



Feasibility Test Analysis of Planetary Type Starter Motor E-Module for Vocational High School Learning

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Abstract

The purpose of this study is to develop and test the feasibility of e-modules, analyze the learning outcomes of learners after using e-modules, and know the response of learners to e-modules. Feasibility testing is reviewed from 1) Media feasibility, 2) Material feasibility, and 3) Student learning achievement. The research started from the development of e-modules with ADDIE development model which is then conducted feasibility testing of e-modules, learning homework, and student response in using e-modules. Based on the results of the calculation of learning media feasibility test obtained a percentage of 90% for media experts and 84.17% for material experts, including in the category of very feasible. The calculation of the feasibility of student learning outcomes was done with t-test which is $t_{\text{count}} = 13.73 > t_{\text{table}} = 2.04$. The increase in student learning outcomes obtained an average test gain of 0.64 with a moderate increase category. Analysis of students' responses to learning media obtained a percentage of 90.61% so that the learning media developed falls into the category of very practical and feasible to apply.

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INTRODUCTION

Each vocational education unit must have learning facilities to support an orderly and sustainable learning process. (Saputra et al, 2018: 1), explains the role of teachers in the learning process is very important, especially in choosing instructional media and design to motivate students to learn. This is inseparable from the ability of teachers in choosing and using appropriate and effective media (Hadromi et al, 2020). An teachers must be able to determine the right and effective learning media, because it greatly affects the success of learners in achieving learning objectives.

The observations of the authors at Vocational High School 1 Semarang with one of the teachers who mastered the automotive electrical subjects of starter motor materials showed that the use of learning media still uses manuals and power points. The use of learning media modules are still in the form of materials and images, this makes students less active and motivated in the process of learning starter motors conducted while in school and outside school.

The observations of the authors at Vocational High School 1 Semarang with students who studied the subjects of automotive electricity starter motor material showed as many as 70% of students still do not fully understand about the starter motor material provided by teachers due to the limitations of learning media used, and 30% of students understand the starter motor by practicum directly, but still not perfect especially about the maintenance of starter motors. The main thing in this problem is the inability of learners in developing an independent understanding of starter motor materials anytime and anywhere with the learning media that has been provided by teachers.

To solve the problem, the author has a solution that is to develop existing learning media and the use of appropriate learning resources to students is expected to be able to improve the learning outcomes of the learners.

(Ferdianto et al, 2018: 2) seeing the importance of interesting learning resources in the learning process and can guide the character of students, learning media is expected to increase the spirit of learning students.

(Mindayula and Sutrisno, 2020: 283), technology based media can facilitate students to organize themselves in independent learning processes. Therefore, the use of technology can also be utilized in learning to become more interactive and involve students in learning, so that the use of media in learning can increase students' learning motivation. (Pratama et al 2019: 2) explains making learning media materials with software applications is expected to increase interest and motivation can be further achieved in learning outcomes.

Starter motor maintenance is one of the competencies that must be mastered by vocational high school students, especially automotive light vehicle engineering skills. (Sofyan et al, 2019), the use of electronic module learning media is expected to increase the interest in learning and facilitate learners in understanding planetary type starter motor maintenance materials, as well as be able to improve the learning outcomes of the learners.

The problem formulation in this study is how the feasibility level of planetary type starter motor e-module learning media developed for learning, whether there is an improvement in learning outcomes in learners after using the learning media e-module starter motor planetary type, and how the learners respond to the learning media e-module starter motor planetary type developed.

The purpose of this study is to develop and analyze the feasibility of learning media e-module starter motor planetary type developed for learning, know the improvement of learners' learning outcomes after using the learning media e-module starter motor planetary type, and know the response of learners to the learning media e-module starter motor type planetary developed.

METHODS

The method of learning media development e-module starter motor planetary type used in this study is the research method R&D (Research and Development). (Sugiyono, 2020: 369) explains the method of research and development or Research and Development can be interpreted as a scientific way to research, design, produce and test the validity of products that have been produced.

E-module development procedure

Research and development procedures of learning media e-module motor starter planetary type using ADDIE. Branch in (Al Ghozali et al, 2020: 896) describes ADDIE development procedures consisting of: Analysis, Design, Development, Implementation, and Evaluate.

