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K3LH ELECTRONIC MODULE DEVELOPMENT AND INDUSTRIAL WORK CULTURE FOR VOCATIONAL HIGH SCHOOL LIGHT VEHICLE ENGINEERING EXPERTISE COMPETENCIES (ASSISTED FLIP PDF CORPORATE EDITION APP)

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Abstract

This study aims to develop electronic-based module teaching materials on K3LH material and Industrial Work Culture for light vehicle engineering competency competencies in Vocational High Schools by using the Flip PDF Corporate Edition application. This research method was carried out using the Research and Development method using the ADDIE development model, which went through the stages namely: 1) Analysis, 2) Design, 3) Development, 4) Implementation, 5) Evaluation. This stage of testing the feasibility quality of the electronic module was validated by material experts with a percentage value of 94% and media experts at 89%, and reinforced from supporting data for student evaluation of 89%, so that electronic modules were categorized as very suitable for use as learning modules in schools. This effectiveness test is carried out to determine the effect of using the module, then obtained the average pretest test results of 65.47 and 73.00 posttest so that there is an increase in the average value after the treatment is carried out and it is effective. The results lead to the conclusion that there is a difference between the use of electronic modules established with the PDF Corporate Edition flip application on K3LH material and Industrial Work Culture before and after treatment.

Keywords: Electronics Module, K3LH and Industrial Work Culture, Research & Development, Flip PDF Corporate Edition, Vocation School

INTRODUCTION

Learning in the 21st century as it exists today is heavily influenced by the development of ICT (literacy in information and communication technology) (Sugiyono, 2015). Nowadays, the innovation of the development of educational facilities has a significant impact (Sugiyono, 2015). The need for the creation of instructional materials for students to attain the standard education (Sudjana, 2019). Modules are one of the learning facilities that can be developed, and their importance lies in the fact that they can be used for face-to-face or independent student learning (Nugroho et al., 2019).

Modules are written components of the learning process that are systematically organized from material aspects, methods, and assessment instruments (Daryanto, 2013). Electronic modules are one of the instructional resources used to enhance student skills (Suarsana, 2019). Using modules facilitates the gradual comprehension of both fundamental skills and engagingly shaped forms of application (Suarsana, 2019).

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Several studies on the development of electronic modules indicate that the development of electronic modules is highly effective in enhancing student achievement of learning outcomes (Herawati & Muhtadi, 2018). The creation of effective learning modules can aid students in comprehending course material (Muhson, 2010). To accomplish this, modules must be appealing, simple to comprehend, and simple to use (Sugiyono, 2015). The developed learning modules must be practical and effective as a means of learning, as well as consistent with the approach to the content being developed (Al Azka et al., 2019).

The development of modules supported by electronic applications makes it simpler for teachers to facilitate a more interactive, active learning environment for their students in the classroom (Nuraeni, 2021). Utilizing various forms of technology effectively can also improve one's educational experience. One of the alternative electronic applications that can be utilized is the Corporate Edition PDF flip, which can display images, text, video, animation, and audio (Zinnurain, 2021). So that Flip PDF Corporate Edition can assist in presenting more engaging content and is required by students (Rusnilawati et al., 2018). It can be saved in HTML, EXE, ZIP, Mac App, FBR, CD, and mobile formats (Sumarni & Dwitiyanti, 2022).

The development of electronic modules is conducted as one of the supporting efforts for the attainment of fundamental competencies in a class of Vocational School students studying light vehicle engineering. According to Law Number 20 of 2003 concerning the National Education System, 2003, the purpose of vocational education is to prepare students to become productive members of society, capable of working independently or filling job vacancies based on their expertise competencies. This light vehicle engineering is an automotive engineering study program, so it is equipped with repair skills and periodic inspections, and it must be based on the ability to implement a culture of occupational safety and health in order to support work productivity (Prasetyo et al., 2018).

