

## Development of Motorcycle Electricity System *Trainer* Media in Class XI TBSM SMK N 5 Pekanbaru

\*Sonsang<sup>1</sup>, Arden Simeru<sup>2</sup>

<sup>1</sup>SMK Negeri 5 Pekanbaru - Indonesia

<sup>2</sup>SMK Negeri 4 Pekanbaru - Indonesia

\*E-mail: sonsangsimeru93@gmail.com

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### ABSTRACT

One of the existing subjects in the TBSM study program is the maintenance of electricity motorcycles taught in class XI and XII, some basic competencies in this Subject are maintaining system charging, maintaining system ignition, system injection, system starter, and still many again. Based on observation beginning obtained not enough understanding it students in Mastering Subjects Maintenance Electricity Proven Motorcycle results in study students are almost 50 percent student did not pass one reason low percentage completeness score students in the eyes lesson Maintenance Electricity Motorcycle is its hard student in understanding Theory it is because no interestingly the learning media used, plus again Theory system electrician this relate with Suite lots of cables because it was developed a media *Trainer* system electricity this for can Becomes solution from the problem this. Based on the background behind here base learning media development system electricity motorcycle-based *Trainer*, is expected to result in study students could increase from before. Method research used is method *Research & Development* (R&D) type 4D. In research this, the researcher develops something product in the learning process System Electricity Motorcycles in Class XI TBSM SMK N 5 Pekanbaru. System *Trainer* practicality test results electricity motorbikes for teachers and students with a statement on indicator convenience use response tool positive by teachers and students, with so the system *Trainer* electricity motorbikes can use as a medium in learning. Teachers still can develop and use tools this not only limited recognize names, functions, and method work components, but also can do disturbance as well as the solution.

*Keywords: Media Trainer, Electrical System, 4D*



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### INTRODUCTION

Development technology in the field of the motorcycle at the moment this very fast, can see all brand motorcycles in Indonesia already take out product motorbikes that have been controlled by electronics, starting from system ingredient burn, system charging, system ignition, brake system and still many again. Development technology must be followed by vocational schools that have TBSM study programs so that vocational schools can produce graduates who are skilled and can be absorbed in the fieldwork or can open effort alone.

Wrong one eye that lesson in the TBSM study program is the maintenance of electricity motorcycles taught in class XI and XII, some Basic Competencies in this Subject is maintaining system charging, maintaining system ignition, system injection, system starter, and still many again. Based on the observation beginning obtained not enough to understand, students, Mastering the Subjects "Maintenance Electricity Proven Motorcycle" with results study students who are almost 50 percent student did not pass.

Factor external also affects the results study one of the student's factor school. According to Slameto (2010) factor school covers method teaching teacher, curriculum school, teacher-teacher relationship student, relationship student with students, rules school,

learning media, time school, standard the lesson above size, state building, method study and assignments home. In the eyes of lesson maintenance, electricity student's motorbikes are sued for understanding Genre cables from one component to component others, so the teacher must make a learning media that can draw Genre system electricity that motorbike themselves so that students could understand and master the material being taught. Media learning could be interpreted as all something that can deliver and distribute messages from a source by planning to create an environment conducive to learning where the recipient could carry out the learning process efficiently and effectively (Munadi, 2013).

Hasan (2021), stated that learning media is one tool used by educators so that activities learning in progress effectively. Medium is something that can be used for conveying a message from sender to receiver that could stimulate thoughts, feelings, concerns, and interests as well as attention to the student so appearance so that the learning process occurs. Medium is all tool physical that can serve messages and stimulate students to study. In context communication, the media is one of the components of strategy learning which is the receptacle message or forwarded distributor to target or receiver message, and the material you want to be delivered is message learning you want to be achieved is a learning process. Based on Thing the could be interpreted that learning media is a tool used by educators to support the success of the learning process and stimulate interest study students.

Tool *Trainer* demonstration is one of the learning media that contains characteristics typical of learned concepts students in the learning process (Sudjana, 2005). With existing *Trainers*, students not only sued for remembering and seeing existing material but also direct practice/make Suite Theory that, so that student more understand Theory. Hasan (2006) suggests that "*Trainers* are a set of equipment laboratory/workshop used as an educational medium which is a combination between working models and mock-ups, the *Trainer* is aimed at for support learning participant educate in applying knowledge/concepts acquired on objects real". The mock-up model is simplification the arrangement of parts main from a process or more system complicated. From the statement, they could conclude that the *Trainer* is a learning medium in the form of a replica or miniature something simulated and an applied device in activity practicum in the laboratory/workshop that helps and makes it easier for students to understand and master the Theory learning presented.

