PROCEEDINGS

4th International Conference on Technical and Vocational Education and Training (TVET)

Theme:
Technical and Vocational Education and Training for Sustainable Societies

Padang, November 9-11, 2017
at Hospitality Center
Universitas Negeri Padang

ISBN : 978-602-1178-21-8 (1)

Penerbitan & Percetakan
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Cetakan :

- Kesatu, Agustus 2018

Publisher:
UNP PRESS
Jln. Prof. Dr. Hamka Air Tawar Padang
West Sumatra – Indonesia

Penerbitan & Percetakan
UNP PRESS

ISBN 978-602-1178-21-8 (1)

9 786021 178218

FOREWORD

Welcome for all respected scholars, researchers, post graduate studentsand especially Keynote Speakers to the 4 ICTVET. The theme of the conference focus on Technical and Vocational Education and Training for sustainable societies and consist of six subthemes. i.e Development of learning model on TVET, Workplace Learning and entrepreneurship, Innovationon applied engineering and information technology, Management and Leadership on TVET, Vocational and Technical Teaachers education, and Assessment and Evaluation on TVET.

Sustainable society shoul be followed by the improvement of various factors that have impacts to the quality of vocational and technical education and training, particularly to overcome the competitiveness of the world business. As we have already known the rapid change of technology as well as the change of demography, having a great effects to the life of peoples in this world, The competitiveness need a collaborativeness to survive the life of millions peoples who lost their jobs. Young peoples as aproductive generation have to be creative and innovative to face the competitiveness. So this prociding contents consist of various findings of research in the field of vocational and technical education as well as applied technology and mainly based on the subthemes of the conference.

Finally, we would like to thank a million for all participants of this conference and all parties who support the success of this conference. Hopefully the seminars and scientific work of this seminar can be a reference material for basic education and elementary school teacher education in Indonesia.

Padang, July 2, 2018

Tim Editor

CONTENT PROSIDING ICTVET 2017 REPOSITORY UNP

ELECTRONIC COMPONENT TESTER AS A LEARNING MEDIA FOR CLASS X STUDENTS AUDIO VIDEO ENGINEERING SMKN 1 SUMBAR

Delsina faiza[1], Thamrin[1], Ahmaddul Hadi[1], Yongki Saputra[1]

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ABSTRACT: This research aims to produce instructional media in the form of Electronic Component Tester on Electrical and Electronics basic subjects of X class students majoring in Audio Video Engineering. The method used in this research, especially in designing electronic component tester is Research and Development (R & D) method, which consists of designing, validation, revision, product manufacture, and testing. manufacture of electronic component tester covering hardware and software. the hardware consists of Atmega328 microcontroller as a control center, LCD as component data display output, LED as indicator tool and three terminal as component test terminal to be tested. The next step is to test the percentage of success and the level of eligibility percentage. The percentage of success is done by comparing the test results of components tested using a component tester with physical data components, datasheet, and multitester measuring instruments and LCR Tester. The level of identification of successful test of the electronic component tester in conducting a test of passive and active electronics component yield average success percentage of 97,14%. The feasibility percentage level is measured using validation instruments with a presentation in terms of physical, technical and instructional design aspects that are tested by the teachers and media expert. The result of the feasibility percentage test based on the overall aspect according to the teacher on average is 89,93% with very feasible category and result of a percentage level feasibility test of an overall aspect according to media expert on average equal to 89,93% with category worthy to be used as medium of learning.

Keywords: Electronic component tester, Learning media, Product Based Learning, Electrical and Electronic Basic

1. INTRODUCTION

Sekolah Menengah Kejuruan (SMK) is one type of formal education institutions for students who want to gain expertise in a particular field. SMK was established to create graduates to be ready for work according to their interests and talents. The goal become the foundation for all SMK in Indonesia, one of which is SMKN 1 Sumatera Barat (Sumbar) which has seven expertise programs such as Audio Video Engineering, Mechatronics, Building Image Engineering, Engineering Technique, Automotive Engineering, Welding Technique and Electric Power Installation Technique.

Audio Video Engineering (Teknik Audio Video/TAV) expertise program is a new skill program that formed at SMKN 1 Sumbar. Based on the information of one of the teachers at SMKN 1 Sumbar, Dra.Hj. Enny Erita, M.Pd TAV expertise program became the favorite program in SMKN 1 Sumbar since the number of students enrolling exceeded the specified quota.

