DEVELOPMENT OF ELECTRONIC MEDIA INTERACTIVE LEARNING BASIS FOR ELECTRONIC INDUSTRIAL ENGINEERING (CASE STUDY SMK INTERNASIONAL BANDUNG)

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ABSTRACT

Learning Basic Electronics Engineering Department of Industrial Electronics Engineering at SMK Prakarya Internasional Bandung has a problem. Based on interviews with teachers at SMK Electronics Engineering Association Prakarya Internasional Bandung stated that students are often difficulties in calculating the value of electronic components. Difficulties students have a lot of class X is felt especially in the first half because at half of these students are faced with calculations of the value of a basic electronic components.

This study aimed to generate media interactive learning basic electronics for industry electronics engineering department at SMK Prakarya International Bandung in order to assist students in learning to calculate the value of electronic components so that students can be more skilled in calculating the value of electronic components. The availability of computer labs in schools must be able to support the learning process. The condition can be satisfied by the existence of a solution is to build an interactive learning media for SMK basic electronics engineering electronics engineering industry.

Based on the results of research that aims to help students to learn calculate the value of electronic components , namely by producing interactive learning media for calculating the value of electronic components . With the learning media is certainly becoming a tool that can be used to help the learning process of students in learning calculate the value of electronic components , about 85 % of students admitted quite helped by the application of this learning media.

Keywords: Basic Electrical Engineering, Learning Media, Interactive.

1. PREFACE

Vocational High School (SMK) International craft Bandung is one school that has six programming skills, which include Automotive Engineering, Mechanical Machining, Electronics Engineering, and Business Management, Computer Engineering and Networks, and Utilization of Electric Power Engineering. Skills Program at SMK Electronics Engineering International crafts Bandung divided into two subject areas of expertise, namely Industrial Electronics Engineering and Electronic Engineering Audio-Video. Based on interviews with teachers at SMK Electronics Engineering Association International craft Bandung stated that students are often difficulties in calculating the value of electronic components. Difficulties students have a lot of class X is felt especially in the first half because at half of these students are faced with calculations of the value of a basic electronic components.

Based on the problems that have been described, students need help learning media, one of the efforts is to create a computer-assisted learning media (CPB). CPB itself is a way or method of learning to use computer applications as the main medium. Application is made interactive learning media because simulate basic electronics practice activities in accordance with reality.

By utilizing instructional media applications is expected to assist students in learning to calculate the value of electronic components, so that students can be more skilled in calculating the value of electronic components and can improve student learning outcomes in basic electronics engineering subjects. As well as trying to implement a computer-assisted learning in school, with the consideration that the computer lab facilities at SMK International craft Bandung.

2. CONTENT OF RESEARCH

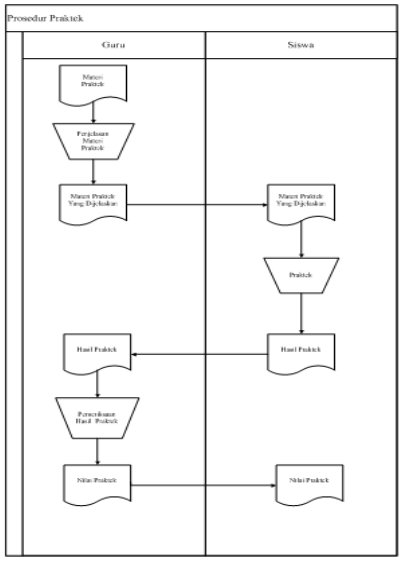
2.1 Analysis System

The analysis system can be defined as the decomposition of a whole system into its component parts with a view to identify and evaluate the problems and needs that is expected , so that the amendments can be proposed . 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 the activities of the learning process carried out by teachers and students in basic electronics engineering practice in vocational crafts Bandung International. Flowmap basic electronics engineering lab activities can be seen in Figure 3. , 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.
d . After the students have completed the practice , the results of the practice given to teachers for further inspected and rated .



2.3 Analysis of a Problem

Analysis of the problem is the first step that must be done in the stage of system analysis. Problems can be defined as a question which is desired to be solved. Therefore, the first step that must be done at this stage is to identify in advance the problems that occur. Analysis of this issue has been presented previously in Chapter I that students are often difficulties in calculating the value of electronic components. Difficulties students have a lot of class X is felt especially in the first half because at half of these students are faced with calculations of the value of a basic electronic components.

