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# Development of Job Sheets as Learning Media in Building Engineering Drawing Subjects

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**ABSTRACT**
This study aims to produce job sheets on the subject of Building Engineering Drawings that are practical, feasible and easy to apply to class X students of the Building Information Modeling Design Expertise Program at SMK Negeri 14 Medan. To produce the job sheet, research and development was carried out using the 4D development model which refers to the Define, Design, Development and Disseminate stages. The research stage begins with analyzing the needs of students related to the Building Engineering Drawing subject and then making media designs. The next stage is media design validation carried out by media experts and material experts. Data collection was carried out using instruments to validate the media by using a work assessment sheet and followed by revising the media (job sheet). The results showed that the average job sheet validation from material expert validators and media expert validators was very feasible with an average yield breakdown of 90.06% from material experts and 87.33% from media experts. The results of student responses based on job sheet requirements were 81.57% with the very feasible category for development. Based on the three variables above, it is necessary to develop a job sheet for the Building Engineering Drawing subject.

***Keywords:*** *Learning Media, Job Sheets, students, validation*

## 1. INTRODUCTION

Technological developments and advances require teachers and schools to create learning that attracts interests and talents so that students get a proper education. Education is needed by every young generation to develop their ideas and creativity. Technological developments and advances can produce skilled, quality and professional human resources, [1]. In order for students to become more skilled and qualified, in the learning process it is necessary to have a learning media in the form of job sheets.

Learning is an activity to shape students to think more and behave positively in dealing with a situation, [2]. Based on the opinion above, it can be concluded that in learning activities students need learning media and the teacher as a facilitator can channel information verbally, or visually. This learning system can convey the objectives of learning so as to create a conducive learning environment with an effective, efficient and fun learning process.

Learning media is a tool for introductory learning. Each learning media is used as a support for the learning process, so that the material and materials discussed can be easily understood by students properly and assist teachers in delivering subject matter. Learning media can be used to create real [3] and active learning conditions and situations. Conversely, without learning media, learning activities become passive and boring, [4]. Good learning media can encourage students' learning motivation, clarify concepts and make it easier to understand them, and can increase the absorption of teaching materials.

One of the learning media that can be used in the learning process is a job sheet. Job sheet learning media is used to streamline students in the learning process which contains instructions and steps to complete assignments. Learning activities become more fun and unforgettable, so as to increase student motivation to get good learning outcomes.

In learning activities for the subject of Building Engineering Drawing which emphasizes drawing skill expertise to students, the appropriate media to use is job

sheet media. This media was chosen to explain clear steps in understanding the subject matter and being able to practice drawing activities directly. The job sheet media contains clear steps and work instructions in carrying out assignments and drawing exercises in accordance with the material.

SMK Negeri 14 Medan is a vocational education unit that prepares graduates who are skilled, qualified, qualified and professional. To increase the competence of students in dealing with the very rapid development at this time, Medan 14 State Vocational School has a Building Information Modeling Design (DPIB) expertise program. One of the subjects in this program is Building Engineering Drawing which is taught in class X in odd and even semesters. This subject consists of seven basic competencies which are carried out in two semesters. The competencies expected in this course are that students are expected to be able to understand, apply and be able to draw buildings in cognitive, affective and psychomotor aspects.

Observation results obtained data that, the information received by students to support the achievement of learning objectives of Building Engineering Drawings is unclear because the available job sheets do not contain clearly about work steps in completing practical assignments of Building Engineering Drawings. This makes it difficult for students to understand the existing job sheets, because they contain brief theories that contain descriptions with little visual displays as work instructions. In addition, the existing visuals do not contain information on the tools and materials used in the drawing task.

## 2. LITERATURE REVIEW

### 2.1. Research Development or Research Besed Development (R&D)

Development research, also known as Research and Development (R&D), is a process or step to develop or perfect an existing product. The form of the product can be an object with hardware (hardware) or software (software). The research process is carried out by analyzing needs, developing products, evaluating products, making revisions and then distributing products.

According to Thiagarajan (in Sugiyono, 2016) states that the steps carried out in development research are known as 4D, namely (1) Define is a definition that contains activities of determining the product to be developed through needs analysis, (2) Design, making designs for products that have been stipulated, (3) Development is development by conducting product validation and (4) Dissemination disseminating products that have been tested.

