



Development of Local Wisdom Digital Books to Improve Critical Thinking Skills through Problem Based Learning

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Abstract

The challenge of education entering the 21st century in the era of the industrial revolution 4.0 is expected to get graduates who are competent in utilizing ICT but also competent in developing critical thinking skills. This research aims to develop digital book based on local wisdom to improve critical thinking skills. This research includes Research and Development (R&D) research using ADDIE (Analysis, Design, Development, Implementation, and Evaluation) models. Data analysis techniques used in this study include descriptive data analysis related to the validity and response of users, while to determine the effectiveness of the product used the N-gain test. The results show (1) the developed digital book has valid criteria regarding aspects of the material, presentation, and language (2) students and teachers provide responses to the local wisdom digital book used in learning with response criteria strongly agree (3) assessment results Students' critical thinking skills show improvement with high N-Gain grades. The developed local wisdom digital book is suitable to be used as an alternative source of learning additive material in natural science learning in the face of the 21st century and the industrial revolution 4.0.

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INTRODUCTION

The current educational position is in a period of knowledge with an extraordinary increase in knowledge. Increased knowledge in the era of globalization in the 21st century has resulted in the activities of daily life including in the world of education can not be separated from the development of information technology. P21 (Partnership for 21st Century Learning) develops learning frameworks in the 21st century that require students to have skills, knowledge and abilities in technology, media and information, learning and innovation skills as well as life and career skills (Partnership for 21st Century Learning, 2015).

Entering the era of the 21st century there were enormous changes in various fields which are often called the industrial revolution 4.0. The purpose of education in the era of the industrial revolution 4.0 is expected to obtain graduates who are competent in terms of utilizing ICT (Information and Communication Technologies) but also competent in literacy, critical thinking, problem solving, communication, collaboration, and have good character quality (Syamsuar & Reflianto, 2018). The 21st century capabilities needed in the business world and in the industrial world are technological capabilities and information media, life and career, the ability and learning to innovate, the ability to learn and innovate which includes critical thinking and problem solving (Wijaya et al., 2016).

Critical thinking is thinking in a rational and reflective way so that they can decide about what they do or believe (Ennis, 2011). According to Liberna (2013) states that the ability to think critically is the ability to solve problems that are very important for every person who is used for daily life through thinking seriously, actively, thoroughly in analyzing all information received by including rational reasons so that the actions to be taken is right. Reading material that accommodates critical thinking does not only display memorization content, but instead focuses on the learning process (Lunenburg, 2011). Users of electronic devices such as smart phones and laptops have been widely used by students both for use in learning and internet access in everyday life. According to Ennis (2011) that critical thinking skills consist of indicators 1) providing simple

explanations, 2) building basic skills, 3) concluding, 4) giving further explanations, 5) building strategies and tactics.

Local wisdom that is around the school can be integrated with mdoul used in learning. The incorporation of electronic modules combined with local wisdom will produce electronic modules based on local wisdom that will make students more interested in learning and learning meaningful. Local wisdom can be used as a source of learning science, which is one of the characteristics expected in the curriculum so that learning becomes applicable and meaningful (Sarah & Maryono, 2014). Local wisdom in Indonesia is very diverse, not just moral messages, but can be in the form of buildings, the use of plants as food and medicine, disaster mitigation and others. (Rusilowati et al., 2015). Teachers should pay attention to the local culture in society to connect concepts, processes and contexts so that students' scientific understanding of natural phenomena will be more meaningful and contextual (Sumarni et al., 2016).

Additive material in science learning is a learning material that requires students to be more selective and critical in understanding concepts. Students are required to be able to think critically to determine the appropriate additives in food processing. This is because there is still a lot of circulation of food containing additives which are harmful to health. The results showed that snacks sold by traders in primary schools still use chilli sauce as a complement that has not been completely free of harmful coloring agents, both from the types of coloring substances that have been banned and the levels that exceed the provisions of the Ministry of Health of Indonesia (Putra et al. , 2014). An understanding of additives in addition to preventing negative effects on the body can also be beneficial in the industry. A caring attitude towards the environment and health makes natural dyes attractive and used in industry. In addition, with natural dyes industrial products have a good market (Pujilestari, 2015; Nurlina et al., 2015).