Occupational safety and health are the process of ensuring and protecting workers by preventing occupational accidents and diseases (Government Regulation (PP) 50 of 2012 concerning the Implementation of an Occupational Safety and Health Management System, 2012). According to (Budiarti et al., 2019), the number of workplace accidents in Indonesia increased to 173,105 in 2018, according to employment BPJS data. Vocational school students, primarily in the light vehicle engineering group, should be provided with a basic understanding of the application of workshop occupational safety and health from an early age, as (Rahadi et al., 2018) indicates that the application of student occupational safety and health in the work sheet area is still classified as very low. This is due to a lack of student knowledge and discipline regarding the importance of implementing a culture of occupational safety and health in workshop practical activities (Djulianto, 2009).

The need for the development of electronic modules for occupational safety and health that refer to regulatory standards is fostered at the Vocation School as part of an effort to promote work ethic and the formation of graduate competency profiles that meet the requirements of the globalized workplace (Subijanto et al., 2020). The establishment of a culture of occupational safety and health encompasses occupational safety and health readiness towards student discipline knowledge (Rugayah et al., 2019), student attitudes

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(Faida & Santik, 2018), educator attitudes and infrastructure supporting the implementation of occupational safety and health in schools properly (Djulianto, 2009).

The development of printed modules that are currently still used as electronic modules is carried out, as an effort to increase understanding of the concept of learning materials (Hartati et al., 2020). A more refined basic knowledge related to K3LH and Industrial Work Culture is important as the basic foundation of students' skills in carrying out practice in the workshop according to the procedures needed by the industrial world. For this reason, this article aims to develop K3LH electronic modules and industrial work culture for the Light Vehicle Engineering Student Group of Vocational School with the help of the Flip PDF Corporate Edition application. As a means of developing instructional materials to facilitate student comprehension, and to maximize the potential for the use of electronics in the current era of globalization. The development of this electronic module pertains to the subjects in the light vehicle engineering expertise group, specifically the fundamental subjects of automotive engineering, which contain learning outcomes based on K3LH elements and industrial work culture phase E, such as the ability to implement safe work practices, hazards at work, emergency procedures, and the application of industrial work culture 5R (Concise, Neat, Caring, Diligent), and Work ethics (Mak, 2022). This topic is one of the underlying competencies for light vehicle engineering. Occupational safety and health are stated in the SKKNI (Indonesian State Work Competency Standards) at the point of reference for work criteria as an improvement point that exists in every learning competency.

Based on interviews with teachers in schools, there are currently no supporting facilities for electronic-based learning, and they have never used electronic-based module applications. As a result, it is crucial to develop electronic modules with the assistance of the Flip PDF Corporate Edition application to facilitate comprehension, so that knowledge, skills, and attitudes can be developed in the application of K3LH and Industrial Work Culture. This electronic module is being developed with practical simulation materials and videos so that it can serve as a reference in the learning process and facilitate both classroom and individual teaching and learning.

Based on the results of the literature study and field interviews related to the development of electronic modules based on the Flip PDF Corporate Edition application, the K3LH material and Industrial Work Culture for the Vocational School student level is the first time it has been carried out. This judgement is supported by evidence from several related studies, including the need to instill in youngsters a recognition for workplace safety and health as well as the skills necessary to implement those values, the value of using Light Fire Extinguishers (APAR), and the risk of hazard contamination in the workplace. As a form of development and improvement of learning that does not yet exist, this electronic module was created, for learning facilities.

RESEARCH METHODS

This type of research uses R&D (Research and Development) which is a research method to produce certain products and test their effectiveness (Sugiyono, 2015). This research refers to the ADDIE development model (Analysis, Design, Development,

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Implementation, and Evaluation). This ADDIE development model contains systematic guidelines for the steps taken by researchers, so that the resulting product design includes feasibility standards. As a form of indication that the product findings from the development activities carried out have objectivity. The design of a product can be realized in drawings or charts and can be used as a guide in assessing and applying it (Sugiyono, 2015). In this research, we develop modules by going through several stages of development as below;