Basic Electrical Electronics is one of the productive subjects taught in the department of TAV. This subject is theoretical and practices given to students of class X with the number of meetings of 4 × 45 minutes per week. The learning process is divided into 2x45 minutes for theory and 2x45 minutes for practice. To give understanding to students before the practice begins, the teacher gives the theory of learning first.

On the subjects of Basic Electrical Electronics class X SMKN 1 West Sumatera academic year 2017/2018 using Curriculum 2013. Subject matter in Basic Electrical Electronics according to syllabus include:

Tabel 1. Basic competence of Basic Electrical Electronics subjects to be applied

Competency standards (SK)	Basic competencies (KD)
Basic Electrical Electronics	1. Identify passive and active electronics components 2. Describe the properties of passive and active electronic components. 3. Explain the concept of electronic circuits

Source: Silabus Teknik Audio Video kelas X

Each basic competency aims at providing knowledge and skills to students to lead to

competence standards on the basic principles of electronic components. Basic Electrical Electronics subjects included in the category of subjects who have difficulty high enough.

Class X TAV is divided into 2 groups which are group TAVA and TAVB, If the total student in a class X 32 students, they will be divided into 16 students per group. Arrangements are made to make it easier for teachers to monitor students while the learning process takes place. However, even with very few students, teachers are often less able to master the class. This is because the existing learning process has not been effective to provide an explanation that is easy to understand and make students less interested to learn it. Students also tend to be less motivated in following the learning activities which will make the students become difficult to understand.

Based on the data of student learning outcomes in the basic subjects of Electronic Element at the odd semester of the academic year 2016/2017 is still relatively low. It can be seen from the result of student learning which shows that 41% of X grade students are not able to achieve the value of learning mastery at least 78. In fact, a class is called thorough learning when in the class there are at least 85% of students who reach the value according to a minimal value.

Learning outcomes achieved by students are influenced by two main factors, and the factors are within students and the other come from outside the student or environmental factors. The first factor also includes the ability that the student has, the motivation to learn, interests and attention, attitudes and habits of learning, diligence, social economic, physical and psychological factors. Meanwhile, the second factor also includes the quality of teachers, methods of teaching teachers and learning tools (Sudjana, 2005: 39). Learning devices are facilities that support the learning process, be it the room, workshop, laboratory and learning media. Of the factors that exist, the most likely factor to note is the use of learning media.

The learning media used by teachers in the TAV skills program is the powerpoint presentation program. Whereas in Basic Electrical Electronics subjects a lot of abstract material that actually cannot be explained only with a writing but must be supported by other media that can describe the actual condition.

One of the solutions to solve this problem is with the Electronic Component Tester. This media is made in mini-form, making it more effective in explaining the concept of electronics components in theory learning. So that it is possible with real applications, the media becomes more interesting and can make the students better to remember the knowledge of each component of electronics. Learning is also focused on students, by applying the concept of demonstration learning to explore student ideas.

2. RESEARCH METHODS

This research is using two type method, where the first is Research and Development, the second method is experimental research. Sugiono (2013: 297) "The research method used to produce a particular product, and test the effectiveness of the product". In Sugiono's book, it is explained that the stages in R & D research begin from potential and problems. Problems faced by the low learning outcomes of students in the Basic Electrical Electronics, an abstract subject matter that actually cannot be explained only by a writing but must be supported by other media that can describe the actual condition, and there is no appropriate learning media to explain subject matter Basic Electrical Electronics.

The R & D strategy consists of Analysis, Product Design, Design Validation, Design Revision, Product Trial.

2.1 Analysis

This stage is done through field study and literature study. Field studies were conducted by direct observation to schools that will be used for research. Observations made is to interview the school teachers Electrical Electronics about the learning media used in learning Basic Electrical Electronics. The purpose of the observation to determine the needs of learning media Basic Electrical Electronics.

Subsequent analysis of literature study activities. Literature study is done by conducting the theoretical study through books and other sources of information related to learning media Basic Electrical Electronics which will be developed.

2.2 Product Design

2.2.1 Hardware Design

In hardware design is made by taking into consideration the needs of SMKN 1 Sumbar with the expertise program of TAV. Learning media is designed to be shaped like a portable measuring device. Product design is made using EAGLE Software for hardware design. As for graphic design is made using Corel Draw X6. Product design consists of Trainer and Module usage.

