

Development of Learning Multimedia Feasibility Instrument

S. Sriadhi

Department of PTIK Universitas Negeri Medan, Indonesia

sriadhi@unimed.ac.id

Abstract. Media is one of the components determining learning outcomes. In fact, a lot of learning media used in the field are not feasible. This study aims to develop the instrument of feasibility and effectiveness of multimedia learning in four aspects, namely (1) content of media, (2) construction of media, and (3) acceptability of media. The effectiveness of learning is tested through quasi-experiments. Validity test for four instruments conducted using item analysis and reliability test using Cronbach Alpha technique. The results of the study show that all instruments are valid. The reliability test also shows high results and the acceptance level of the media is classified as very high. The study concluded that the instruments developed had fulfilled the eligibility requirements with a very high acceptance rate.

Keywords: multimedia, feasibility, assessment

1. Introduction

The problem of low learning outcomes is caused by many factors and one of them is learning media. Some studies emphasize the role of learning media in determining the quality of learning outcomes [1,2,3]. In addition, Aydin [4] through their research found that low learning outcomes are caused by a lack of learning media. Likewise in Indonesia, which faces various obstacles and problems with regard to learning media as one of the factors causing low learning outcomes. The problem of low learning outcome is caused by the lack of instructional media especially information technology-based media [5]. The same thing is stated that the lack of learning media to support the learning process caused low learning outcomes [6]. It is in accordance with the study results by Sriadhi, et al [7] which shows low learning outcomes are due to the lack of learning media.

The results of these studies prove that multimedia learning will improve learning achievement. This is also supported by several relevant research results [1-3, 6]. But, the reality is not in line with expectations, because the results of the study found that the learning media is so lacking that the learning process, especially in the field of vocational education, has not been able to meet the quality as demanded by the professional life [8]. The results of Sriadhi's research shows that instructional media in Vocational High Schools only meet the feasibility of around 42% of the curriculum needs [9]. Even the results of subsequent research [7] show the percentage of media needs for the vocational teacher was only 18.16% in the form of power points and only 7.58% in the form of animated video media. Besides, it was not developed as needed but was taken from You Tube and other sources. Furthermore, only 10.61% of the Specialization Package teachers use power-point media and 6.06% use video and animation media. Additionally, the quality aspect of all types of media used by teachers is deemed not feasible. The results also state that low instructional media, both the quality of the feasibility and the quantity, are the causes of insufficient learning outcomes.

The results of the preliminary study show that the low learning media both in terms of quantity and quality are caused by two main factors. The factors are the lack of teachers' ability to develop media specifically based on electronics and weaknesses in media feasibility testing. The learning media developed by the teacher have generally not been tested for their feasibility. A small part of it has been tested using inappropriate instruments so that the correctness and effectiveness of the media produced cannot be guaranteed. To address this problem, this study will examine multimedia learning theory and multimedia design principles [10,11]. Besides, this research aims to develop standard instruments to test the feasibility of multimedia learning in reference to Alessi and Trollip [12]. The instrument consists of three domains, namely (1) media feasibility testing instruments; (2) media construction feasibility testing instruments; and (3) media acceptance level test instruments. This standardize instrument is expected to be the quality control of the developed media by the teacher before it is implemented. A good quality learning media is believed to contribute to improving student learning outcomes.

2. Research Method

This research was carried out in the Information Technology and Computer Education (ITCE) Study Program of Engineering Faculty, State University of Medan, carried out in the year 2018. As an implementation material, learning multimedia was used with the topic of the RLC Series which was built using the ADDIE Model, with Adobe Flash based. The instruments for assessing the feasibility of multimedia learning consist of three domains, namely (1) media content assessment instruments, (2) media construction assessment instruments, (3) media acceptance level assessment instruments.

The development of the media feasibility test instrument refers to Alessi and Trollips [12], Mayer [10] and Wahono [13]. Indicators of content feasibility include : conformity with curriculum/objectives, relevance, coverage and depth, contextually and actual, quality of materials, systematic, clarity of exposure, use of examples and illustrations, sequence of material, and consistency of evaluation. Media construction feasibility indicators include guidance, navigation, hyperlinks, interactivity, quality of text/graphics, audio quality, visual quality, animation quality, aesthetics, colouring, operational reliability, maintainable, usability, software support systems, compatibility, program integration, manual, and reusable. The indicator of acceptability level is an accumulation of two feasibility indicators and is equipped with pedagogical aspects that refer to the ARCS model namely Attention, Relevance, Confidence, Satisfaction [14].