### *2.2.* Instructional Media

Learning is a form of education in the form of interaction between teachers and students. The learning process uses learning materials, methods of delivering learning materials, learning strategies, and learning resources in a learning environment, [5]. The purpose of learning is to improve the cognitive, psychomotor, and affective aspects of students, [6]. To achieve learning success through the learning process and can be seen from the learning objectives. By achieving the learning objectives, it shows the level of success of the teacher as a facilitator in the learning process. With proper learning through formal education in schools, students can develop their own potential, such as comprehensive skills and insights, [7]. In the learning process, the use of learning media must be appropriate to the competencies to be achieved. Appropriate learning media must be used to support students' understanding of a material. With learning media able to create an efficient and effective learning environment.

Learning media is something that concerns materials or tools that can be used to convey the content of material from learning resources to students individually or in groups, [8]. With the existence of learning media can stimulate the thoughts, feelings, concerns, and interests of students so that ultimately the learning process becomes more effective and enjoyable.

Some things that can be developed in the learning process that uses learning media, namely theoretical and conventional learning systems can become more real and concrete. Can generate motivation to learn because learning takes place more interesting so that it can focus the attention of students and learning becomes clearer and easier to understand. Apart from that, it stimulates students so that their curiosity becomes higher

### *2.3. Development of Job Sheet*

One of the effective learning media to be used in the learning process is job sheets, especially for subjects that require work practice or action. Job sheets are also called worksheets which contain a collection or instructions for activities or ways of working carried out by students, [9] and with job sheets learning is maximized because it can develop basic skills in accordance with indicators of achievement of learning outcomes.

Job sheet is a guideline or practice guide that is arranged systematically, operationally and directed, [1]. Using a job sheet really helps students in doing assignments or practice. The use of job sheets aims to make it easier for students so that they can increase the efficiency and effectiveness of time, personnel and facilities in achieving learning objectives optimally.

The use of job sheets can provide a good experience for students, because it can facilitate mastery and

understanding of the basic competencies of the learning process or practical work, [10]. With job sheets encourage students to be more enthusiastic in doing practical assignments. It can be concluded that job sheets can facilitate the learning process, facilitate the understanding of basic competencies in achieving learning objectives. Job sheets are prepared based on the objectives to be achieved, the tools and materials used, practical procedures and practical steps.

## 3. METHODOLOGY

The research was conducted at SMK Negeri 14 Medan Jalan Karya Dalam No. 26, Medan Baru District, Medan City, North Sumatra. The research was conducted for 30 students of class X Building Information Modeling Design Skills (DPIB) in the subject of Building Engineering Drawings. The time of the research is carried out in the 2021/2022 school year. The curriculum used is the 2013 curriculum (K13).

The resulting product is a job sheet learning media product through a feasibility test of job sheet material at the validation stage by 2 material experts and 1 media expert and knowing the responses of students. The resulting product can help teachers to more easily explain subject matter. For students, the products produced can help to understand the material presented, so that students can learn independently both in theory and practice.

The resulting learning media is then tested for its feasibility. The material expert feasibility test instrument is reviewed from three aspects, namely (1) the content feasibility aspect, (2) the job sheet presentation aspect and (3) the usability aspect. This due diligence instrument is given to tutors and lecturers who are experts in their fields. Then a media expert feasibility test was carried out which was reviewed from five aspects, namely (1) appearance aspect, (2) ease of use aspect, (3) consistency aspect, (4) format aspect and (5) graphic aspect.

After conducting the feasibility test for material experts and media experts, the job sheets can be disseminated to students to carry out development feasibility tests using a questionnaire. The questionnaire instrument is used to assess the job sheet to be developed. The questionnaire assessment grid consists of aspects of the attractiveness of learning media with several indicators.

The next step is to analyze the due diligence of material experts, media experts and student response analysis. The results of job sheet feasibility analysis data can be calculated using the following formula.

$$P\ (\%) = \frac{\Sigma F}{N \times I \times R} \times 100\%$$

(Source: Riduwan, 2015)

Keterangan:

P(%) : Percentage Results
I : Highest Score
N : Lots of Validators
ΣF : Number of Validation Checks

The results of the validation carried out by the validator are processed and measured using intervals on the Likert scale, with the following criteria (Table 1):

**Table 1**. Criteria for the score of Material Expert and Media Expert

| Percentage | Category |
|---|---|
| 0% - 20% | Very Ineligible (STL) |
| 21% - 40% | Not Eligible (TL) |
| 41% - 60% | Enough Eligible (CL) |
| 61% - 80% | Eligible (L) |
| 81% - 100% | Very Eligible (SL) |

(Source: Ridwan, 2015)

The results of student responses were processed and measured using intervals on the Likert scale, with the following criteria, (Table 2):

