Research Paper

The Feasibility Study of Moodle-Based E-Learning to Analyse the Scientific Literacy of Elementary School Students

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ABSTRACT

Literacy competency are better known as scientific literacy in science learning. Building generations with strong scientific attitudes and understanding that can successfully communicate knowledge and research findings to the broader public is closely tied to scientific literacy. Students will be able to pursue higher education while still residing in a contemporary culture that is presently greatly influenced by advances in science and technology. This study's objective is to determine whether e-learning for primary school pupils using the moodle platform is feasible. The Borg & Gall Research & Development (R&D) model's eight development stages are utilized in this study. Using instrument validation sheets customized for each expert, the resulting product was then validated by media, content, and learning experts. The information about the viability of moodle-based e-learning in the form of notes from experts and the percentage of e-learning validity. Descriptive analysis was used to examine the viability of moodle-based online learning. The outcome of this development research is a moodle-based e-learning program designed for fifth-grade elementary school students that has received very favorable validity ratings from three experts: a media expert (93%), a material expert (97,14%), and a learning expert (94,54%). These findings demonstrate that the generated e-learning meets the extremely practicable standards and can be used with some minor material adjustments.

Keywords: E-Learning, Feasibility, Moodle, Scientific Literacy

INTRODUCTION

Technology and information development have undergone substantial changes as a result of the Industrial Revolution 4.0. The Fourth Industrial Revolution is a digital era in which every machine is interconnected via a cyber system or the internet (Syamsuar & Reflianto, 2018). This is proven by how frequently information and technology are used to implement learning with the use of information technology in education involves WhatsApp Massenger application, Zoom Cloud Meeting, Google Classroom, and Google Forms (Ma'ruufah et al., 2021). Education must continue to alter to reflect the shifts brought about by Industrial Revolution 4.0. Educational idea known as Education 4.0 was developed in response to the rise of the fourth industrial revolution. (Pratidhina, 2020). One of the characteristics of Education 4.0 according to Fisk (Lase, 2019) namely the opportunity to learn at a time and place that is flexible.

The nation needs human resources (HR) to deal with fast advancing technical breakthroughs which have three key pillars, namely character, competence, and mastery of literacy. (Ibda, 2018). Efforts to build Human Resources (HR) have been carried

out through the realm of education, namely by activating the Gerakan Literasi Nasional (GLN) and through the Asesmen Kompetensi Minimum (AKM). Gerakan Lierasi Nasional (GLN) launched by the Ministry of Education and Culture is one of the efforts to face the challenges of the era of disruption (Hermanda et al., 2019, p. 152). Asesmen Kompetensi Nasional (AKM) as part of the Asesmen Nasional (AN) is a national-scale educational evaluation program that was launched as a substitute for the Ujian Nasional (UN) in Indonesia (Sudianto & Kisno, 2021). Permendikbudristek Nomor 17 Tahun 2021 explained that the Asesmen Kompetensi Minimum was carried out to measure the reading literacy and numeracy competencies that students must possess (Kemendikbudristek, 2021).

Literacy skills are better known as scientific literacy in science learning. Building a generation with strong scientific beliefs and attitudes and capable of effectively communicating knowledge and research findings to the general public is closely tied to scientific literacy. (Shofiyah et al., 2020). Students will have the opportunity to continue their education while residing in a contemporary society that is currently greatly influenced by advances in science and technology (Yuliati, 2017).

Based on the results of a recent study from TIMSS and PISA, students' scientific literacy achievement in Indonesia is still low. Indonesian students in 2015 scored 44th out of 47 countries in terms of their scientific literacy TIMSS data, which is a global study of trends in mathematics and science (IEA, 2015). Indonesian students are placed 70th out of 78 nations in terms of their proficiency in scientific literacy according to PISA data (OECD, 2018).

An innovation is needed to overcome these problems, namely by utilizing information technology in education. E-learning can be used as a learning support medium in addition to the fast advancement of information technology (Prihastanti et al., 2021). E-learning is a computer-based education system that allows learning anywhere and anytime (Irtawanti, 2021). Learning through e-learning Virtual classrooms, computer-based learning, network-based learning, and digital collaboration are all examples of media (Wati, 2020). This concept which is known as e-learning brings a new paradigm in the development of conventional learning into digital form. Teachers and students can take advantage of virtual classes to facilitate access to material digitally quickly without any space and time barriers that have limited the world of education (Lukman et al., 2020). A learning management system (LMS) required to enable anytime, everywhere access to e-learning. Learning management system (LMS) is a piece of software used for administrative tasks, documentation, resource searching, activity reporting, and the provision of training materials for online teaching and learning activities (Yauma et al., 2020). Moodle is a Learning Management System (LMS) application which is free and can be used and modified by users based on their wishes, especially the teaching and learning process. (Bariyah & Imania, 2018). Moodle can be an option to be used as an e-learning medium in learning.

