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OPENING SPEECH FROM RECTOR OF UNESA

Assalamu Alaikum Wr. Wb.,

Good morning Ladies and Gentlemen, allow me in this opportunity to open this conference by first praying our grateful and praise to Almighty God for all His blessings, grace, and mercies that have made us possible to gather here in this room in excellent condition and health.

Dear distinguished guests and participants of the **The International Conference on Vocational Education and Electrical Engineering (ICVEE) 2015 with the theme –Overcoming Challenge towards Asean Economic Community (AEC) 2015 in Profesional Qualification on Vocational Education and Electrical Engineering”**. Universitas Negeri Surabaya (Unesa) is very pleased to host this conference in Surabaya.

I believe the conference will provide an opportunity for participants to disseminate new knowledge specially in Vocational Education, Electrical Engineering, and Informatics major, and share recent experiences and knowledge as well as new practices, technologies, and new concept.

My sincere appreciation also goes to all Keynote Speakers who have volunteered and spent your tight schedule to contribute to this special event in Surabaya. Your contribution to this conference and specially to Indonesia is highly appreciated.

Greatest thanks are due to all our Organizing Committee members for their dedication and continuous efforts and hard work in preparing as well as organizing this conference with the supports from Unesa lecturers and students. To our main and supporting sponsors and donors, our most gratitude and thanks for their generous contributions to make this conference possible.

Greatest thanks also to our participants, especially those who have contributed technical papers, thank you for your participation in this conference. I am convinced that this conference will be inspiring, and wish you all a successful and memorable time.

I would like to sincerely congratulate all of you to have fruitful conference and discussions and enjoy meeting new friends and colleagues and to take advantages to support your profession during this conference. I wish you all have a truly sweet memory and enjoyable stay in Surabaya.

Wassalamu Alaikum Wr. Wb.,

Prof. Dr. Warsono, M.S.

Rector of UNESA





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ADDRESSING MESSAGE FROM DEAN OF FACULTY OF ENGINEERING UNESA

Honorable Rector of Universitas Negeri Surabaya, Prof. Dr. Warsono.

Honorable Speakers and Participants,

Distinguished Delegates, Guests, Ladies, and Gentlemen.

Assalamu Alaikum Wr. Wb.,

I am sincerely glad to welcome all you here, especially as I see very many familiar colleagues, friends, and our partners.

Welcome to our campus!

First of all, I would like to praise God for His blessings and mercies which allow all of us to be here today in this building in good health. I wish to express our deepest appreciation to those who have come from far away, many of them having been involved in commencing exactly what we have gathered here for.

It would be our great pleasure to welcome all of you, experts, engineers, and professional researchers from all over the world. **The International Conference on Vocational Education and Electrical Engineering (ICVEE) 2015** is a scientific forum where all of us could meet colleagues and friends of broad areas, discuss and disseminate research findings and discoveries as well as to develop knowledge, technology, arts, and sustainable research networks, particularly in vocational education, electrical engineering, and informatics. This year conference raises a very important theme on “Overcoming Challenge towards Asean Economic Community (AEC) 2015 in Profesional Qualification on Vocational Education and Electrical Engineering”. Therefore, it is a great pleasure and beneficial for all of us here today if we are able to take this advantage to build strong sustainable networks among researchers in order to develop knowledge, technology through recent research and innovation.

By hosting this conference, Faculty of Engineering Unesa is not only gaining the advancement of science and technology from all the findings and discoveries delivered during the conference, but also fruitful to encourage and enhance the arts and cultural values that would further dignify our nation and country among other worldwide.

Finally, I would like to convey our sincere gratitude to all participants, distinguished guests, and speakers that make this conference a great success. Thank you very much for being here. On behalf Faculty of Engineering Unesa, I thank you very much for your hard and untiring efforts. I wish that all of you may put all your continuous plants into undisturbed actions. And should push come to shove, that all your core processes may be continued seamlessly elsewhere. Today’s program offers many various approaches to the issue. I wish you a very successful, productive, and inspiring conference!

The conference is an annual event which is held near the end of the year. We do hope that we could welcome you again next year in the 2nd ICVEE 2016, which certainly offers the most recent topics as well as advance science and technology in various areas.