2.4 Analysis Media Interactive Learning Built

Interactive learning media is media that contains learning materials about basic electronics engineering therein . This interactive learning media including computer-assisted learning into a kind of simulation . The main purpose of this is to produce instructional media learning media that can help students to learn to calculate the value of electronic components so that students can be more skilled in calculating the value of the component and can improve student learning outcomes in basic electronics engineering subjects.

2.5 Description Media Interactive Learning Basics Of Electronics Engineering

Media interactive learning basic electronics is a desktop -based instructional media , in which the material berisis basic electronics engineering practice . The material presented in this study is the media material bracelet resistor calculation , how to read the 2D graphics offerings include interactive simulations so that students can play an active role in the process so as to better understand pembelajran diperlajari material . Instructional media to be built has 2 main menu , namely the material menu , simulation and evaluation menu containing the questions of the whole chapter .

2.6 Analysis Of Material

Analysis of the material in the media interactive learning basic electronics will be described based on each matter that is material Resistor Value Calculation Bracelet , How to Read the Code Numbers Capacitors , resistors static measurement using avometer , how to solder , how to measure direct current source . Analysis of the material to be built can be seen in Table 1.

Table 1 Analysis of Material

Materi	Kegiatan Siswa	Tujuan	Sumber Belajar
Perhitungan Gelang Resistor	1. Siswa melilih warna gelang apa saja yang akan di hitung 2. Siswa memilih warna gelang nilai toleransi yang akan di pergunakan dan letakan pada kolom yang tersedia 3. Setelah memilih warna gelang siswa menekan button hitung.	1. Siswa terampil membaca kode warna resistor 2. Siswa terampil menghitung besar toleransi dari masing-masing resistor 3. Siswa terampil menghitung nilai minimum dan maksimum dari masing-resistor sekaligus dapat menentukan nilai range resistor.	1. Jobsheet,Teknik Elektronika, Septia Hermawan 2. Buku-buku literature lainya tentang Elektronika Dasar 3. Sumber informasi dari internet
Membaca Kode Angka Kapasitor	1. Siswa memilih jenis bahan kapasitor yang akan dihitung 2. Setelah memilih jenis bahan kapasitor siswa meletakkan kapasitor di tempat yang telah disediakan.	1. Siswa dapat mengklasifikasi bahan kapasitor 2. Siswa dapat menasejemahkan kode angka pada kapasitor 3. Siswa dapat menyusun daftar komponen beserta nilainya.	1. Jobsheet,Teknik Elektronika, Septia Hermawan 2. Buku-buku literature lainya tentang Elektronika Dasar 3. Sumber informasi dari internet
Cara Pengukuran Resistor Statis Menggunakan AvoMeter	1. Siswa memutarkan terminal AvoMeter pada posisi ohm meter 2. Tempatkan probe secara bebas pada kedua kaki resistor 3. Usahakan sampai jarum bergerak dan menunjukan angka.	1. Siswa dapat menggunakan AvoMeter utama pada posisi Ohm meter 2. Siswa dapat membaca skala pengukuran pada AvoMeter 3. Siswa dapat membandingkan hasil perhitungan dengan pengukuran.	1. Jobsheet,Teknik Elektronika, Septia Hermawan 2. Buku –buku literature lainnya tentang Elektronika Dasar 3. Sumber informasi dari internet

Table 2 Analysis Material (Lanjutan)

Materi	Kegiatan Siswa	Tujuan	Sumber Belajar
Cara Penyolderan	1. Siswa memilih dan memasangkan komponen elektronika pada tempat yang telah disediakan 2. Sesudah memasangkan komponen-komponen yang akan disolder siswa memilih button mulai penyolderan untuk mulai melakukan penyolderan.	Siswa dapat menyolder dengan baik dan benar	1. Jobsheet, Teknik Elektronika, Septia Hermawan 2. Buku – buku literature lainnya tentang Elektronika dasar 3. Sumber informasi dari Internet.
Cara Pengukuran Sumber Arus Searah (DC)	1. Siswa memilih komponen yang akan diukur. 2. Siswa melakukan pengukuran terhadap komponen yang akan diukur.	1. Siswa dapat mengukur arus searah dengan menggunakan ala ukur 2. Siswa dapat memperbaiki rangkaian arus searah (DC) dengan benar.	1. Jobsheet, Teknik Elektronika, Septia Hermawan 2. Buku-buku literature lainya tentang Elektronika Dasar 3. Sumber informasi dari internet