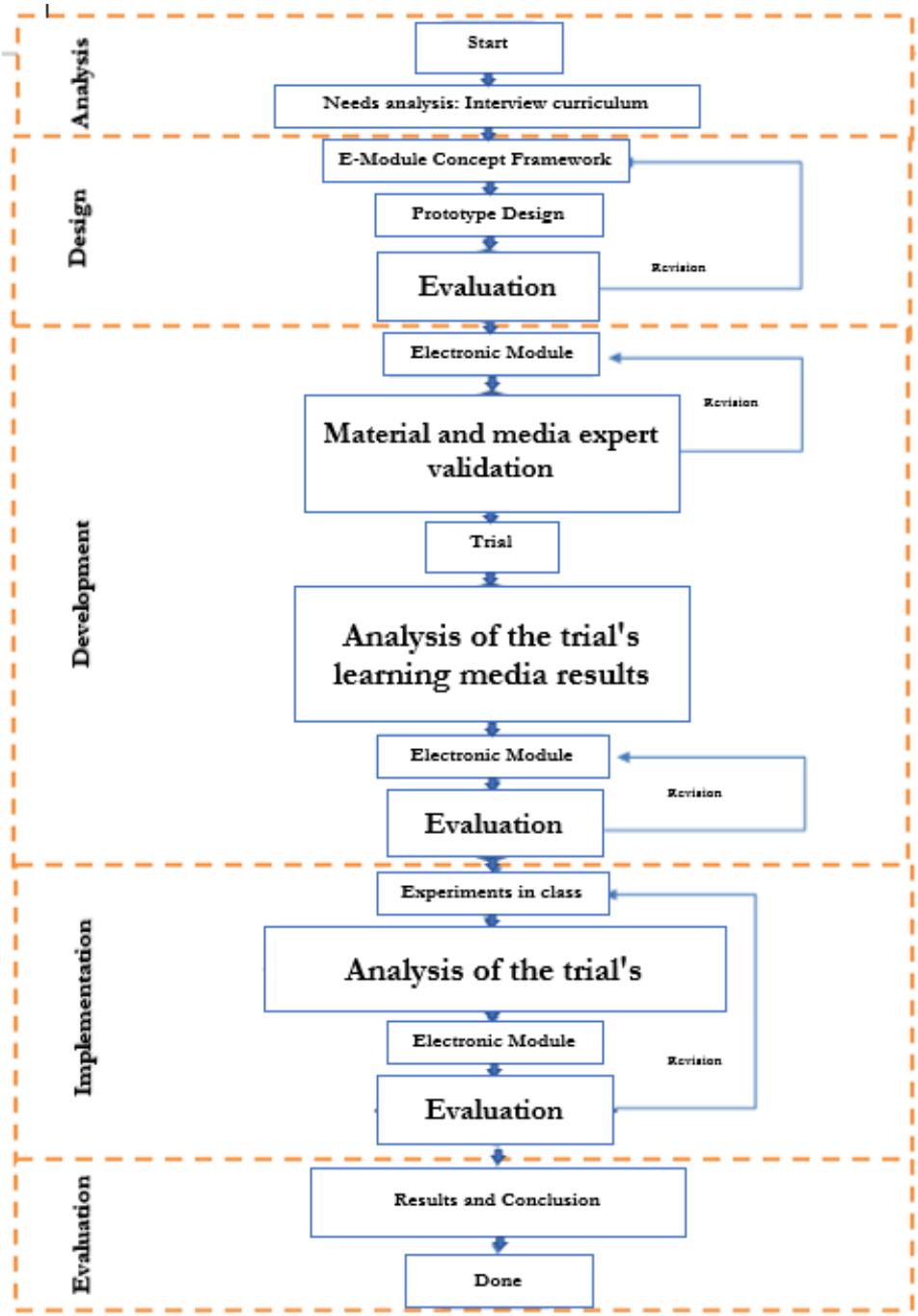

Figure 1. Development Stage

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Instrument data from this prerequisite test is carried out to validate, carried out by material and media experts. This data analysis is obtained by using a rating scale (Sudjana, 2005) as well as equipped with a conclusion statement including the appropriate category or not used in the learning process in class. Conclusions are made in the form of statements made in three-point statements, namely feasible to use, suitable for use with improvements, and not suitable for use. The results of calculations from the level of validation in research are classified into categories on the scale (Gonia, 2009).

