

MAS HOEDAH



ISBN 979620430-4

PROCEEDING
INTERNATIONAL SEMINAR
ON EDUCATION
Responding to Global Education Challenges



Yogyakarta State University
19 May 2009

INTERNATIONAL SEMINAR ON EDUCATION
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**INTEGRATED BRIEFCASE MODEL :
A TEACHING AID IN THE PRACTICUM OF DIGITAL ELECTRONICS**

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ABSTRACT

This research is aimed at designing as well as producing an integrated briefcase model as a teaching aid in the teaching of digital electronics practicum and its feasibility.

This research can be classified as research and development study. It was conducted in the Electronics Engineering Education Department and State Vocational School 2 Yogyakarta. The teaching aid was developed through: conducting need analysis, designing, implementing, and testing. The testing carried out twice covered the performance and feasibility. The data were collected by using questionnaires distributed to the users. The students of SMK Negeri 2 Yogyakarta were the subject of the research. In this research the data were analyzed descriptively.

The research findings showed that the teaching aid could be realized and meet the competence required in the digital electronics subject. The score obtained from the content validity test was 90% (categorized as very feasible). The score of the material validity was 80% (categorized as feasible). The score of its feasibility in terms of the material aspect was 42% (categorized as feasible). The technical aspect was scored 69.83% (categorized as feasible).

Keywords : briefcase model, digital

I. Background, Framework and Purposes

The increasing demand of the relevance of education to the industry world results in the implementation of various concepts related to curriculum, materials, teaching media, methods, and teaching strategies. It is stated in the 2004 Curriculum of Vocational Schools that vocational education constitutes a secondary education which prepares the students, especially to work in a certain field, who possess skills, knowledge, and attitude to be competent. Competent graduates can be produced only through a process supported by suitable supporting components. Those components include the selection of teaching

methods suitable for the materials, as well as the available equipment in the laboratory.

In reality the laboratories in many vocational schools do not have practicum units for digital electronics due to some factors, such as finance, room availability, practicality, and incomplete practicum units as teaching media to achieve the expected competence.

It is stated in www.dikmenjur.go.id that "In supporting the improvement of the quality of the vocational schools, the government will provide the equipment to meet the demanded competence and the the development of science and technology." The equipment for the vocational schools are expected to be local products or substitution technology.

Concerning the background, the researchers conducted a research related to "Integrated Briefcase Model as Teaching Media in the Digital Electronics Practicum", equipped with a module for the digital electronic practicum.

II. Theoretical Review

1. Teaching Media

Arief S. Sadiman (2003:6) explains that 'media' comes from the word 'medium' which literally means mediator or the message channel from the sender to the message receiver. From the definition, teachers, books, modules, practicum equipment, and the environment where the the teaching learning process takes place can be considered as media.

Azhar Arsyad (2003:4) states that media are learning sources which contain instructional materials around students which can stimulate them to learn. Further, it is explained that teaching media are anything which is used to send messages and can stimulate thinking, feeling, attention, and motivation of the learners to make the teaching learning process to happen intentionally, purposefully and under control. Based on those ideas, it can be concluded that teaching media are anything that can be used to send messages from teachers to students to stimulate the students' thinking, attention, and motivation in joining the lessons.

2. Functions and Advantages of Teaching Media

Muhamad Ikhsan in his article in <http://teknologipendidikan.wordpress.com/2006/03/21/prinsip-pengembangan-media-pendidikan-sebuah-pengantar/> says that AECT (Association for Educational Communication and Technology) differentiates six kinds of learning resources that can be employed in the learning process, namely (1) message, including curriculum and subjects, (2) people, including teachers, parents, experts, etc., (3) materials, a format used to keep the teaching messages, (4) equipment; the facilities (instrument, hardware) to present the materials in item 3 above (5) technique; the procedure used in teaching to achieve the instructional objectives, (6) setting; including the room layout, lighting, etc.

3. Criteria and Kinds of Teaching Media

Nana Sudjana and Ahmad Rivai (1991:5) propose a number of criteria in selecting media, namely : (1) Do they meet the teaching objectives? (2) Do they support the teaching materials? (3) Are they easy to get? (4) Do teachers have the skills in using them? (5) Are they suitable to students's level of thinking?

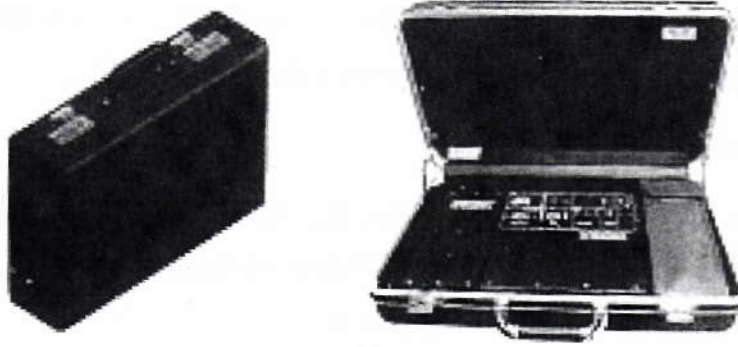
4. The Competence Standard of the Vocational Subject of Audio-Video Electronic Program

There are two standards of competence in this program:

- a. The competence standard of Audio-Video Program of vocational schools
 - Mastering the basic theories of electronics
 - Mastering the digital electronics
- b. The vocational competence of audio-video program

5. Integrated Briefcase

Integrated Briefcase is teaching media designed for the digital electronic practicum. It consists of all units which are designed to achieve the teaching objectives of the digital electronic practicum. The units available in the integrated briefcase are expected to help teachers in teaching the digital electronic practicum. The Integrated Briefcase is shown in the picture below.



