E-MODULES FOR BASIC SCIENCE AND ELEMENTARY SCHOOL CONCEPTS BASED ON CASES IN THE CONTEXT OF LOCAL WISDOM

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ABSTRACT

Purpose: This preliminary study aims to describe the need for developing an e-module in a case-based Elementary Science Basic Concepts course with the context of local wisdom and determine the characteristics of the e-module to be developed.

Method: This research is a Research and Development that focuses on analyzing the needs of product development. The subjects in this study were 30 Elementary School Teacher Program students and three science core lecturers at the Mpu Kuturan Singaraja State Hindu Religion College. The data collection technique was carried out primarily through questionnaires given to students and lecturers and secondarily through e-module documents at five tertiary institutions, which can be accessed via Google searches.

Results and Conclusion: The results of this introduction show that product development in the form of an e-module course based on case-based Elementary Science Basic Concepts with the context of local wisdom is very much needed in the learning process because it can overcome problems of learning difficulties, integrates with local wisdom, and offers better interactivity compared to current e-modules. The characteristics of the e-module course in the case-based Elementary Science Basic Concepts course with the context of local wisdom structurally consists of 8 components, namely: (i) topic or subject matter; (ii) instructions for use; (iii) learning objectives; (iv) learning content; (v) summary, (vi) evaluation complete with discussion, (vii) glossary; and (viii) references.

Keywords: Preliminary Study, E-Module, Case-Based Learning, Local Wisdom, Science Learning.

MÓDULOS ELETRÔNICOS PARA CONCEITOS DE CIÊNCIA BÁSICA E ENSINO FUNDAMENTAL BASEADOS EM CASOS NO CONTEXTO DA SABEDORIA LOCAL

RESUMO

Objetivo: Este estudo preliminar visa descrever a necessidade de desenvolver um e-módulo em um curso de Conceitos Básicos de Ciência Elementar baseado em casos com o contexto da sabedoria local e determinar as características do e-módulo a ser desenvolvido.

Método: Esta pesquisa é uma pesquisa e desenvolvimento que se concentra na análise das necessidades de desenvolvimento de produtos. Os temas deste estudo foram 30 alunos do Programa de Professores do Ensino Fundamental e três professores principais de ciências do Mpu Kuturan Singaraja State Hindu Religion College. A técnica de coleta de dados foi realizada principalmente por meio de questionários enviados a alunos e professores e, em segundo lugar, por meio de documentos de módulos eletrônicos em cinco instituições de ensino superior, que podem ser acessados por meio de pesquisas do Google.

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1 INTRODUCTION

E-modules are digital-based teaching material products designed to facilitate student learning independently (Panggabean et al., 2021). Learning independence is very necessary, especially in the learning process in tertiary institutions. The hope of e-modules in learning is to enable students to learn independently with or without a facilitator (lecturer) (Wijaya & Vidiandi, 2020). In general, the existing e-modules are still in the form of document files uploaded on several learning platforms, so they have not been able to maximize interactivity or
learning independence. This leads to learning outcomes, both problem-solving abilities and low critical thinking skills.

The low ability to solve problems, especially in science learning in tertiary institutions, is caused by the learning process that is not following the cognitive development of students (Samo et al., 2018), low ability of students to analyze problems (Hadi, 2019), learning process that does not encourage students to solve problems and there are no teaching materials that train problem-solving abilities (Wahyudiana et al., 2021). In addition, it is caused by a lack of knowledge, motivation, and emotional aspects, as well as the application of learning models that are not oriented toward empowering problem-solving abilities (Çetin, 2020). The low ability to solve this problem can be seen in two indicators, according to Polya, namely implementing the plan and checking back (Astuti et al., 2020).

Likewise, low critical thinking skills (25.57%) in science learning in tertiary institutions are caused by limited time for lecturers to develop learning tools that emphasize critical thinking skills (Rusmansyah et al., 2019) and limited learning resources oriented towards empowering critical thinking skills (Syawaludin et al., 2019). Other research also shows students' critical thinking skills with The Oliver-Hoyo Rubric for Critical Thinking (OHRCT) showing results in the low category (M = 13.65, SD = 2.023) (Irwanto et al., 2019) and a mean score of 63.99 (Syawaludin et al., 2019). The low level of critical thinking skills is identified from four elements of error, namely interpreting, understanding concepts, procedures, and techniques (Umam & Susandi, 2022).

On the other hand, integrating local wisdom into learning in tertiary institutions is the mandate of the Minister of Education and Culture Number 3 of 2020. The purpose of this integration is to create a learning process that is holistic, interactive, integrative, scientific, thematic, contextual, effective, collaborative, and centered on students. This is an opportunity to design learning that encourages students to solve problems and empower critical thinking skills through meaningful learning activities and following students' cognitive development.

