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Development of Online Web Learning with Ethnomatematics Content on Self Regulated Learning

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Abstract

Along with the development of technology, a set of abilities is needed to master the 21st-century skills which are often referred to as 4C, namely Critical Thinking, Communication, Collaboration, and Creativity and Innovation. The purpose of this research is to develop online web learning with ethnomathematics content on self-regulated learning. The development model in this research is to develop online web learning with ethnomathematics content on KPK and FPB material for elementary schools with the Lee and Owen model design (2004). The development model consists of (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. After discussing the findings, this study produces several conclusions. First, in order to achieve learning outcomes and learning objectives, content from the etomathematics aspect is needed in the KPK and FPB materials so that students do not only get mathematics but understand how elements of local culture can foster a love for local culture. Second, to foster student interest, it requires the use of images, audio and video more than text. Third, applications can be used to support learning. This is due to the limited time that the researcher has. In the future, products that have been made large group trials and tests on student self-regulated learning.

Keywords: online web learning, ethnomathematics, self-regulated learning

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INTRODUCTION

Along with the development of technology in the 21st century, a shift has occurred in the world of education. One of the things that can be seen is the characteristics of students, including liking freedom in learning, like learning new things, being comfortable with an environment connected to the internet network, preferring communication with pictures, icons, and symbols compared to text, having an attention span short, and interacts complexly with the media (Arianti & Pramudita, 2022; Direktorat et al., 2015; Kahila et al., 2020; Lee, 2016; Niemi & Niu, 2021). A set of abilities is needed to master the 21st-century skills which are often referred to as 4C, namely Critical Thinking, Communication, Collaboration, Creativity, and Innovation. These skills need to be developed to be successful in life in the future (Erdoğan, 2019; Naredi et al., 2022).

The emergence of 21st-century skills convinces education units to modify teaching styles by reducing teacher centers, becoming mentors, as motivators, providing infrastructure, and using appropriate learning models (Arianti &

Pramudita, 2022; Direktorat et al., 2015; Erdoğan, 2019; Lambert & Cuper, 2008; Maphosa & Mashau, 2014; Meilani & Aiman, 2020). 21st-century learning is supported by rapid technological developments to shift traditional learning to technology-based and internet-connected learning including using personalized learning, serious games, and using mobile devices such as computers, laptops, smartphones, and i-pads (Assya'bani & Majdi, 2022; Erdoğan, 2019; Kahila et al., 2020; Lee, 2016; Naredi et al., 2022; Niemi & Niu, 2021; Robertson, 2021)

Many people perceive mathematics as a difficult knowledge that does not affect everyday life. This is a misunderstanding (Bender & Beller, 2018). Learning mathematics requires real situations that are often faced by students. Tradition as local wisdom from the surrounding community can be used for learning mathematics so that students can reach abstract mathematical contexts (Otin Martini, Engkus Kuswarno et al., 2021; Utami et al., 2022). Ethnomathematics means cultural mathematics, which refers not only to ethnic culture, but also to general experiences such as language, beliefs, customs, or history (Wikan, 2017). Future learners will benefit from seeing ethnomathematics topics in their learning. This allows students to make connections with cultures and develop a deeper understanding of mathematics. Linking content and culture helps build knowledge and meaning for learners (Bazinet & Marshall, 2015). Students feel helped by learning ethnomathematics because it is an effort to maintain local cultural wisdom (Budi Utami et al., 2019). Ethnomathematics is usually done with hands-on practice, but in this study, it will become part of the KPK and FPB material assisted by the media, namely online web learning.