Table 1. Interpretation of the Ratting Scale

Percentage Score (%)	Interpretation
0 – 25	Highly Invalid (forbidden to use)
25 – 50	Invalid (unusable)
50 – 75	Valid enough (can be used with minor revisions)
75 – 100	Highly Valid (can be used without revision)

Source: Statistical Method (Sudjana, 2005)

The data analysis was carried out as follows:

1) Validity Test
   Instruments that can measure objects accurately and with certainty can be said to be valid in conducting tests. Testing on all instrument items can be done by looking for the differentiating power of item scores from the group that gives the highest and lowest answers (Sudjana, 2005).
2) Reliability Test
   Reliable is a measurement that is consistent over time (Sugiyono, 2017). In this test using the Guttman scale because the respondents' answers include discrete data. Point 0 for wrong answer and point 1 for correct answer.
3) Normality Test
   The normality test will be carried out to find out whether the data is normally distributed or not. If the data is not normally distributed, then the data must be modified to become normally distributed data so that the t-test can be carried out (Sudjana, 2005). The normality of distribution data becomes a conditional assumption in order to determine what type of statistics will be used in further data analysis.
4) Homogeneity Test
   Homogeneity test is used to determine whether several population variants are the same or not (Sudjana, 2005). This test was carried out for prerequisites in the analysis of independent sample t tests and ANOVA analysis of variance is the variance of the population is the same. These two variance similarity test is used to test whether the distribution of the data is homogeneous or not, namely by comparing the two variances.
5) Effectiveness Test
   The effectiveness test is carried out in order to find out whether or not there is an influence from using learning suggestions in the form of K3LH and Industrial Work Culture modules from before and after the treatment. Seeing the difference in the average paired

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samples, namely (1 respondent has 2 values obtained from before the treatment is carried out and after the treatment is carried out (Sugiyono, 2017).

RESULT AND DISCUSSION

Analysis

1) Curriculum
   The analysis phase of this curriculum is based on learning outcomes of basic subjects – basics of automotive engineering phase E for vocational school as defined by Education Standards, Curriculum, and Assessment Agency of the Indonesian Ministry of Education, Culture, Research, and Technology to formulate learning achievement indicators based on elements (Mak, 2022) From the subject objectives of the basics of automotive engineering phase E, this analysis was carried out on the curriculum currently used in Vocational School, namely the implementation of the independent curriculum.
2) Support teacher
   Learning in schools currently still relies on printed modules, the level of difficulty of students' understanding regarding industrial work culture is still lacking, this is because they have not applied work discipline or prioritized K3LH, especially when practicing in workshops.
3) Study of literature
   The learning achievement of the Basic Automotive Engineering subject, the learning element of phase E was developed because students' knowledge related to OSH 51.4% was in a fairly low category (Kemassias, 2017). Knowledge, very influential on the attitude of awareness of K3 behavior by 35.2% (Widhiarni & Lukmandono, 2017). Knowledge and attitudes of students related to OSH will greatly affect self-cleanliness 52% use of practical tools 63% and application to the work environment 56% which is still relatively low (Rahadi et al., 2018). Thus, the trigger factor for work accidents from unsafe behavior (Faida & Santik, 2018). The need for an evaluation of the disciplinary attitude of vocational school students (Subijanto et al., 2020), it is necessary to increase the knowledge and principles of OSH implementation (Prasetyo et al., 2018). In accordance with the performance elements contained in SKKNI K3 and need to be cultivated and become a profile of vocational high school graduates (Subijanto et al., 2020).
4) Design and Development
   At this stage, we designed a material development design in the learning module, at this stage it was started by making an Outline of Material Content (GBIM) as the initial basis for development based on the development of existing printed materials and modules.

Implementation

Product Feasibility Test

This product feasibility test was conducted to determine the level of validation of the electronic module being developed. This test was carried out through several stages of testing, both with testing by material experts, media experts, then limited trials related to the

use of this module, with one-by-one small group testing, followed by small group tests and large group tests or field trials. This is done, to determine the level of feasibility related to development which is carried out as follows;