Picture 1. The Briefcase before being used as an integrated teaching media unit

III. Research Method

This research is classified as a research and development (R&D) study. The object of the research was the teaching media for the digital electronic practicum by using an integrated briefcase equipped with a module as a practicum module for the digital electronic practicum subject. The steps in this research were conducting a need analysis, designing, and testing.

A. Need Analysis of the System

In this step the process of identifying the needs was conducted. The need is adjusted with the need of practicum which can support the achievement of the students' competence, in line with the materials in the basic competence of understanding the concepts of digital electronics.

1. Designing

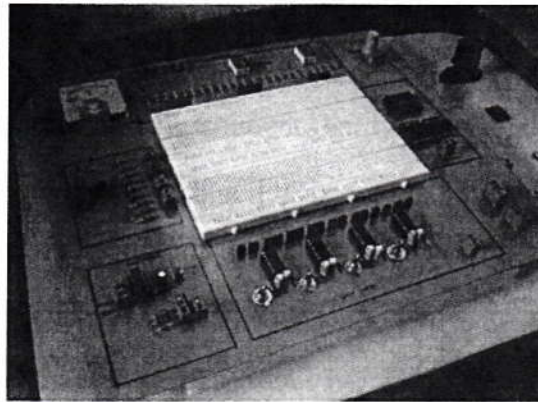
In this stage the design of the teaching media was produced. The media was designed to be flexibly used for various logic circuit. The units available in the integrated briefcase were arranged as follows:

- 1) Input Unit
- 2) Display Unit
- 3) Experiment Unit
- 4) Power supply unit
- 5) Clock Generator Unit
- 6) Analog to Digital Converter (ADC) Unit
- 7) Digital to Analog Converter (DAC) Unit
- 8) Connector Unit

- 9) Meter Unit
- 10) Potensiometer Unit

2. Implementation

In this implementation stage, the design was realized into the real circuit. The result of designing the teaching media put in the integrated briefcase is shown in the following picture.



Picture 2 The result of Designing the Teaching Media put inside the Integrated Briefcase

B. Data Collection Technique

The data were collected in the two following stages.

1. Testing and Observing

Testing and observing were intended to get the results of what the digital teaching media in the integrated briefcase can perform.

2. Distributing Questionnaires

Questionnaires were employed to determine the feasibility of the teaching media to be used in the teaching of digital electronic practicum subject. The results were then tabulated and analyzed.

C. The Research Instrument

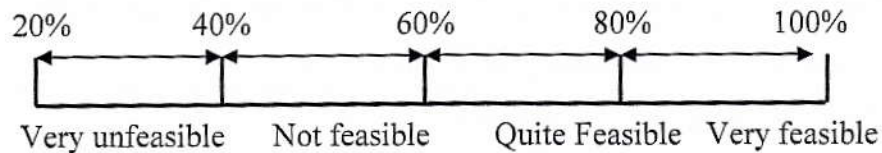
To obtain the data of the testing and observing Multimeter and Oscilloscope were used as instruments. To identify the feasibility questionnaires were used as

instruments. This instrument consisted of 2 aspects, the content of the materials and the display of the teaching media in terms of the technical aspect.

D. Data Analysis Technique

To determine the feasibility category of the digital teaching media, Likert Scale was used. The obtained data in the form of numbers can then be interpreted qualitatively (Sugiyono, 2006:135).

Further, the feasibility of the teaching media in this research was classified into five categories of feasibility by using the scale. The scale used, according to Suharsimi Arikunto (2004:18), belongs to the quantitative criteria without any consideration. The following is the feasibility scale.



Picture 3 Measuring Scale

Table 1 Category of Feasibility Percentage

Number	Score in percent (%)	Feasibility Category
1	< 20%	Very unfeasible
2	21% - 40%	Not feasible
3	41% - 60%	Quite feasible
4	61% - 80%	Feasible
5	81% - 100%	Very feasible

The formula of the final score of the indicator (Suharsimi Arikunto, 2004:21), is

$$NI = \frac{BSI \times NSI}{JB}$$

NI = Nilai Indikator (the score of the indicator)

BSI = Bobot Subindikator (the weight of the subindikator)

NSI = Nilai Subindikator (the score of the subindikator)

JB = Jumlah Bobot (the sum of the weight)

IV. Data presentation, Results, and Analysis

A. Data Description

1. The Data of the Test Result and Performance Measurement

a. Testing the Power Supply Circuit

The measured voltages were 0 Volt, 4,8 Volt and 12 Volt.

b. Testing the circuit in the input unit.