The feasibility of the developed instruments was tested in three stages, namely content validity by experts, followed by construct validity with 30 respondents consisting of Electrical Circuit expertise lecturers and teachers, and students as respondent to measure media acceptances. The construct validity test was done using item analysis (correlation) while the reliability test used the Cronbach Alpha technique [15].

$$r_i = \left(\frac{k}{k-1} \right) \left(1 - \frac{\sum \sigma_b^2}{\sigma_t^2} \right)$$

The tests were carried out at a significance level of $\alpha = 5\%$. To reduce bias, multimedia used as the object of assessment using the instruments developed is a normative multimedia standard, namely the RLC Series Multimedia.

3. Result and Discussion

3.1 Feasibility of Media Content

The results of the content validity test by experts produced 28 valid items from 30 items developed. Through the construct validity test, only 24 items were declared valid while 4 items were excluded. Of the 24 items stated as valid, the mean and standard deviation are described according to groups as in the following table.

Table 1. Statistics of Media Content Feasibility

	Feasibility Aspects		
	Instruction	Content of Media	Evaluation
n	4	12	8
Mean	3.71	3.73	3.6
SD	0.85	0.83	0.80

Of the 24 items declared valid through content validity analysis by experts as well as the results of statistical calculations construct validity, based on the aspect group shows the average value in the range of 3.6 to 3.73 in scale 5. This indicates that the instrument developed has high and significant. It is in accordance with the reliability test results which show that the instruments in the domain of media content have a high and significant reliability $r_{11} = .85$. The results of this test confirm that the media content feasibility test instrument is feasible to use, in the sense of valid and reliable, to assess the feasibility of multimedia learning.

Table 2. Reliability Test of Media Content

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha based on Std Items	N of Items
0.84	0.85	24

3.2 Feasibility of Media Construction

The domain of media construction, the test result is also carried out through content validity analysis by experts, construct validity with item analysis using correlation coefficients and reliability tests using Cronbach Alpha. Table 3 and Table 4 below show the feasibility test result of the instruments for the domain of media construction.

Table 3. Statistics of Media Construction Feasibility

	Feasibility Aspects		
	Instruction	Operation of Media	Systematics; Aesthetics; Design
n	3	10	25
Mean	3.61	3.87	3.42
SD	0.74	0.65	0.81

Table 4. Reliability of Media Construction

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha based on Std Items	N of Items
0.78	0.79	38

The results of the content validity test for the media construction domain get all developed items, with a total of 40 items are valid on content validity, while the construct validity test obtained 38 valid items and 2 invalids. Of the 38 items that were declared valid in the media construction domain, the average feasibility level was classified as high in all aspects, especially the systemic, aesthetic and media forms that reached 3.76 in the range of scores 1-5. Likewise, the reliability test results show a significant level (coefficient $r_{11} = 0.78$). Thus, the multimedia learning assessment instruments in the media construction domain are declared valid and reliable so that they have high feasibility to use.

For the feasibility instrument on the media acceptance level, a total of 40 items are declared valid for content validity, but 4 items fail in construct validity so that the valid instrument is 36 points in total. The following tables 5 and 6 show a summary of the test results for the feasibility of the developed media.

Table 5. Statistics of Media Acceptance Feasibility

Feasibility Aspects					
	Instruction	Media Operations	Evaluation	Design & Facilities	Pedagogical Effect
n	4	12	5	10	5
Mean	3.64	3.78	3.52	3.67	4.12
SD	0.74	0.77	0.62	0.58	0.66

The test results of construct validity produce 36 valid items having a feasibility score at a relatively similar level as a high level. Aspects of pedagogical effects get a score of 4.12 followed by aspects of the media operational, media design and facilities, guidelines and evaluation aspects that are also not far below. This shows the respondent's answer as a media user showing the same answers or understanding in giving an assessment of the assessed media. Reliability test also results in a greater coefficient than the value of the table so that it is interpreted as an instrument that has high reliability and is significant, as shown in table 6 below.

Table 6. Reliability Test of Acceptance Media

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha based on Standard Items	n of Items
0.73	0.726	36

When compared between the domains of the assessment instruments developed by the three domains, the cooperative coefficients are not significantly different. In the domain of media content obtained an average of 3.6, the media construction domain 3.76 and the media acceptance domain 3.74. In relation to the instrument's test for the multimedia assessment, the

result is relatively good because it shows that the data is not heterogeneous. As stated by Syed Jamal, et al, [16], and Mustafa [17] that the results of validity tests that have the same relative coefficient indicate the strength of a developed instrument, both from validity and reliability. Likewise, items that are developed based on theory, the right criteria and indicators will determine the quality of the instrument [4, 17].