MATERIALS & METHODS
Descriptive analysis is the method of analysis employ qualitative and quantitative data that are utilized to represent the data. Qualitative data includes comments and advice from media experts, material experts and practitioners which are then used as a reference for improving the Quantitative data

from the created e-learning materials built on Moodle includes evaluation results from the validation questionnaire of media experts and subject matter experts. Questionnaires for media expert validation were employed in conjunction with material experts, practitioners, and practitioners to assess the viability of Moodle-based e-learning media. Quantitative descriptive data analysis techniques were used to analyze quantitative data obtained from questionnaires. Quantitative data obtained were tabulated prior to analysis. Tabulation is done to make it easier to process and analyze data. The tabulated data then calculated the average score. The average score is calculated using a formula adapted from Akbar (Akbar & Holid, 2016, p. 83). The formula used is.

$$V = \frac{TSe}{TSh} \text{ x } 100\%$$

Description:

V	= Validity
TSe	= Total empiric score
TSh	= Total maximum score

$$Average\ score = \frac{Total\ score}{Item\ number}$$

After the quantitative data is calculated, the average is then converted into a qualitative value on a scale of five using the value conversion formula adapted from Widoyoko (2019) which is described in Table 1.

Table 1. Quantitative Data Conversion to Qualitative Data with a Scale of Five

Formula	Average Score	Category
$X > \bar{X}i + 1{,}8 \text{ x } sb_i$	$> 4{,}2$	Very Decent
$\bar{X}i + 0{,}6 \text{ x } sb_i < X \leq \bar{X}i + 1{,}8 \text{ x } sb_i$	$> 3{,}4 - 4{,}2$	Decent
$\bar{X}i - 0{,}6 \text{ x } sb_i < X \leq \bar{X}i + 0{,}6 \text{ x } sb_i$	$> 2{,}6 - 3{,}4$	Pretty Decent
$\bar{X}i - 1{,}8 \text{ x } sb_i < X \leq \bar{X}i - 0{,}6 \text{ x } sb_i$	$> 1{,}8 - 2{,}6$	Less Worth
$X \leq \bar{X}i - 1{,}8 \text{ x } sb_i$	$\leq 1{,}8$	Unsuitable

Description:

Maximum ideal score	=	5
Minimum ideal score	=	1
Empiric score	=	X
Average ideal	=	$\bar{X}i$
Standard deviation ideal	=	sb_i

$\bar{X}i = \frac{1}{2}$ x (Maximum ideal score + Minimum ideal score)

$= \frac{1}{2}$ (5+1)

$= 3$

$Sb_i = \frac{1}{6}$ x (Maximum ideal score – Minimum ideal score)

$= \frac{1}{6}$ (5-1)

$= 0{,}67$

Moodle-based e-learning media can be said to be very feasible if the average score obtained from material experts, media experts, and practitioners is more than 4.2; feasible if the average score obtained is more than 3.4 and less than or equal to 4.2; quite feasible if the average score obtained is more than 2.6 and less than or equal to 3.4; less feasible if the average score obtained is more than 1.8 and less than or equal to 2.6, and very less feasible if the average score obtained is less than or equal to 1.8. The data conversion guidelines in Table 3.9 are used to determine the feasibility category of the product being developed.

Table 2. Guidelines for Converting Scores to Assessment Results

Interval Score	Category	Category
$X > \bar{X}i + 1{,}8 \times sb_i$	X > 4,2	Very Feasible
$\bar{X}i + 0{,}6 \times sb_i < X \leq \bar{X}i + 1{,}8 \times sb_i$	3,4 < X ≤ – 4,2	Feasible
$\bar{X}i - 0{,}6 \times sb_i < X \leq \bar{X}i + 0{,}6 \times sb_i$	2,6 < X ≤ 3,4	Pretty Feasible
$\bar{X}i - 1{,}8 \times sb_i < X \leq \bar{X}i - 0{,}6 \times sb_i$	1,8 < X ≤ 2,6	Less Feasible
$X \leq \bar{X}i - 1{,}8 \times sb_i$	X ≤ 1,8	Very Less Feasible

RESULTS AND DISCUSSIONS

The Results of Media Expert Validation

The media validation test aims to obtain the feasibility of the product being developed. Media validation test was carried out by Dr. Gatot Sarmidi, M.Pd. who is a Primary Education Lecturer at Universitas PGRI Kanjuruhan and Primary Education Tutor at UPBJJ Universitas Terbuka Malang. The step of the validation activity is carried out by providing a validation sheet to the validator as a guide in obtaining the data used to obtain the eligibility criteria and product validity. The data obtained is in the form of quantitative data in the form of scores and qualitative data in the form of suggestions and input obtained from the validator. The media validation results obtained from media experts are described in Table 3 as shown below.

