eai.20-10-2022.2328881

by Erma Yulia

Submission date: 12-Jun-2023 03:27PM (UTC+0700)
Submission ID: 2114350205
File name: eai.20-10-2022.2328881.pdf (431.82K)
Word count: 2555
Character count: 14596

Feasibility and Effectiveness of Interactive Multimedia Courses of Occupational Safety and Health Assisted with Macromedia Flash Software

Siti Ulgari[1*], Firdaus[2], Banu Nursanni[3], Erma Yulia[4]

{siti_ulgari@unimed.ac.id}

Mechanical Engineering Education, Faculty of Engineering, Medan State University, Medan, Indonesia

Abstract. The learning process of occupational safety and health (K3) courses at the Department of Mechanical Engineering Education, Faculty of Engineering, Unimed, requires interaction, namely the interaction made by students with learning resources. Utilization of information and communication technology devices, allows for more interactive learning process activities.The purpose of this study was to determine the feasibility and effectivenessinteractive multimedia for K3 courses assisted by macromedia flash. Development of interactive multimedia for K3 coursesusing the ADDIE development modelnamely (1) Analyze in the form of analysis of learning needs, (2) Design, planning and formulation of learning objectives (3) Development, in the form of making digital learning materials for K3 courses, (4) Implementation, application to students, and (5) Evaluation.The feasibility assessment was carried out by material experts, media experts and learning design experts. Data collection techniques were carried out using a questionnaire using a Likert scale.The effectiveness of interactive multimedia is measured by calculating learning outcomes before using interactive multimedia (pretest) compared to after using interactive multimedia (posttest).This study resulted in the feasibility of learning design experts with a mean score of 4.6, learning materials experts 4.5 and learning media experts 4.4.The results of the pretest and posttest showed an increase in the value of learning outcomes by 85.02%.It can be concluded that the teaching materials developed are very feasible to be applied in the learning process of occupational safety and health (K3) courses.

Keywords: feasibility, multimedia, interactive, K3, macromedia flash

1 Introduction

Efforts to face future challenges in the era of globalization, mastery of science and technology is the main requirement to obtain opportunities and adapt in a growing global society. Fast-paced globalization has led to a restructuring of life, affecting both the world of work and school life. Human resources are the main assets of the mastery of science and technology. Quality human resources will be able to master science and technology. For this reason, it is necessary to improve the quality of human resources. Improving the quality of human resources can be done through improving the quality of education, including education in universities. Forming the character and mental attitude of professionals oriented to a global mindset is a new paradigm of education [1]

Universities should place more emphasis on achieving competence in accordance with

ACEIVE 2022, October 20, Medan, Indonesia

DOI 10.4108/eai.20-10-2022.2328881

the provisions contained in the 2014 National Higher Education Standards (SN DIKTI), Article 5 paragraph 1 which states "Standards of graduate competence are minimum criteria regarding the qualifications of graduates' abilities which include attitudes, knowledge, and skills stated in the formulation of graduate learning outcomes" [2] Each study program must be equipped with learning achievement targets as a form of accountability for the implementation of education programs to stakeholders.

This is in line with the opinion of Sallis who revealed that the quality standard of college graduates is measured by criteria according to the needs of the world of work, customer or user satisfaction. In its implementation, the quality of graduates is a profile of graduates of educational institutions that are in accordance with educational qualifications and customer satisfaction which is marked by the increasing interest of external customers towards graduates of educational institutions [3].

Learning in higher education tends to be content-oriented and ignores goals, the presentation of learning materials is given based on the knowledge of the lecturer, not based on the needs of students; learning methods and strategies are monotonous and only run one direction, not maximizing various learning resources to reach each individual student; the use of media and learning technology is still conventional and the assessment is only result-oriented, not process [4].

In essence, the learning process in higher education is a communication process between lecturers and students. One effort to overcome this situation is the need for innovative learning media in the learning process. In a learning process, two very important elements are teaching methods and learning media [5].

Advances in information technology make the contents of learning media can be displayed using digital (electronic) equipment with the same layout and appearance as books. Digital learning media can contain the same information as printed textbooks and can be stored on CDs, flash disks, computers and smartphones so that they do not take up a lot of space and carry it more easily than ordinary books.

Advances in information technology provide access to changes in people's lives in all fields including the field of education. Learning using multimedia can be designed by utilizing information technology. [6]

While Schwier and Misanchuk [7] defines:

"Multimedia: An instructional program which includes a variety of integrated sources in the instruction. The program is intentionally designed in segments, and viewer responses to structured opportunities (eg, menus, problems, simulated crises, questions, virtual environments) influence the sequence, size, content, and shape of the program".