Thank you most cordially for your attention.
Wassalamu Alaikum Wr. Wb.

Dean of Faculty of Engineering
Universitas Negeri Surabaya

Prof. Ekohariadi, M.Pd.



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WELCOME SPEECH OF GENERAL CHAIRMAN OF ICVEE 2015

Dear Distinguished Delegates and Guests,

First, let us pray gratitude to the presence of Almighty God, for blessing and His permission, so "The 1st International Conference on Vocational Education and Electrical Engineering (ICVEE) 2015" can be done well. Secondly, let us convey my warm welcome and high appreciation for the presence and the willingness of key speakers who came from Taiwan, Brunei, Malaysia, and Indonesia as well as other speakers, at an international seminar held on this day.

Ladies and Gentlemen,

Science and technology continue to evolve. Discovery after discovery continues to be obtained so as to make the world continue to change and evolve into a better direction. Tokyo Motor Show (TMS) in 2015 is one evidence of some of the latest findings. TMS 2015 exhibited a number of recent developments in the automotive field. Nissan Corp showing a concept car without a driver (Intelligent driving system = IDS). This concept makes Nissan IDS seem futuristic. The car has a manual and automatic mode. Automatic mode is used when the passenger wants to chat along the way. In that mode, the steering wheel will automatically folded down, replaced the screen so that someone can open an email, or talking through a "video call". IDS will become a mainstay of the new Nissan to be the pioneer in the world automotive industry. Next year there are at least a driver replacement system for toll roads in Japan, and is targeted by 2020, IDS cars can pave the roads of Japan.

Mitsubishi Motors Corporation introduced the concept car "X electric crossover" is the latest electric car system. This car took part of the Outlander PHEV which includes models that demonstrate the framework of the technical features of electric vehicles and plug-in system twin motors 4 WD, so it is easy to drive. This car can monitor the situation around the vehicle, can control the speed, including a driver can use a smartphone to give instructions so that the car can park itself. To 44 other manufacturers, competing to develop fuel cell cars. Fuel cell car that's environmentally friendly hydrogen fuel. The chemical reaction between hydrogen stored in the fuel cell stack and oxygen that exist in nature, generating electrical energy stored in batteries. Electricity from the battery rotating electric motor to drive the car. Under conditions of full hydrogen, the car can travel a distance of 650 km, making the manufacturer mentions that fuel cell cars will become the flagship car of the future.

Hopefully some examples of the development of science and technology as described above, inspired on "The 1st International Conference on Vocational Education and Electrical Engineering (ICVEE) 2015" held on November 18, 2015 on the campus of the State University of Surabaya.

Ladies and Gentlemen,

This seminar can be accomplished, for the help of various parties. On this occasion, let us express our appreciation and gratitude to the key note speaker, the speakers, both from within and outside the country, so this seminar is warm and lively. To all those who have helped so that this international seminar to run smoothly in accordance with the intent and purpose, we extend our appreciation and gratitude. Not to forget we convey an apology, if in the organization of this seminar there are many shortcomings, and it all happened, solely because of the limitations that exist in us. Thus, thank you for all the attention, billahi taufik walhidayah, assalamu allaikum warahmatullahi wabarokhatuh.

Chairman,

Prof. Dr. H. Supari Muslims, Drs. MPd
General Chairman of ICVEE 2015



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Development of Learning Media Based E-Learning in Vocational High School

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Abstract - This study aims to development of learning media based E-learning. This research is motivated by the lack of vocational students' learning outcomes. Students difficult to understand the subject matter due to less media used by educators that can lead to creative thinking power of the material being studied. The research method using the Research and Development (R & D) and combined with instructional design the ADDIE model (Analisis, Design, Development, Implementation, Evaluation). Feasibility studies towards learning of E-learning by media experts showed an average of 4.4 and expressed "very decent" and materi testing by experts showed an average of 4.4 expressed "very decent". Testing phase one to students by an average of 4.5, and are categorized as "Very Good" and the Testing phase two average of 4.5, and are categorized as "Very Good". Based on the results of feasibility and testing of media experts and material experts as well as the students, it can be inferred media based learning E-learning is very good and deserve to be used as a medium of learning.