Digital technology in education is growing. Educational technology offers many benefits, including access to knowledge, mobility, multiple means of engagement, accessibility, distance learning, and the ability to connect in unprecedented ways (Ilin, 2022). There are three main factors in using online learning, namely control over the learner, self-regulated learning, and satisfaction (Ilin, 2022). The most important thing in online learning is the interaction between students and students and vice versa and also students with students (Hwang, 2018) so it can be said that communication competence has an important role in online learning and self-regulated learning (Lin & Dai, 2022). Now schools and teachers are more prepared in designing and providing learning with online systems compared to before so it is hoped that this can support students in improving learning outcomes (Kennedy & Boyle, 2021). This is because a lot of research has been conducted related to the positive impact of online learning (Ilin, 2022). Online learning supports and facilitates learning activities by utilizing existing potential (Alzahrani, 2022) including accompanying parents as a substitute for teachers to control student learning at home (Susiawati, 2021) so that online learning is as effective as traditional learning (Rina Mirdayanti et al., 2022; Vivolo, 2016).

Learning is an educational process carried out by the teacher for students, learning will be more effective if it uses the media (Budi Utami et al., 2019; Mulyati et al., 2022; Muslim et al., 2022; Rusmono & Alghazali, 2019). The media to be developed is online web learning that is used is online web learning. Online web learning is a trend that cannot be avoided now and in the future. Online web learning leads to active and independent learning so that students can build their comfort, organize and manage their learning, and be responsible for their learning process

(Safitri et al., 2015). In other words, maintaining self-regulated learning is necessary when using online web learning (Bin Tajudin et al., 2022).

Self-regulated learning regards learners as active agents who can shape and make their progress (Jones, 2019). Self-regulated learning is a process that is carried out independently and consists of planning, monitoring, evaluating, and reflecting on learning (Korostyshevskiy, 2021). Steps that can be taken care setting goals, developing strategies and schedules, procrastinating, managing emotions, and applying flexible learning strategies (Bazinet & Marshall, 2015; Khiat, 2022). Self-regulated learning has a positive and long-term impact on the academic development, employability, and career advancement of students (Atmojo et al., 2020; Gabriel et al., 2020; Huh & Reigeluth, 2018; Rivers et al., 2022; Russell et al., 2022) Emotions, motivation, and metacognition play important roles in determining students' abilities when learning (Alhadi & Supriyanto, 2017; Woodill & Udell, 2014).

The purpose of this research is to develop online web learning with ethnomathematics content on self-regulated learning.

METHODS

The development model in this study was to develop an online web learning with ethnomathematics content on KPK and FPB material for elementary schools with the Lee and Owen model design (2004). The development model consists of (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation.

The process of developing online web learning with ethnomathematics content is presented in Figure 1 below:

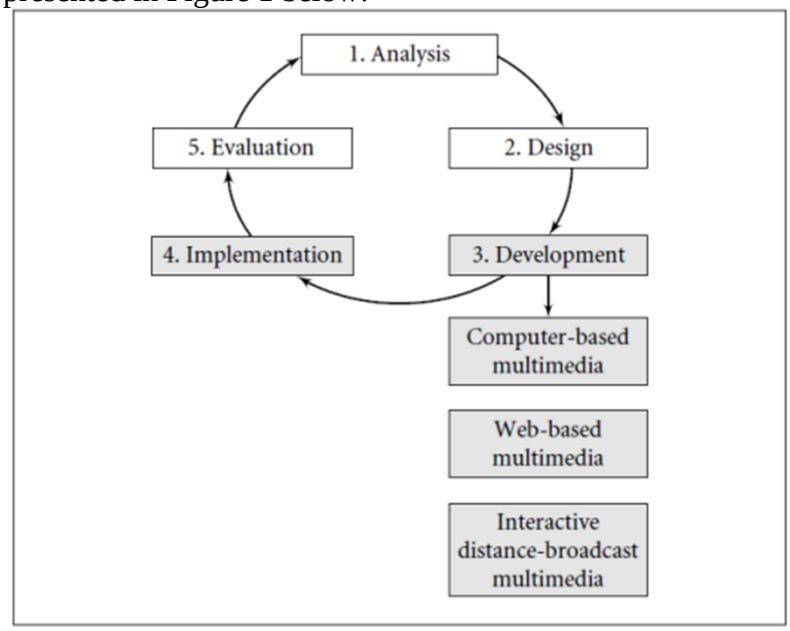

Figure 1. The process of developing online web learning with ethnomathematics content (Lee and Owen, 2004).