Based on preliminary studies through test questions with indicators of critical thinking skills obtained results in the category is still low. The ability to think critically has not been integrated in science learning so when given questions with indicators of critical thinking skills students are not accustomed to working on problems with these

critical thinking abilities indicators. Based on interviews with teachers, students are only accustomed to practice questions in the companion book that do not yet have indicators of critical thinking skills. So learning must be created that trains students' critical thinking skills, one of which is through problem based learning learning models. Students also tend to get bored with learning that emphasizes memorization through textbooks. Innovation is needed so students are more enthusiastic and active in learning so that it will support their thinking abilities.

The use of simulation and feedback with the help of technology makes learning more innovative so that students are not fed up with learning. The use of multimedia in the learning process can increase activities

METHODS

This study uses a Research and Development (R&D) approach. This research was conducted using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). Development research is used to produce products, test product effectiveness and test product user responses. The products produced in this study are electronic modules based on local wisdom. The subject of development research was class VIII of MTs Wahid Hasyim Warungasem. The research subjects for small-scale trials consisted of ten students, while for large-scale trials consisted of two classes with a total of 65 students. Electronic module eligibility data collection techniques were taken using a questionnaire, student and teacher response data to electronic modules were taken using a questionnaire and electronic module effectiveness data to improve critical thinking skills were taken using pretest and posttest questions which were then analyzed using N-Gain.

RESULTS AND DISCUSSION

Digital Book Validity

The results of the digital book validity assessment were validated by experts according to their fields. The design of an digital book based on local wisdom was validated by three expert lecturers. Content experts, presentation experts and linguists. The results of the assessment of the

appropriateness of content, appropriateness of presentation and appropriateness of languages can be seen in Table 1

Table 1. Expert Validation Result

Expert	Percentage (%)	Notes
Content	83.33	Valid
Presentation	94.64	Valid
Language	93.75	Valid

The validated digital book design based on local wisdom was subsequently revised according to input from the three experts. Revisions from the three experts can be seen in Table 2

Table 2. Revised DigitalBook Design

Component	Recommendation
Content	Added duties related to local wisdom of food. Added problem based questions in life
Presentation	Map mapping are made more comprehensiv. Giving color to the keyword font of a definition. Additional references so students' insights increase.
Languages	change the pronoun "you"

Digital books are developed with the help of the Lectora Inspire application. Digital books developed in natural science learning are designed in the offline form (Figure 1). Students use digital books with the help of electronic devices in the form of computers in school. According to Sumarlina et al., (2016) that the development of electronic modules in learning science in junior high schools can use the Lectora Inspire application and is suitable for use as teaching material.



Figure 1. Digital Book Display

This digital book local wisdom developed, besides having local wisdom characteristics, it does not only include writing but is equipped with pictures, videos and interactive quizzes. Interactive quizzes will make students immediately get feedback from the selected answers. The implemented feedback aims to strengthen students' understanding of concepts and conceptual connectedness so as to correct their own misconceptions (Saptono et al., 2017).

Local wisdom is integrated in digital books in the form of traditional foods that exist in the environment around schools in Batang such as *serabi*, *megono*, *sototauco* and *salted fish*. The preparation of teaching materials and learning tools can be adjusted to the conditions of the region which are based on the uniqueness and excellence that are characteristic of the area (Damayanti et al., 2017).

The main foundation of knowledge is the concept of science itself, while technology is a tool to facilitate obtaining a concept. Science concepts can be linked through local wisdom (Parmin et al., 2015). Local wisdom can be integrated in science learning through multimedia according to the times. This is in accordance with research Damayanti et al., (2013) that wisdom can be integrated in science learning on vibration and wave material in the form of compact disc learning. Introducing local wisdom in science learning in schools can be done by integrating local wisdom content in the form of multimedia to facilitate and attract students' attention in learning (Andriana et al., 2017).