2.7 Specification Software Needs

System and software design involves the identification and description of abstarksi basic software systems and relationships. Functional design stage, and the non-functional design. Based on business rules, the software requirements specification of the system to be built are described in Table 2 :

Table 2 Specification Software Needs

No	Kode	Deskripsi Kebutuhan
1	SKPL-F-01	Sistem dapat menampilkan materi praktek tenik elektronika dasar per bab
2	SKPL-F-02	Sistem dapat menampilkan simulasi materi praktek teknik elektronika dasar
3	SKPL-F-03	Sistem dapat menampilkan evaluasi materi berupa soal-soal pengujian dari keseluruhan bab.
4	SKPL-F-04	Sistem dapat melakukan pengisian jawaban evaluasi
5	SKPL-F-05	Sistem dapat menampilkan nilai pada akhir evaluasi

2.8 Analysis Non Functional Needs

Non-functional analysis is the analysis needed to determine the system requirements specification. This specification also includes elements or components of what is needed for the system to be built until the system is implemented. The needs analysis also determines the input specifications. The required system output to be produced by the system and processes needed to process inputs to produce a desired output. In the analysis of non-functional system requirements are described analysis software requirements, hardware requirements analysis and user analysis.

2.8.1 Analysis Hardware Needs

Hardware contained in SMK Prakarya Internasional Bandung can be seen in Table 3 and the hardware needed to run the application can be seen in Table 4.

Tabel 3 Specification Avaliable Hardware in SMK Prakarya Internasional Bandung

No	Perangkat Keras	Spesifikasi
1	Processor	Processor dengan kecepatan 3.00 GHz
2	Memory	RAM 2 GB
2	Monitor	Monitor dengan resolusi 1024 x 768 pixel
3	Graphic Card	VGA I GB
4	Harddisk	500 GB
6	Peranti Pendukung	Papan ketik (*keyboard*) , tetikus (*mouse*), dan speaker

Tabel 4 Specification Hardware needs

No	Perangkat Keras	Spesifikasi
1	Processor	Processor dengan kecepatan 1.4 GHz
2	Memory	RAM 1 GB
2	Monitor	Monitor dengan resolusi 1024 x 768 pixel
3	Graphic Card	VGA 512 MB
4	Harddisk	5 GB
6	Peranti Pendukung	Papan ketik (*keyboard*) , tetikus (*mouse*), dan speaker

2.8.2 Analysis Software Needs

Avaliable software ini SMK Prakarya Internasional Bandung can see in table 5 and software needs for running for this application can see in table 6 .

Tabel 5 Specification Avaliable Software In SMK Prakarya Internasional Bandung

No	Perangkat Lunak	Spesifikasi
1	Sistem Operasi	Windows 7

No	Perangkat Lunak	Spesifikasi
1	Sistem Operasi	Microsoft Windows XP, Windows 7, Windows 8
2	*Tools Compiler*	Adobe Flash CS3

Table 6 Sofware Requirement

2.9 Analysis Requirement User

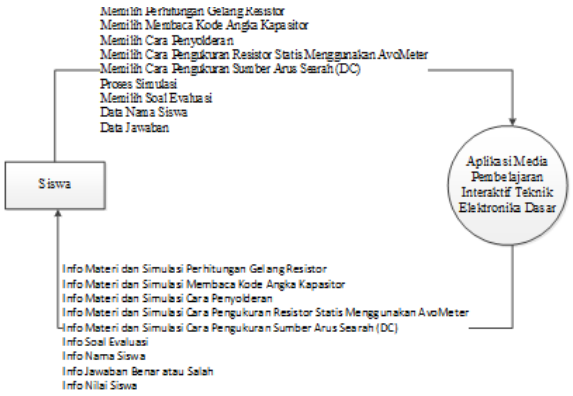
User analysis is an analysis of the users who will use the applications that have been built . The users of this application is the basic electronics engineering student majoring in International craft SMK Bandung , students who will be using this application are given training or guidance on the procedure for using the application media interactive learning basic electronics engineering so that students can run this application properly.

2.10 Analysis Of Th Function

Analysis of functional requirements describe the process of activities to be implemented in a system and describes the system requirements necessary for the system to run smoothly and according to need. System modeling modeled using Data Flow Diagrams (DFD) and Data Dictionary .