The results of this study are in line with previous research, especially Mustafa, Aydin and Said Alhadi who developed instruments for evaluating media feasibility referring to standard indicators relevant to the theory of multimedia-based learning. Therefore, the instrument for assessing the feasibility of learning media can be used to measure or assess multimedia learning, along with the mechanism and rules of assessment.

4. Conclusion

This study produced a multimedia learning feasibility assessment instrument consisting of three domains, namely the feasibility of media material, the feasibility of media construction and the assessment of media acceptability. Validity test shows a high level of significance for both media material domain assessment instruments, media construction and acceptability levels. Similarly, the reliability test also gets a high level of significance. Thus, the developed instrument has the feasibility to be used in assessing the quality of multimedia learning, including the content domain, media construction and acceptability by users.

5. Acknowledgments

This research was supported by the Ministry Research, Technology and Higher Education of Indonesia through the Rector of Universitas Negeri Medan in part by grant of KDBK research, as the contract No. 282 / UN33.8 / PL / 2018.

6. References

- [1] Truong, M T (2014). Multimedia Teaching Methods in Positive Course of Engineering. *3rd UPI International Conference on Technical and Vocational Education and Training*. Bandung, Indonesia, 12-15 November 2014.
- [2] Moore J.C, (2014) *Efficacy of Multimedia Learning Modules as Preparation for Lecture-based Tutorials in Electromagnetism* (Dept. of Chemistry and Physics, Coastal Carolina University, South Carolina, 29528, USA).
- [3] Komaro M, Djohar A, Setiawan A, Hasan B, Hidayat S, (2014) Animation Multimedia (MMA) of Improving the Concept Mastery of Atomic Crystal Structure that Determinants Mechanical Properties of Material. *3rd UPI International Conference on Technical and Vocational Education and Training*. Bandung, Indonesia.
- [4] Aydin K, (2016), The Validity and Reliability of the Turkish Version of the Collaborative Learning Scale. *Int. J. of Educational Research Review* 1 (2), pp. 42 – 48
- [5] Rifai B, Joko, (2014), Pengembangan manual book praktikum mesin arus searah di jurusan Teknik Elektro Fakultas Teknik Universitas Negeri Surabaya. *J. Pendidikan Teknik Elektro* 3(2) pp 311 – 317.
- [6] Erwin A, Mohamed N A G 2015 The Validity and Reliability of Assessment for Learning (AfL). *J. Education* 4(2) pp 64-68.

- [7] Sriadhi S, Gultom S, Restu R, (2017), The Assessment of Media Feasibility at Vocational School. In *1st International Conference on Educational Sciences* 1 pp 248-252.
- [8] Sriadhi S, Gultom Syawal, Restu R, Simarmata J, (2018), The Effect of Tutorial Multimedia on The Transformator Learning Outcomes Based on The Students' Visual Ability. *J. Material Science and Engineering, Conf. Series*, 384(2018)012059.
- [10] Mayer R.E. (2014), *Multimedia Learning* 2nd ed (New York: Cambridge University Press)
- [11] Clark R, Mayer R.E. (2008), *E-Learning and the Science of Instruction* 2nd ed (San Francisco: John Wiley & Sons, Inc.)
- [12] Alessi S.M, Trollip S.R. (2001), *Multimedia for Learning : Method and Development* 3rd ed (Boston, MA: Allyn & Bacon, Inc.)
- [13] Wahono R.S. (2008), *Meluruskan Salah Kaprah tentang e-Learning*. <http://www.RomiSatria> Wahono.net. Accessed on 4 April 2017.
- [14] Keller J.M. (1987), *IMMS: Instructional Materials Motivation Survey* (Florida State University).
- [15] Arikunto S 2014 *Prosedur Penelitian: Suatu Pendekatan Praktek* (Jakarta : Rineka Cipta)
- [16] Syed Jamal A.N, David A, Halimato H. (2010), A Pilot Test Report on Quality Framework for The Assessment of Multimedia Learning Materials. *The 6th International Science Conference, e-Learning and Software for Education*,
- [17] Mustafa Y, (2018), A valid and Reliable Tool for Examining Computational Thinking Skills. *J. Education and Inf. Tech.* S pringer Nature 2018, doi:10.1007/s10639-018-9801-8.