Designing in the manufacture of hardware and the main components that form the system is made. Figure 1 shows the block diagram of the system to be designed.

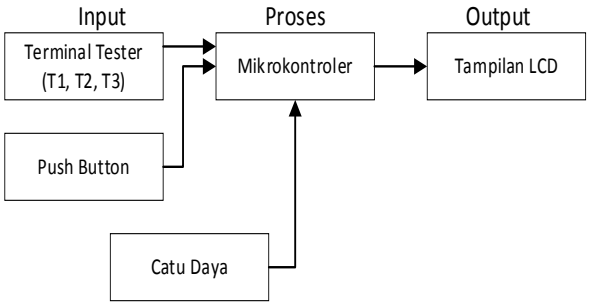


Figure 1. Block Diagram of the system design

2.2.2 Block Input Tester

Tester point has 3 terminal that serves as a detection of the type of component that is used. First, the components are placed on the terminal component of the tester. Then, the program will initialize based on the difference of voltage and current on each connection ports.

2.2.3 Minimum System Block

The minimum system serves as a basic set of microcontrollers that are used as the heart of the circuit system and the data processing program that we input through the downloader.

2.2.4 Display Block

The display block serves to display the measured data of detected components at the terminal tester. After component data obtained, then the data will be processed in accordance with the program that we have entered on the microcontroller and then displayed on the LCD screen.

2.2.5 Power Supply Block

The power supply circuit plays an important role in the activation of the tester component circuit. Besides acting as a supply voltage This power supply also acts as a voltage approximation regulator at Tester point terminals.

The following series of electronic component tester:

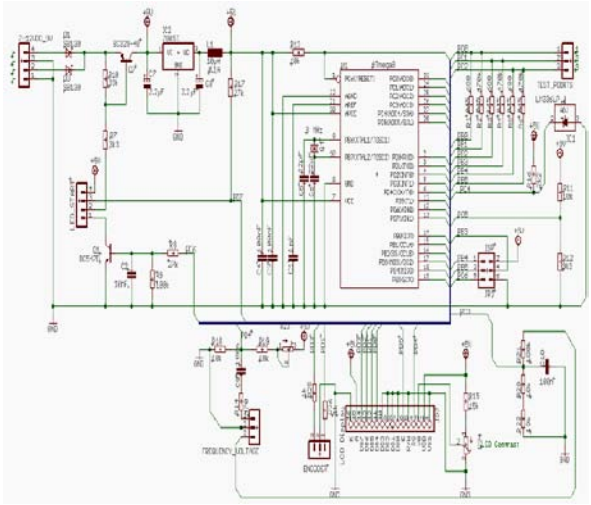


Figure 2. electronic component tester scheme

2.2.6 Software Design

Based on the working principle of the series above can be arranged in the form of the flowchart as follows:

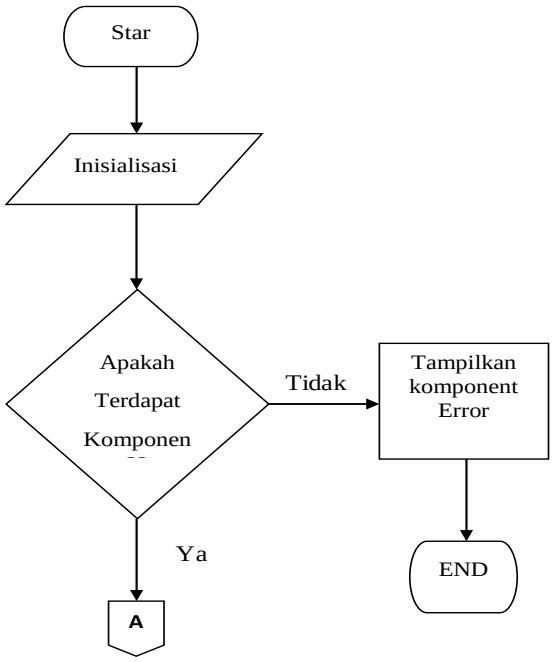


Figure 3. Flowchart part 1

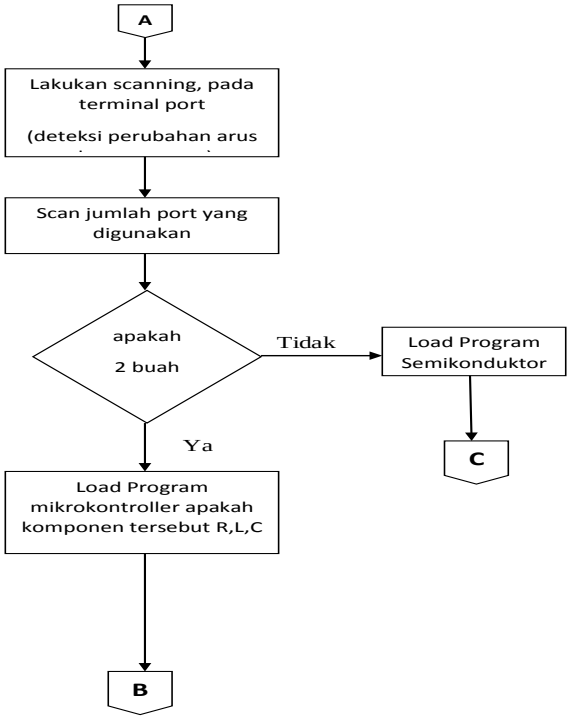


Figure 4. Flowchart part 2

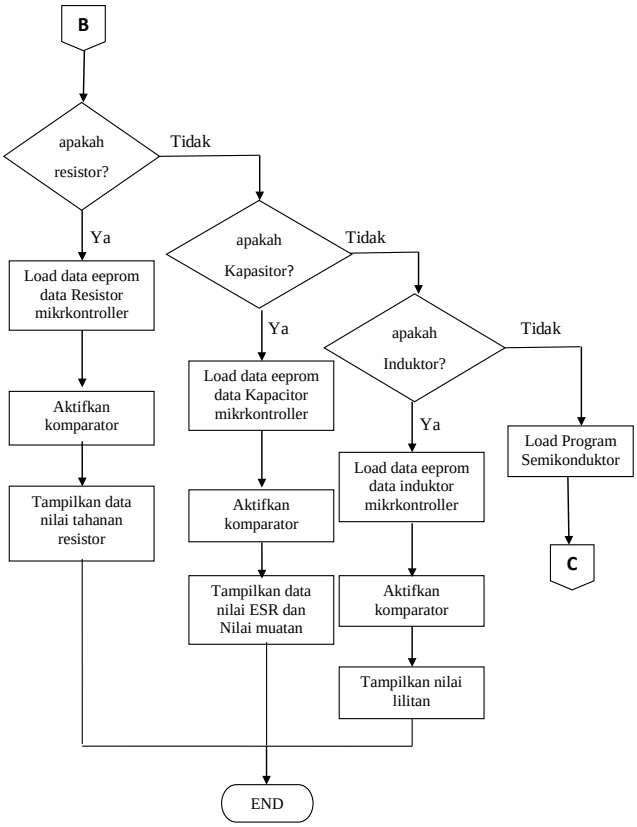


Figure 5. Flowchart part 3

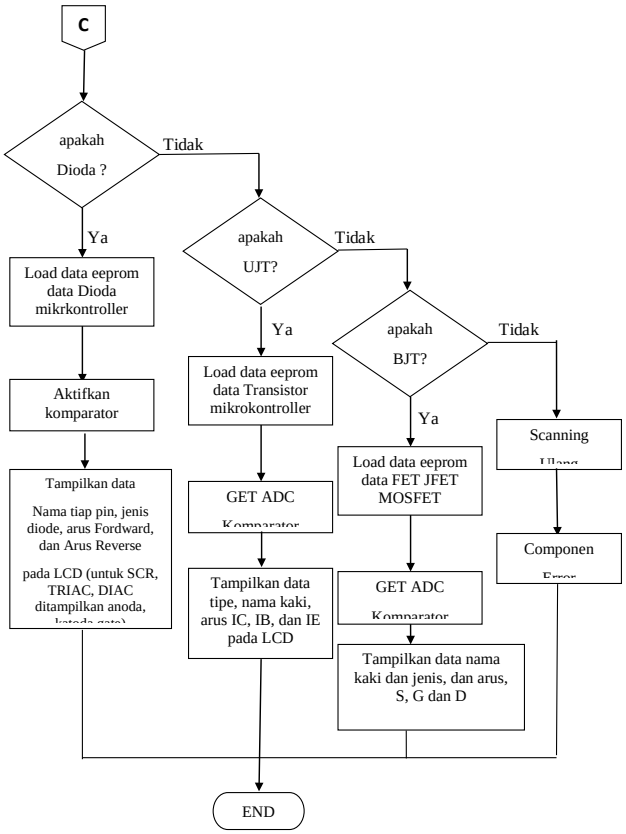


Figure 6. Flowchart part 4

a. Product Validation

To test the validity of circuit layout, simulation was done using electronic software. After the results obtained in accordance with the theoretical then proceed to the next stage.

