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Adobe Flash-Based Multimedia Learning System in Basic Analog and Digital Electronics Subject

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Abstract. The objective of this research is to develop a multimedia learning for basic analog and digital electronics subject. This present study employed research and development method. Prior to the trials, the developed learning media will be validated by experts in media and material. The results reveal that the total score of the validation by 1) media experts reaches 86 (90.52%) and 2) material experts reaches 110 (91.66%), 3) the outcome of the user trial encompasses aspect, e.g., (a) aspect of media with the score 666 (88.80%), (b) aspect of learning material with the score 517 (86.17%), and (c) aspect of media with the score 546 (91%). The overall score of the assessment by the students regarding multimedia learning is 1729 (88.67%). From the results of the feasibility test, it is concluded that the developed learning media are of feasible to use in the class to improve the students' learning, specifically in introducing electronic components.

Keywords: learning media, learning outcome, electronic components.

1. Introduction

Basic analog and digital electronics are among the compulsory subjects for grade XI students majoring in computer network engineering in vocational school SMK Negeri 1 Wonosari. This school has started to implement curriculum 2013. The aforementioned subject has been the focus of some studies due to several reasons, such as the lack of practicum. This issue leads to a decline in the students' motivation.

The issue of the lack of motivation impacts on the students' capabilities to comprehend the subject. This also negatively affects the students' learning outcome. According to the preliminary observation in the research site (conducted during the internships or PPL), the students showed little interest in learning the basic analog and digital electronics subject. It is revealed that only 12 among 30 students who passed the minimum mastery standard with an average score of 85.53. The score of other students is 67.33 on average. These data concludes that students' ability on the subject is relatively low. This suggests a varied learning model in order to improve the students' learning outcome.

The above problem urges research on the development of multimedia learning to boost students' interest in learning. It is expected that the developed learning media improves the motivation of the students and cultivate their creative thinking. In addition, teachers are also expected to benefit from the multimedia learning model to have successful learning activities.



2. Research Methodology

This present study employed a research and development (R&D) method. The objective of this research is to develop a multimedia learning model and to validate the model to ensure its feasibility [1]. The procedures of this research adapt the development model [2,3]. These procedures involve six steps, i.e., (1) survey and collecting of information, (2) planning, (3) development of the product format, (4) testing, (5) revision of the product, and (6) evaluation of the outcome.

This research was conducted in vocational high school SMK Negeri 1 Wonosari, Boalemo Regency, Gorontalo. The subject involved 30 students majoring in computer network engineering. This interactive multimedia development research used questionnaires as its instrument to evaluate the developed learning media [4]. These questionnaires are divided into three major groups, i.e., 1) media expert feasibility testing instruments, 2) content expert feasibility testing instruments, and 3) user response test instruments.

The data of this research consisted of primary and secondary data. These were generated from critics and suggestions in all of the questionnaires. Moreover, the quantitative data were analyzed using a quantitative descriptive method. The analyzed data consists of the feasibility of the media by content experts, media experts, and the response from the students as the object of the trials.

3. Results and Discussion

Multimedia learning is used in the subject of basic analog and digital electronics in grade XI students majoring in computer network engineering in SMK Negeri 1 Wonosari. The following is the discussion of the research results.

3.1. Validation by the Media Experts

Validation was performed using the questionnaire of media feasibility test. The questionnaire consists of two assessment components, i.e., display and programming. Furthermore, the response in the questionnaire is in the form of a rating scale from one (1) to five (5) [4]. The criteria of the quality of media experts are provided in the following table [3].

Table 1. Criteria of category assessment by media experts

No.	Range of Score	Feasibility percentage		Description
		(%)		
1	$X > 79.788$	81% - 100%		Very good
2	$64.596 < X \leq 79.788$	61% - 80%		Good
3	$49.404 < X \leq 64.596$	41% - 60%		Moderate
4	$35.788 < X \leq 49.404$	21% - 40%		Low
5	$X > 35.788$	0% - 20%		Very Low

The questionnaire of validation by media experts has two components of assessment, i.e., display and programming. The indicators comprise 19 numbers. The result of the validation of media expert is depicted in the following Table 2.