Index Terms - E-Learning; Research and Development (R&D); Model ADDIE

I. INTRODUCTION

At the Vocational High School - Technology as an institution that organizes vocational education, is a very appropriate place to establish expertise in learners. But seen from the graduates of vocational school students are still far from what was planned from the prescribed curriculum. This is evidenced from the results of interviews with subject teachers at SMK Tamansiswa Medan stating that the learning outcomes of 40 students from 63 students in class X Computer Network 1 and X Computer Network 2 to subjects Electronics Analog and Digital that has value below the minimum completeness criteria is <75.0.

Value graduation subjects Analog and Digital Electronics is the value taken by finding the average value of daily tasks and test scores. However, many students found to not be able to complete the tasks in accordance with the terms regulated, so that the value obtained student is still below the average passing score, so that they are required to follow the remedial.

Based on the information from teachers of analog and digital electronics in learning in the school system is rarely used medium of learning. The

medium that used only a simple media such as media images. This media has many limitations is merely display static images are displayed on the whiteboard or LCD projector. Other than that there are very limited facilities which resulted the students is difficult to perform repetitions in deepening material. This leads to the lack of understanding of students on the material presented because learners can not interact directly then make students less active in carrying out the learning process.

One of the media can be used with media-based learning with e-learning is to apply learning with the help of a computer that can create a learning does not only reveal a static image, but may also be able to display a moving image or animation often called. The subject matter can be created through the help of a software program applications that use Adobe Flash CS6 so in the learning process, teachers can display the subject matter more interesting and not boring, and students more easily understand the subject matter.

The survey shows the unavailability of media-based learning e-learning using interactive multimedia in vocational Tamansiswa especially on the subjects of Analog and Digital Electronics. Science teachers can only provide simple instructional medium. Based on the description that has been stated above, the researchers are interested in doing research titled: "Development of learning media based e-learning in vocational high school"

II. THEORITICAL REVIEW

A. *Understanding of Learn and Learning*

Learning is a factor that greatly influences in shaping a person's character either private establishment and formation of behavior. Thus the study can not be separated from the educational process. Both formal, informal and non-formal undertaken by learners. Learning experienced by a person basically is to meperoleh new things or new knowledge.

There is some sense to learn according to some experts. According to Surya in Rusman (2013: 85) "learning can be defined as a process by individuals to acquire new behavior changes as a whole, as a result of the individual's own experience in interacting with the environment"[1]. Sudjana (2010: 28) explains the "learning a process that is

characterized by a change in a person" [2]. Based on the definition of learning from some experts who described it can be concluded that the notion of learning is the behavioral changes that result from the process of training, experience, or habits that have been done by someone.

Learning is basically a process of interaction between teachers and students. The interaction can be either direct interaction such as face-to-face or indirect such as use of instructional media used. Learning is a blend of several components that are formed into a system. These components include the objectives, materials, methods, and evaluation. The fourth component of the study should be considered by educators in selecting and determining media, strategy, and what the right approach should be used in learning activities [1].

According Warsita (2008: 85) "study is an attempt to make students learn or an activity for learners are teaching" [3]. Learning is done to seek to create conditions so that teaching and learning takes place.

Law No. 20 Year 2003 on National Education System chapter 1 verse 20 states that learning is a process of interaction of learners with educators and learning resources in a learning environment [4]. Miarso (2007) explains there are five types of interaction that occur during the learning process takes place, namely: 1) the interaction between educators with learners; 2) interaction among learners or among peers; 3) interaction of learners with a resource; 4) interaction of learners together pedidik with learning resources deliberately developed; and 5) the interaction of learners together educators with sosial and natural environment [5].

From the description above it can be concluded that learning is a conscious effort from the teacher to make students learn, which is a change of behavior on students who are studying, which change with the acquisition of new skills applicable in a relatively long time and because of the effort

B. Learning Media

The word comes from the Latin media medium that has the meaning of "intermediate" or "introduction". So according to the media language means pengantar message from the sender to the recipient of the message. More specifically, the notion of media in teaching and learning prses be interpreted as graphics tools, photographic, or electronic to capture, process and reconstruct inforasi visual or verbal (Azhar Arsyad in Sukiman, 2012) [6].