The appearance of the media *Trainer* will clarify presenting ideas, illustrating or decorating possible facts fast forgotten if not visualized. Hasan (2006) suggests that *Trainers* set equipment in the laboratory used as an educational medium which is a combination between work models and mockups. *Trainer* meant to support learning students in applying knowledge/concepts acquired in Thing real. The mock-up model is simplification the arrangement of parts main from a process or more system complex. thing three dimensions that can be touched and touched by students is an application from media *Trainers*. this medium is made to resolve limitations objects and situations so that the learning process is a permanent walk. Modeling objects or tools and possible props made at cost low could define as a process of forming media from something system.

## METHODS

The method used is *Research & Development* (R&D) type 4D. In this study, researchers developed a product in the learning process of Motorcycle Electrical systems in Class XI TBSM SMK N 5 Pekanbaru.

Model development device learning suggested by Thiagarajan, Semmel, and Semmel (1974); Trianto (2010) is a 4-D Model. this model consists of 4 stages of development that are defined, designed, develop and disseminate or adapted into a 4-P Model, i.e defining, designing, developing, and deploying

## RESULTS

### 3.1 Planning Stage

On Step, this conducted planning tools that will be used as trainees. destination from step this is for designing an interesting and appropriate *Trainer* with a destination from making the *Trainer* alone. For more details, it can be seen in Fig 1 below.

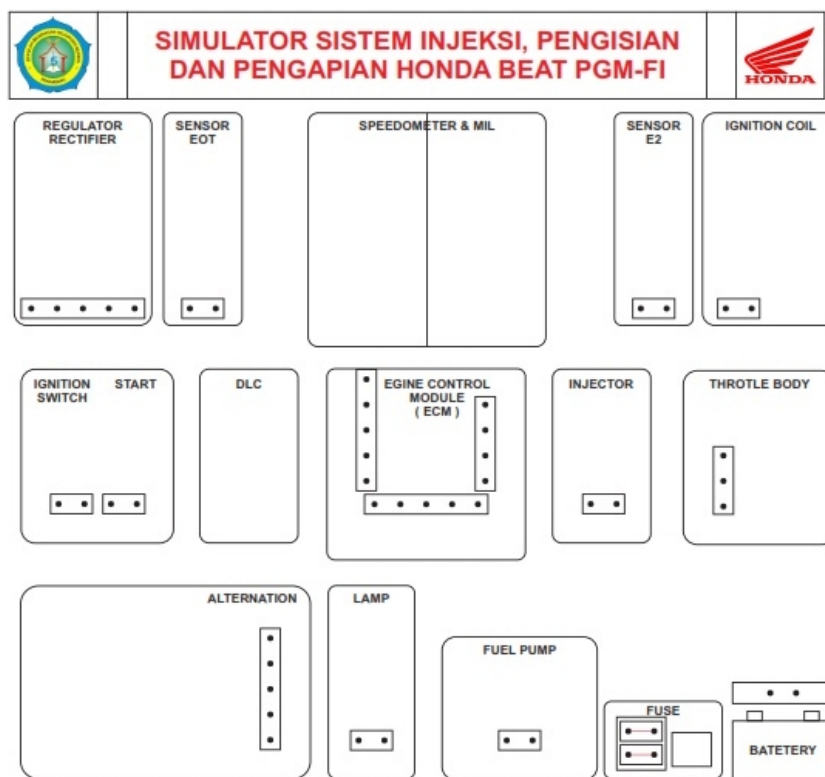


Figure 1 Plan Early *Trainer*/Simulator

In the electricity *Trainer* system, three basic competencies can be taught to students, first, the charging system, the ignition system, and the injection system, where this *Trainer* is equipped with an electric motor that is used to rotate the alternator so that the charging process of the battery, the ignition process, and the system injection ingredients burn so that the process can be observed and understood by students.

### 3.2 Development Stage

This stage aims to get a valid, practical, and effective simulator.

### 3.3 Deployment Stage

Stage The distribution of this media *Trainer* is done with the method to promote this *Trainer* to the teacher who teaches TBSM so that the learning process becomes more

effective and more efficient for the Theory charging system, ignition system, and injection system. More details can be seen in Fig 2 below.