Table 2. Validation Result of Media Experts

No.	Components	Frequency					Σ Indicator	Max Score	Σ Score e	(%)
		1	2	3	4	5				
1	Display	0	0	0	9	5	14	70	61	87.14
2	Programming	0	0	0	0	5	5	25	25	100

Total	19	95	86	90.53
Description	Very good			

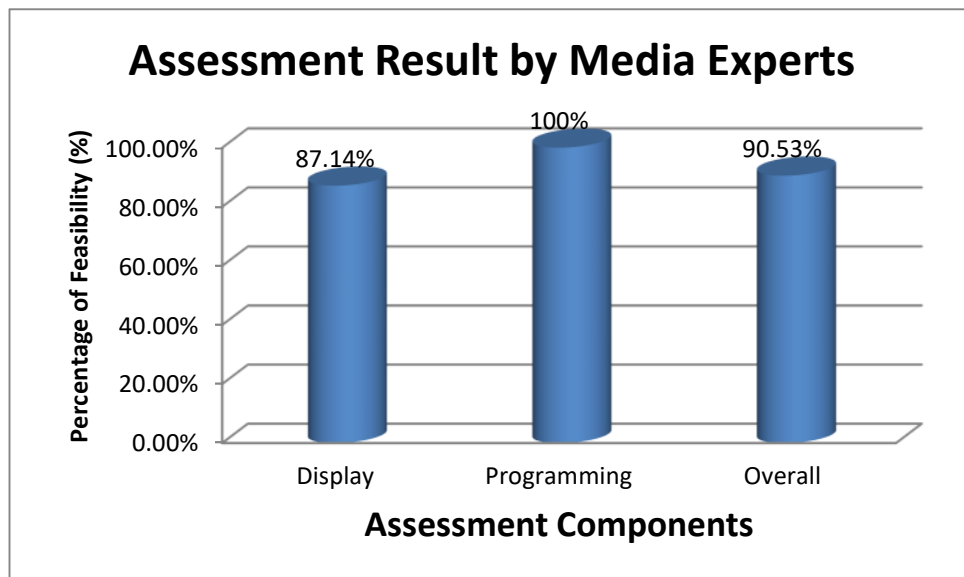


Figure 1. Diagram of percentage of validation by media experts

The score of quality of the learning media, based on the validation of media expert, reaches 86. From the criteria of ideal assessment in Table 1, it is confirmed that the quality of the learning media, according to the media expert, is in the range of $X > 79.788$ with the percentage of feasibility at 90.53%. This signifies that the feasibility of the learning media by the media experts is categorized “very good”.

3.2 Validation Result of Content Experts

The quantitative data in form of assessment score given by the content experts is used to determine the feasibility of the media. Further, the experts’ suggestions and criticisms are treated as reference in improving the developed learning multimedia product. The criteria of feasibility and quality of learning media as assessed by experts is displayed in the following table 3 [5].

Table 3. Criteria of category of assessment by content experts.

No.	Score Range	Feasibility Percentage (%)	Classification
1	$X > 100.8$	81 – 100 %	Very Good
2	$81,6 < X \leq 100.8$	61 – 80 %	Good

3	$62,4 < X \leq 81.6$	41 – 60 %	Moderate
4	$43.2 < X \leq 62.4$	21 – 40 %	Low
5	$X \leq 43.2$	0 – 20 %	Very Low

The questionnaire of validation by content experts is classified into two main aspects, i.e. content and learning, in which the indicators are 24 items in total. The following table displays the detailed experts' assessment.

Table 4. Validation Result of Content Experts

No.	Components	Frequency					Σ Indicator	Max. Score	Σ Score	(%)
		1	2	3	4	5				
1	Content	0	0	0	4	4	8	40	36	90
2	Learning	0	0	1	4	11	16	80	74	92.5
Total							24	120	110	91.66
Description									Very Good	

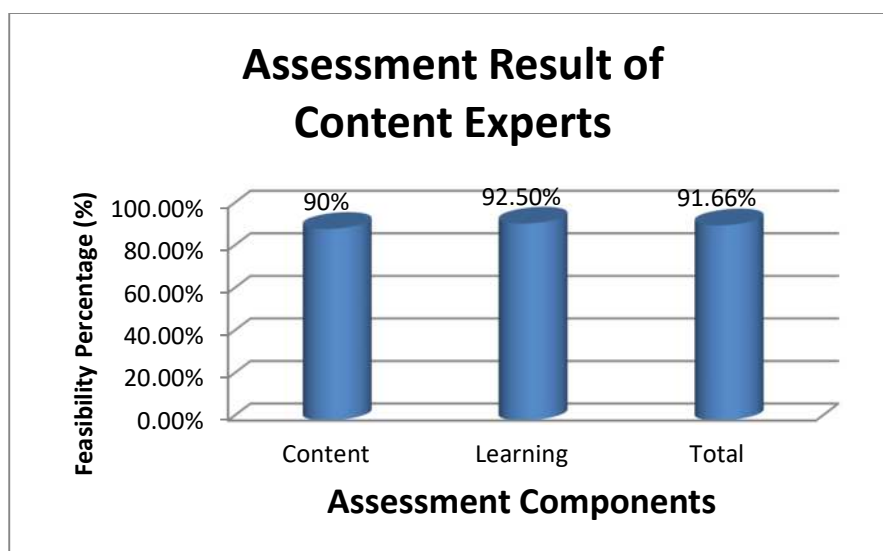


Figure 2. Diagram of percentage of content experts' validation.