**Table 2**. Student Score Criteria

| Qualitative Assessment | Rating Weight | Percentage |
|---|---|---|
| Strongly Disagree (STS) | 1 | 0% - 20% |
| Disagree (TS) | 2 | 21% - 40% |
| Neutral (N) | 3 | 41% - 60% |
| Agree (S) | 4 | 61% - 80% |
| Strongly Agree (SS) | 5 | 81% - 100% |

(Source: Ridwan, 2015)

After conducting a feasibility test on material experts and media experts and continuing to assess student responses from each aspect being assessed, the average score of all aspects is first determined to get the overall score. Then the test results are described qualitatively using score interpretation criteria. The job sheet developed is said to be valid if the learning media according to media experts and material experts fall within the minimum feasible criteria. While the results of the participants' responses showed a minimum approval rating, the job sheet could be used as a learning medium.

## 4. RESULTS AND DISCUSSION

### *4.1. Result*

The results of the job sheet validation by 2 material experts can be seen in Table 3.

**Table 3**. Results of Material Expert Validation

| Aspect / Indicator | | Validator's answer | | Total | Result (%) | criteria |
|---|---|---|---|---|---|---|
| | | 1 | 2 | | | |
| **Content Eligibility** | | | | | | |
| a. | Compatibility with KI | 4 | 4 | 8 | 80 | L |
| b. | Compatibility with KD | 4 | 5 | 9 | 90 | SL |
| c. | Suitability to the needs of students | 4 | 5 | 9 | 90 | SL |
| d. | Compatibility with teaching m | 4 | 4 | 8 | 80 | L |
| e. | The truth of material substanc | 4 | 5 | 9 | 90 | SL |
| f. | Benefits for increasing knowledge and skills | 5 | 5 | 10 | 100 | SL |
| | average score | | | | 88,33 | SL |
| **Job Sheet Presentation Aspect** | | | | | | |
| a. | Instructional provision | 5 | 4 | 9 | 90 | SL |
| b. | Clarity and ease of material | 4 | 5 | 9 | 90 | SL |
| c. | Information completeness | 5 | 5 | 10 | 100 | SL |
| | average score | | | | 93,33 | SL |
| **Benefits** | | | | | | |
| a. | Give focus attention | 5 | 4 | 9 | 90 | SL |
| | average score | | | | 90,00 | SL |

The results obtained show an average value for the content eligibility aspect of 88.33% with very feasible criteria (SL), for the presentation aspect the results obtained are 93.33% with very feasible criteria (SL), and for the benefits of the job sheet the results obtained 90.00% with very decent criteria (SL). The results of the material expert feasibility test on each aspect with the indicators can be seen in Table 3. Then the data recapitulation of the analysis results from each material expert can be seen in Table 4. The results of the analysis show that the range of values given by 2 material experts does not show significant differences significant with very feasible outcome criteria (SL) for each aspect reviewed.

**Tabel 4**. Material Expert Recapitulation

| No | Feasibility Test Instruments | Material expert 1 | Material expert 2 | Total score | criteria |
|---|---|---|---|---|---|
| 1 | Content Eligibility Aspects | 4,33 | 4,5 | 8,83 | SL |
| 2 | Job Sheet Presentation Aspects | 4,67 | 4,67 | 9,34 | SL |
| 3 | Benefits Aspect | 5,00 | 4,00 | 9,00 | SL |
| | average score | 4,67 | 4,39 | 9,06 | SL |

The results of the job sheet validation by 1 media expert can be seen in Table 5.

**Table 5**. Media Expert Recapitulation

| Aspect / Indicator | | Validator answer | Result (%) | Criteria |
|---|---|---|---|---|
| **Display Aspect** | | | | |
| a. | The cover of the job sheet is attractive and contains elements of the title and | 4 | 80 | L |
| b. | Proportional font size and legible | 4 | 80 | L |
| c. | Color composition of text and pictures | 4 | 80 | L |
| | average score | | 80,00 | L |
| **Ease of Use Aspect** | | | | |
| a. | Systematic presentation | 4 | 80 | L |
| b. | The language is easy to understand | 5 | 100 | SL |
| c. | Effective and efficient use of language | 5 | 100 | SL |
| d. | Compatibility with Indonesian language rules | 4 | 80 | L |
| | average score | | 90,00 | SL |
| **Consistency Aspect** | | | | |
| a. | Consistent words, terms and sentences | 4 | 80 | L |
| b. | Consistent font size and shape | 5 | 100 | SL |
| c. | Layout consistency | 4 | 80,00 | L |
| | average score | | 86,67 | SL |
| **Format Aspects** | | | | |
| a. | Paper and font sizes | 5 | 100 | SL |
| b. | Sizes and proportions of figures, tables and text | 4 | 80 | L |
| | average score | | 90,00 | SL |
| **Graphic aspect** | | | | |
| a. | Color | 4 | 80 | L |
| b. | Display design. | 5 | 100 | SL |
| | average score | | 90,00 | SL |