2.11 DFD (Data Flow Diagram)

Data Flow Diagram is a medium that is used to describe the flow of data that flows on an information system . In the Data Flow Diagrams (DFD) consist of external entities , data flow , and data storage processes . Here is the DFD of interactive learning media electronics engineering basis for CMS. Besides DFD context diagram used also tools , context diagram itself is a diagram illustrating the input , process and output of the software system to be built . The following diagram context of media learning basic electronics engineering , can be seen in Figure 1.



Gambar 1 Diagram Konteks

2.11.1 DFD Level 1

DFD Level 1 describes the entire functionality that can be performed on media interactive learning basic electronics engineering for CMS , which can be seen in Figure 2.

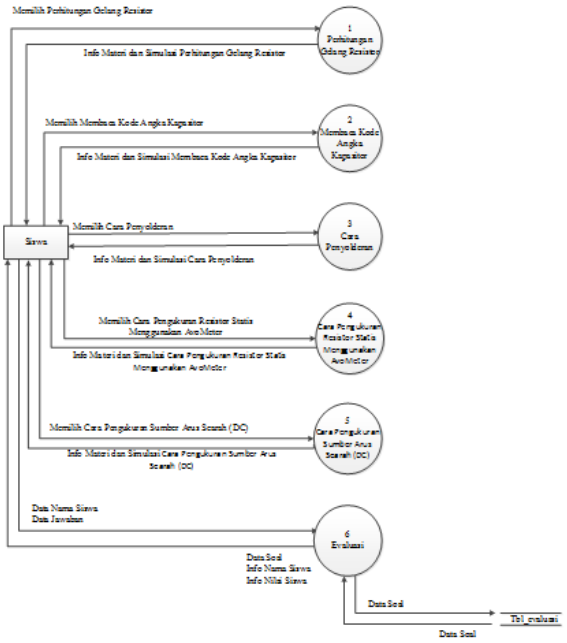


Figure 2 DFD Level 1

2.12 System Design

The design is a part of the methodology development of a software development carried out after the stage to give a detailed description, after going through the stages of analysis. To be able to design the system then do some steps are as follows:

1. Table Structure
2. Relation Diagram Design
3. Structure Menu Design
4. Interface Design
5. Semantic Network

Procedural Design

2.12.1 Table Structure

The structure of column- column table is contained in the table or also called attributes or fields and are based on the Entity Relationship Diagram (ERD) that have been designed previously . Table structure of instructional media applications electronics engineering base class X SMK International craft Bandung -based desktops can be seen in Table 7.

Tabel 3.19 Struktur Tabel Evaluasi

Field	Type	Panjang	Keterangan
Id_soal	Int	2	*Primary Key*
User_name	char	5	*Foreign Key References* tbl_user (user_name)
Pertanyaan	Text		
PilihA	Varchar	300	
PilihB	Varchar	300	
PilihC	Varchar	300	
PilihD	Varchar	300	
Kunci jawaban	Char	1	

Tabel 3.20 Struktur Tabel User

Field	Type	Panjang	Keterangan
User_name	char	5	*Primary Key*
User_pass	Varchar	50	

Table 7 Table Structure

2.12.2 Relation Diagram Design

Relationship diagram is a model that describes the relationship between the data contained in a database based on the data base objects that have relations between relations . Relationship diagrams from the application of instructional media and simulation techniques basic electronics class X SMK International craft Bandung -based desktops can be seen in Figure 3 .

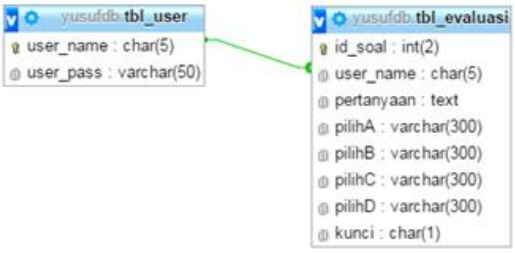
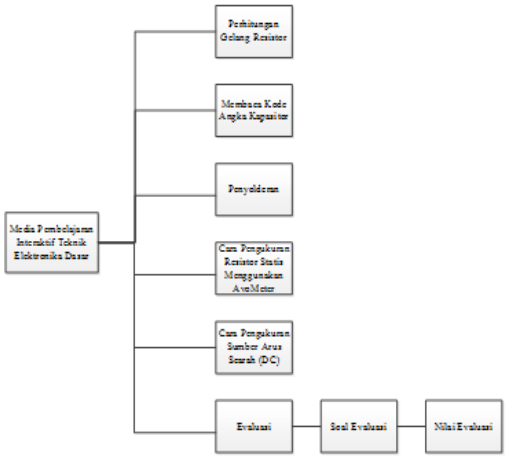


Figure 3 Relations Diagram

2.12.3 Structure Menu Design

The design of the structure of the menu is a picture track application usage so the application is easy to understand and easy to use . The design of the menu structure of instructional media applications and simulation techniques basic electronics class X SMK International craft Bandung -based desktops can be seen in Figure 4 .