The validation result indicates that the learning media quality scores 110. Therefore, it is assumed that the learning media quality is within the score range of $X > 100.8$ and categorized "very good" with feasibility procedure of 91.66%.

After the validation and revision step, the learning media is tested in 30 students of XI Computer Network Engineering class of Vocational High School SMK Negeri 1 Wonosari. Students are asked to fill out the response questionnaire consisting of 13 questions covering aspects of media, material, and learning from multimedia developed. The response result is observable in the following table.

Table 5. Result of test towards students

No.	Aspect	Frequency					Σ Indicator	Max. Score	Σ Score	(%)
		1	2	3	4	5				
1	Media	0	0	13	58	79	5	750	666	88.8
2	Material	0	1	15	50	54	4	600	517	86.17
3	Learning	0	0	8	38	74	4	600	546	91
Total							13	1950	1729	88.67

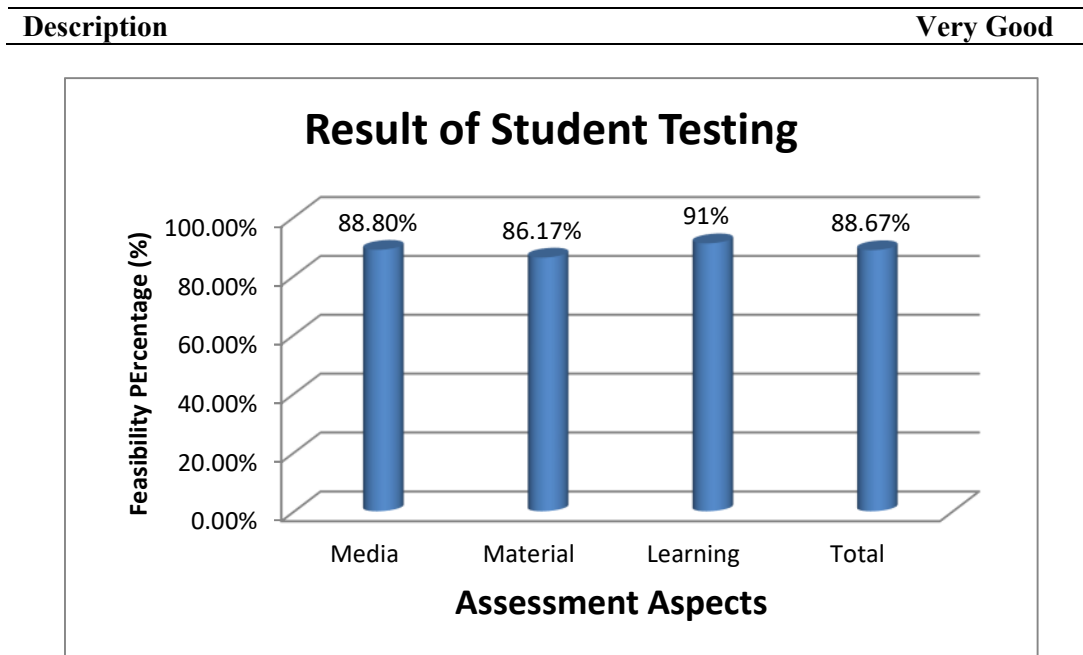


Figure 3. Diagram of percentage of testing towards students.

The test result shows that: (1) the aspect of the media obtains score of 666 (88.80%), (2) the material aspects scores 517 (86.17%), and (3) the learning aspect's score is 546 (91%). In total, the students' assessment on learning multimedia achieves score of 1729 (88.67%). Based on the feasibility percentage scale, the multimedia is categorized "Very Good".

Based on data from the result of field testing, the researchers do not make any significant improvement. However, it is crucial to state that students are to be guided of optimal learning media utilization in performing independent learning. Moreover, it is essential for the students to pay full attention on material presented within learning media.

4. Conclusion

Based on the research findings and elaboration, the study generates several conclusions as follows: The study employed developmental research by Borg and Gall's procedure which is simplified to adjust with research needs. The procedure involves 6 phases of development, i.e. (a) survey and information collection, (b) planning/pre-production, which consists of designing flowchart and storyboard, (c) development of product format and validation of content and media experts, in which it results in feasible status with minor revision, (d) testing phase, in which the learning media is categorized very good and feasible to use in Class XI of Computer Engineering Network of Vocational High School SMK Negeri 1 Wonosari, (e) the product revision stage, during which no significant change performed. Henceforth, the study synthesizes that the learning multimedia of basic analog and digital electronics developed is feasible to use in learning process.

5. Recommendations

The research proposes several recommendations as follows:

1. It is essential for teachers to utilize the learning media developed as an alternative in learning process of basic analog and digital electronics lesson.
2. It is essential for further relevant researchers to develop extensive and interactive multimedia by adjusting with development of curriculum, in order that the learning media is capable of improving the students' competence.

6. References

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