DEVELOPMENT MEDIA INTERACTIVE LEARNING INJECTION FOR MOTORCYCLES SMK ENGINEERING DEPARTMENT OF MOTORCYCLE (STUDY CASE SMK PRAKARYA INTERNASIONAL)

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ABSTRACT

Learning Techniques in the SMK Motorcycle International Bandung has some problems. Based on interviews with teachers in the department of automotive engineering techniques in SMK motorcycle International craft Bandung Mr Wawan Gunawan, ST claim that SMK Prakarya International Bandung has two laboratory, namely the practical work lab computer and workshop engine, the facility is quite complete, but the device engine with injection technology is limited, because of high device used to practice on motorcycles with injection technology, besides teaching aids is still very limited, so the practical activities undertaken becomes ineffective and frequent errors resulting components or spare parts become damaged and cannot be reused.

Availability of school computer network laboratory can certainly support the learning process. The condition can be satisfied by the existence of a solution is to build a learning medium for injection motorcycle engineering. Evaluation of the material by using simulation in this instructional media can be an alternative learning because students can feel playing while learning.

Based on the results of tests consisting of a black-box testing and beta with pretest and posttest can be incrase score of evaluation concluded that the media interactive motorcycle injection using this simulation can meet the needs of users in helping to learn about motorcycle injection.

Keywords : Teknik Sepeda Motor, Simulasi, Media Pembelajaran.

1. PREFACE

Vocational High School SMK Prakarya Internasional Bandung is one of the six schools that have programs such expertise is automotive engineering, machining techniques, the use of electric power engineering, and business management, computer and network engineering, and electronics engineering. Motorcycle engineering program is one program that really requires expertise garage work space. Automotive engineering expertise program in vocational craft Bandung International has only one garage space.

Based on interviews with teachers in the department of automotive engineering techniques in SMK motorcycle International craft Bandung Mr Wawan Gunawan, STmenyatakan that CMS International craft Bandung has two chambers, namely practical work engine lab and computer lab, the facility is quite complete, but the device engine with injection technology is still lacking, because of the high cost of devices used to practice on a motorcycle with injection technology, besides teaching aids that there is still very limited so that the activities of a practice be ineffective and frequent errors resulting components or spare parts into damaged and can not be reused, besides that there are constraints on textbooks because they can not simulate a working system so that the engine could cause difficult students understand the material and simulating that of the book, so that when students are working on the evaluation still has not got the maximum value.

SMK craft Bandung International does not have wi - fi network (the Internet) and not all students in engineering a motorcycle has a mobile phone based on Android , but in vocational crafts International has a computer lab , should be pursued developments means learning media that can help students understand the material motorcycle injection . Based on these problems then be made computer-assisted learning media . Application is made interactive learning media to simulate a motorcycle engine practice activities that fit into the real world . Smk International craft because in the absence of the Internet network in SMK International craft then making this application is more suitable because the intranet -based accordance

with existing facilities in Bandung International craft vocational schools have not been using the tools of media applications learning .

Based on the background of the problem can be identified some of the subject matter as follows :.

1. The practice of students' activities often experience an error in the installation of motorcycle components resulting components or spare parts can not be reused .
2. Media instructional books still have limitations in simulating the material in the lesson , so that the results of the evaluation of the student is still not maximum value .

2. CONTENT RESEARCH

2.1 Analysis Sistem

Analysis system can be defined as the decomposition of a system whose whole into its component parts with a view to identify and evaluate the problems , opportunities , barriers that occur and needs are expected to be proposed in the amendments . In the analysis of this system will be discussed on problem analysis , functional analysis , analysis of non - functional , user analysis .

2.2 The Analysis Procedure that is Currently Running

Analysis of current procedures is to analyze the activities of work procedures that occur on the running system . Results of this analysis the activities of a real picture of the sequence of activities learning process carried out by teachers and students in the practice, while the flow of the procedure is as follows :

a. The teacher explains the contents of practice material to the students .
b. Students receive practice material described by the teacher
c. Students practice.