The model used has the following basics:

1. It is a procedural model that has a descriptive nature, provides clear and careful steps to produce a product,
2. The development stage is carried out by researchers specifically for online web learning.

Development Procedures

The procedures for developing online web learning follow the stages in the Lee and Owens (2004) model as follows:

Needs Analysis Stage

1. Determine the current situation and circumstances, carried out by identifying the causes of the desired needs,
2. Identifying the situation ideal according to the applicable regulations,
3. Determine the requirements for the ideal situation to be achieved,
4. Identify the current situation and circumstances,
5. Identify the potential needed before the research is carried out.

The steps in the initial and final analysis, namely

1. Participant analysis, aims to find out the characteristics and initial knowledge of students. The data used includes knowledge, skills, attitudes, and user classes,
2. Technology analysis, the purpose of which is to identify how technological capabilities are owned, including devices and the internet,
3. Task analysis, the goal is to explain the tasks related to work performed as a result of training or support from an appearance,
4. Critical incident analysis, conducted to determine the skills or knowledge that should be targeted as a result of online web learning interventions,
5. Situation analysis, carried out to identify the environment that affects the goals and design of online web learning,
6. Analysis of objectives, the goal is to determine the domain to be achieved following learning outcomes and learning objectives.
7. Media analysis, aims to choose the right strategy for using media,
8. Analysis of teaching materials, aims to identify existing teaching materials, manuals, references, and learning objectives flow (ATP),
9. Cost analysis, aims to identify the costs used and the profits earned in developing the product.

RESULTS & DISCUSSION

Results

This research is still in its early stages, namely developing web learning with ethnomathematics content. The research sample selected elementary schools that have computer laboratories and students that have devices. The steps carried out are as follows

1. Needs analysis

   Based on the results of observations made on elementary school students in Tegal district, the following was found:

a. Learning is still carried out using textbooks provided by the government, and applications used in online learning are still limited to zoom, google meet, and whats app.
b. Ethnomatematics-based learning is carried out only by a few schools, this is due to the demands of the material delivered to students and the adaptation of the new curriculum, namely the independent curriculum. What is being done is strengthening the profile of Pancasila students, namely by introducing market snacks that can be associated with mathematics.
c. Learning is still a teacher-centered system even though it uses media but is still learner-centered.
d. Lack of supervision of students when using devices because the content that is opened is sometimes not material but entertainment content such as games.

2. Analysis of student characteristics
   Observations made to obtain the following results:
   Online web learning with ethnomathematics content is presented to fourth-grade elementary school students with an age range of 10-12 years. The material presented will adjust to the development of students. The development of online web learning will also adjust to the diversity of student abilities. Content is presented in the form of text, images, audio, and video so students can choose according to their learning style. In addition, an interactive menu is also provided so that communication occurs between students and students and fellow students.
3. Analysis of student characteristics
   When learning mathematics the students feel boredom, this is due to learning that still uses textbooks so that students can only read and see the pictures in the book. Mathematics learning which contains ethnomathematics, for example, KPK and FPB with traditional food which is packaged in online web learning, is expected to help students' understanding because it is presented in the form of text, images, audio, and video.
4. Technology analysis
   Schools have facilities such as computer laboratories, and internet network connections and students have other devices such as smartphones, laptops, and tablets that will be used to download material that needs to be studied.
5. Task analysis
   Students can use the internet, and some students can use devices.
6. Critical incident analysis
   a. Students can understand the material following the expected learning outcomes and learning objectives,
   b. Fostering a sense of love for local culture and preserving it,
   c. With online web learning, students can do learning anywhere and anytime so students are expected to be able to plan, monitor, evaluate, and reflect on learning independently.
7. Situation analysis
   a. Internet connection at school is available so that school members can use it for learning purposes,
   b. Parents and students become drivers and supervisors in learning
8. Analysis of teaching materials

The material used in online web learning is KPK and FPB material which will be presented with ethnomathematics through the introduction of traditional food.