The knowledge gained by students in science learning that is integrated with local wisdom, then students will know the local wisdom itself in order to continue to grow and remain preserved (Reffiane & Utaminigrum, 2018). The material presented in the module is related to daily life and is equipped with pictures as background information about the contents of the material can make it easier for students to understand the concept (Wardani et al., 2016).

Presentation of material and activities in digital books applying a scientific approach to the problem based learning learning model. The implementation of electronic modules based on local wisdom in science learning uses a problem based learning (PBL) learning model. The application of problem based learning in science

learning can develop critical thinking skills (Fakhriyah, 2014).

The involvement of teachers in the innovation of making instructional media is needed to face the 21st century in the era of the industrial revolution 4.0. Lectora inspire application can be used to encourage teachers to create innovative learning media that involve technology (Shalikhah et al., 2017).

Digital Book Effectiveness (Critical Thinking Improvement)

The effectiveness of using digital books based on local wisdom is measured by tests. The effectiveness of the product can be seen using the N-gain formula. The use of N-gain aims to determine the increase in learning outcomes of students' critical thinking skills before being treated (pretest) and after treatment (posttest). N-gain is used to measure the difference in the pretest-posttest value. The results of the N-Gain for each class are included in the high category. The pretest-posttest and n-gain scores are presented in Table 3

Table 3. N-Gain Result

	Class VIII A	Class VIII B
Pretest	37.08	36.57
Posttest	81.25	81.62
N-Gain	0.702	0.710
Improvement	High	High

There are five indicators of critical thinking ability that are measured. The indicators of critical thinking skills are providing simple explanations, building basic skills, concluding, giving further explanations, as well as strategies and tactics. Pre-test and post-test results for all classes for each indicator of critical thinking can be seen in Figure 2.

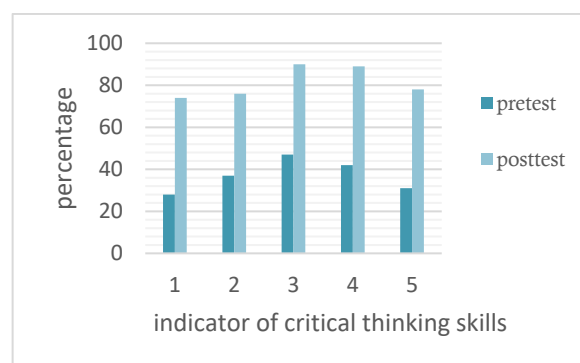


Figure 2. Pre-test and post-test results of critical thinking skills

Student and Teacher Responses

Student and teacher responses to local wisdom digital books are included in the excellent category. The results of student responses in individual trials can be seen in Figure 3, the results of student responses in field trials can be seen in Figure 4 and the results of teacher responses can be seen in Figure 5.

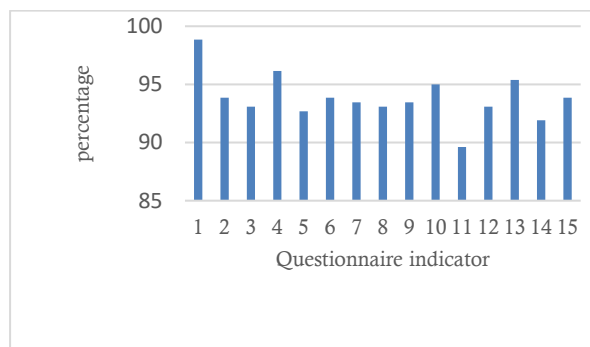


Figure 3. Individual student test results

Indicator description: (1) use of language (2) choice of words (3) use of spelling (4) suitability of language with cognitive level (5) explanation according to student education level (6) interesting modules (7) creative modules (8) easy questions understood (9) matching module layout (10) matching illustrations (11) matching color compositions (12) matching fonts (13) matching letter sizes (14) clarity of material sequences (15) navigation is easy to understand. Some input from students is that there is language or vocabulary that is still difficult to understand. The revision of the electronic module is done by replacing vocabulary that is easier to understand but does not change the meaning of the sentence (Yulia et al., 2017).