The results of the average score given by media experts from the job sheet display aspect are 80% with feasible criteria (L), from the aspect of ease of use 90% with very feasible criteria (SL), from the aspect of consistency 86.67% with very feasible criteria (SL), from the format aspect 90% with very decent criteria (SL) and from the graphic aspect 90% with very decent criteria (SL).

The following are the results of the development feasibility test obtained by distributing questionnaires via Google form to 30 students. In the questionnaire students can choose answers, namely strongly disagree (STS), disagree (TS), neutral (N), agree (S), and strongly agree (ST). The number of questions asked was 14 items consisting of 3 negative sentences and 11 positive sentences. The recapitulation results can be seen in Table 6.

**Tabel 6**. Recapitulation of Student Responses

| No | Statement | Total score | Percentage of Selected Answers (%) | | | | |
|---|---|---|---|---|---|---|---|
| | | | STS | TS | N | S | SS |
| 1 | Learning by using job sheets makes me active in following the lessons | 120 | 0 | 6,67 | 26,7 | 26,67 | 40,00 |
| 2 | The use of job sheets makes me lazy to discuss with classmates | 81 | 20,00 | 26,7 | 26,67 | 16,67 | 10,00 |
| 3 | Using a job sheet makes me understand the procedure for drawing different types | 124 | 3,33 | 3,33 | 16,7 | 30,00 | 46,67 |
| 4 | Learning with job sheet media helps me understand the material for the types of lines | 132 | 0 | 0 | 13,33 | 33,33 | 53,33 |
| 5 | I am very enthusiastic about taking the building engineering drawing course | 127 | 0 | 6,67 | 13,33 | 30,00 | 50,00 |
| 6 | The use of job sheets makes it difficult for me to understand the material for the types of lines | 124 | 3,33 | 6,67 | 10,00 | 33,33 | 46,67 |
| 7 | The use of job sheets helps me to increase my knowledge, especially on line types | 134 | 0 | 0 | 13,33 | 26,67 | 60,00 |
| 8 | The language used in the job sheet is easy to understand | 127 | 0 | 10,00 | 10,00 | 26,67 | 53,33 |
| 9 | Proportional cover layout makes me interested in using this job sheet | 121 | 3,33 | 10,00 | 13,33 | 26,67 | 46,67 |
| 10 | The use of images in accordance with the content of the material | 128 | 0 | 0 | 20,00 | 33,33 | 46,67 |
| 11 | The suitability of the appearance of the letters in the job sheet is correct, making it easier to read | 125 | 3,33 | 3,33 | 16,67 | 26,67 | 50,00 |
| 12 | The job sheet preparation format is very good so it is easy to understand | 124 | 0 | 10,00 | 13,33 | 30,00 | 46,67 |
| 13 | The graphics in the job sheet don't match the material so it's hard to understand | 122 | 3,33 | 6,67 | 13,33 | 33,33 | 43,33 |
| 14 | The format for the division of material for each chapter is clear. | 124 | 3,33 | 6,67 | 16,67 | 20,00 | 53,33 |
| | **Total** | **1713** | | | | | |

Furthermore, the recapitulation results were analyzed to see the percentage of student responses.

$$P\ (\%) = \frac{\Sigma F}{N \times I \times R} \times 100\%$$

$$P\ (\%) = \frac{1713}{(30 \times 5 \times 14)} \times 100\%$$

$$P\ (\%) = 81{,}57\%$$

The results of the analysis show that the percentage of students' responses to the development of the use of job sheets is 81.57%. If it is linked to Table 3 regarding the criteria for interpreting student scores, the responses of class X students in Building Information Modeling Design Skills (DPIB) at SMK Negeri 14 Medan strongly agree (SS) that the jobsheet is developed.

## *4.2. Discussion*

The development stage aims to produce jobsheet learning media based on input from the feasibility test results from the validator and student responses. Job sheet validation uses a questionnaire filled out by 2 material experts and 1 media expert. The selected material experts are lecturers in the Department of Building Engineering Education, Medan State University and teachers at SMK Negeri 14 Medan with the Expertise in Building Information Modeling Design (DPIB). For media expert lecturers, they are lecturers in the Department of Building Engineering Education, Medan State University.