Learning through interactive multimedia, added by Schwier and Misanchuk that, "Interactive Multimedia Instruction (MI) is an instructional program which includes a variety of integrated sources in the instruction with a computer at the heart of the system.[8]

One of the courses that must be followed by students of the Unimed Mechanical Engineering Education Department is the K3 course with a weight of 3 credits. The learning process for K3 subjects has not shown a process of developing student creativity. The learning process for K3 courses, especially in the evaluation system, is still limited as a transfer of knowledge process.

The results of preliminary observations show that the tendency of lecturers in choosing and using the learning method for K3 courses is speculative, resulting in boring learning activities. Learning in the digital era requires digital-based learning media as well, so that students are able to understand learning materials and be able to keep up with the times [8]

Given the need for interactive multimedia and interactive multimedia is not yet availableK3 courses need to be developedinteractive multimediaK3 courses at the Department of Mechanical Engineering Education, Faculty of Engineering, Unimed.

2 Research methods

This study uses a research and development (R & D) approach. The development of interactive multimedia uses the ADDIE development model (a) Analysis (b) Design (Development Implementation (e) Evaluation [9]. Research flow chart depicting procedure research can be seen in Figure 1.

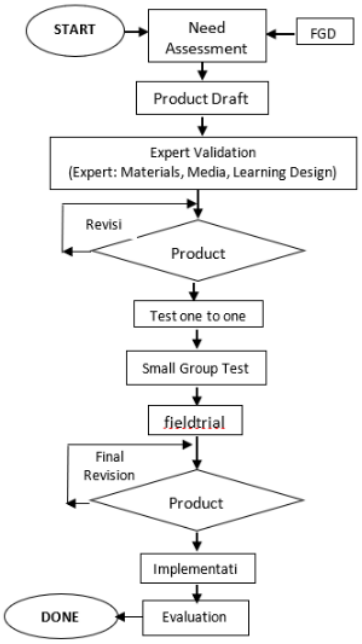

Figure 1. Research procedure

The research subjects are learning design experts, learning materials experts and learning media experts, each expert 1 person. In addition to experts, other research subjects are students of the Department of Mechanical Engineering Education, Faculty of Engineering, State University of Medan who take K3 courses as many as 30 people.

The data analysis technique was carried out using descriptive analysis techniques, namely by analyzing quantitative data obtained from the material expert test questionnaire, learning design experts and learning media experts interpreted in a qualitative sense.To analyze the data from the questionnaire, by calculating the average value obtained from the total data then divided by the number of respondents [10].

$$\bar{X} = \frac{\sum X}{N}$$

Where :
X = Courseware eligibility score
X = Total score for each subvariable
N = Number of subvariables

Based on the above calculations, the percentage range and the appropriate qualitative criteria can be determined [11] as shown in Table 1.

Table 1. Interpretation of Validity and Expectation of Learning Module Score range 0 - 5

No	Score Interval	Interpretation	
1	1.00 – 2.49	Not feasible	Low expectations
2	2.50 – 3.32	Decent enough	Enough expectations
3	3.33 – 4.16	Worthy	High expectations
4	4.17 – 5.00	Very Worthy	Very high expectations

2.1 Interactive Multimedia Effectiveness

The effectiveness of interactive multimedia is measured by calculating the increase in student learning outcomes before using interactive multimedia (pretest) and after using interactive multimedia (Posttest). The effectiveness of the model is carried out at the end of the field trial test by carrying out a post-test, then comparing the mean pre-test and post-test scores. Interactive multimedia is categorized as effective if there is an increase in learning outcomes during the learning process after multimedia is applied [12] and [13].

3 Research Results

This research was started by conducting a need assessment and Focus Group Discussion (FGD) together with 4 (four) lecturers in the Department of Mechanical Engineering Education, State University of Medan. From the results of the FGD, conclusions can be drawn as shown in table 2.

Table 2. Learning Conditions FGD Results

No	Previous/Current Learning Conditions	Required Learning Conditions
1	Learning objectives and competencies are not in accordance with student needs.	Learning objectives and competencies are adjusted to student needs.
2	Do not use evaluation sheets in assessing the learning process	Using the evaluation sheet in assessing the learning process
3	Learning materials are difficult to understand, inadequate because they are incomplete and there are no conclusions	Provide complete and interesting learning media.
4	Learning activities have no introduction, presentation and closing	Learning activities are adjusted to the learning strategy, namely introduction, presentation and closing

5	The initial test of student abilities is not carried out	Conduct a preliminary test of student abilities
6	Students and lecturers state that it is necessary to develop learning media for K3 courses	The development of interactive digital/multimedia learning materials for K3 K3 courses was carried out.