This learning activity is also mandated in the Minister of Education and Culture Regulation Number 3 of 2020, which explains that learning in higher education can be in the form of group discussions, simulations, case studies, collaborative, cooperative, project-based, problem-based, or other learning that effectively facilitates the fulfillment of learning achievement. Following the characteristics of the material and the context of local wisdom in the Elementary Science Basic Concepts course, a relevant form of learning that can be implemented is a case study or Case Based Learning. Case-based learning is a learning model
oriented toward case investigations and is student-centered to connect theory with practice and encourage inquiry-based learning processes (Bi et al., 2019).

Following this description, integrating local wisdom and case-based learning is a concrete effort to design interactive e-modules to improve problem-solving and critical thinking skills. Therefore, a preliminary study is needed to describe the need for e-module development in the case-based Elementary Science Basic Concepts course with the context of local wisdom and determine the characteristics of the e-module to be developed.

2 METHOD

This type of research is Research and Development, which focuses on a needs analysis and aims to describe the needs for developing an e-module for the case-based Elementary Science Basic Concepts course with the context of local wisdom and determine the characteristics of the e-module to be developed. The subjects in this study were 30 elementary school teacher education students and three science core lecturers at the Mpu Kuturan Singaraja Hindu Religious College. Data collection techniques were carried out primarily through questionnaires given to students and lecturers and secondarily through e-module documents at five tertiary institutions, which can be accessed via Google searches, and distributing questionnaires to students, which were carried out from 9 to 12 September 2022. Data analysis techniques was carried out using an interactive data analysis model that included data reduction, data display, and conclusion drawing. Besides, the researchers also did triangulation based on relevant literature.

3 FINDING AND DISCUSSION

Based on a preliminary study of 30 students and three lecturers supporting science courses at the Mpu Kuturan Singaraja State Hindu Religious College and document analysis, some information was obtained regarding the need for developing e-modules for the Elementary Science Basic Concepts course. This information can be viewed from learning difficulties, the urgency of integrating local wisdom in learning, and the reality of e-modules in science learning in tertiary institutions.

The learning process for science core science courses in the Elementary School Teacher Program Study Program at the Mpu Kuturan Singaraja State Hindu Religious High School experienced several difficulties or obstacles. Based on data analysis from both the perspective
of lecturers and students, information was obtained that: (i) students had difficulty understanding the material in core science courses due to limitations in the online learning process; (ii) learning that takes place tends to be one-way so that students are less active and unable to photograph students' thinking skills continuously, and (iii) the limitations of teaching materials cause students to use several types of sources through independent exploration but have not been able to synthesize these learning resources to construct their knowledge and understanding.

These findings are following several previous studies and research which show that the paradigm of learning science in tertiary institutions is still centered on educators (lecturers) (Egne, 2022; Selvi, 2022), learning orientation on the result is not a process that causes learning to be less than optimal (Lassoued et al., 2020; Selvi, 2022), and learning still experiences technical constraints in blended or hybrid mode (Alnajjar, 2021; Ichsan et al., 2021; Lassoued et al., 2020; Selvi, 2022), as well as limited learning resources (Alnajjar, 2021; Altawalbeh & Al-Ajlouni, 2022; Lassoued et al., 2020).

Therefore, a concrete form of learning product is needed that can accommodate blended, hybrid, online, or offline modes, as well as encourage an increase in the quality of the learning process to build students' thinking skills. The development product in question can be in the form of e-modules. Electronic modules are learning resources that facilitate the student learning process independently (Wijaya & Vidiandi, 2020), able to improve cognitive, affective, and psychomotor abilities (Maksum & Purwanto, 2022), improve higher-order thinking skills (Asih et al., 2022), and improve interpretation and decision-making in learning (Villatoro et al., 2019).

Judging from the urgency of integrating local wisdom in learning, information is obtained that explicitly learning science is not integrated with local wisdom but only refers to text teaching materials, tends to memorize, and is less varied. This causes students to experience difficulties in discussing and understanding science learning content in everyday life. On the other hand, the integration of local wisdom is beneficial for (i) introducing forms of local wisdom in science learning; (ii) increasing awareness of culture; (iii) preserving and maintaining local wisdom; (iv) adding insight about local wisdom; and (v) is contextual. Integrating local wisdom can improve understanding and thinking skills because learning techniques are interesting, contextual, concrete, and present problems requiring thinking.

Integration of local wisdom in science learning in tertiary institutions is needed to improve learning outcomes (Pujiastuti et al., 2020) and reconstruct scientific concepts (Suprapto et al., 2021) to create a holistic, interactive, integrative, scientific, thematic, contextual, effective, collaborative, and student-centered learning process (Peraturan Menteri
Pendidikan dan Kebudayaan 3, 2020). In addition, this integration also follows Article 11 paragraph (3) of the Minister of Education and Culture Regulation Number 3 of 2020, which states that learning characteristics are carried out holistically, internalizing local excellence and wisdom as well as national wisdom.