The results of the first stage of validation by elementary school math material experts, namely PGSD lecturers, obtained that

1. On the substance of the material
   a. Online web learning has focused on the material, namely KPK and FPB but it is necessary to bring up ethnomathematics used so that it does not just look like counting but also cultural elements visible,
   b. The terms used in online web learning are good,
   c. The material presented is sufficient to represent learning outcomes and learning objectives,
   d. The description of the material presented in online web learning still does not enrich the cultural themes raised so it is not can be used to foster a love for local culture,
   e. The depth level of the material is still limited so it is necessary to add interesting topics that can be used as material for student discussion and make students active in critical and creative thinking,
   f. Presentation of material in online web learning is following the Flow of Learning Objectives,
   g. The material presented on the online web learning it is necessary to add examples with ethnomathematics nuances so that they have a high appeal for students,
   h. The material provided is following field conditions,
   i. It is hoped that the material presented is not only from government reference books but can be used by other books so that the material becomes richer.
2. On Learning Objectives
   a. Learning outcomes and learning objectives in online web learning are following the material,
   b. Sentences of learning outcomes and learning objectives need to be formulated both in terms of cognitive, affective, and psychomotor,
   c. The verbs used in learning outcomes and learning objectives require good formulation to show cognitive, affective, and psychomotor sides,
   d. The learning outcomes and learning objectives developed are following the flow of learning objectives.
3. Material substance
   a. KPK and FPB material on online web learning is quite easy to understand,
   b. KPK and FPB material on online web learning contains easy-to-understand ethnomathematics,
4. Assignments and quizzes
   a. Question items on quizzes contained in online web learning following learning outcomes and learning objectives,
   b. The assignment on online web learning is quite clear.

Results of the second stage of validation by an elementary school math material expert. After making improvements to the results of the first stage of validation, it was found that the material on KPK and FPB contained ethnomathematics that could be tested on students.

The results of the first stage of validation by learning media experts, namely learning technology lecturers

1. Design and presentation
   a. The domain name used is correct,
   b. Display on online web learning is still not in line with the target, namely elementary school children,
   c. The design used is quite interesting, unique, and different from the others,
   d. The design that is made needs to be adjusted again so that diversity will be obtained in terms of text, images, and videos,
   e. The accessories used are quite appropriate,
   f. There is the ease of navigation,
   g. Neat appearance,
   h. The use of appropriate typeface and writing,
   i. The online web learning that is presented is still very simple, so a touch is needed to make it more varied,
   j. ease in operating online web learning as a whole.
2. Online web learning operations
   a. Online web learning is easy to operate,
   b. Online web learning is easily accessible for all browsers,
   c. Online web learning can be opened with mobile devices properly,
   d. Online discussion forums are good and usable,
   e. Neatly arranged so that it makes it easier for students to surf.
3. Interaction
   a. The selection of communication tools is appropriate,
   b. Using chat tools,
   c. There is clarity regarding the interaction instructions,
   d. Independent assignments on online web learning are not yet varied,
   e. The quizzes used are still monotonous,
   f. In accessing value on online web learning is good enough.

The results of the second stage of validation by learning media experts. After making improvements to the results of stage I validation and resubmitting them to learning media experts, the result was that online web learning could be tested on students. Figure 2 is an online web learning display that is ready to be tested.