If students have completed the practice , the results of the practice given to teachers for the next rated and allowed to menlanjutan practice to the next matter . If the student has not completed the practice continued to practice next week and should not proceed to the next practice material .

2.3 Learning Media Analysis Using Simulations

Analysis using simulation learning media is media that contains learning materials on techniques motorcycle injection motor therein. Learning media is intended for students of class XI International craft SMK Bandung. The main purpose of this is to produce instructional media learning media that can overcome the limitations of existing props and help students master and understand the subject matter of motorcycle engineering practices that can improve student learning outcomes in subjects motorcycle engineering practice.

Description of learning media technique class motorcycle XI SMK is a media-based learning intranet, therein describe all course materials engineering class motorcycle XI SMK for 1 semester based Education Unit Level Curriculum (SBC) 2013 equipped with simulations of some concepts techniques motorcycle with delivery of interactive for students to play an active role in the learning process so as to better understand the material being studied.

Learning media will be built has 2 main menu, the choice of material per semester, which contains material from each chapter there is a material that is at the end of the training material, and material evaluation menu that contains the form of the questions of the whole chapter is presented. As each explanation of the menu, namely:

1. Material Option Materials engineering a motorcycle that will be given is a combination of text and images so that students can more easily learn and master the material presented, and can interact using the application as a medium to carry out a simulation of the concepts of materials engineering a motorcycle that is presented interactively to students in simulation.
2. Evaluation of Materials,Evaluation of this material is a test of the material that has been studied per semester. On testing these materials students will be given some questions that can be changed by the teacher on the description of the motorcycle and engineering materials students will receive grades based on the number of questions have to answer every question will be given a value of 100, and will be divided by the number of questions that the teacher input

2.3.1 Analysis Material

Analysis of the material the use of simulation in teaching media motorcycle injection technique will be described based on each material relating namely ; The main component material crankcase , piston cylinder block , head of cylinder head , injection system and electrical system . Analysis of the material to be built can be seen in the table

Table 1 Analysis Material

Materi		Kegiatan Siswa	Hasil Akhir
BAB 1	Komponen Utama Pada Cranckase	1. Siswa melakukan prosedur emasangan bagian blok kanan crankcase yakni magnet	Cara kerja bagian crankcase seperti magnet
BAB 2	Blok silinder piston	1. Siswa melakukan pemasangan komponen yang ada dalam silinder seperti piston, ring piston, dan pen piston 2. Siswa melakukan penyesuaian ukuran piston dengan silinder 3. Siswa dapat menghitung kapasitas CC motor berdasarkan ukuran piston dan panjang silinder	1. Sistem dapat menghasilkan kinerja piston 2. Sitem menghasilkan hasil pengukuran kapasitas CC pada motor
BAB 3	Head Silinder	Siswa memasangkan bagian yang ada di dalam head yakni noken as, klep, per klep, rocker arm, dan busi pada bagian pengapian	Sistem dapat menghasilkan cara kerja komponen yang telah dipasangkan.

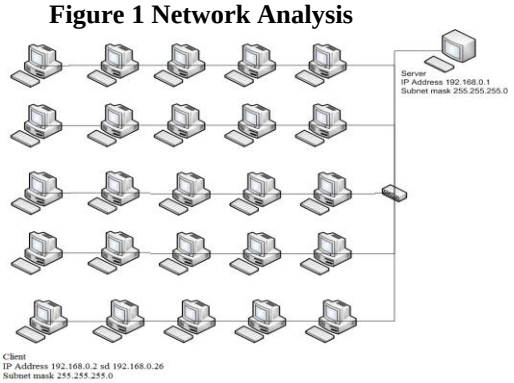
Table 2 Analisis Materi (Next)

Materi		Kegiatan Siswa	Hasil Akhir
BAB 4	Sistem Injeksi	Pemasangan injector pada karrburator injeksi, pemasangan sensor,	Sistem menghasilkan cara kerja karbu injeksi ke seluruh komponen kerja sepeda motor
BAB 5	Sistem kelistrikan	Pengukuran voltase pada aki motor, pengecekan tegangan listrik.	Sistem menghasilkan lampu menyala sesuai dengan aki.