According to the NEA (National Education Association) defines the media as objects that can be manipulated, seen, heard, read or discussed along with the instruments that are used by both the teaching and learning activities, and can affect the effectiveness of the instructional program. Then the Association for Education and Communication technology (AECT) provides limits on media as forms and channels used to convey the message or information (Sukiman, 2012: 28) [6].

Media is one of the communication tools in conveying the message is very useful when applied in the learning process, the media used in the learning process is referred to as a medium of learning. Heinich and friends (Arsyad, 2005: 4) suggests a medium of learning as follows: "Limitations as an intermediary medium that transmits information between the source and the receiver" [7]. Meanwhile, according to Anderson (Sukiman, 2012: 28). explained that "learning media is a medium that allows the realization of the relationship between the work of someone developers langsung subjects with the students" [6].

Based on the various opinions that have been described, it can be concluded learning media is anything that can be used to deliver the message so as to achieve the learning objectives effectively.

Essentially learning media as a vehicle to convey the message or information on the source of the message forwarded to the recipient. Messages or information submitted is learning materials to achieve the learning objectives or the number of competencies that have been formulated, in the process requires media as a sub-system of learning.

C. E-Learning

E-Learning (elektronik learning) is a study that uses media elektronik. E-learning covers learning at all levels, both formal and informal, are using the intranet (LAN) or extranet (WAN), in whole or in part, interactions, facilitation (Allen in Sutopo, 2012: 3) [8]. With e-learning, can make the learning process without having to meet directly with the teacher.

E-learning was first introduced by the University of Illinois at Urbana-Champaign by using computer-assited instruction system and a computer named PLATO (Darmawan, 2014: 15) [9].

Web-based learning is a subset of e-learning and learning refers to the use of browsers (such as Internet Explorer, Google Chrome, and others) (Sutopo, 2012: 3) [8]. But other than that educators also use e-learning in the form of video or flash with different formats are used as learning. Pebelajaran is presented in the form of CDs whose contents can be tutorials, video documentary or instructional materials are already widely used for education (Darmawan, 2014: 15) [9].

D. Interactive Multimedia

In a multimedia language derived from the multi (Latin, nouns) which means a lot, various sorts, and medius were in the plural medium (Latin) meaning something that is used to convey or bring something. Multimedia is commonly known today is a wide variety of combinations of graphics, text, sound, video and animation. (Arsyad, 2013: 10) [7].

Multimedia can be used in all fields, especially in education. In the field of education, multimedia can be used as a medium of learning tools that help educators deliver the message content to be more easily understood by learners. With the help of multimedia, interactive learning can also be where learners can interact actively and directly.

Utilizing multimedia in learning will be able to improve the understanding of students in mastering the material. It is as disclosed Baugh (Arsyad, 2013: 13) less than 90% of one's learning results obtained through the senses of sight, and only about 5% obtained through the senses of hearing and 5% again by the other senses. But Dale (Arsyad, 2013: 13) estimates that the acquisition of learning outcomes through the sense of sight around 75%, through the sense of hearing about 13%, and through the other senses approximately 12% [7]. According to Bruner, there are three main levels learning mode that direct experience, experience the image and experience of the picture (Rusman, 2013: 165) [1]. One illustration of the most widely referenced as the theoretical basis of media use in the learning process is Dale Cone Experience (Experience Cone Dale) as can be seen in the following figure:



Fig. 1 Experience Cone Dale). (Source : Rusman, 2013)

Basic development of cone above is not the level of difficulty, but the level of abstraction number of types of sensory participate during acceptance teaching content or message. Direct experience will give the impression of the most intact and the most meaningful of the information and ideas contained in that experience, because it involves the senses of vision, hearing, feeling, smell and touch. This is known as Learning by Doing, or Learning to Do (Sukiman, 2012: 33) [6].

Using multimedia learning media is often referred to as interactive multimedia-based learning media. According Niken and Haryanto (2010: 25) is a multimedia interactive multimedia equipped with a controller that can be operated by the user so that the user can select what is desired for further processing. Examples of interactive multimedia are: multimedia interactive learning, gaming applications, and others [10].

