,18 %	Very High

From Table 2 above we see that the assessment rate acceptance by learners at SMK Negeri 5 Medan on one-one trial states that the Web-Based Learning that the accented is very high with the average percentage of 87.71%. When the acceptance test is done in the small

group in SMK Negeri 5 Medan, the ratings of learners stated that the Web-Based Learning Media efficient developed by the accented is very high as well as well into the "most feasible" category, with a percentage of 86.18%.

3.2. Learning Outcomes

The media is said to be effective after showing satisfactory results in achieving the expected goal. In this case, the product trial is done in the learning process. The effectiveness of the media comes from the result of learners' achievement.

Cabada (2018) makes a literature study on the effectiveness of Web-based learning on the process of learning programming language. His research concluded that the use of Web-Based learning could support the effectiveness of learning where students' successful levels of experiment class was higher compared with the control class that use conventional learning media. The experimental class has a pleasure when they learn and even they intend to use web-based learning in the future and recommend to their friends.

From the results of research data processing conducted there is a difference in the learners' learning outcomes that use Web-Based Learning Media on the Chassis and Drive Train Maintenance of Light-Vehicle subject compared to learners who use textbooks as learning media. Average scores taught using Web-Based Learning as a media learning of Chassis and Drive Train Maintenance of Light-Vehicle is higher than that using textbooks as learning media. From the test results using t test, obtained $t_{value} = 2,388$ while $t_{table} = 1,701$. Because $t_{value} > t_{table}$, it can be concluded that learners' learning outcomes who use Web-Based Learning is higher than those who learn using textbooks.

From the result of the calculation obtained $t_{value} = 2,388 > t_{table} = 1,701$. It turns that the value of $t_{value} > t_{table}$, thus H_0 rejected and H_a is accepted, thus the research hypothesis states: The Web-Based Learning developed is feasible and effective to be used to improve learning outcomes.

The use of Web-Based Learning Media that was tested on class XI students on the competence of Chassis and Drive Train Maintenance of Light-Vehicle at SMK Negeri 5 Medan showed a positive and significant influence on learning outcomes, especially in mastering factual, conceptual, procedural knowledge and analyzing differential's topic. With Web-Based Learning model, students are equipped with 21st century skills, namely critical thinking, creative and communicating.

4. CONCLUSION

Based on research and the development of Web-Based Learning Media the Chassis and Drive Train Maintenance of Light-Vehicle Subject that have been tested to XI Grade Students at SMK Negeri 5 Medan, it can be concluded as follows: (1) Web-Based Learning Media on the Chassis and Drive Train Maintenance of Light-Vehicle subject is shown to be highly feasible apply in XI grade students at SMK Negeri 5 Medan, (2) the use of Web-Based Learning Media is more effective in improving the results of Chassis and Drive Train Maintenance of Light-Vehicle than the text-based learning.

REFERENCES

- [1]. Aksoy, M.E., Guven, F., Sayali, M.E., & Kitabcioglu, D. (2019). The effect of web-based learning in pediatric basic life support (P-BLS) training. *Computers in Human Behavior*, 56-61.
- [2]. Alavi, M., & Leidner, D. E. (2001). Research commentary: Technology-mediated learning—A call for greater depth and breadth of research. *Information Systems Research*, 12(1), 1–10.
- [3]. Anderson, L.W., dan Krathwohl, D.R. (2001). *A Taxonomy for Learning, Teaching and Assesing; A Revision of Bloom's Taxonomy of Education Objectives*. New York: Addison Wesley Lonman Inc.
- [4]. Borg, W. R., & Gall, M. D. (1983). *Educational research: An Introduction* (4th ed.). New York: Longman. Inc.
- [5]. Borg, W. R., & Gall, M. D. (2007). *Educational research: An Introduction* (8th ed.). New York: Longman. Inc.
- [6]. Buzzi, Marina. (2010). *E-Learning*. India: In-Tech.
- Chicca, J., Shellenbarger, T. (2018). Connecting with Generation Z: Approaches in Nursing Education. *Teaching and Learning in Nursing*, 13(3), 180-184.
- [7]. Cabada, R. Z., Estrada, M. L. B., Hernández, F. G., Bustillos, R. O., & Reyes-García, C. A. (2018). An affective and Web 3.0-based learning environment for a programming language. *Telematics and Informatics*, 35, 611–628.
- [8]. Chomsatu, Y., & Suhendro. (2014). Model Pembelajaran Pasar Modal Berbasis Simulasi Perdagangan Daring Melalui Perdagangan Maya BEI. *Jurnal Akuntansi Multiparadigma*, 5(2), 170–344.
- [9]. Clark, R. C., & Mayer, R. (2008). *e-Learning and the Science of Instruction*. San Francisco : John Wiley & Sons, Inc.
- [10]. Dick, W., Carey, L., & Carey, J. O. (2015). *The Systematic Design of Instruction* (8th ed.). Boston: Pearson/Allyn and Bacon.
- [11]. Ding, Y., Zhang, P. (2018). Practice and effectiveness of web-based problem-based learning approach in a large class-size system: A comparative study. *Nurse Education in Practice*, 161-164.
- [12]. El-Ali, A., Kamal, F., Cabral, C. L., Squires, S. H. (2019). Comparison of Traditional and Web-Based Medical Student Teaching by Radiology Residents. *Journal of the American College of Radiology*, 492-495.
- [13]. Finkelstein, M.J., Frances, C., Jewett, F.I., Scholz, B.W. (2000). *Dollars, Distance, and online Education; The New Economics of College Teaching and Learning*. America Council and Education: Oryx Press.
- [14]. Gerlach, V. S. & Ely, D. P. (1980). *Teaching and Media a Systematic Approach: Second Edition*. New Jersey, U.S: Prentice-Hall.
- [15]. Gillies, J., & Cailliau. R. (2020). *How The Web Was Born*. New York: Oxford university Press.
- [16]. Haj-Mirzaian, A., Sethi, N., de Francesca, B., Sahni, S., & Zaheer, A. (2020). Web-based Radiology Subspecialty Training Program: Pilot Feasibility and Effectiveness Analysis on Ethiopian Radiologists. *Academic Radiology*, 27, 293–299.
- [17]. Khan, M. R., & Kharat, R. B. (2016). Design & Analysis of E-Learning System for MCA Programme. *International Journal of Information, Business and Management*, 8(3), 96–111.
- [18]. Mayer, R. E., Clark, R. C. (2016). *E-Learning and The Science of Instruction* (4th ed.). Canada: Wiley.
- [19]. Reigeluth, C. M. (1983). Meaningfulness And Instruction: Relating What Is Being Learned To What A Student Knows. *Instructional Science*, 12(3), 197–218.
- [20]. Toyota. (1995). *New Step 2 Chasis Group*. Jakarta: PT. Toyota Astra Motor.
- [21]. Ghirardini, B. (2011). *E-learning methodologies: A guide for designing and developing e-learning courses*. Food and Agriculture Organization of the United Nations.