2.3 Analysisi Network

Network analysis using a simulation in interactive learning media motorbike injection for smk in motorcycle engineering will be illustrated by the intranet network (LAN) to be used . Analysis of the network to be built can be seen in Figure 1

Figure 1 Network Analysis



2.3.1 Analysis Requitment Hardware

Analysis of hardware requirements intended that the information system can run well , then the required hardware according to application needs . The following hardware specifications are provided in vocational craft Bandung International , can be seen in Table 3

Table 3 Specifications Hardware SMK Prakarya Internasional

No	Perangkat Keras	Spesifikasi
1	Processor	Processor dengan kecepatan 2.5 GHz
2	Memory	RAM 1 GB
2	Monitor	Monitor dengan resolusi 1024 x 768 pixel
3	Graphic Card	VGA 256 MB
4	Harddisk	50 GB
6	Peranti Pendukung	Papan ketik (*keyboard*) , *mouse*, kabel LAN

2.3.2 Analysis Requitment Software

Software requirements analysis is paramount in supporting the performance of a system . The software used in the system are the commands given to the hardware in order to interact. The software required for the development of interactive learning media injection motorcycle to motorcycle engineering in vocational International craft using intranet -based simulation can be seen in Table 5 .

Table 5 Spesification Requirment

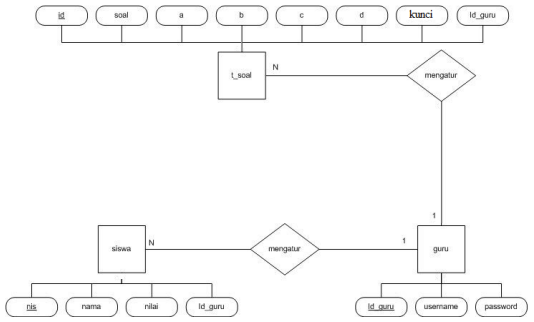
No	Perangkat Lunak	Spesifikasi
1	Sistem Operasi	*Microsoft Windows 7*
2	*Toos* Pembangun	*Adobe Flash CS3*
3	*Tools Design*	*Adobe Photoshop*
4	*Tools Compiler*	*Adobe Flash Player* 15 dan Mozila firefox (*browser*)

The needs of software available to run applications Learning Media Engineering injection Motorcycles can be seen in Table 6 .

Tabel 6 Spesification in SMK Prakarya Internasional

No	Perangkat Lunak	Spesifikasi
1	Sistem Operasi	*Microsoft Windows 7*
2	*Tools Compiler*	*Adobe Flash Player* 14 dan Mozila firefox (*browser*)

2.3.1 ERD



2.4 Functional Needs Analysis Analysis of functional requirements

Describe the activities to be implemented in a system and describes the system requirements necessary for the system to run smoothly and according to need. Modeling system modeled using Data Flow Diagrams (DFD) , Process Specification and Data Dictionary .

2.4.1 Diagram Konteks

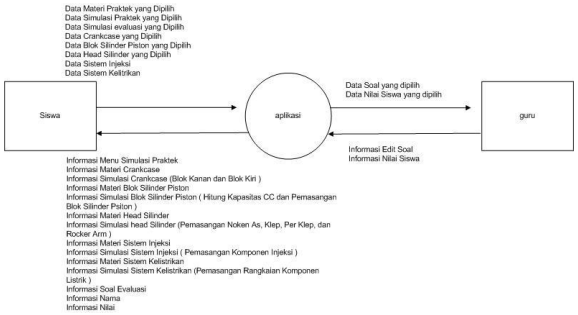


Figure 2 Diagram Konteks

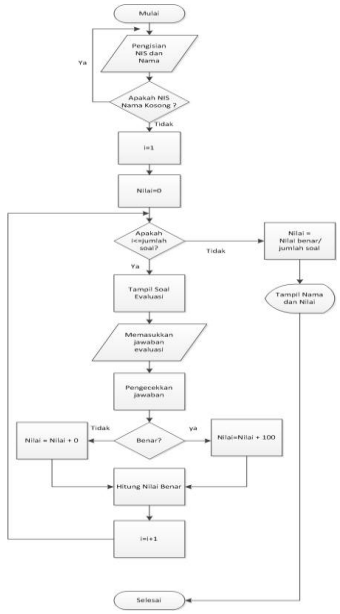
2.4.2 Data Flow Diagram

Data Flow Diagram is a medium that is used to describe the flow of data flowing on an information system . In the Data Flow Diagrams (DFD) consisting of external entities , data flow , and data storage processes . Here is the DFD of instructional media applications and simulation techniques motorcycle