Gambar 3.16 Perancangan Struktur Menu Siswa



Figure 4 Structure Menu

2.12.4 Interface Design

Interface design aims to provide an overview of the application to be built . So it will be easier to implement applications . This design is implemented into a program that is intact and can be used by users of the system .
Media application interface design engineering learning basic electronics class X SMK International craft Bandung is as follows :

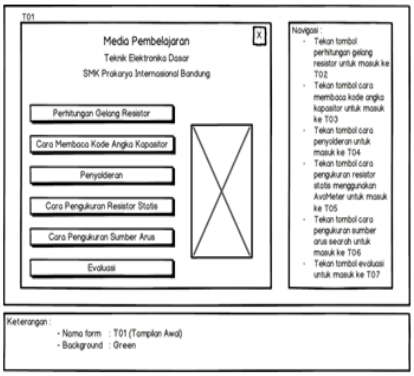


Figure 5 Interface Design

2.12.5 Semantic Networks

The structure of the application is described in detail with made into small modules that are easy to make, easy to be tested, and easily modified. In. Making these applications using the assistance of the structural chart is also called semantic networks. Semantic network describing the structure in this application is described in Figure 6.

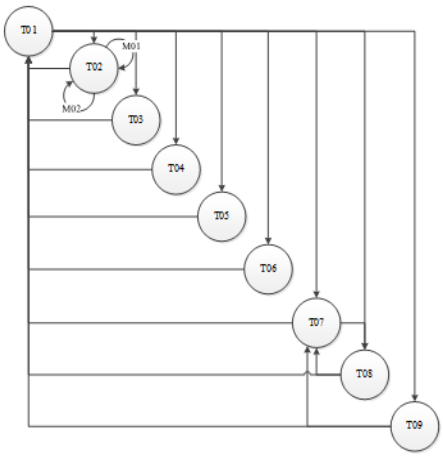


Figure 6 Semantic Networks

2.12.6 Procedural Design

The design is used to describe the procedural steps or grooves of each process on the system. Here is a procedural design of the application to be built.

2.12.6.1 Procedural Simulation Design Perhitungan Gelang Resistor

Procedural simulation design perhitungan gelang resistor can be seen in Figure 7.

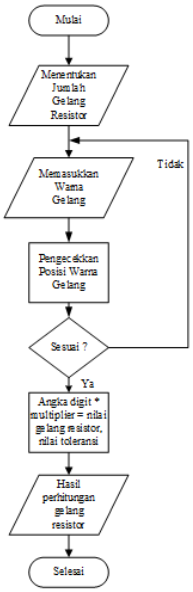


Figure 7 Flowchart Simulation Perhitungan Gelang Resistor

2.12.6.2 Procedural Design Evaluasi

Procedural design for evaluasi The media learning basic electronics engineering for SMK can be seen in Figure 8

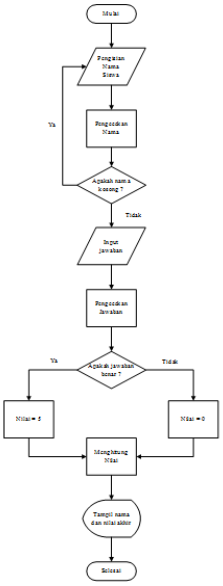


Figure 8 Flowchart for Evaluasi

2.13 Implementation

Implementation of the system is a translation stage design based on the results of the analysis into a particular programming language and application software that is built on a real environment. The goal is to confirm the implementation of the program which has been designed on the perpetrators of the system so that the user can provide input to the system developers. Implementation of this system will explain the hardware requirements and software is used.