Validation carried out by material experts shows that the aspect of content feasibility requires adjustments to core competencies (IC). Input from experts needs a work system on the jobsheet that shows conformity with KI, namely in clearer procedures or stages in cognitive, affective and psychomotor students so that they can develop their ideas and creativity. In addition, the revisions and suggestions given by material experts are contained in indicators of conformity with teaching materials. There needs to be more detailed material about line material which is translated into images so that the reasoning power of students can develop which in turn can develop their creativity. Jobsheet development as teaching material is more directed towards independent learning so that learning takes place centered on students, [11].

Furthermore, the validation results from media experts on the display aspect need to be revised so that the resulting jobsheet becomes more attractive. This is in line with the function of the jobsheet as a tool to expedite the understanding of information or messages. The presence of jobsheets as learning media is a tool for channeling the information needed for learning. In the jobsheet, the theory and work steps of building engineering drawings are presented. Submission of theory and guidance is delivered in the form of text and pictures arranged in an attractive format. Thus, the information and instructions conveyed are easy for students to understand, [12].

The validation results from material experts and media experts resulted in a conclusion that the available jobsheets were very feasible (SL) to be presented and tested for their feasibility to students. By developing jobsheets as instructions and guidelines in practice and doing drawing assignments is an effort to produce competent students, [9].

Jobsheet development can be done based on student responses. Based on the responses of 30 class X students to the feasibility of the jobsheet, it is necessary to develop the jobsheet under study. The results of the questionnaire which are student responses can increase understanding of information in visual and verbal forms. The results of the students' questionnaires are used to determine the contribution of jobsheets in the learning process as learning media, [13]. The results of the questionnaire recapitulation of student respondents showed "strongly agree" (SS) to be repaired. There needs to be improvement in the graphics, images and colors used so that the jobsheet can contribute while students practice drawing.

## 5. CONCLUSION, IMPLICATIONS, AND SUGGESTIONS

### *5.1. Conclusion*

Based on the results of research and development it can be concluded, as follows:

a. The feasibility of jobsheet learning media in the Building Engineering Drawing subject class X Building Information Modeling Design Expertise Program (DPIB) can be seen from the results of material expert validation on 3 aspects, namely the content feasibility aspect, the presentation aspect and the usability aspect. Of the three aspects, the results obtained were 90.06% with the criteria of "very eligible" (SL).
b. The results of the average score given by media experts from the appearance aspect, the ease of use aspect, the consistency aspect, the format aspect and the graphic aspect is 87.33% with the " very eligible " (SL) criteria.
c. The results of the analysis of students' responses to the jobsheet adequacy test amounted to 81.57% with the criteria "strongly agree" (SS) carried out jobsheet development.

### *5.2. Implications*

Based on the results and conclusions of the research, it shows that jobsheet development can be done to provide variety and convenience in the learning process. Jobsheet development can be carried out based on input from material experts and media experts as well as due diligence tests from students so as to produce learning media that are interesting and easy for students to understand.

The existence of a jobsheet in the learning process can help students carry out practice and do drawing assignments, so that they become active in doing assignments. Another thing is that students become more skilled, and innovative and have critical reasoning in developing their ideas and creativity so that learning objectives are achieved.

For the implementation of jobsheet development, researchers and teachers collaborate with each other in determining the direction and objectives of implementing the practice so that students have competence in accordance with the basic competencies of the subject. In this case, it is necessary to have the role of researchers and teachers in planning job sheets, reflecting and evaluating results so that the job sheets produced are truly in accordance with the competency learning objectives. Students take an active role in responding to all updates that can be implemented in the development of learning media.

### *5.3. Suggestions*

Based on the results of data analysis and conclusions, the suggestions that can be given are:

a. The use of jobsheets can make it easier for students to complete practical assignments quickly and correctly in every learning process, so jobsheets are facilities that must be available in the learning process, especially for practice-based subjects.

b. There needs to be full support from the parties involved in the learning process, so that jobsheet learning media can continue to be developed based on the potential and creativity of students. All of this will have a good impact on student learning outcomes.

## AUTHORS' CONTRIBUTIONS

Siti Zulfa Yuzni (SZY), Juntan Dionisius Tampubolon (JD) and Syafiatun Siregar (SS) Harun Sitompul (HS), implemented ideas in the form of research and compiled and planned experimental designs. SZY developed theory and due diligence by conducting analysis assisted by JD using computation. SS and HS help analyze and verify it. SZY, JD, SS and HS jointly drafted and wrote the script.

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