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Development of Interactive Learning Media (Scaffolding) on Learning Materials of Stone and Concrete

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Article Info	ABSTRACT (10 PT)
  Corresponding Author: Novianto Adi Nugroho, Departement of Informatics Education, Sebelas Maret University, Jl Ahmad Yani, no 200, Pabelan, Kartasura, Surakarta, Jawa Tengah, 57169, Indonesia. Email: vianadinugroho@gmail.com	This research aims to develop interactive learning media on learning materials of stone and concrete for building engineering majors in class X and knowing the feasibility based on material experts, media experts and learning practitioners assessment's and to know the usability level of its so it can be applied on teaching and learning activities. Research methods that used in this research is research and development method's modified with 4-D development models. These method includes 4 development phase's namely, (1) Defining phase (Define), (2) Designing phase (Design), (3) Developing phase (Develop), (4) Disseminating phase (Disseminate). Results of the research showed that interactive learning media (scaffolding) has been successfully created with 94% of feasibility level's, its consisting of 90,5% of material feasibilities from material expert, 92% of media feasibilities from media expert and 99,5% of learning feasibilities from learning practitioners. So, it can be concluded that interactive learning media (scaffolding) has a very feasible of feasibility levels. Results of the research also showed that interactive learning media (scaffolding) has 86% of usability levels that consisted of 88,5% of effectively component's, 87,5% of efficiency component's and 81% of user satisfaction component's. So, it can be concludes that interactive learning media (scaffolding) has a very good usability levels to use by media user's. **Keywords:** learning media, interactive learning media, stone and concrete materials DOI: https://doi.org/10.20961/joive.v2i1.35700

1.   INTRODUCTION

In this present day with the development of more advanced technology created many tools or containers that usually called media. Development of media can be used for supporting educational activities so with the help of its will make students more easier to understand the subject matter and its give students a different experience in learning activities[2] and according to the study by Wawan, S. & Bambang, E. P. [12] showed that interactive learning media can provide variations to teachers in creating a more conducive atmosphere of teaching and learning activities and assisting individuals for independent learning.

However, according to Nana Sudjana & Ahmad Rivai [9], development and used of learning media for teaching and learning activities in Indonesia hasn't been done evenly. Based on observation results in SMK N 5 Surakarta majoring in building engineering at the time of stone and concrete material learnings that was in the subject of building construction, researcher still find the facts that the used of learning media in teaching and learning activities is still very lacks so its causing the atmosphere in teaching and learning activities weren't conducive and lacks of interests of the students for that subject.

Based on that problems, this research aims to develop interactive media learning, named scaffolding, on concrete materials created with adobe flash application and knowing its feasibility and usability levels so it can be used in teaching and learning activities of stone and concrete materials.

Literature Review

There are several relevant studies to the topics in this research such as, Nicola Whitton [13] from this research it can be concluded that interactive game-based learning media can be used to improve the motivations of students. Other that, on the study conducted by Widi Widayat, Kasmui & Sri Sukaesih (2014) concludes that the use of interactive multimedia can improve students learning achievements.

      Furthermore, in a study conducted by Rendy Dwi Pangesti [7]can be concluded that interactive game-based learning media has a level of feasibility that belongs to feasible categories with 73,4% scores from material expert and 81,43% scores from media expert. With these results, so learning media were able to use for supporting teaching and learning activities.

      With the study conducted by Irman Hermadi, Yuni Nurhandryani dan Susi Katarina (2013) can be concluded that usability testing on the applications has a score of 91,1% which is belongs to very well categories so it was easy for the user to use it in its application.

2. RESEARCH METHOD

Research methods used in this research is Research and Development (R&D) methods modified with 4-D (Four-D) development models [11] and adapted with application requirements which is consist of 4 development phase, that is defining phase (Define), designing phase (Design), development phase (Develop) and disseminating phase (Disseminate).