It was intended to make sure that the output unit would produce a 5 volt voltage when the switch was on, and would produce a 0 volt voltage when the switch was off.

c. Testing the LED display circuit

It was intended to ensure that LED could be on when given the 5 volt input voltage and could off when given 0 volt voltage.

d. Testing the 7-segment display circuit

It was done to ensure that all segments were on when given the input voltage. The test was done by giving 5 volt voltage. The test result showed that all segments were on.

e. Testing the Clock Generator Circuit

The test was intended to find out the output frequency. The test was done by using LED and oscilloscope. The frequencies produced were 2 Hz, 4 Hz and 40 Hz.

2. The Data of the Validity Test Result

The validity level of the media for the teaching of the digital electronics by using the integrated briefcase was tested through the validity test which included content validity and construct validity. The data of the content validity were obtained from an expert of teaching material. He was the teacher of the digital electronic practicum subject in State Vocational 2 Yogyakarta. The data of the construct validity were obtained from an expert of teaching media. He was a lecturer of teaching media.

a. The Result of the Content Validity Test

The result of the content validity test can be seen in the table below.

Table 2 The Expert Judgment of the Teaching Material

Number	Indicator	Mean Score	Σ The Highest Score	Percentage (%)
1	Material relevance	4,5	50	90
	Total	4,5	50	90

b. The Result of the Construct Validity Test

The result of the construct validity test is presented in the table below.

Table 3 The Expert Judgment of the Teaching Media

Number	Indicator	Mean Score	Σ The Highest Score	Percentage (%)
1	Technical aspect	4	50	80
	Total	4	50	80

3. The Data of the Feasibility Test Result

The feasibility test of the teaching media was carried out by trying it out to the vocational school students. The number of the students under observation was 24.

a. The result of the feasibility test in term of its technical aspect

The result is presented below.

Table 4 The Feasibility Test Score in Terms of its Material Aspect

Number of Indicator	Σ Score 1	Σ Score 2	Σ Score 3	Σ Score 4	Σ Score 5	Final Score (%)
1	0	1	8	11	4	75.00
2	1	1	8	10	4	72.50
3	0	1	10	12	1	70.83
4	1	2	18	2	1	60.00
5	1	3	12	8	0	62.50
6	2	5	4	11	2	65.00
7	0	1	8	12	3	74.17
8	1	5	6	10	2	65.83

9	0	1	9	12	2	72.50
10	1	3	9	10	1	65.83
Mean						68.42

b. The Result of the Feasibility Test in Terms of the Technical Aspect

The result of the feasibility test is shown in the following table.

Table 5 The Final Scores of the Feasibility Test in Terms of the Technical Aspect

Number of Indicator	Σ Score 1	Σ Score 2	Σ Score 3	Σ Score 4	Σ Score 5	Final Score (%)
11	1	2	7	14	0	68.33
12	0	3	10	10	1	67.50
13	1	1	7	12	3	72.50
14	0	3	7	14	0	69.17
15	0	2	9	8	5	73.33
16	3	2	8	9	2	64.17
17	1	1	9	6	7	74.17
18	1	1	11	5	6	71.67
19	0	3	6	10	5	74.17
20	2	3	11	5	3	63.33
Mean						69.83

B. Discussion

1. The Performance of the Teaching Media

The performance of the teaching media can be explained as follows:

- a. The power supply in the teaching media can produce the voltage required to supply the circuit in the teaching media.
- b. The teaching media can be used in the practicum for the logical circuit with four input and eight output terminals.
- c. The teaching media can display the two digit numeration.

2. The Result of Content Validity and Construct Validity Tests

The content validity and construct validity were based on Expert Judgment. The judgment was from the experts of material and media. The expected level of the content validity was using the scoring ranging from 1 to 5. The result was 90%, and it could be classified as very feasible. The result of the construct validity was 80% and it could be classified as feasible.

3. The Result of the Feasibility Test

- a. In terms of the material aspect which includes the material suitability, sequence, depth, difficulty level, way of presentation, clarity, the feasibility test showed the score as high as 68.42% which could be classified to be feasible.
- b. In terms of the technical aspect which includes the comprehensiveness of the module, the lay out, the ease, the suitable size, the ease of storing, the obtained score was 69.83% which could be classified to be feasible.

V. Conclusion and Implication

1. The media for teaching the digital electronic practicum using the integrated briefcase have been designed and met the demand of competence of the digital electronic subject.
2. The validity test viewed from its relevance to the materials showed the score as high as 90%, and it can be categorized as feasible. The construct validity test viewed from the technical aspect showed the score of 80%, and it can be categorized as feasible.
3. The feasibility test seen from the aspect of the material showed the final score as high as 68.42%. Then, it can be stated that the media used in the teaching of the digital electronic practicum by using the model of the integrated briefcase worth using.
4. The score obtained from the feasibility test seen from the technical aspect was 69.83%. So, it can be stated that the teaching media used in the digital electronic practicum by using the briefcase model worth using.

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