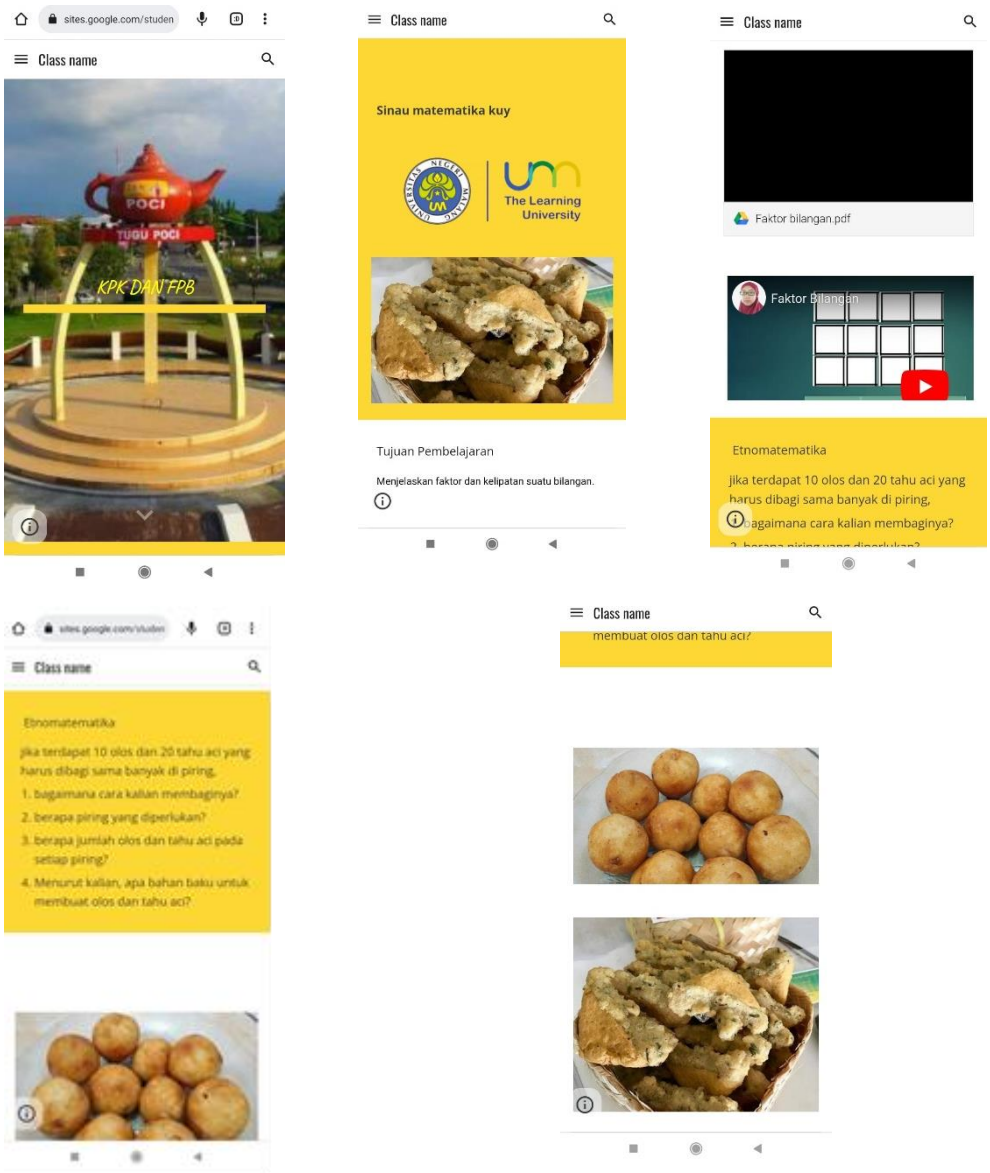

Figure 2. Display of online web learning with ethnomathematics content https://sites.google.com/students.um.ac.id/etnomat/home

After all the series are done, the next step is a small-scale product trial using 10 students which are presented in picture 1 below

Table 1. Comparison of Pretest and Posttest

No	Appraisal Items	Score	
		Pre-Test	Post Test
1	Score min	57	81
2	Score max	67	87
3	Mean	62.42	84.33

Table 1 explains that before using web learning with ethnomathematics content, an average of 62.42 was obtained. After using web learning with ethnomathematics content, students' abilities increased, this can be seen from the

average gain, which was 84.33. So, web learning with ethnomathematics content can be tested on moderate-scale students.

