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Development of open online ethnomathematics course

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Abstract

Ethnomathematics examines mathematical aspects in a particular culture of a community or region. Ethnomathematics studies are still very potential to be carried out for Indonesian culture that is very rich and diverse. The results of this ethnomathematics study, in addition to increasing knowledge in mathematics and mathematics education, can also be utilized in mathematics learning, especially in the provision of contextual problems. To accelerate and enrich the ethnomathematics study in this broad Indonesian culture, it is necessary to involve many people in all regions of Indonesia. In this study, a virtual class was designed and developed by utilizing the Moodle Learning Management System to facilitate and empower students, teachers, lecturers and observers of mathematics education in conducting ethnomathematics studies. This study aims to design and develop virtual classrooms using Moodle that can facilitate people who will conduct ethnomathematics studies in Indonesia, and analyze the feasibility of the aforementioned virtual classes developed. The present study employs design research, which includes the context analysis phase, literature review, design and development of virtual classes, focus group discussions, limited trials, broad implementation, and implementation analysis. The results discussed in this

article include the stage of context analysis, literature review, design and development of virtual classes and focus group discussions.

Author keywords

design research; etnomathematics; moodle; open online course

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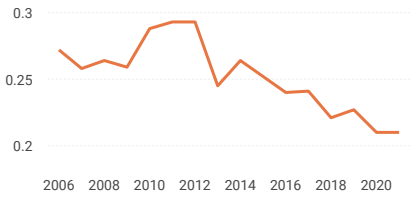

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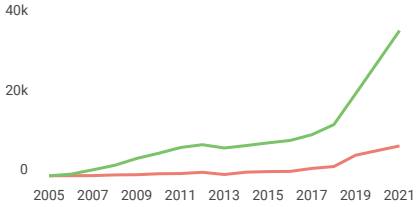

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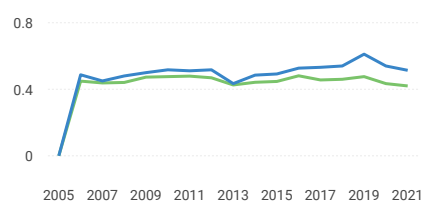

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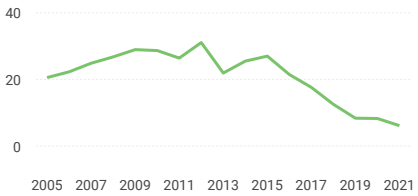

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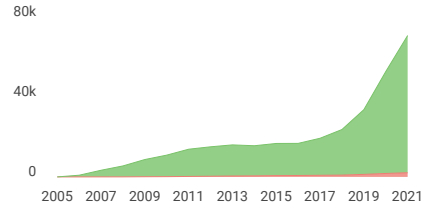

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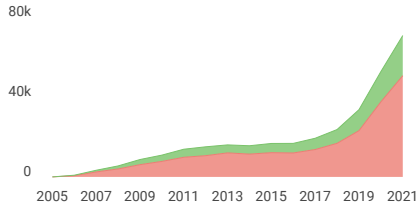

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Preface

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Development of open online ethnomathematics course

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Abstract. Ethnomathematics examines mathematical aspects in a particular culture of a community or region. Ethnomathematics studies are still very potential to be carried out for Indonesian culture that is very rich and diverse. The results of this ethnomathematics study, in addition to increasing knowledge in mathematics and mathematics education, can also be utilized in mathematics learning, especially in the provision of contextual problems. To accelerate and enrich the ethnomathematics study in this broad Indonesian culture, it is necessary to involve many people in all regions of Indonesia. In this study, a virtual class was designed and developed by utilizing the Moodle Learning Management System to facilitate and empower students, teachers, lecturers and observers of mathematics education in conducting ethnomathematics studies. This study aims to design and develop virtual classrooms using Moodle that can facilitate people who will conduct ethnomathematics studies in Indonesia, and analyze the feasibility of the aforementioned virtual classes developed. The present study employs design research, which includes the context analysis phase, literature review, design and development of virtual classes, focus group discussions, limited trials, broad implementation, and implementation analysis. The results discussed in this article include the stage of context analysis, literature review, design and development of virtual classes and focus group discussions.

Keywords: etnomathematics, open online course, moodle, design research

1. Introduction

Ethnomathematics examines the mathematical aspects in a particular community or regional culture. Ethnomathematics study is still very potential to be carried out for a very rich and diverse Indonesian culture. The results of this ethno-mathematical study in addition to increasing knowledge in mathematics and mathematics education, can also be utilized in learning mathematics, especially in the provision of contextual problems.