b. Design Revision

The revised design is the use of a voltage source, in addition to using a battery can also use a power supply.

c. Trial of Product

At this stage is done assembly of components, so the resulting physical form of the tool as follows:

No	Display Electronic Component Tester Condition	Notes
1		Off condition
2		Battery Condition
3		The tested component is damaged or the component has not been connected to the terminal probe

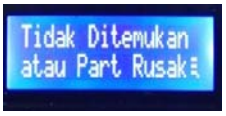
No	Display Electronic Component Tester Condition	Notes
1		Off condition
2		Battery Condition
3		The tested component is damaged or the component has not been connected to the terminal probe

Figure 7. The result of making the tool

To know the success rate of the tested electronic component tester. Some components will be tested by type using an electronic component tester. The reading result of the electronic component tester compared to the commonly used electronic component test instrument is multitester and LCR Tester then compared with the result of physical value calculation. The comparison result is processed to calculate the percentage of success rate of electronic component tester in conducting test of passive and active electronic components.

Questionnaire is a data collection technique that is done by giving a set of questions or written statement to the respondent to be answered. Questionnaire is used to determine the percentage level of media component tester eligibility. Respondents involved in data collection are subject teachers applying the basic of electronics and lecturer of electronics as media expert. The product will be applied in learning when it has been declared eligible by experts.

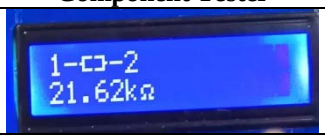
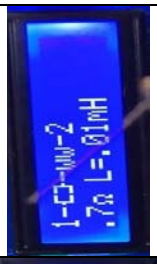
3. DISCUSSION

Through the process of collecting materials and theoretical basis to the work process, has made an Electronic Component Tester tool.

Tablel 1. Information on electronic component tester

The component tester tool is capable of testing some passive and active electronic components such as resistors, capacitors, inductors, transistors, diodes, FETs, and thyristors.

Table 2. Display component testing using electronic component tester

No	Components name	Display of Electronic Component Tester	Display Notes
1	Resistor		1 and 2 are the probes used to test the resistors and 21.62kΩ are the values of the resistors tested
2	Capacitor		1 and 2 are the probes used to test the capacitor. V loss is the percentage of voltage that is passed 3313nf is the value of the tested capacitor. ESR is the equivalent value of the resistance of the tested capacitor.
3	Inductor		1 and 2 are the probes used to test the inductor. 0.7 represents the value of the inductor resistance. L is the value of the inductor being tested
4	Diode		1 and 2 are the probes used to test the leg diode 1 as cathode and leg 2 as anode. Ir = Reverse current 48pF-31pF is the diode capacitance at 5V voltage
5	Zener Diode		1 and 3 are the probes used to test the zener diode. Leg 3 terminal of zener cathode and foot 1 terminal of zener anode. Vt is the forward voltage of the zener diode and 3063mV is the breakdown voltage of the zener diode

6	Transistor		PNP or NPN is the type of transistor tested. 123 = Base pin position, Collector, and Emitter on Ie = Emitter foot current Ic = Collector foot collector The transistors are tested. B = beta value or HFE in the transistor under test. Vbe is the emitter-base voltage ICEO is the cut off current of the transistor collector under test
7	Mosfet		N-E-MOS = is the type of Mosfet tested. 123 = GDS is Gate pin position (G), Drain (D), Source (S) in the tested mosfet. The diode and figure symbols are the position of the diode in the mosfet. Vt is the diode voltage in the forward condition of the mosfet.
8	Triac		123 = 12G is the position of the legs of Terminal 1, Terminal 2, Gate on the Triac. Vt is the voltage at moment of triac under On state condition

After testing several active and passive electronic components using electronic component tester and compared using multitester measuring instrument, LCR Tester and datasheet percentage of electronic Component Tester success rate as in table 4.