Analysis stage is the stage of analyzing some of the needs required in research. Analysis of these needs includes: determination of learning materials, determination of software, and determination of users.

Design stage is the design stage of the learning media to be created. The creation of learning media begins with determining the steps of making a good and correct learning module. Determining the concept of materials in the learning media, and determining the layout of materials on the maintenance of a good starter system in the form of text, images, animations and videos is expected to make it easier for learners to use and learn the material in the learning media.

Development stage is the stage of creating learning media with a design that has been designed in such a way. After the learning media has been created, then validation is done by media experts and material experts.

Implementation stage is a test stage in classroom learning using learning media that has been developed and has been declared feasible.

Evaluation stage is a stage to know the results of respondents' assessment of the

learning media developed as a whole. The assessment results were obtained from the feasibility test of media experts and material experts as well as the attractiveness of students of class XI Automotive Light Vehicle Engineering. Improved learning outcomes were analyzed using Pre-Experimental Designs using a one-group pretest-posttest design experimental model. A diagram of the e-module development procedure can be seen in figure 1 below.

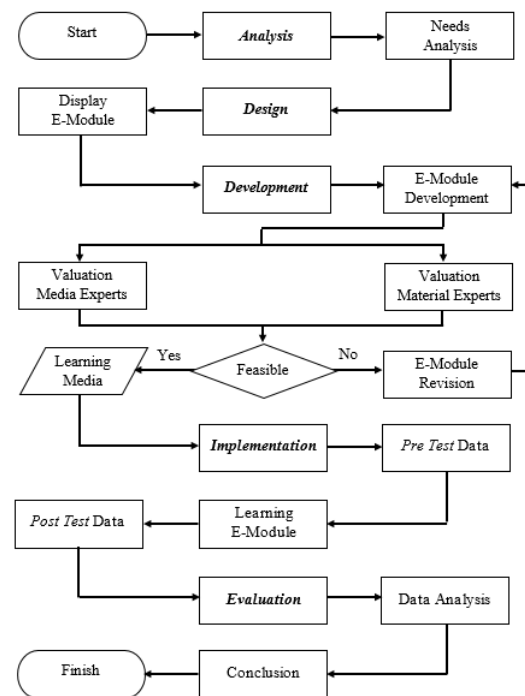


Figure 1. E-module Development Procedure Diagram

Population and research samples

The population and research samples are students of Automotive Light Vehicle Engineering class XI Vocational High School 1 Semarang numbering 30 who have followed the subjects of automotive electrical starter motor material.

Data and research instruments

The data obtained in this study are qualitative and quantitative data. Furthermore, the instruments used in this study use assessment questionnaires of learning media feasibility tests by media experts and material experts, tests, and

questionnaires of the attraction of learners to the developed learning media.

E-module Feasibility test

The feasibility testing of learning media developed is reviewed from 3 aspects, namely:

Media Feasibility

Media feasibility test aims to determine the feasibility of learning media developed by the author.

$$P = \frac{\sum S}{S_{max}} \times 100\%$$

(Saregar et al, 2019: 3)

Material Feasibility

Material feasibility test aims to determine the feasibility of learning materials developed by the author.

$$P = \frac{\sum S}{S_{max}} \times 100\%$$

(Saregar et al, 2019: 3)

Student Learning Outcomes

Data obtained on student learning outcomes before processing with t-test and gain test, then conducted normality test, and homogeneity of data as follows:

Normality test aims to determine whether the data is normally distributed or not by using the chi-squared formula.

$$\chi^2 = \sum_{i=1}^k \frac{(O_i - E_i)^2}{E_i}$$

(Sudjana, 2005: 273)

Homogeneity test aims to find out if the pretest and posttest groups have the same variant or not.

$$F = \frac{\text{Varians besar}}{\text{Varians kecil}}$$

(Sugiyono, 2020: 266)

T-test aims to test the difference between two observations and a one-sided experiment conducted on subjects tested before and after using learning media.

$$t = \frac{Md}{\frac{\sqrt{\sum x^2 d}}{N(N-1)}}$$

(Arikunto, 2013: 125)