Figure 2. Trainer That Has Been Assembled

Procedure in use this *Trainer* is this *Trainer* equipped with an AC electric motor in use for rotating the magnet that is in the alternator, when this magnet turn so system ignition, charging and system injection on this *Trainer* will work, between This *Trainer* component is connected to a second cable end cable the there is a banana socket, so the student can be disassembled install Suite that.

The network flow system Ignition of this *Trainer* is from Battery ECM ignition coil cable spark plugs, when the magnet rotates so will occur splash the fire spark plug, from set this student will understand the components and methods work from the system ignition of the Network flow system filling this *Trainer* is the alternator (magnet and coil ) regulator/rectifier fuse battery, when the magnet rotates so the mix will produce voltage AC power, voltage electricity this will be processed by regulator/rectifier so that produce DC voltage, voltage this is what will be saved to battery, from set this student could understand function and method work component system charging.

Component system injection could be divided by 3 by line big that is the first sensor is components that can detect changes to the motorcycle sensors in this *Trainer* are the EOT sensor (Engine Oil Temperature ), the O2 sensor (Oxygen Sensor), the TP sensor (Throttle Position Sensor), the second process components, namely processing components things that are detected by sensors called ECM (Engine Control Module), the third component actuator that is components that work based on the order of ECM, components actuator on this *Trainer* pump ingredient fuel (Fuel Pump), Injector, MIL lamp, Ignition Coil. On system injection, this student could understand function components injection, understand method work system injection and perform the ECM reset process.

### 3.2 Validity test

The process of collecting data on the validity of the *Trainer* is a learning process using a questionnaire. The tool validation test phase is carried out so that the feasibility of the product developed can be known based on the assessment of experts. Validation test data was obtained through a validation instrument filled out by 3 validators. The results of the input from the expert were used as material for the first product validation revision carried out by the learning material expert. Sheet validation containing didactic conditions, construction aspects, and terms 4 system. More details can be seen in Table 1 below.

Table 1. System *Trainer* Validation Electricity Motorcycle By Media Expert

No	Item Evaluation	V	Category
Condition didactic			
1	<i>Trainer</i> developed refers to the Honda curriculum in SMK	93.33	Valid
2	Developed <i>Trainer</i> could support activity understanding the concepts presented in learning	86.67	Valid
3	Developed <i>Trainer</i> could increase Effective quality of learning process	93.33	Valid
4	Developed <i>Trainer</i> made with consider character student in learning	80.00	Valid
5	Developed <i>Trainer</i> could guide student in learning	100	Valid
6	Developed <i>Trainer</i> could interesting interest and attention student	93.33	Valid
Average		91.11	Valid
Aspect Construction			
1	<i>Trainers</i> made support destination learning	100	Valid
2	<i>Trainers</i> made load tree materials and details	80.00	Valid
3	<i>Trainers</i> made have identity ( title material )	93.33	Valid
4	Use <i>Trainer</i> could used by simple, clear, and easy understood by students	93.33	Valid
5	<i>Trainer</i> this could used for learning by independent	93.33	Valid
6	Learning with <i>Trainer</i> this Becomes more interesting	86.67	Valid
7	Use <i>Trainer</i> this could increase study student	100	Valid
Average		92	Valid
Condition Technical			
1	Appearance <i>Trainer</i> interesting	93.33	Valid
2	Combination color used appropriate and attractive	80	Valid
3	Components on <i>Trainers</i> clear and able understood	100	Valid
4	Quality appearance <i>Trainers</i> made support material presented	93.33	Valid
5	Lamp in accordance with method work on <i>Trainer</i>	80	Valid
Average		89.33	Valid
Validation Product		90.94	Valid

Validation data analysis results from the *Trainers* questionnaire according to media experts can be viewed for condition didactic 91,11 with valid categories and conditions construction 92 with Valid category and terms technical 89.33 with valid category, so validate this *Trainer* by overall 90.94 with Valid category. From the result, this can be concluded that the system *Trainer* charging, system ignition, and system injection can be used for the study.

### 3.3 Practical Test

The practicality test data was obtained from filling out a questionnaire on the practicality of using the tool as a learning medium the teacher. Practicality data was taken through a questionnaire filled out by subject teachers, workshop heads, and heads of motorcycle business engineering departments. The charging result questionnaire practicality by the teacher can see in Table 2 below this as follows.