a. Material Expert Validation Test Results
   After the electronic module has been developed, it is necessary to go through the validation stage, the first by material experts this validation stage is carried out before the electronic module enters the field trial stage. The test results obtained are 68 divided by the maximum score of 72 and then multiplied by 100%, the calculation result is 94%. Conclusions are drawn with scale categories (Gonia, 2009) that this electronic module is highly valid and can be used without revision.
b. Media Expert Validation Test Results
   This validation is carried out to produce electronic modules that can be used properly, in terms of design operation and also the quality of the appearance of the materials that have been presented. The test results obtained data of 71 divided by the ideal score of 80 and then multiplied by 100%, the final result is 88.75% or rounded up to 89%. Then the percentage figures from the validation results are classified in the scale category (Gonia, 2009), and concluded that the electronic module is stated to be highly valid and can be used without revision.
c. Student Validation Test
   This test was carried out after conducting validity tests by previous experts both in terms of material and learning media which stated the feasibility of the electronic module to be widely tested, for this reason at this stage testing was carried out in the use of electronic modules on K3LH material and industrial work culture. Field test results of student responses in using electronic modules in K3LH material and Industrial Work Culture with the help of the Flip PDF Corporate Edition application are very suitable for use as learning materials. Regarding the assessment given by students who were very positive in using this electronic module.

Due Diligence Results

The first stage of the feasibility test is carried out by material experts, media experts and user or student responses. Then, from the results of the validation of the assessment carried out, it can provide constructive criticism and suggestions for the electronic modules that are developed to achieve development according to needs. The data from the due diligence of the K3LH electronic module and Industrial Work Culture that has been carried out can be seen as follow:

Table 2. Feasibility Test Results for Electronic Modules

No.	Validators	Results Evaluation	Qualification	Information
1	Material Expert	94%	feasible	No Revision Needed
2	Media Expert	89%	feasible	No Revision Needed
3	One to One Test	83%	feasible	No Revision Needed

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4	Small Group Test	94%	feasible	No Revision Needed
5	Large Group Test	88%	feasible	No Revision Needed
	Average	89.6%	feasible	No Revision Needed

Source: Research Data

Due diligence related to the research and development of this electronic module has an average value of 89.6%, it can be concluded that the K3LH electronic module and Industrial Work Culture with the help of the corporate edition flip PDF application can be said to be very suitable for use in the learning process (Purwanto et al., 2020).

Table 3. Expert Criticism and Suggestions

No.	Validators	Criticism and suggestions
1	Media Expert	Complete the module with back, next and home menu buttons to make it easier to use.
2	Material Expert	The electronic module that is made is good enough

Source: Research Data

As a result of the criticisms and suggestions given by material experts and media experts, improvements or product revisions are made as shown below;

Table 4. Media Expert Revision Results

No.	Criticism and suggestions	Before Revision	After Revision
1.	Complete the module, back menu, next and home buttons to make it easier to use the module.		

Source: Research Data

Effectiveness Test Results

Based on the results of the pretest-posttest values, it can show that there is a difference from the results of the average value. This test is carried out to determine the level of effectiveness when using electronic modules in the learning process.

a. Pretest-Posttest Instrument Analysis

Testing the validity of the items used as measurement instruments was carried out to measure the validity or validity of a questionnaire. The results of this study can be said to be valid if the measured variable data does not deviate from the research object (Yusup, 2018).

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Based on the number of questions tested as many as 30 items, then you can compare the results of r statistic with r table = 0.361, the test results obtained r count of each item > 0.361, it is stated that all 30 items are declared valid, so that the items can be tested in the pretest and posttest. The test results at this stage can be seen in the attachment.

b. Pretest-Posttest Instrument Reliability

This calculation was done with SPSS 26 using the Spearman brown split. This was done by responding to the respondents in the form of discrete data, and a Gutman scale with point 1 for the correct answer and point 0 for the wrong answer. The basis for this conclusion is using Cronbach alpha (Ghozali, 2018), as follows;

Table 5. Reliability Statistics

Cronbach's Alpha	N Of Items
0.969	30

Source: Research Data

Based on the calculation results above, the Cronbach alpha value is 0.969 > 0.6 so that it can be concluded that the questionnaire instrument can be said to be reliable. From the results of this conclusion it can be said that each instrument variable can be used as a measuring tool (Amanda et al., 2019).

Pretest -Posttest Prerequisite Test

If the data for this test meets the requirements, a parametric test will be carried out, and if the data does not meet the prerequisites, the data will be processed using a non-parametric test.

a. Normality test

This test was conducted to determine whether the data distribution in this study was normal or not normal. This normality test was carried out with the help of the SPSS 26 application with the analysis of the one sample Kolmogorov Smirnov test, so the following table data is obtained.