3.1 Interactive Multimedia Eligibility Results

The feasibility of interactive multimedia was carried out by 3 experts, using an assessment instrument on the questions given in a 1-5 scale score. The average assessment of learning design experts can be seen in Figure 2, the average assessment of learning materials can be seen in Figure 3 and the average Assessment of Learning Media Experts can be seen in Figure 4.

Figure 2. Average Eligibility of Learning Design Experts

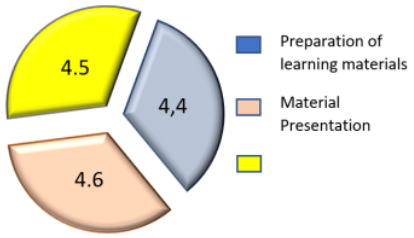

Figure 3. Average Feasibility Results of Material Experts

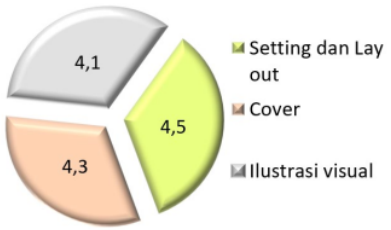

Figure 4. Average Eligibility Value of Learning Media Experts

The average feasibility value given by Learning Design Experts, Material Experts and Learning Media Experts is presented in table 3.The average value of the feasibility of the experts is 4.21 which is included in the very feasible group [11].

Table 3. Eligibility Score from Expert

No	Expert	Average Score	(%)
1	Learning Design Expert	4.10	82
2	Material Expert	4.25	85
3	Learning Media Expert	4.30	86
	Average Eligibility Score	4.21	84.33

3.2 One to one Trial Results and Small Group

One to one trial was conducted on three students, 1 student representing low achievement, 1 student representing moderate achievement and 1 student representing high achievement After receiving input from the one to one test, revisions were made, the results The revision was carried out by a small group trial. Small group trials were conducted on 12 students who took K3 courses. The results of the one to one and small group trials are presented in table 4.

Table 4. One to One and Small Group Test Score

No	Test	Material Preparation	Grammar	Visual Illustration	Average Score	(%)
1	One to one test	4.25	3.75	4	4.00	82%
2	Small Group Test	4.5	4.25	4.40	4.38	85 %

3.3 Field Trial Test Results

The purpose of this field trial trial is to identify the shortcomings of K3 learning textbook products when used in the learning process of K3 courses that are in accordance with the actual situation. The field trial was conducted at the Mechanical Engineering Department of Unimed and the number of students who attended was 30 people. Learning activities begin with conducting a pretest, explaining the material using interactive multimedia and ending with carrying out a post test.

3.4 Interactive Multimedia Effectiveness Results

The interactive multimedia effectiveness test was carried out at the end of the fieldtrial test by carrying out a post-test, based on the calculation of the mean pre-test score was 41.12 and the post-test mean was 74.80. Judging from the results of the pre-test and post-test scores there was an increase in the value of 33.69 or 81.92%. This means that there is an increase in learning outcomes during the learning process for K3 courses using interactive multimedia that has been developed as a result of the development that has been applied.

Referring to opinionMiarso [12] and Suparman, [13], interactive multimedia K3 courses have been effective, as evidenced by an increase in student learning outcomes of 81.92% (pre-test and post-test results).

Table 5. Effectiveness Test Score

No	Test	Pretest	Posttest	Value Increase (number)	Value Increase (%)
1.	Field trial	40.43	74.80	34.37	85.02%.

Based on the relevant research conducted by Jonias (2016) entitled "Development of Mathematics Learning Media E-Comic Based on"*e-booksto Increase the Critical Thinking Skill and Character of Junior High School Students"*[14], the results obtained using interactive multimedia improve critical thinking skills better.

4 Conclusion

Based on the problem formulation and research objectives, it can be concluded that: (1) The steps for developing interactive multimedia for K3 courses start from conducting Analysis (analysis), Design (design), Development (development), Implementation (implementation/execution) , Evaluation (evaluation/feedback). The physical form of the development result is in the form of interactive multimedia for K3 courses; (2)the feasibility value of the experts is 4.21 which is included in the very feasible group. (3);There was an increase in learning outcomes during the K3 course learning process using interactive multimedia courses of 85.02%.