2.4.3 Procedural Design Evaluation

Procedural design for evaluation on a motorcycle instructional media techniques can be seen in figure 3

.



Gambar 3 Flowchart Evaluation

2.4.4 Interface Implementation

Interface implementation is the stage that contains the exposure of each display media that was built along with the files , and HTML5 as the layout of each interface . Following implementation of the interface can be seen in Table 8 .

Table 8 Implementation Interface

No.	Halaman	Deskripsi
1	Menu Utama	Menampilkan menu utama.
2	Menu Pilih Materi	Menampilkan menu pilih materi.
3	Materi BAB 1	Menampilkan materi *crankcase*
4	Simulasi BAB 1	Menampilkan simulasi *crankcase*
5	Materi BAB 2	Menampilkan materi sistem blok silinder piston
6	Simulasi BAB 2	Menampilkan simulasi blok silinder piston
7	Materi BAB 3	Menampilkan materi Head Silinder
8	Simulasi BAB 3	Menampilkan simulasi Head Silinder
9	Materi BAB 4	Menampilkan simulasi sistem Injeksi
10	Simulasi BAB 4	Menampilkan simulasi sistem Injeksi
11	Materi BAB 5	Menampilkan materi sistem kelistrikan
12	Simulasi BAB 5	Menampilkan simulasi sistem Kelstrikan

Here is the main page of instructional media Motorcycle Engineering Injection to be seen in Figure 9 .

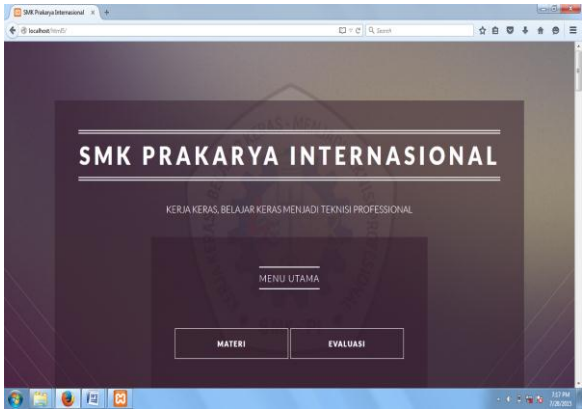


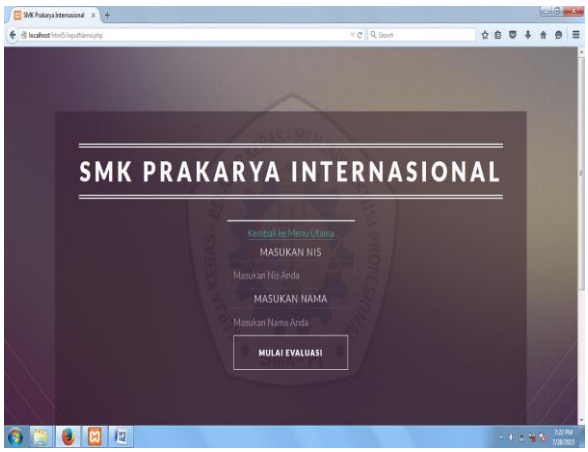
Figure 9 Main Menu page

Here is a menu page views matter and simulation can be seen in Figure 10 .



Figure 10 Page Menu Materials and Simulation

Here is a menu page views matter and simulations can be seen in Figure 11



2.4.5 Testing System

This system test is the most important stages conducted to find flaws or errors in the

software being tested . Testing intended to determine the software that is made already meet the appropriate criteria . Tests conducted namely Black box testing and beta testing .