Gain test aims to determine the magnitude of the improvement in students learning ability in experimental classes and control classes.

$$\frac{(\text{posttest score}) - (\text{pretest score})}{(\text{maximum possible score}) - (\text{pretest score})}$$

(Meltzer, 2002: 1260)

Analysis of student responses aims to obtain data on the results of students attractiveness to the learning media developed.

$$P = \frac{n}{N} \times 100\%$$

(Hamid et al, 2019: 220)

RESULTS AND DISCUSSION

After the learning media e-module starter motor planetary type has been created and developed, then conducted due diligence to know the level of feasibility of the learning media. The due diligence was conducted by two media experts (table 1) and two material experts (table 2). Assessment of learning media conducted by media experts and material experts, provided criticism and suggestions column on the assessment sheet. Criticisms and suggestions are used as a reference in improving the learning media of planetary type starter motor e-module.

Table 1. Media Expert Criticism and Suggestions

No	Criticism and Suggestions
1	Provide instructions for use
2	Provide zoom in and zoom out facilities on the material buttons on the material map
3	Provide the starter image function located in the bottom center of the page as the home button (material map)
4	Provide zoom facility on image
5	The ultimate goal of learning media is to match the component achievement indicators on the syllabus

Table 2. Material Expert Criticism and Suggestions

No	Criticism and Suggestions
1	Quiz links can be included in learning media
2	Image caption Learning media can be clarified

The layout design of the learning media e-module starter motor planetary type developed by the author is as follows:

E-module learning media front cover design. The front cover design of the learning media e-module is the initial look when the user opens the 3D Pageflip Professional application.

**Figure 2.** E-module learning media front cover design

Learning media design (indicators and objectives). The design of learning media (indicators and objectives) is a view when the user is inside the 3D Pageflip Professional application on the description of indicator materials and objectives.

**Figure 3.** Learning media design (indicators and objectives)

Learning media design (material). The design of the material learning media is a display when the user is inside the 3D Pageflip Professional application in the description of the starter system maintenance material especially the planetary type.

**Figure 4.** Learning media design (material)

Learning media design (exercise). The design of the material learning media is a display when the user is inside the 3D Pageflip Professional application in the description of the starter system maintenance exercises especially planetary type.

**Figure 5.** Learning media design (exercise)

Learning media design (conclusion). Material learning media design is a display when the user is inside the 3D Application Pageflip Professional on the conclusion of the starter system maintenance especially planetary type.

**Figure 6.** Learning media design (conclusion)

E-module learning media back cover design. The back cover design of the learning media e-module is the final look when the user opens the 3D Pageflip Professional application.



Figure 7. E-module learning media back cover design

The learning media feasibility assessment data developed is obtained from the assessment of two experts, namely media experts and material experts, shown in tables 3 and 4, as follows.

Table 3. Media Expert Assessment Data

No	Media Expert	Score
1	Manikowati, M.Pd	50
2	Rizki Kurniawan, S.Pd	58
	Total Score	108
	Maximum Score	120
	Percentage	90
	Category	Very Feasible

Based on the data shown in table 3 can be analyzed on the assessment aspect of media experts argue that the product is included in the development of creative and interesting learning media. Based on the results of the average percentage of media experts assessment shows a figure of 90%, so it can be concluded that the product belongs to the category of very feasible.

Table 4. Material Expert Assessment Data

No	Material Expert	Score
1	Adhetya Kurniawan, S.Pd., M.Pd	47
2	Hari Kurniawan, S.Pd	54
	Total Score	101
	Maximum Score	120
	Percentage	84.17
	Category	Feasible

Based on the data shown in table 4 can be analyzed on the aspect of expert assessment materials argue that the product is included in the development of good learning media and contains complete learning materials. Based on the average percentage of material expert assessment shows a figure of 84.17%, so it can be concluded that the product belongs to the category feasible.

The increase in student learning outcomes for the lowest pretest score was obtained at 33.33 and the lowest posttest score was obtained at 66.67. As for the highest pretest score obtained 76.67 and the highest posttest score obtained 93.33. So the average value for the pretest value is 52.56 and the posttest value is 83.78. This can be seen in

figure 8 of the pretest-posttest value chart below.