So from some of the above opinion can be concluded that interactive multimedia is a combination of multiple media such as text, images, sound, video and animation that comes with the controller so that users can navigate, interact and

III. RESEARCH METHODOLOGY

Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception

would be the use of English units as identifiers in trade, such as $\frac{3}{8}$ -inch disk drive.”

Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.

In this research, design and manufacture of products using the learning model of ADDIE combined by steps of research development recommended by Borg and Gall with the consideration that the models are suitable for developing a product model of instructional / learning is right on target, effective and dynamic and very helpful in the development of learning for teachers. The fusion between the stages of R & D research methods with the ADDIE model of learning can be seen on the following table:

TABLE I BLEND OF R & D METHODS WITH ADDIE LEARNING MODEL

R&D Research Methods	ADDIE Learning Model
1. Research and information collecting	1. Analysis
2. Planning	2. Design
3. Develop preliminary form of product	3. Development
4. Preliminary field testing	4. Implementation
5. Main product revision	
6. Main field testing	5. Evaluation
7. Operational product revision	
8. Operational field testing	
9. Final product revision	
10. Dissemination and implementation	

This study was conducted in SMK Tamansiswa Medan is located at Jl. Sabaruddin 8 Medan in the academic year 2015/2016 first semester of class X in July 2015.

Objek penelitian adalah mata pelajaran elektronika analog dan digital. Subjek penelitian meliputi 5 siswa kelas X TKJ yang termasuk kelompok kecil dan 10 siswa kelas X TKJ yang termasuk kelompok besar di SMK Tamansiswa Medan.

The object of research is the subject of analog and digital electronics. Research subjects include 5 class X Computer Network which included a small group of 10 students of class X and Computer Engineering networks including large groups in vocational Tamansiswa Medan.

Questionnaire is a technique of data collection that contains the questions submitted in writing to the person or group of people to get an answer or response and the information that required by the researcher. Data obtained from the questionnaire is the answer in the form of an explanation (qualitative

data) validation of instructional media development of analog and digital electronics. With so researchers will give a presentation picture of the situation examined in the form of a narrative description. Questionnaire data obtained will be analyzed with the following steps:

- 1) The questionnaire which has been filled by respondents, examined the completeness of the answer, then prepared in accordance with the code of respondents.
- 2) Quantify the question by giving a score in accordance with a predetermined weighting.
- 3) Creating a data tabulation.
- 4) Then transformed into the following table:

TABLE III
INTERVAL CRITERIA

No	Interval Skor	Interpretasi	
1	0.00 - 2.49	Not Good	Not Feasible
2	2.50 - 3.32	Less Good	Less Feasible
3	3.33 - 4.16	Well	Worthy
4	4.17 - 5.00	Very Good	Very Decent

(Source : Sriadhi, Penilaian Multimedia Learning, 2014)

IV. RESULT AND DISCUSSION

The execution of the software starts from the making of the background image with the help of Adobe Photoshop and put it in Adobe Flash CS6 and then place the buttons for in accordance with a predetermined design so that the software can be used as desired.

Menu porch was the main ingredient in this software. On the menu, there are several menu leading to sub-learning materials and sub-sub exercise and contains the instructions for use and profile of instructional media makers.



Fig. 2 Display Porch Menu.

The menu is a menu that contains destination information to students about the learning objectives are based on the design of lesson plans.



Fig. 3 Display Learning Objectives Menu.

The menu contains the instructions for use on the use of the navigation instructions in using this interactive media.

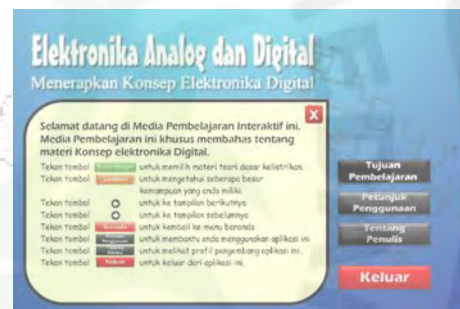


Fig. 4 Display Instructions for Use Menu.