Discussion

The research was conducted using the development method using the Lee and Owen (2004) model design which consisted of 5 stages, namely (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. What was developed in this research is online web learning with ethnomathematics content.

Online web learning contains ethnomathematics in the form of media used for learning mathematics in grade IV elementary school education units. The purpose of developing online web learning with ethnomathematics content is to assist students in learning mathematics, especially KPK and FPB material, and to foster a sense of love for local culture. By using online web learning, students can organize, plan, and evaluate their learning without space and time limitations because they can study anywhere and anytime.

On online web learning with ethnomathematics content, instructions will be presented, learning outcomes and learning objectives, ethnomathematics-laden material in the form of text, images, audio, and video, tests, and material reinforcement in the form of projects related to ethnomathematics to find out to what extent students understand the material presented.

The results obtained are expert validity tests. The experts involved were material and learning design experts. This aims to obtain opinions from other parties regarding the accuracy of the material from material experts and physical design from media experts.

The first validation of elementary school mathematics material experts showed that learning outcomes and learning objectives, learning objectives were good enough, but it was necessary to show the ethnomathematics aspects of the KPK and FPB material so that students did not only get mathematics but understood elements of the local culture to foster a love for local culture. From the results of the first validation, the researchers made improvements by strengthening the ethnomathematics concept with KPK and FPB materials on local culture in the form of an introduction to traditional dry food, for example, tofu aci and lactopia. After revision, it was submitted again to the elementary school mathematics material expert, and got the result that the material could be tried out on students.

The first validation of learning media experts showed that the design used was good but still not attractive to elementary school level students, increased use of images, audio, and video instead of text, and the quizzes and assignments given were still monotonous and less challenging for students. Improvements made include redesigning the display to make it attractive, reducing the use of text as an explanation of material, and developing quizzes and tests to make them more varied. After being corrected and resubmitted in stage II, getting online web learning results can be tested on students.

This application has been tested on a small scale using 10 students. The results obtained that the application can be used to support learning, this is in accordance with the results of the study (Ihwono et al., 2023; Meduri et al., 2022; Saputri & Hannah, 2018).

This research is still in its early stages, namely at the expert validation stage, and has not yet reached the implementation stage. This is due to the limited time that the researcher has. In the future, products that have been made large group trials.

After the product test is carried out, it will then be examined regarding self-regulated learning after using the product by making closed questionnaires that are distributed to students. The indicators used in self-regulated learning are (1) learning planning with indicators determining learning strategies to be used, feeling obligated to complete school assignments, and self-regulating in preparing for learning, (2) implementation of learning with indicators of setting cognitive and metacognitive strategies, monitor and control emotions and motivation, and carry out activities, and (3) evaluation of learning with indicators of selecting strategies for overcoming learning failures, feeling capable of evaluating learning outcomes, and reviewing the results of one's work.

CONCLUSION

After discussing these findings, this study produces several conclusions. First, in order to achieve learning outcomes and learning objectives, content from the etomathematics aspect is needed in the KPK and FPB materials so that students do not only get mathematics but understand how elements of local culture can foster a love for local culture. Second, to foster student interest, it requires the use of images, audio and video more than text. Third, applications can be used to support learning. This research is still in its early stages, namely at the stage of expert validation, and small-scale trials and has not yet reached the implementation stage.

This is due to the limited time that researchers have. In the future, the products that have been made will be tested and followed by large group trials and tests on student self-regulated learning. This research is still in its early stages, namely at the stage of expert validation, and small-scale trials and has not yet reached the implementation stage. This is due to the limited time that researchers have. In the future, the products that have been made will be tested and followed by large group trials and tests on student self-regulated learning.

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