Table 2. Practicality Results by Teacher

No	Item Rating	V	Category
Theory			
1	Trainers used this already in accordance with desire user	95	Very Practical
2	Use Trainer could cause interest study student	90	Very Practical
3	Study use Trainer this could make student more fast understand Theory	95	Very Practical
4	Use Trainer this could make learning more interesting	90	Very Practical
5	Developed Trainer can be implemented by the teacher	95	Very Practical
6	Designed Trainer in accordance with Theory learning	85	Very Practical
7	Use Trainer this can save time in presentation Theory	95	Very Practical
8	Developed Trainer can Becomes Trainer independent	90	Very Practical
9	Trainer this can used because have clear instructions	90	Very Practical
10	Trainer this help the teacher give experience study for student	95	Very Practical
11	Trainer this could help teachers develop knowledge student	95	Very Practical
12	Learning process use Trainer centered to student	80	Practical
13	With existence Trainer this as learning aids in convey Theory	95	Very Practical
14	Trainer the easy understood by students	85	Very Practical
15	As motivation study for student	95	Very Practical
Average		91.33	Very Practical

Based on the teacher's response table about the practicality of the motorcycle electrical system *Trainer*, it can be seen that the average teacher's response to this *Trainer* is 91.33, which can be categorized as very practical. Practicality is related to convenience in the use of developed tools. Practicality data was obtained through a questionnaire filled out by practitioners. The practicality of using a motorcycle electrical system *Trainer* as a learning medium was also obtained from student responses about the practicality of using the simulator which can be seen in Table 3 below.

Table 3. Practicality Results Based on Response Student

No	Rated aspect	V	Category
Ease of Use of Media Simulator			
1	By using this trainer I can find out the learning objectives that I am doing	94	Very Practical
2	I can learn ignition system, filling system and injection system with this trainer	95.33	Very Practical
3	I can follow the learning stages in this trainer	88	Very Practical
4	I find it easy to use this trainer	91.33	Very Practical
5	I can understand the workings of the ignition system, filling system and injection system	96.67	Very Practical
6	I can follow the instructions in the ignition system, filling system and injection system trainer	88	Very Practical
7	This trainer motivated me to learn about ignition systems, filling systems and injection systems	94	Very Practical
8	This trainer interest me to learn about ignition system, filling system and injection system	91.33	Very Practical
9	Improve my ability to do theory theory and working on ignition system, filling system and injection system	93.33	Very Practical
10	My understanding of the learning process has increased	89.33	Very Practical
11	I understand the material clearly	86	Very Practical
Average		91.58	Very Practical
Time Used In Implementation			
12	It didn't take me long to learn about the ignition system, filling system and injection system with the help of a trainer	88.67	Very Practical
13	The time used is quite efficient	90.67	Very Practical
14	This trainer helped me make it easier to understand the material on ignition systems, filling systems and injection systems	92	Very Practical
15	This trainer can facilitate me to study independently	88.67	Very Practical
Average		90.00	Very Practical

No	Rated aspect	V	Category
<b>Media Appeal</b>			
16	The language used by this trainer is easy to understand	90.67	Very Practical
17	The information in the simulator is clear	92	Very Practical
18	Is this trainer good?	93.33	Very Practical
19	Nice trainer color combination	94	Very Practical
20	Do you agree with this new trainer	94.67	Very Practical
<b>Average</b>		<b>92.93</b>	<b>Very Practical</b>

Based on the student response Table 3 about the practicality of using ignition system trainers, filling systems, and injection systems as learning media, it can be seen that the average score of the ease of use of the simulator media is 91.58% with the "very practical" category, judging from the time spent in implementation that the average score is 90.00% in the "very practical" category, and judging from the attractiveness of the media that the average score is 92.93% in the "very practical" category. So it can be concluded that the simulator developed is very practical based on student responses.

### 3.4 Media Trainer Effectiveness Test

The effectiveness of using a motorcycle electrical system trainer as a learning medium for motorcycle electrical system maintenance is obtained from the achievement of student learning outcomes after using this trainer. Student learning outcomes compare the control class with the experimental class. The exam process is carried out at the end of the lesson using the Google Form system with a total of 40 questions.

### 3.5 Realm of Knowledge

Table 4. Normality Test, Homogeneity Test, and Hypothesis Testing The use of a motorcycle electrical system trainer.