Testing *Black-box*

In the functional testing phase used is intended to test the new system is to use black box testing . Black box testing focuses on functional requirements of software consisting of test plans and test case results .

2.5 Beta Testing

Tests will be divided into two , namely pre-test and post-test , the first class was given a pretest (test before the lesson as usual) and posttest (testing after learning as usual) . While the second class are given a pretest (test prior to running the application and learning as usual) and posttest (testing after running applications and learning as usual) . Assessment criteria in pretest and posttest are described in the following table :

Table 9 pretest and posttest assessment criteria

Materi yang diuji	Jumlah Soal	Nilai Setiap Jawaban	Total Nilai
- *Crankcase* - Blok Silinder - Head Silinder - Sistem Injeksi - Sistem Kelistrikan	20	5	100

Data analysis techniques to determine the increase students' understanding after treated was analyzed with an average difference in the two is the t test . hypothesis

Control class = 1

Experiment class = 2

H0 : There is an increased understanding of the students after learning media applied electrical car on learning.

H1 : There is a growing understanding of the students after application of interactive learning media injection motorcycle .

To determine the increase students' understanding by using instructional media electrical car, then analyzed the gain normalized score is calculated using the formula :

$$g = \frac{skor\ postest - skor\ pretest}{skor\ maks\ ideal - skor\ pretest} \qquad [2.1]$$

Keterangan :

G = *gain*

To see the students' understanding of the cognitive domains before and after treated (treatment) , it is necessary to processing and data analysis of the pretest and posttest scores . Increased understanding of the students in the cognitive domain after using learning media can be viewed based on the value of the gain is the difference between pretest to posttest scores . Sampling seek gain value can be seen in the calculation below. Pretest and posttest value is taken from the table 4:11 sample 1 class XI TSM no.1

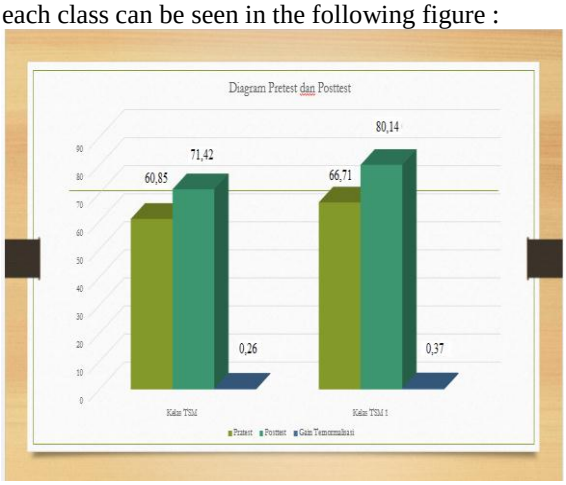
$$G = \frac{70 - 60}{100 - 60} = 0{,}25 \qquad G = \frac{70 - 50}{100 - 50} = 0{,}40$$

(gain ternormalisasi 1) (gain ternormalisasi 2)

The following is a table of control class and experimental class :

Sample 1 Kelas XI TSM 1	Nilai *pretest* 1	Nilai *posttest* 1	Gain ternormalisasi 1	*Sample*2 KelasXI TSM 2	Nilai *pretest* 2	Nilai *posttest* 2	Gain ternormalisasi 2
1	50	70	0.4	1	60	70	0.25
2	50	60	0.2	2	65	70	0.42
3	60	60	0	3	80	80	0
4	70	80	0.33	4	75	80	0.2
5	60	80	0.5	5	60	80	0.5
6	60	70	0.25	6	60	80	0.5
7	80	90	0.5	7	70	90	0.65
8	80	80	0	8	65	80	0.42
9	50	70	0.4	9	60	80	0.5
10	50	70	0.4	10	75	80	0.2
11	50	60	0.2	11	60	70	0.25
12	75	80	0.2	12	60	80	0.5
13	60	60	0	13	70	85	0.55
14	70	80	0.33	14	55	80	0.55
15	60	80	0.5	15	60	80	0.5
16	60	70	0.25	16	65	80	0.42
17	50	60	0.2	17	80	80	0
18	60	60	0	18	70	85	0.55
19	50	70	0.4	19	75	80	0.2
20	55	70	0.33	20	85	85	0
21	70	70	0	21	60	85	0.62
22	65	80	0.43	22	70	85	0.55
23	50	70	0.4	23	50	80	0.6
24	60	70	0.25	24	75	80	0.2
25	50	70	0.4	25	70	75	0.16
26	65	80	0.43	26	75	80	0.2
27	60	70	0.25	27	60	85	0.62
28	60	70	0.25	28	75	80	0.2
29	60	60	0	29	70	75	0.16
30	70	80	0.33	30	60	85	0.62
31	50	60	0.2	31	65	80	0.42
32	70	70	0	32	65	75	0.28
33	70	70	0	33	60	85	0.62
34	70	80	0.33	34	70	80	0.33
35	60	80	0.5	35	60	80	0.5
Rata-Rata	60.85	71.42	0.26	Rata-Rata	66.71	80.14	0.37