Menu start learning is a sub-menu containing options menu of learning presented in this software.



Fig. 5 Display Start Learning Menu

The menu is a menu that contains material information related to the content of the materials that will be presented starting from the "Basic Principles of Digital Systems", "Understanding Gate Logic", and the kinds of logic gates.



Fig. 6 Display Material Basic Principles of Digital Systems Menu

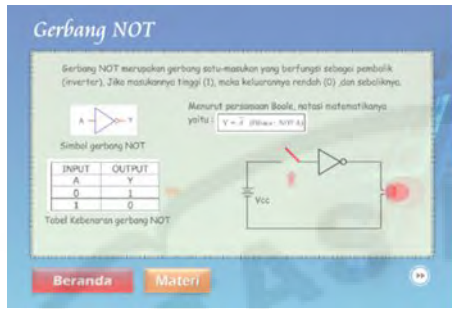


Fig. 7 Display Logic Gate Materials Menu

Exercise menu is a menu that contains practice questions to gauge the level of understanding of students in mastering the material they have learned. On the menu there is another sub-menu option to select multiple choice questions or essay.

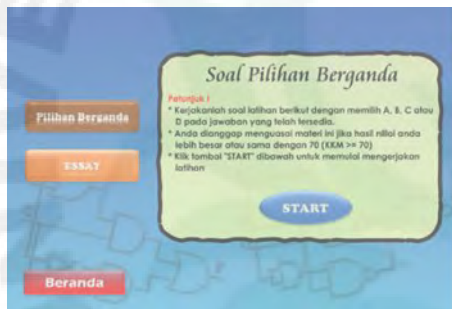


Fig. 8 Display Multiple Choice Questions Menu



Fig. 9 Display Essay Menu

A. Validation By Expert Media and Material Expert
 The results of validation the media by medium experts note that medium get the average assessment on the indicator Information Guide 4.7 (Very Good), indicator Courseware use of 4.3 (Very Good), Aesthetic Quality indicators Exposure of 4.2 (Very Good) and if averaged overall scores of 4.3 and can be expressed "very good". But there are some responses from expert advice to revise the medium: (1) better facilitate navigation buttons; (2) an assessment of the results of the essay and multiple-choice exercises tailored to the instructions; and (3) as much as possible to determine the duration of working time practice questions.

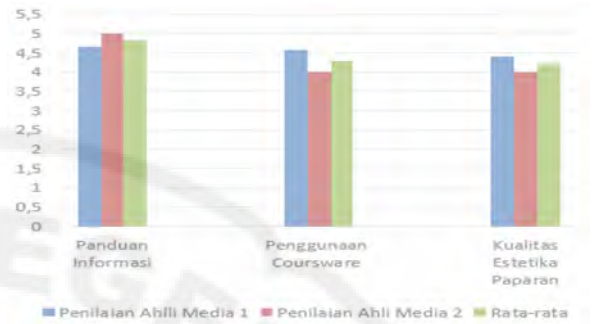


Fig. 10 Graph Results Validation By Expert Media.

The results of validation by the material experts note that the media get the average assessment on the indicator Information Guide 4.7 (Very Good), Teaching Material Content indicator of 4.3 (Very Good) and if averaged overall scores 4, 4 and can be expressed "very good" However there are a few comments / suggestions from the expert material that is (1) the media-based learning e-learning if it allows more material is loaded; (2) displaying video or simulation to create a digital electronic circuits.

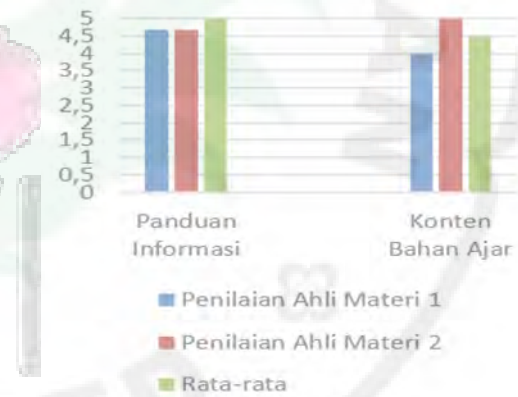


Fig. 11 Graph Results Validation By Material Expert.