Table 1. Phase and Explanations of 4-D Development Model

Phase	Explanations
Defining (Define)	It is a phase to decide and define the requirements in learning activities and arranged it into solutions.
Designing (Design)	Aims for preparing the prototype of learning media.
Development (Develop)	On development phase, the prototyping of media was consulted and checked by lecturer. Next, its was validated by material expert, media experts and learning practitioner to find out whether it is feasible to be tested in the field. And then, held the usability testing for the media to determine level's of media usability for student and teachers.
Disseminating (Disseminate)	The results of interactive learning media that have been done of feasibility and usability testing then given to the students and teachers for teaching and learning activities.

Feasibility Test

Feasibility testing is used to collect data and to find out the feasibility levels of learning media. Feasibility testing is conducted by material expert, media expert and learning practitioner for the media that have been created. The feasibility testing will be carried out at the development phase so its results can be used as media evaluation material.

Usability Test

Usability is an analysis to determine how easy the users to use an application's interface. Its can be correlated to the conclusion of Nielsen's study [4] that an application can be called usable if its functions could be implemented effectively, efficiently and satisfactorily.

The effectiveness related with the successment of the user to achieve the purpose of using the software. The efficiency related with the easiness of the user to achieve its purpose. The satisfaction related with the user acceptance attitude for using the software. Usability testing was performed to evaluate whether the application was accordance with the user requirements or not.

Feasibility Assessment Sheet

Feasibility Assessment Sheet is a list of questions that used to score the media that has been created. Its made up of three versions for material expert, media expert and learning practitioner.

The instruments on this feasibility assessment sheet using a questionnaire that adapted from several previous studies that has been adjusted with its development requirements. Furthermore, the instruments was used to test the application's feasibility from experts opinions based on several aspects accordance with ISO 9126. The instruments that used in this research based on Sulistiyono's instruments (2013) with several modifications.

Table 2. Table Feasibility Instrument for Material Expert

Aspects	Indicators
Learning	A. Learning Objectives
	B. Material Delivery
	C. Submissions of Practicum Tutorial
	D. Evaluation
Material	E. Material Relevance
	F. Material Selection
	G. Material Accuracy
	H. Suitability of Tutorial Practicum

Table 3. Table Feasibility Instrument for Media Expert

Aspects	Indicators
Interface	A. Text
	B. Conformity with Indonesia Language
	C. Sentences Effectiveness
	D. Design
	E. Pictures, Animations, and Videos Illustrations
	F. Color Combinations
Device	G. The Accuracy of the use of Terms and Symbols
	H. Navigations Easiness
	I. Manual Instructions
	J. Interactions with Media

Table 4. Table Feasibility Instrument for Learning Practitioner

Aspects	Indicators
Material	A. Material Relevance
	B. Material Clarity
	C. Ease of Learning Material
	D. Ease of Learning Practicum
	E. Appropriatess of Evaluations
Media	F. Interactivity to Media
	G. Ease of Using Media
	H. Media Effectiveness
	I. Interactions with Media

Feasibility component analysis performed by given the value from *likert* scale on its. After that, data was analyzed by calculating the average of answers based on its score. The scores that has been obtained will changed into percentage. And the formula to calculate it is :

$$Feasibility\ Level = \frac{V}{T} \times 100\ \%$$

Explanation :
V : Value Obtained
T : Total Maximum Value

The feasibility assessment criteria of learning media by Ridwan (2012: 15) can be seen in Table 5.

Table 5. Table Feasibility Criteria Percentage

Percentage	Assessment Criteria
0 % - 20 %	Very Infeasible
21 % - 40 %	Not Feasible
41 % - 60 %	Less Feasible
61 % - 80 %	Feasible
81 % - 100 %	Very Feasible

Usability Test Task Sheet

Usability testing was performed with instructing respondents to do some tasks. Tasks was used to get informations related to usability problems and alternative solutions. The subjects that evaluated in usability testing be like, user reactions for the first time when using the interactive learning media, the effectiveness of material and practicum features that exist in interactive learning media, procedures for using interactive learning media, the effectiveness of evaluation features and the accuracy of score while doing the evaluations. Every parts on its then divided into ten tasks. Measurement of usability was obtained from the users while doing the tasks and the length of time that used to complete every tasks.