Regarding the reality or existence of science e-modules currently at five tertiary institutions, namely modules at Esa Unggul University by Syofyan in 2019, Open University by Nugraha in 2019, Prof. Dr. Hamka by Yusuf in 2019, University of Muhammadiyah Jakarta by Nurfadhilah in 2020, and Ganesha University of Education in 2022 by the Science Lecturer Team show that the modules compiled are not interactive and are still in the form of document files to convert modules into e-modules. When examined from its structure, the module contains topics or subject matter, objectives and/or indicators, materials, exercises, summaries, and references. Even though the e-module used is still relatively simple and does not integrate local wisdom, students feel the benefits of supporting the independent learning process so that the learning process in class runs in an interesting, interactive, and fun way.

On the other hand, learning science subjects in the Elementary School Teacher Program Study Program at the Mpu Kuturan Singaraja State Hindu Religious High School has not used e-modules. However, learning is still facilitated with textbooks. The benefits felt by students with the existence of these textbooks are as a reference for the learning process both independently at home and in class. This textbook is still simple in a document file, not interactive, textual. It does not integrate local wisdom so that students explore further in finding other relevant information to construct knowledge. The structure of this textbook consists of topics or subject matter, an introduction related to learning objectives, a presentation of material, summaries, exercises/assignments, and references.

Students highly expect the existence of e-modules as a source of independent learning to maximize the facilitation of the independent learning process. Using e-modules in learning can strengthen and integrate students' basic science and clinical knowledge (A. Major et al., 2021) and improve higher-order thinking skills (Asih et al., 2022). The e-module product produced in a study that integrates local wisdom has a positive instructional impact, namely increasing scientific literacy (Setiawan et al., 2017) and study results (Pujistuti et al., 2020). In terms of process, local wisdom-based e-modules are very well implemented with case-based learning to improve problem-solving skills (Bi et al., 2019; Fronke et al., 2022; Gholami et al., 2021; Koehler et al., 2020) and critical thinking skills (Li et al., 2019; Ma & Zhou, 2022; Sapeni & Said, 2020).
Following the information needs, the e-module is a learning resource that can overcome the problem of limited learning resources. The developed e-module is expected to facilitate various learning modes, hybrid, blended, online, and offline. Therefore, a concrete form of interactivity between students and learning resources must be realized in e-modules. Technically, this interactivity is built through e-module design in the Macromedia Flash 8 application and integration with various media or other learning applications. Interactivity can be built through case-based learning activities and the context of Balinese local wisdom. This interactivity design is expected to improve students' problem-solving and critical thinking skills.

As a form of effort to realize the interactive e-module, the case-based e-module with the local wisdom context that will be built contains several components, namely: (i) topic or subject matter; (ii) instructions for use; (iii) learning objectives; (iv) learning content; (v) summary, (vi) evaluation complete with discussion, (vii) glossary; and (viii) references. In detail, the design or characteristics of case-based e-modules in the context of local wisdom can be observed in the following table.

**Table 1**

*Characteristics of case-based e-modules with the context of local wisdom*

<table>
<thead>
<tr>
<th>No</th>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The topic or subject matter</td>
<td>Shows the material presented in the e-module according to the planning in the syllabus and lesson plans.</td>
</tr>
<tr>
<td>2</td>
<td>Instructions for use</td>
<td>Presenting technical information about using e-modules sequentially, concisely, and easy-to-understand.</td>
</tr>
<tr>
<td>3</td>
<td>Learning objectives</td>
<td>Presenting measurable learning process information and oriented towards problem-solving abilities and students' critical thinking skills.</td>
</tr>
<tr>
<td>4</td>
<td>Learning content</td>
<td>Presenting case-based learning with the context of local wisdom, worksheets, concept maps, presentation of basic concepts, learning videos, and verification of understanding.</td>
</tr>
<tr>
<td>5</td>
<td>Summary</td>
<td>Displays the basic concept of each sub-subject in a learning topic.</td>
</tr>
<tr>
<td>6</td>
<td>Evaluation</td>
<td>Perform formative assessments to measure student learning progress. This assessment is oriented towards improving problem-solving abilities and critical thinking skills.</td>
</tr>
<tr>
<td>7</td>
<td>Glossary</td>
<td>Presents information about essential terms related to the topic of learning.</td>
</tr>
<tr>
<td>8</td>
<td>Reference</td>
<td>Displays information about references or references to e-module learning content.</td>
</tr>
</tbody>
</table>