Based on the values obtained from class XI - TSM 1 (control group) and XI - TSM 2 (experimental group) , it can be seen the average value for the pretest , posttest and gain of each class .. Below average value flat in the picture using the graph of each class can be seen in the following figure :



Test Data Normalization

To test the normal distribution of data or not , it must be tested normalization , normalization of test results is shown in Table 4.11. For data normality test application uses IBM SPSS Statistics with the following steps :

a. Formulate hypotheses testing normality of the data as follows :

H0 : normal Data

H1 : Data is not normal

equation

D = Ft - Fs = maximum deviation

D = .37-.26 = 0.11

b . See significant value in the Kolmogorov - Smirnova column , using a significance level of 5% (α = 0.05) , criteria for decision-making as follows :

If sig < 0.05 then H0 is rejected

If the normal distribution , then followed by a test of homogeneity . If one class of distributed control and experiment is not normal , it is not tested homogeneity , but used non - parametric statistical test with Mann - Whitney U test that can be seen in Table 4:12 .

Table 4.12 Normalized Test Results

Tests of Normality

	Kelas	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
N Gain	Kelas Kontrol	.166	35	.001	.888	35	.002
	Kelas Eksperimen	.188	35	.003	.911	35	.008

a. Lilliefors Significance Correction

Dari tabel diatas dijelaskan bahwa data tidak terdistribusi normal, yang dapat dilihat dari nilai signifikasi. Nilai signifikasi yang didapat dari gain kelas eksperimen < 0.05, maka data di atas terdistribusi tidak normal. Karena tedapat kelas yang terdistribusi tidak normal maka tidak diuji homogenitasnya

2.6 Conclusion Beta Testing

Based on the test results of pre-test and post-test calculations using IBM SPSS Statistics, it can be drawn some conclusions as follows:

1. There is an average of the changes to the value of the gain in a row in the control and experimental classes is at 0.26 and 0.37. This shows that the injection motorcycle instructional media can enhance students' understanding.
2. The significance value obtained from the experimental class gain is 0.03 <0.05, then the above data is not normally distributed. Since there are classes that are not normally distributed then tested homogeneity, but testing non-parametric statistical test Mann-Whitney U.

Based on the Mann-Whitney U table above shows that the control and experimental classes gain significant value (2-tailed) of 0.02 is smaller than 0.05. Based on testing criteria if the value is significantly smaller than 0.05 then H0 is rejected. It means that there is an increased understanding of the students after learning media applied motorcycle injection on learning.

3 CLOSING

Based on the results of the implementation and testing obtained the following conclusions:

1. The use of simulation can make children more quickly understand a material provided for the simulation the students can remember of what is seen and heard. With the learning media is certainly become a tool that can be used to aid the learning process.
2. Based on the results of the research objectives is to increase the value of evaluation of students, there is an increase in the value of the students after the use of the application on the results of pretest and posttest. It means that there is an increased understanding of the students after learning media applied motorcycle injection on learning.

Suggestions

The material is much more interactive with the addition of sound in the simulation related learning Motorcycle Engineering

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