Usability testing for effectivity and efficiency components are measured with user's success rate (percentage of user's successness). User's success rate is percentage of tasks that has been completed correctly by user during observations [5] While the satisfaction levels is measured using percentage that has been obtained from comparison of satisfaction value with maximum score of likert scale multiplied by number of respondents. And, usability level is the avarage of effectivess, efficiency and satisfaction components.

$$Effectivity, Efficiency\ (\%) = \frac{(\sum_{i=1}^{n} Xi)}{n} \times 100\%$$

Explanation :
Xi : The Success value's that has been obtained by the-i respondent, Xi= {0,1}
n : Total number of respondents

$$Kepuasan\ (\%) = \frac{(\sum_{i=1}^{n} Xi)}{5 \times n} \times 100\%$$

Explanation :
Xi : The Success value's that has been obtained by the-i respondent, Xi= {0,1,2,3,4,5}
n : Total number of respondents

$$Usability\ (\%) = \frac{(Effectivity + Efficiency + Satisfaction)}{3} \times 100\%$$

The usability assessment criteria of learning media by Ridwan (2012: 15) can be seen in Table 6.

Table 6. Table Usability Criteria Percentage

Percentage	Assessment Criteria
0 % - 20 %	Very Bad
21 % - 40 %	Not Bad
41 % - 60 %	Good Enough
61 % - 80 %	Good
81 % - 100 %	Very Good

3.   RESULT AND ANALYSIS (10 PT)

Interactive learning media (scaffolding) that has been created has several features excellence such as, notes features, it is a feature to create and show the notes that has been created by user. Next, evaluation features that has two types of exercises, its also show the exercises randomly and its created as attractive as possible so users do not feel bored when doing the exercises. Last, there is a feature to print out the certificate of evaluation results that will earned when users completed the evaluation. Several features that has been explained can be seen in figure below.

Figure 1. Note Features in Interactive Learning Media (Scaffolding)

Figure 2. Evaluation Features in Interactive Learning Media (Scaffolding)

Figure 3. Certificate in Interactive Learning Media (Scaffolding)

Furthermore, interactive learning media (scaffolding) that has been created will be validated by material expert, media expert and learning practitioner. The validations results that has been obtained were used to determine the feasibility of interactive learning media (scaffolding).

Material expert validation's aims to find out the feasibility of interactive learning media (scaffolding). The assessment was reviewed from two aspects, that is learning aspect and material aspect.

Table 7. Validation of Interactive Learning Media (Scaffolding) by Material Expert

Item	Indicators	Score
1	Learning Aspect	90 %
2	Material Aspect	91 %
Average		90,5 %

Based on Table 7 the results of validation by material expert, obtained 90,5% of average percentages. Based on the result, the feasibility of interactive learning media (scaffolding) reviewed from learning aspect and material aspect was categorized into very feasible level.

Media expert validation's aims to find out the feasibility of interactive learning media (scaffolding). The assessment was reviewed from two aspects, that is interface aspect and device aspect.

Table 8. Validation of Interactive Learning Media (Scaffolding) by Media Expert

Item	Indicators	Score
1	Interface Aspect	95 %
2	Device Aspect	89 %
Average		92 %

Based on Table 8 the results of validation by media expert, obtained 92% of average percentages. Based on the result, the feasibility of interactive learning media (scaffolding), reviewed from interface aspect and device aspect, was categorized into very feasible level.

Learning practitioner validation's aims to find out the feasibility of interactive learning media (scaffolding). The assessment was reviewed from two aspects, that is material aspect and device aspect.

Table 9. Validation of Interactive Learning Media (Scaffolding) by Learning

Practitioner

Item	Indicators	Score
1	Material Aspect	100 %
2	Media Aspect	99 %
Average		99,5 %

Based on Table 9 the results of validation by learning practitioner, obtained 99,5% of average percentages. Based on the result, the feasibility of interactive learning media (scaffolding), reviewed from material aspect and media aspect, was categorized into very feasible level.