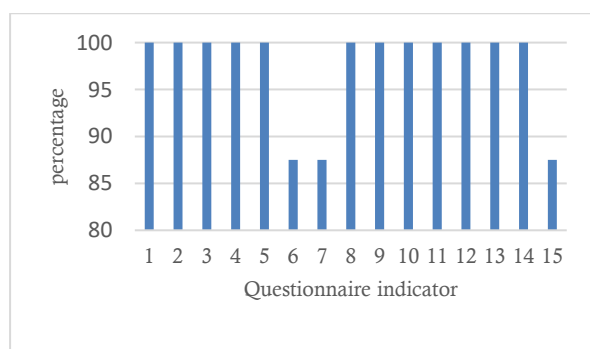


Figure 4. Results of field test student responses

Description of indicators: (1) integration of local wisdom in concepts (2) using examples in daily life (3) presentation of modules easily understood (4) makes it easy to explain the

similarities and differences of things (5) encourages curiosity (6) makes it easier to choose trusted sources (7) easy-to-read text (8) attractive display (9) makes it easy to conclude (10) not boring (11) easy-to-operate modules (12) proportional colors (13) clear images (14) make it easy to explain terms (15) makes it easy to determine a solution.

Students as a whole like learning using local wisdom digital books. Interest when learning with electronic modules because it is something new for students. The use of electronic modules in learning can help mastering concepts while playing games in this case in the form of interactive quizzes. Educational games can be a media liaison between education and entertainment that has content and focus on student activities (Hamari et al., 2016). The availability of game applications as an attractive learning media, easy to use so that it will improve student learning outcomes (Adnan et al., 2017).

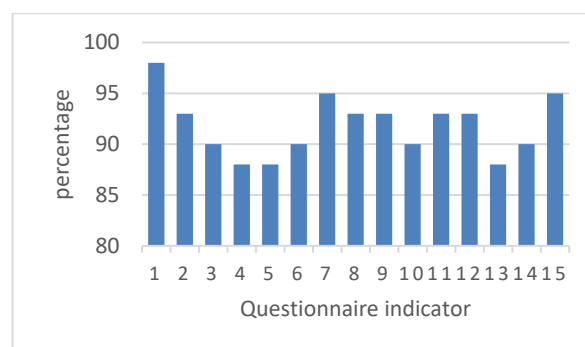


Figure 5. Results of teacher responses to local wisdom digital books

Indicator Description: (1) conformity with basic competencies (2) systematic explanation (3) support the achievement of basic competencies (4) support problem-based learning process (5) contextual integrated local wisdom (6) support learning of additive material (7) up to date according to current issues (8) easy to operate modules (9) colors in proportional modules (10) clear images (11) pictures in accordance with the material (12) practice critical thinking skills (13) link concepts to real life (14) motivate teachers to using electronic modules (15) motivates teachers to create similar modules with different subject matter. Overall the response of teachers has an average of 97.50% which falls into the category of strongly agree. The teacher suggests that the local wisdom of traditional foods be raised at the preliminary stage of apperception. Concise and contextual

presentation of teaching materials can be used to face challenges in the 21st century because students are more interested in knowledge that is correlated with life (Mustofa et al., 2013).

CONCLUSION

Validity local wisdom digital books get the valid category from content experts, presentation experts and linguists so that the product can be used as an alternative source of learning additives in natural science learning. Test the effectiveness of students' critical thinking skills that are included in the high category. These results indicate that the product developed is effectively used to improve critical thinking skills in learning additives. Student and teacher responses to the use of local wisdom digital books provide a very good response when used in the science learning process of additives.

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