Table 3. Average Percentage Success Rate.

No	Component Type	Rate of Success (%)
A.	**Passive**	
1	Resistor	90
2	Capacitor	100
3	Inductor	80
B.	**Active**	
4	Dioda	100

5	Transistor	100
6	Mosfet	100
7	Thyristor	100
The percentage of success rate		**97,14**

Based on the data in table 4, the average percentage success rate of electronic component tester in conducting test of passive and active electronics component is 94,17%. Based on the data it can be concluded that the electronic component tester has the ability to test passive and active electronic components so that it can meet basic competence in Basic Electrical Electronics subject that is identifying passive and active electronics component.

The testing phase on the feasibility of using Electronic Component Tester as a learning media is done using validation test which includes validation by subject teachers applying Basic Electrical Electronics and validation of media experts by electronics lecturers.

3.1 Teacher Validation Test Results

This validation test is an assessment questionnaire that is assessed by the subject of Basic Electrical Electronics subject as a material expert. Assessment is reviewed on three aspects: physical, technical and instructional design aspects.

Table 4. The result of the validation test by the subject teacher

No	Aspect of Assessment	Average Score	Σ Score Results	Σ Maximum Score Results	Percentage (%)
Teacher 1					
1	Physical Design	3,625	29	32	90,63
2	Technical	3,889	35	36	97,22
3	Instructional	4	16	16	100
Percentage of Overall Aspects Of Teacher 1					95,95
Teacher 2					
1	Physical Design	3,375	27	32	84,38
2	Technical	3,444	31	36	86,11
3	Instructional	3,25	13	16	81,25
Percentage of Overall Aspects Of Teacher 2					83,93
Average percentage of all Aspects of Teacher					83,91

Based on table 5 validation data analysis, percentage eligibility of electronic component tester obtained from the assessment of all aspects by teacher 1 of 95.95% with the category is very suitable to be used as a medium of learning. For the results of data analysis of teacher validation 2 based on the assessment of the overall aspect, the electronic component tester eligibility percentage level of 83.91% with the category is very suitable to be used as a medium of learning.

The average percentage gain of electronic component tester eligibility level in all aspects as a medium of Basic Electronic Element subjects tested to two subjects of SMK subjects is 89.91%. Based on the percentage of feasibility level data from all aspects, it can be concluded that electronic component tester is feasible to be used as a medium of learning in SMK on Basic Electrical Electronics subjects.

3.1.1 Media Expert Validation Test Result

This validation test is a questionnaire assessment assessed by two lecturers as media experts. Assessment is reviewed on three aspects: physical, technical and instructional design aspects.

Table 5. The Result of Validation Test by Media Expert

No	Aspect of Assessment	Average Score	Σ Score Results	Σ Maximum Score Results	Percentage (%)
Media Expert 1					
1	Physical Design	3,375	27	32	84,38
2	Technical	3,444	31	36	86,11
3	Instructional	3,5	14	16	87,5
Percentage of Overall Aspects Of Media Expert 1					86
Media Expert 2					
1	Physical Design	3,875	31	32	96,88
2	Technical	3,556	32	36	88,89
3	Instructional	4	16	16	100
Percentage of Overall Aspects Of Media Expert 2					95,26
Average percentage of all Aspects of Media Expert					90,63

Based on Table 6 the percentage eligibility of electronic component testers obtained from the assessment of all aspects by media expert 1 of 86% with the category is very suitable to be used as a medium of learning. For the analysis of media expert 2 validation data based on the assessment of all aspects, the electronic component tester eligibility percentage level of 95.26% with the category is very suitable to be used as a learning medium. The average percentage gain of electronic component tester eligibility level in all aspects as a medium of Elementary Electronic

Element subjects tested by two media experts is 90.63%. Based on data percentage level of eligibility of the whole aspect can be concluded that electronic component tester worthy to be used as a medium of learning.

4. CONCLUSION

Based on the discussion, it can be concluded that:

a. Electronic Component Tester made is already operating properly in identifying passive and active electronic components.
b. Electronic component tester has the ability to test passive and active electronic components so that it can meet basic competence in Basic Electronic Element subject that is identifying passive and active electronics component.
c. Based on the percentage of feasibility level data from all aspects tested by teachers and media experts, it can be concluded that electronic component tester is suitable for learning media.

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