The feasibility level of interactive learning media (scaffolding) is measured using total average of validation results that has been scored by material expert, media expert and learning practitioner.
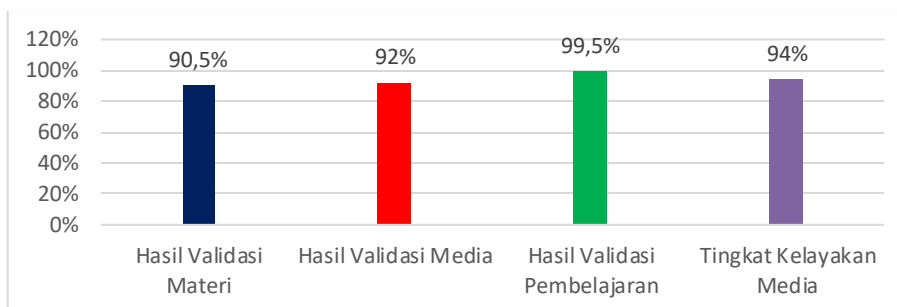

Figure 4. Diagram of Feasibility Level for Interactive Learning Media (Scaffolding)

Based on picture 4, diagram of usability level for interactive learning media (scaffolding), is obtained 94% of feasibility levels. With these results, it can be seen that the feasibility level of interactive learning media (scaffolding) was categorized into very feasible level.

Furthermore, the testing of components usabilities is performed by media users. The results of usability components testing is used to determine the usability level of interactive learning media (scaffolding). The testing of usabilities components consists of, effectivity components testing, efficiency components tesing and user satisfaction components testing.
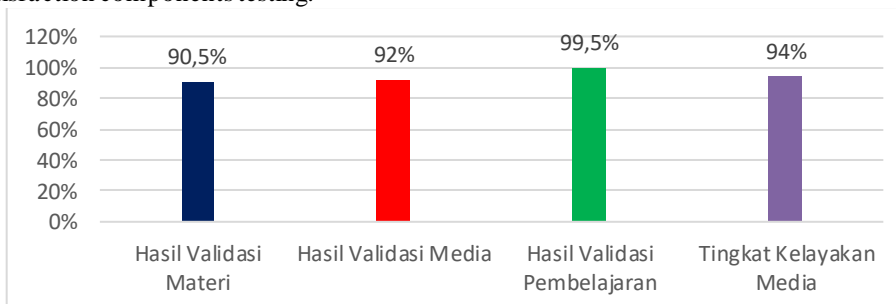

Figure 5. Diagram of Usability Level for Interactive Learning Media (Scaffolding)

Usability level of interactive learning media (scaffolding) is measured using total average of usability components that have been obtained from the observations of media user. Based on figure 5, diagram of usability level for interactive learning media (scaffolding), is obtained 86% of usabilitiy levels. With these results, it can be seen that the usability level of interactive learning media (scaffolding) was categorized into very good level.

4.   CONCLUSION

The feasibility assessment results for interactive learning media (scaffolding) reviewed from learning aspect and material aspect obtained the percentage of 90,5% from material expert, the feasibility assessment results for interactive learning media (scaffolding) reviewed from interface aspect and device aspect obtained the percentage of 92% from media expert, and the feasibility assessment results for interactive learning media (scaffolding) reviewed from material aspect and media aspect obtained the percentage of 99,5% from learning practitioner. From these results can be conclude that the feasibility level of interactive learning media (scaffolding) categorized into very feasible level with an average percentage of 94% and it can be used to support teaching and learning activities.

The usability assessment results for interactive learning media (scaffolding) reviewed from effectivity components obtained the percentage of 88,5%, the usability assessment results for interactive learning media (scaffolding) reviewed from efficiency components obtained the percentage of 87,5%, and the usability assessment results for interactive learning media (scaffolding) reviewed from users satisfactions components obtained the percentage of 81%. From these results can be conclude that the usability level of interactive learning media (scaffolding) categorized into very good level with an average percentage of 86% so it will be easy to use for the users on its applications.

With the development of interactive learning media (scaffolding) provides the following implications: 1) Can help students to do independent learning activities. 2) Can help to create a more conducive and fun learning atmosphere. 3) Assist students in preparing for practicum activities.

For the sustainability of this learning media can be performed by adding more and varied material discussions, making the learning media going online, and adding the corrections and explanations on evaluation features.

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