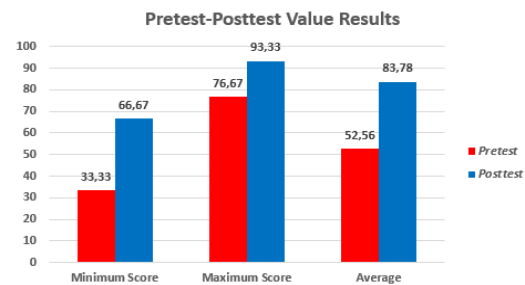


Figure 8. Pretest-Posttest Value Result Graph

Normality test result between pretest and posttest using chi-squared formula at a significant level of 5% and $dk = 6 - 1 = 5$ obtained $\chi^2_{table} = 11.1$, can be seen in table 5 below.

Table 5. Pretest and Posttest Normality Test Data

No	Normality	x^2_{count}	x^2_{table}	Conclusion
1	Pretest	5.32	11.1	Normal Distributed Data
2	Posttest	5.69		

Normality test results obtained data that $x^2_{\text{count}} < x^2_{\text{table}}$ ($5.32 < 11.1$) for pretest data and ($5.69 < 11.1$) for posttest data, so it can be

concluded that pretest and posttest data are normally distributed. Homogeneity test results can be seen in table 6 below.

Table 6. Homogeneity Test Data

F_{count}	F_{table}	Conclusion
3.68	4.20	Homogeneous Data

Based on table 6 homogeneity test results obtained F_{count} price of 3.68. With dk numerator = $2 - 1 = 1$ and dk denominator = $30 - 2 = 28$ at the level of signification 5% (0.05) obtained F_{table} price of 4.20. Since $F_{\text{count}} < F_{\text{table}}$, which means H_a is accepted and H_o is

rejected then it can be concluded that the research data is homogeneous.

T-test calculation result obtained $t_{\text{count}} = 13.73$ while at $\alpha = 5\%$ with dk numerator = $30 - 1 = 29$ obtained $t_{\text{table}} = 2.04$. The t-test calculation results can be seen in table 7 below.

Table 7. T-test Data

t_{count}	t_{table}	Conclusion
13.73	2.04	Improved Learning Outcomes

Based on table 7 t_{count} located outside the H_o reception area ($t_{\text{count}} > t_{\text{table}}$), then H_o was rejected and it can be concluded that there is a significant improvement in learning

outcomes between pretest and posttest data. Pretest and posttest gain test results can be seen in table 8 below.

Table 8. Gain Test Data

Gain	Score	Average gain	Conclusion
Pretest	1577	0.64	Moderate Increase
Posttest	2513		

Based on table 8 results of gain test calculation of 30 students obtained as many as 17 students experienced a moderate increase with the gain between 0.3 - 0.7 and 13 students experienced a high increase with the gain of more than 0.7. The average gain of 30 students is 0.64, so it can be concluded to be included in the moderate increase. The results of the analysis of students' attractiveness to learning media using the percentage formula adapted from Sugiyono in

(Alamsyah et al, 2019: 278) can be seen in table 9 below.

Table 9. Percentage Analysis Student Response Criteria

Poll Value	Alternative Answer Options
81–100	Very Practical
61–80	Practical
41–60	Enough
21–40	Impractical
0–20	Very Impractical

Based on table 9 which refers to the analysis of student responses to learning media obtained the total average score from the student response questionnaire of 90.61%. So it can be concluded that learning media belongs to the category of very practical.

In this study has produced the final product that is the learning media e-module starter motor planetary type with a very feasible category based on the assessment of media experts and material experts. The learning medium of this planetary type starter motor e-module developed obtained a feasibility rate of 90% by media experts and 84.17% by material experts. Based on the assessment in terms of media consists of several aspects that are assessed, namely, the feasibility of content, language, graffiti, and servings. In terms of material consists of several aspects that are assessed, namely the suitability of the material with basic competencies, accuracy and material truth, as well as supporting material learning.