Acknowledgments

Thank you to the State University of Medan which has assisted in the full financing of this research with no contract 0141/UN33.8/PPKM/PD/2022.

References

[1] Husnul Hotimah,. Ida Ermiana., & Awal Nur Rosyidah, (2021). Development of Macromedia Flash-Based Interactive Multimedia To Improve Mathematical Communication Skills. *EDUCATION PROGRESS*, Vol.2, No.1, p.7.

[2] Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 49 of 2014 concerning National Standards for Higher Education, Article 5 Paragraph 1,https://gillandgroup.co.id/ (accessed October 11, 2022)

[3] Sally, Edward. (2015) *Total Quality Management in Education*. Jogjakarta: IRCiSoD,.

[4] Yaumi, Muhammad. (2014). *Learning Design Principles Adapted to the 2013 Curriculum* Jakarta: Prenadamedia Group.

[5] Turrahmi, N., Erfan, M., & Yahya, F (2017). Development of Microsoft Office Power Point Based Video Learning Media for Natural Science Objects. *QUARK: Journal of Physics and Technology Learning Innovation*

[6] Husnul Hotimah,. Ida Ermiana., & Awal Nur Rosyidah, (2021) Development of Macromedia Flash-Based Interactive Multimedia to Improve Mathematical Communication Skills. *EDUCATION PROGRESS*, Vol.2, No.1, p.8.

[7] Schwier, Richard A. & Earl R. Misanchuk. (2013). *Interactive Multimedia Instruction*. New Jersey: Educational Technology Publications, Inc.

[8] Ali, M. (2019). Macromedia Flash for Innovation in Teaching Mathematics and Science at SDN Baubau City, *Journal of Community Service*, Vol.2, No.2

[9] Serhat Kurt.(2017). *ADDIE: Model: Instructional Design*. Chicago: University of Illinois Press

[10] Sugiyono. (2013). *Quantitative, Qualitative and R&D Research Methods*. Bandung: Alfabeta. CV

[11] Sriadhi. (2018). *Learning Multimedia Assessment Instruments*. Medan: Medan State University.

[12] Miarso, Yusufhadi. (2012). "Learning Development Model Survey". Jakaarta: *Paper Presented as teaching material for students of S3 Postgraduate Educational Technology Study Program UNJ*, p.2

[13] M. Atwi Suparman, (2014). *Modern Instructional Design*. Jakarta: Erlangga

[14] Jonas . (2016) “Development of Mathematics Learning Media EComic Based on e-book to Increase the Critical Thinking Skill and Character of Junior High School Students” *Journal of Electrical Engineering Education*. Vol. 05 No.01, pp.83 – 88

eai.20-10-2022.2328881

ORIGINALITY REPORT

9%	8%	6%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	mil.pasca.undip.ac.id Internet Source	1%
2	ejournal.unp.ac.id Internet Source	1%
3	ejournal.undiksha.ac.id Internet Source	1%
4	repository.iain-ternate.ac.id Internet Source	1%
5	garuda.kemdikbud.go.id Internet Source	1%
6	Hobri, R P Murtikusuma, L I Hermawan. "Development of e-comic using pixton and kelase web on linear program of two variables assisted by geogebra", Journal of Physics: Conference Series, 2019 Publication	1%
7	eudl.eu Internet Source	1%
8	jurnal.iainponorogo.ac.id Internet Source	

		1 %
9	journal.unimma.ac.id Internet Source	<1 %
10	news.unej.ac.id Internet Source	<1 %
11	Marsono, Risky Kristyanto. "The Development of Learning Media Based on Augmented Reality for Industrial Metrology and Quality Control Courses", 2021 7th International Conference on Electrical, Electronics and Information Engineering (ICEEIE), 2021 Publication	<1 %
12	repository.unikama.ac.id Internet Source	<1 %
13	www.researchgate.net Internet Source	<1 %
14	"Development Learning Models of Fish Stock Assessment Technique Subjects based E-Learning at Aquatic Resources Technology Management Program Study at the Jakarta Fisheries High School", International Journal of Engineering and Advanced Technology, 2019 Publication	<1 %
15	Angela Schorr. "1.2 Interactivity: The New Media Use Option – State of the Art", Walter	<1 %

de Gruyter GmbH, 2002
Publication

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		