Table 6. One Sample Kolmogorov Smirnov Test

No			Unstandardized Residual
1	N		30
2	Normal Parameters[a.b]	Mean	0.000
		Std. Deviation	3.699
3	Most Extreme Differences	Absolute	0.100
		Positive	0.100
		Negative	-0.085
4	Test Statistic		0.100
5	Asymp. Sig (2-tailed)		0.200[c.d]

Source: Research Data

The results of the calculation of the normality data above, it can be concluded that the significance value (Asymp. Sig (2-tailed)) is 0.200 > 0.05, it can be concluded that the residual values are normally distributed.

b. Homogeneity Test

Homogeneity testing was carried out to determine the similarity of the sample variances obtained from the same population. This test was carried out with the SPSS 26 application, so the calculation results are obtained as shown in the table below;

Table 7. Test of Homogeneity of variances

Test of Homogeneity of Variances					
		Levene Statistics	df_1	df_2	Sig.
Study Results	Based on mean	1.250	1	58	0.268
	Based on median	1.767	1	58	0.189
	Based on median and with adjusted df	1.767	1	51.367	0.190
	Based on trimmed mean	1.530	1	58	0.221

Source: Research Data

The results of calculations with the help of the application, it is concluded that based on the results of calculating the significance value of 0.268 > 0.05, it can be said that the variance of the data in this study is homogeneous.

c. t test

The basis for the formulation of the hypothesis to be tested is "there is an effect of the use of electronic modules on the learning outcomes of K3LH material and Industrial Work Culture in tenth grade at XY Vocational School". The basic prerequisites for making a decision are as follows:

- If Sig. (2-tailed) < 0.05, then the assumption H0 is rejected and H1 is accepted.
- If Sig. (2-tailed) > 0.05, then the assumption H0 is accepted and Ha is rejected.

H0 : There is no difference in the use of the K3LH electronic module and Industrial Work Culture on the average pretest-posttest learning outcomes.

H1: There are differences in the use of K3LH electronic modules and industrial work culture on the average score of pretest-posttest learning outcomes.

Further, the t test is carried to find out the conclusions of the variable data tested from the final results of this research. The following is the calculation data obtained;

Table 8. T-Test Results

Paired Samples Test				
		t	dt	Sig. (2- tailed)
Pair1	Pretest-posttest results	-12.798	29	0.000

Source: Research Data

Based on the results of the t test calculation above, the sig value is obtained. (2-tailed) = 0.000 which means it is less than the significance value α = 0.05. Thus, it is concluded that H0 is rejected and Ha is accepted, there is a difference in the use of the K3LH electronic module and Industrial Work Culture on the average learning outcomes on pretest-posttest scores. With an average pretest score of 65.47 and an increase after the treatment, the average posttest score was 73.00.

This research generated a final product in the form of an electronic module for the fundamentals of automotive engineering on K3LH material and Industrial Work Culture in order to improve student achievement of learning outcomes, particularly in relation to K3LH material and Industrial Work Culture. The development of this research went through several stages, namely 1.) needs analysis stage, 2.) design, 3.) development and implementation.

The first stage is analysis, when conducting a needs analysis both in terms of learning and the condition of the school. At this stage, it produces information from the results of interviews with support teachers related to the development of electronic modules as a support for the learning process and curriculum review. Literature Review related to relevant previous research, as initial supporting data for the development of K3LH teaching materials and Industrial Work Culture for the automotive light vehicle Engineering study program.

The second stage is design, at this stage the preparation and development of teaching materials is carried out, designing an outline of the content of the material (GBIM), the description of the material, material documents, and the preparation of electronic module design instruments.

The third stage is development and implementation, the production process and developing electronic modules. In this stage, we carried a validation of material experts, media experts to get appropriate criticism and development suggestions. Furthermore, trials were carried out on students at "XY" vocational school with the aim of seeing student responses to the electronic modules being developed as well as providing comments and suggestions on the electronic modules being developed.