2.13.1 Implementation Aplication

Learning Media Interactive Applications for SMK Electronics Association consists of training and testing materials in the subject Basic Electronics Engineering . This application does not need to be installed , simply double-click on this application (executable) . In addition a copy of the folder containing the application , and then installed in the servers , for access by the client . With conditions on the Windows operating system must be installed Adobe Flash Player 15 , Adobe Flash CS5 , mozilla firefox browser and XAMPP as database storage media in order for the application of this learning media can be run.

2.14 System Test

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 were carried out , namely Alpha and Beta Testing testing.

2.14.1 Alpa Testing

At this stage of functional pengujiaan used to test the application was negligent testing . Alpha testing is done by using black box method . Black box testing focuses on functional requirements of software consisting of Pengujan plan and test case results .

2.15 Beta Testing

Beta testing is testing conducted objectively . Beta testing is done by testing directly in the research conducted within the International craft SMK Bandung aims to determine the extent to which the system is built to be an alternative medium of learning . Beta testing is done by giving questionnaires to 35 students of class X SMK majoring in electronics engineering industry and interviews with teachers electronics engineering base , Dedy Suhardiman , S.Pd. Testing techniques used in this beta testing is a technique Likert scale.

For every single question on the questioner will get a different valuation point. The following table point assessment can be seen in Table 7.

Tabel 7 Point Penilaian

Jawaban	Point Penilaian
Sangat Setuju	5
Setuju	4
Ragu-Ragu	3
Tidak Setuju	2
Sangat Tidak Sejutu	1

3 CLOSING

3.1 Conclusion

Based on the results of research that aims to help students to learn to calculate the value of electronic component , namely by producing interactive learning media for calculating the value of electronic components . With the learning media is certainly becoming a tool that can be used to help the learning process of students in the study calculates the value of electronic components.

3.2 Suggestion

In the construction of Using Simulation Learning Media is certainly still far from perfect and still has shortcomings. Therefore, it is necessary to do further development and refinement in order to meet the needs of the users are increasing. The suggestions for the development of instructional media, namely:

1. Added audio and video on this application in order to attract more students to learn.
2. 2. In the evaluation , the final value of the evaluation in order to be saved to the database so that the teacher is easy to see the value of the final evaluation.

REFERENCES

[1] Nasir, Moh. (1999). *Metodologi Penelitian*. Jakarta : Ghalia Indonesia.

[2] Pressman, Roger S. (2012). *Software Engineering: A Practitioner's Approach". 7th Edition. McGraw Hill Higher Education.*

[3] Sunarto, Sunaryo. *Pembelajaran Berbasis Komputer* (PBK). http://staff.uny.ac.id/sites/default/files/131568300/PEMBELAJARAN%20 BERBANTUAN%20KOMPUTER-2.pdf, diakses tanggal 14 Maret 2015.

[4] Idris, Husni. (2008). *Pengembangan Multimedia Pembelajaran Berbantuan Komputer*. Januari. 51-52. http://jurnaliqro.files.wordpress.com/2008/08/05-husni-48-57-final.pdf. diakses tanggal 14 Maret 2015.

[5] Munir. (2001). "*Aplikasi Multimedia dalam Proses Belajar Mengajar*". UPI Press: Bandung.Sadiman, Arif S.1993.Media Pendidikan, Pengertian, Pengembangan, dan pemanfaatannya. Graffindo Persada: Jakarta.

[6] Ali, Muhammad. (1996). *Guru dalam Proses Belajar Mengajar*. Sinar Baru Algensindo: Bandung.

[7] Arsyad, Azhar. (2003). *Media Pembelajaran*. Jakarta : Rajawali.

[8] Sadiman, Arif S. (1993).*Media Pendidikan, Pengertian, Pengembangan, dan pemanfaatannya*. Graffindo Persada: Jakarta.

[9] Rusman. (2010). "Model-model Pembelajaran: Mengembangkan Profesionalisme Guru". Jakarta. Rajawali Pers. PT. Rajagrafindo Persada. Hal: 142. Hal: 145. Hal: 149.

[10] Al-Fatta, Hanif. (2007). Analisis dan]]] Perancangan Sistem Informasi. Yogyakarta : Andi.

[11] Jogiyanto, Hartono. (2005). Analisis dan Desain Sistem Informasi, Edisi III. Yogyakarta: Andi.

[12] Sugiyono.(2005). *Metodologi Penelitian*

[13] *Kuantitatif*. PT Alfa Beta: Bandung.

Wahana Komputer. (2012). *Beragam Desain Game Edukasi dengan Adobe Flash CS5*. Yogyakarta : Andi.