The learning media of planetary type starter motor e-module developed has been tested to students of class XI Automotive Light Vehicle Engineering at Vocational High School 1 Semarang with a total of 30 students and proven effective to improve student understanding (cognitive) significantly with a difference in average pretest value and posttest score of 31.22. The use of learning media e-module motor starter planetary type has obtained the criteria of student learning outcomes in the moderate category based on the results of the gain test with a score of 0.64. So it can be concluded that the learning media e-module starter motor type planetary based PageFlip 3D effectively used for the learning process. The learning media of planetary type starter motor e-module gets a very practical response with a percentage of 90.61%, so it can be interpreted that the learning media is worth using for the learning process and able to increase the attractiveness of students to understand the competency of starter system maintenance.

Learning media e-module starter motor type planetary based PageFlip 3D has several

advantages that can help teachers in delivering materials how to care for the starter system, especially planetary type to students, and can be used independently anytime and anywhere by students through laptop or computer devices without the need to use additional applications (Hadromi et al 2021). The learning media of e-module motor starter planetary type is equipped with learning videos. This is supported by the opinion of (Handayani et al 2019), that with the learning video can provide an overview or illustration and high-level thinking ability to students on how to test the planetary starter motor, and how to care for the planetary starter motor.

This is in line with several previous studies, including research from (Triwibowo et al, 2020) and research conducted by (Sunaryo et al 2020: 455). Based on the results of research and discussion of e-modules, conclusions can be drawn as follows. Validation by experts results in an average score percentage of 85% overall, 72% by media experts, 78% by material experts, and 88% by secondary school teachers. While the student trials showed that 77.7% of small groups and 82% of large groups scored in very good categories. This indicates that the electronic module is feasible as a learning module. E-module is an effective tool to improve the thinking skills of high-level middle school students.

Further research was conducted by (Diana et al 2020: 7) and research conducted by (Churiyah et al, 2020). Media expert assessment of the final product developed results in an average assessment with excellent criteria. Expert assessment of the material on the final product developed results in an average assessment with excellent criteria. In the student response test to the final product developed, small group trials produced an average assessment with very interesting criteria and field trials resulted in an average assessment of 86% with very interesting criteria. In testing educator responses to developed end products resulted in an average assessment with excellent criteria.

CONCLUSION

Based on the results of research and discussion can be concluded that the learning media e-module starter motor type planetary pageflip 3D developed is very feasible to be used in the learning process. This is in accordance with the results of the learning media feasibility test, obtained the percentage of the final result of 90% of the assessment of media experts and 84.17% of the assessment of material experts.

Based on the results of pretest and posttest values to find out the improvement of the understanding of learners in starter motor maintenance materials, especially planetary types obtained the average results of pretest and posttest scores of learners of 52.56 and 83.78, respectively. Based on the calculation of t-test obtained $t_{\text{count}} = 13.73$, while $t_{\text{table}} = 2.04$, so it can be concluded that there is a significant improvement in learning outcomes between the pretest and posttest values after using the learning media e-module starter motor type planetary based PageFlip 3D. Based on the calculation of test gain obtained on average of 0.64, so it can be categorized as included in the criteria of improvement of moderate learning outcomes.

Based on the results of the study response of the attraction of learners to the learning media e-module starter motor type planetary based PageFlip 3D obtained a percentage of 90.61%, so it can be concluded that learning media is very practical to use for the learning process and proven to attract students to understand the material of starter motor care, especially planetary type.

Based on the conclusion about the learning media e-module starter motor type planetary based PageFlip 3D, there are suggestions as follows:

The development of e-module learning media will be more effective if the computer or laptop device uses the operating system windows 7, windows 8, or windows 10 that has not been updated until the end of 2020.

The results of e-module learning media development will be more effective if

displayed on the projector LCD screen so that learning materials can be delivered to students with a large number of groups.

The results of the development of e-module learning media can be redeveloped in the form of HTML5 so that it can be operated on computer devices, laptops, and smartphones online.

The results of e-module learning media development can be developed even better with a more complete display of design, animation, video and learning materials.

The results of e-module learning media development can be redeveloped by teachers for use in other learning competencies.

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