Table 3. Data Results by Media Expert

No.	Assessed Aspects	Obtained Score	Maximum Score
1	Interface	47	50
2	Navigation	25	25
3	Interactivity	17	20
4	Content	18	20
	Total Score	107	115
	Percentage	93%	

Description: *V* : Validity

TSe: Total Empiric Score

TSh: Total Maximum Score

The number of statement items contained in the questionnaire given to the validator was 23. The statement items written on the media validation questionnaire were adjusted to the development of students and material. In accordance with the results of the scores obtained from the validation questionnaire given to the validator, the e-learning media developed has very valid validity criteria. This validity criterion can be proven by obtaining a score from the questionnaire of 107. The acquisition of a score of 107 if converted to a percentage scale, the validity level gets a percentage of 93%.

The Results of Content Expert Validation

Material validation tests were carried out to experts in the field of primary education. The validator in question is Dr. Firsta Bagus Sugiharto, S.Pd., M.Pd. who is a lecturer in Primary Education at Universitas Tribhuwana Tunggadewi and a Primary Education Tutor at UPBJJ Universitas Terbuka Malang. The validator is in charge of filling out the validation sheet that has been given by the researcher. The results of the validation sheet obtained from the validator are then used as material for consideration in revising the material either to reduce or add the components in it so that appropriate and valid criteria are obtained for use. The results of the material validation obtained from the validator are described in Table 4 namely.

Table 4. Data Results by Material Expert

No.	Assessed Aspects	Obtained Score	Maximum Score
1	Content	27	30
2	Language	13	15
3	Evaluation	28	30
	Total Score	68	75
	Percentage	97,14%	

The validation sheet given to the validator presents 15 statements as a benchmark for the suitability of the material with student competencies and the suitability of the material with the product being developed. The results of the material validation score get very valid validity criteria. Very valid criteria is evidenced by the score obtained from the validation sheet given to material experts of 68. The results of the score 68 are converted into a percentage scale, the validity level gets a percentage of 97.14%.

The Results of Learning Expert Validation

Table 5. Data Results by Learning Expert

No.	Assessed Aspects	Obtained Score	Maximum Score
1	Learning Instruction	48	50
2	Content	22	25
3	Language	14	15
4	Interface	20	20
	Total Score	104	110
	Percentage	94,54%	

The practitioner validation sheet given to the validator consists of 22 statement items. The score obtained by 104 is equivalent to the percentage validity level of 94.54%. The developed e-learning media obtains Very Feasible validity criteria based on the score obtained from the practitioner validation sheet.

The Product of Moodle-based E-Learning

The moodle-based e-learning can be accessed in https://belajarakm.com. Users (student and authorized teacher) can surf on the e-learning after signing into the system.

Learning expert validation tests are given to practitioners in the field of primary education to find out aspects of learning, material, language, and media appearance after using e-learning media. Ursula Lita Justina, S.Pd.SD is a Teacher of SDN 4 Ardirejo at Malang Regency, Practical Teacher of Guru Penggerak, Assessor of Teacher Profession Education Program at The Ministry of Education, Culture, Research, and Technology. The data obtained from practitioners are shown in Table 5 as shown below.

the first interface shown in Figure 1. Meanwhile, the developed e-learning shown in Figure 2. In advance, the e-learning will then be further developed and tested for the students.
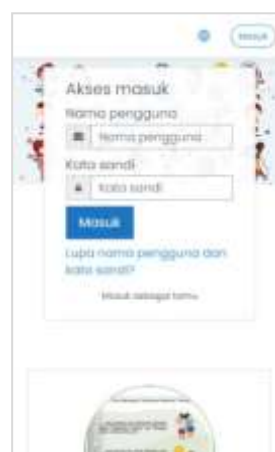

Figure 1. Welcoming interface of e-learning

Figure 2. Example of navigation page

Descriptive Analysis

The validity of the developed e-learning media was determined by media experts, material experts, and practitioners. The level of validity is determined based on predetermined criteria. The recapitulation of the product validity level results is shown in Table 6 namely.

Table 6. Product Validity Level Recapitulation Results

Validator	Results	Criteria
Media Expert	93%	Very Feasible
Content Expert	97,14%	Very Feasible
Learning Expert	94,54%	Very Feasible

The validity of e-learning media based on media experts obtained 93% with the criteria of "Very Valid", material experts obtained 97.14% with the criteria of "Very Valid", and practitioners obtained 94.54% with the criteria of "Very Valid". The average result of the validity of the developed e-learning media product is 94.89% with the criteria of "Very Valid", so that this e-learning media can be said to be "Very Feasible" for use in learning.

CONCLUSION

The research conclusions are as follows: the e-module are scored at 93% for media expert, 97,14% for content expert, and 94,54% for learning expert, so it can be stated that the product of Moodle-Based E-Learning that has been developed reaches the "Very Feasible" criteria to be applied in classroom during the learning process.

Suggestions for the use of e-learnings, it can be used as supporting teaching materials by teachers and students to learn scientific literacy. Suggestions for the dissemination of e-learnings, the teacher must adjust the needs of the students. Suggestions for further development, namely e-learning development can use more diverse themes.

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