The effectiveness of the use of electronic modules can be measured based on the validation results carried out by material and media experts. The results of the trials carried out, the K3LH and Industrial Work Culture electronic modules have been declared feasible and effective for use in the learning process. Due to the fact that the developed electronic modules are conceptually organized and employ language that is simple for students to comprehend, and are expected to improve learning outcomes'.

The development of this electronic module includes all K3LH material and Industrial Work Culture in accordance with the implementation of the independent curriculum which is currently being implemented in schools. This electronic module includes material that has been adapted by the automotive world, equipped with a lighter at the beginning of each sub-chapter, as well as a video simulation as an example of the application of the material in any existing work, especially in the automotive sector, complete with questions as a form of evaluating the achievement of the material. In appearance, each material is presented in a sheet, like opening a book sheet in general, but this is in digital presentation, the material is

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presented in as little detail as possible and is accompanied by sample pictures to make it more attractive.

Based on the results of the feasibility testing carried out, it can be concluded that in the development of this electronic module, the first test was carried out by material experts, media, students, and the results of the pretest and posttest. Material experts are related to exposure in electronic module applications and get a response of 94%, which means that this development is very feasible to use. Media experts evaluate media related to the use of modules with an 89% response stating that it is very feasible to use. Students with an average rating related to application users of 89% stated that it was very feasible to use.

Then, after the feasibility test stage, the developed electronic module also goes through the effectiveness test phase in the use of the module. The item validation test is carried out so that the measurement instrument used can be said to be valid and reliable when the measurement is carried out. The normality test is carried out to provide an overview regarding the distribution of the data obtained, the test results state a significance value of 0.200> 0.05 residual data is normally distributed. Homogeneity test significance value 0.268 > 0.05 homogeneous data. Meanwhile, t test significance value 0.000 <0.05 then H1 is accepted in other words there is a difference before and after using the electronic module.

The use of this electronic module is expected to assist in the learning process at school in understanding the material presented so that it can achieve the set learning objectives. The development of this electronic module is effective for increasing student learning outcomes and effective for significant student interest in learning (Raibowo et al., 2020). Students can access this learning module anywhere and anytime, both individually and in groups, can repeat and study this material at any time. The development of this electronic module can be said after testing.

CONCLUSION

Based on the research and development carried out, this research aims to produce electronic modules in the subject of Automotive Engineering for the Automotive Light Vehicle Engineering Vocational School expertise program. The R&D research used a one group pretest-posttest pre-experimental design. According to the result, we have concluded as follows:

1) This research and development resulted in an electronic module on K3LH material and Industrial Work Culture for the Automotive Light Vehicle Engineering study program with the help of the Flip PDF Corporate Edition application. This module is developed using the ADDIE model, and arranged systematically and in accordance with the independent curriculum which is tailored to the needs of students.
2) The results of the electronic module feasibility test on K3LH material and Industrial Work Culture for light vehicle engineering competency vocational students are very suitable for use as study material.
3) The results of testing the effectiveness were obtained based on the validation results (data attached) item > 0.361, the measuring instrument was declared valid and reliable, the Cronbach alpha value was 0.969 > 0.6. Asymp normality results. Sig. (2 - tailed) 0.200 >

0.05 residuals are normally distributed. Homogeneity 0.268>0.05 the variance of the data is homogeneous. The t test 0.000 < 0.05, then H0 is rejected and Ha is accepted. Hence, there is a difference in the use of the K3LH electronic module and Industrial Work Culture on the average pretest learning result of 65.47 and posttest 73.00. As such, the use of electronic modules is very effective in improving vocational school student learning outcomes on K3LH material and Industrial Work Culture.

Regarding research and development of this electronic module, researchers can provide several recommendations for:

1) Teacher and student
   In its use, teachers and students maximize the use of electronic modules in learning as a support for the formation of an industrial work culture for each individual.
2) Curriculum Developer Innovation
   In curriculum development what is needed at this time is development in accordance with the form of independent curriculum implementation. The modules developed in this study can be used as a reference in developing digital-based modules using computers, laptops, tablets and even smartphones as the maximum form of using IT in the learning process.
3) For future research, it is highly expected that improvements will be made both in terms of material and media so that they are even more interactive and can be used as learning materials in a more varied class in accordance with the era of the development of the world of education.

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