No	Parameter	Class		Information
		Control	Experiment	
1	Average	76.29	83.56	$X_{\text{hitung}} < X_{\text{tabel}}$
2	Test Normality	$L_0 = 0.120$ $L_t = 0.154$	$L_0 = 0.108$ $L_t = 0.156$	Distributed normal
3	Test Homogeneity	$F_{\text{count}} = 0.91$ $F_{\text{table}} = 1.82$		$F_{\text{count}} < F_{\text{table}}$ variance Homogeneous
4	Test Hypothesis	$t_{\text{count}} = 4.560$ $t_{\text{table}} = 0.031467$		$t_{\text{count}} > t_{\text{table}}$ Hypothesis accepted

Based on the results in Table 5, seen that results study students in class experiment have scored average class taller compared with class control.

### Realm of Skill

Table 5. Assessment Results Realm of Skills

No	Meeting	Competence Skills			
		Experiment		Control	
		%	Criteria	%	Criteria
1	Meeting 1	83.08	good	65,40	Enough
2	Meeting 2	86	Very good	57.83	Not enough
3	Meeting 3	87.12	Very good	55,30	less g
<b>Average</b>		<b>85.27</b>	<b>Very good</b>	<b>59.51</b>	<b>Not enough</b>

From Table 5 above the score for Skills, every class meeting \_ experiment is taller than

class control, which can be concluded that the use of media trainers can increase the aspect Skills students.

Table 6. Test Results of Using Media Trainer Against Realm of Affective Student

No	Meeting	Competence Skills			
		Experiment		Control	
		%	Criteria	%	Criteria
1	Meeting 1	86.616	Very good	42.172	Not enough Very
2	Meeting 2	89,646	Very good	43,939	Not enough Very
3	Meeting 3	88.64	Very good	43,939	Not enough Very
Average		88,300	Very good	43.35	Not enough Very

Table 6 could see that the third observed meeting During process learning shows that media trainers are capable increase aspect attitude in learning. For aspect, the ability gives responses used for digging and sharing information from each group, on class experiment even reach criteria well. If compared with the KKM domain at school so score effective student has reached completeness, KKM which set in school is 75.

Studying this produces a learning media in the form of a motorcycle electrical system trainer that can be used as a learning medium for subjects understanding the motorcycle electrical system. The development of this simulator is based on initial observations of the learning process to find out what problems, obstacles, and phenomena are encountered in the field in connection with learning.

Furthermore, the authors conducted a needs analysis (need analysis), including unit analysis in teaching and identification of the material needed. This tool has gone through the stages of testing its validity, practicality, and effectiveness. The validity test is done by asking the opinion of experts through validation. Aspects that are validated in this tool contain didactic requirements, construction aspects, and technical requirements, from the trials, conducted, the results show that all of these aspects are valid. Practicality test was carried out by asking the opinion of teachers and students through a practicality questionnaire sheet. From the practicality test, it is known that the resulting product is in the very practical category to be used as a learning medium. Trial effectiveness conducted with the method see an average comparison of class control and class experiment, where from the results study this can be seen class average experiment taller than class control

## CONCLUSIONS

A motorcycle electrical system trainer media has been successfully developed for learning motorcycle electrical maintenance at SMK N 5 Pekanbaru which has gone through the stages of testing validity, practicality, and effectiveness. The results of the analysis of the validity of data from 3 expert opinions, motorcycle electrical system trainers, it is known that the average value is: didactic requirements 91.11 with valid categories, construction aspects 92 with valid categories, and technical requirements 89.33 with valid categories. So when viewed from the total results, the overall average score is 90.94 with a valid category. The results of the data analysis seen from the practicality based on the responses of 4 (four) teachers responses about the practicality of the motorcycle electrical system trainer, can be seen that the average teacher response to this trainer is 91.33%, which can be categorized as very practical and the results of data analysis can be seen from practicality based on student responses, it is known that the



average score of the ease of use of the simulator media is 91.58% with the "very practical" category, judging from the time used in the implementation that the average score is 90.00% with the category "very practical", and judging from the attractiveness of the media that the average score is 92.93% in the "very practical" category results study students in the class experiment have scored average class taller compared with class control. On test normality data saw that data on the second class have  $Lo < Lt$ , which means data is distributed normally, next conducted test homogeneity data. From the data, it can be seen that the second class sample has  $F_{count} < F_{table}$  which means the data obtained have homogeneous variance. Results test normality and test homogeneity data show that data are distributed normally and have homogeneous variance, so a testing hypothesis to test is used. After being tested statistics is known that the hypothesis is accepted.

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