By looking at the results of validation by the media experts and expert material, then software-learning multimedia interactive learning is already worth to be used // applied on research.

B. Testing Phase I dan Phase II

From the results of this first test we can see the results of the test had an average assessment on the indicator Information Guide at 4.5 (Very Good), Teaching Material Content indicator of 4.2 (Very Good), Media Quality indicators of 4.6 (very Good), Pedagogy Effect indicator of 4.9 (Very Good) and when averaged overall by 4.5 and categorized as "very Good". There are several inputs obtained as (1) learn to use this medium is not boring, (2) the learning using this medium is very interesting and already understood (3) good medium because they can learn while using the computer.



Fig. 12 Graph of Testing Phase I.

From the results of this second test we can see the results of the test had an average assessment on the indicator's Guide Information of 4.4 (Very Good), Teaching Material Content indicator of 4.2 (Very Good), Media Quality indicators at 4.5 (very Good), Pedagogy Effect indicator of 4.9 (Very Good) and if averaged overall by 4.5 and categorized as "very Good". There are several inputs obtained as (1) very good, and useful for many people, (2) if it could all subjects using medium like this, (3) we suggest if you are teaching teachers using this medium because it is easier to understand, (4) very interesting and very useful to increase knowledge (5) medium good father, (6) a way of learning good but the exercise are difficult, (7) very interested in learning to use this medium, (8) medium very nice.

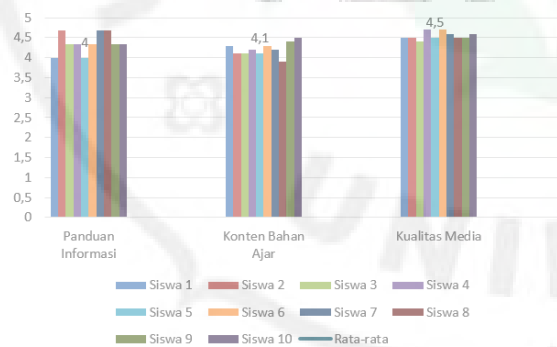


Fig. 13 Graph of Testing Phase II.

V. CONCLUSION

Based on the research that has been done in class X TKJ VOCATIONAL HIGH SCHOOL Tamansiswa Medan, software-based instructional media e-learning that has been developed is feasible to be used / applied to the learning process.

REFERENCES

- [1] Rusman. 2013. Belajar dan Pembelajaran berbasis komputer – Menggabungkan profesional guru abad 21. Bandung : Alfabeta H. Simpson, *Dumb Robots*, 3rd ed., Springfield: UOS Press, 2004, pp.6-9.
- [2] Sudjana, Nana. 2010. Penilaian Hasil Proses Belajar Mengajar. (Cet. XV). Bandung: PT. Ramaja Rosdakarya
- [3] Warsita, Bambang. 2008. Teknologi Pembelajaran Landasan & Aplikasinya. Jakarta: Rineka Cipta
- [4] Undang Undang RI Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional. Jogjakarta : Media Wacana Press.
- [5] Miarso, Yusufhadi. 2007. Menyemai Benih Teknologi Pendidikan. Cetakan Ketiga. Jakarta: Kencana Prenada Media Group
- [6] Sukiman. 2012. Pengembangan Media Pembelajaran. Yogyakarta : Pedagogia.
- [7] Arsyad, Azhar. 2013. Media Pembelajaran. Jakarta : Rajagrafindo Persada.
- [8] Sutopo, Ariesto Hadi, 2012, Teknologi Informasi dan Komunikasi Dalam Pendidikan, Yogyakarta : Graha Ilmu
- [9] Darmawan, Deni. 2014. PENGEMBANGAN E-LEARNING TEORI DAN DESAIN. Bandung: Remaja Rosdakarya
- [10] Niken Ariani dan Haryanto. 2010. Pembelajaran Multimedia di Sekolah. Jakarta: Prestasi Pustaka.
- [11] Sriadhi. 2014. Penilaian Multimedia Learning. Konferensi Nasional Pengembangan Teknologi Informasi dan Komunikasi, Ke-TIK, USU Press.