Source: Results of data analysis

The characteristics of the e-module were developed in the Elementary Science Basic Concepts course, which, in terms of the content aspect, contains three fields of science, namely Physics, Chemistry, and Biology. The studies in this course include (i) quantities, units,
dimensions, and measurements; (ii) motion and force; (iii) energy and simple machines; (iv) temperature and heat and changes in the shape of objects; (v) vibrations, waves, and sound; (vi) light and optics; (vii) electricity and magnetism; (viii) solar system; (ix) life organization system; (x) the life cycle of living things; (xi) organ systems in humans; (xii) plant diversity; (xiii) diversity of animals; and (xiv) ecosystem and preservation of natural resources. Regarding the context of local wisdom, the study material is classified into five dimensions: local knowledge, local culture, local skills, local resources, and local social process. (Setiawan et al., 2017). Likewise, in terms of learning activities carried out with case-based learning through seven stages known as the "Seven Jump Process," namely: (i) cases are established, (ii) groups analyze cases, (iii) brainstorming, (iv) formulas learning objectives, (v) dissemination of new findings, (vi) group share results, and (viii) identify areas for improvement and integrated into clinical practice (Kanhadilok et al., 2019; Williams, 2005). The following presents the relationship between study material in the Elementary Science Basic Concepts course, the context of local wisdom, and case-based learning activities in building e-modules' characteristics.
Table 2

Connectivity of study materials, the context of local wisdom, and case-based learning activities in elementary science basic concepts courses

<table>
<thead>
<tr>
<th>No</th>
<th>Material Science Basic Concept</th>
<th>Elementary Science Basic Concept</th>
<th>Wisdom Context Local</th>
<th>Dimensions of Local Wisdom</th>
<th>Case Based Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Measurement</td>
<td>Asta Kosala-Kosali, Traditional Measurement</td>
<td>local knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Motion and Force</td>
<td>Balinese Dance, Melasti</td>
<td>local culture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Simple Energy and Aircraft</td>
<td>Agriculture Tools Seka Subak</td>
<td>local skills, local social processes</td>
<td>(i) case is established, (ii) case is analyzed by groups, (iii) brainstorming, (iv) formulate learning objectives, (v) dissemination of new findings, (vi) group share results, dan (viii) identify areas for improvement and integrated into clinical practice</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Temperature, Heat, and Shape Change of Things</td>
<td>Ngaben</td>
<td>local culture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Vibrations, Waves, and Sound</td>
<td>Balinese Gamelan</td>
<td>local skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Light and Optics</td>
<td>Traditional Balinese Puppet Show</td>
<td>local culture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Electricity and magnetism</td>
<td>Panca Datu</td>
<td>local knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Solar System</td>
<td>Jyotisha, Wariga, Wuku, Sasih, Kala Rahu</td>
<td>local knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Life Organization System</td>
<td>Panca Maha Bhuta (Microcosm)</td>
<td>local knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Life Cycle</td>
<td>Catur Asrama Reincarnation</td>
<td>local knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Human Organ Systems</td>
<td>Dasendria Element</td>
<td>local knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Diversity of Plant</td>
<td>Usadha Taru Pramana</td>
<td>local resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Diversity of Animal</td>
<td>Mapepada</td>
<td>local knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Ecosystem And Natural Power Source Preservation</td>
<td>Tri Hitu Karana Tumpek Wariga Tumpek Kandang</td>
<td>local knowledge, local resources</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Results of data analysis

4 CONCLUSION

The development product in the form of an e-module course on the Basic Concepts of Elementary Science in Elementary Schools based on a case with the context of local wisdom is very much needed in the learning process. This e-module is a solution for overcoming the problem of learning difficulties in blended, hybrid, online, or offline modes, as well as encouraging an increase in the quality of the learning process to build students' thinking skills. This e-module is also a concrete form of learning that integrates local wisdom according to the mandate of the Minister of Education and Culture Number 3 of 2020 to create a learning process that is holistic, interactive, integrative, scientific, thematic, contextual, effective, collaborative, and student-centered. Likewise, when viewed from the aspect of the current existence of e-modules, case-based e-modules for Elementary Science Basic Concepts courses with the context of local wisdom offer better interactivity than other e-modules. This interactivity is characteristic of the e-module, which structurally consists of 8 components, namely: (i) topics
or subject matter; (ii) instructions for use; (iii) learning objectives; (iv) learning content; (v) summary, (vi) evaluation complete with discussion, (vii) glossary; and (viii) references.

Based on the results of this analysis, several suggestions can be put forward in implementing the e-module development for the case-based Elementary Science Basic Concepts course in the context of local wisdom. The suggestions are: (i) the development of the e-module is expected to be able to present local wisdom cases that are easy to understand and have a close relationship with the study material for Elementary Science Basic Concepts courses; (ii) the development of e-modules is expected to have direct implications for improving the quality of learning, problem-solving abilities, and critical thinking skills; and (iii) the development of e-modules is expected to accommodate technical learning in the independent curriculum in tertiary institutions so that it can be applied continuously.

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