Ethnomathematics was introduced by D'Ambrosio, a Brazilian mathematician in 1977. D'Ambrosio [1] suggested that ethnomathematics is mathematics practiced among cultural groups identified in labor groups, groups of a certain age, workers and group of professional class. Therefore, ethnomathematics is interpreted as cultural anthropology from the field of mathematical studies and mathematics education so that mathematics can be practiced by a group of cultures, such as rural, urban communities, labor groups, certain groups, indigenous peoples, and other. Arismendi [2] explains that the study of ethnomathematics is related to the investigation of a culture of a particular group in terms of classifying, sorting, counting, measuring, considering, concluding, modeling, coding, and solving problems. In Rosa & Orey [3], Barton said that ethnomathematics is a program of inquiry into a cultural group in terms of understanding, articulating and applying various concepts and practices that can be identified as mathematical activities.

To accelerate and enrich ethnomathematics studies in broad Indonesian culture, it is necessary to involve many people throughout Indonesia. In order to be able to involve many people, such as students, teachers and lecturers in the field of mathematics, it is necessary to make efforts to empower and assist in conducting ethnomathematical studies. Empowerment includes an understanding of the understanding and steps in conducting a study until it is realized in a scientific article. In the study process, it is not always smooth and easy, so in the process of the study they need to be given assistance when processing the ethnomathematics process.

Because of the development of information and communication technology, this can be facilitated in open and distance learning (ODL). The concept of open learning and the distance education system focuses on open access to education and training to make students free of time and place constraints and offer flexible learning opportunities for individual and group students. Open and distance learning is one of the most rapidly developing fields of education and has a large impact on all education delivery systems [4],[5],[6].

To carry out the learning process required a facility or facility in the form of a virtual classroom. Virtual classrooms are learning and teaching environments where participants can interact, communicate, view and discuss presentations, and engage with learning resources while working in groups, all in an online setting (Teknopedia, 2019). To build this virtual classroom Learning Management System (LMS) is required. According to Ellis [7] LMS is a software or software for administration, documentation, material search, report on an activity, providing training materials for online teaching and learning activities connected to the internet. LMS is an application that automates and virtualizes the teaching and learning process electronically.

One well-known LMS is Moodle. Moodle stands for (Modular Object-Oriented Dynamic Learning Environment) is a software package produced for internet-based learning activities. Moodle is one of the applications of the concepts and mechanisms of teaching and learning that utilize information technology, which is known as the concept of electronic learning or e-learning. Moodle can be used freely as an open source product (open source) under a general public (GNU) license. Moodle can be installed on any computer and operating system that can run Hypertext Preprocessor (PHP) and support database structured query language (SQL) (Wikipedia, 2016).

Learning 4.0 emerged as a response from industry 4.0 where humans and technology were harmonized to allow for new possibilities (https://content.seamolec.org/). For this reason, this study will be designed and developed in a virtual classroom by utilizing the Moodle Learning Management System to facilitate and empower students, teachers, lecturers and observers of mathematics education in conducting ethnomathematical studies by following the principles of learning 4.0.

2. Research Methodology

This type of research is design research. In this type of research there are three stages which (ideally) are repeated until a product is discovered along with a new theory which is the result of a revision of the product and the theory implemented.

2.1. Stage 1: Preparation

2.1.1. In this stage, context analysis and literature study will be carried out. The aim of this stage is to form a conjecture of students' thinking/response strategies and determining the learning objectives or final goals to be achieved on the project-based learning trajectory.

2.1.2. At this stage also designed Learning Trajectory and Hypothetical Learning Trajectory (HLT). The local instructional theory conjecturers formulated consist of learning objectives, learning activities, and virtual classes to assist the learning process such as a review of ethnomathematics concepts, steps of ethnomathematics study and tasks to be completed, until a product in the form of a scientific article is reviewed.

2.1.3. The results of the preparation of sections 2.1.1 and 2.1.2 will be discuss with the experts in the form of Focus Group Discussion (FGD) activities.

2.2. Stage 2: Implementation

At this stage virtual classes and their learning activities are implemented in phase 1. There are two cycles in this stage.

2.2.1. Cycle 1: limited implementation. At this stage, virtual classes and HLT will be implemented on a limited number of participants and in limited activities. In this cycle, the readability and the feasibility of virtual classes are arranged. Input from this cycle is used as a revision of the previous product and HLT.

2.2.2. Cycle 2: field implementation. This stage is an implementation of the virtual class and HLT which has been improved in cycle 1 above.

2.3. Stage 3: feasibility analysis

At this stage, data obtained from learning activities in virtual classrooms are analyzed. The results of this analysis are used to revise or improve virtual classes and HLT and also to obtain better products and theories.

The research subjects for the FGD were 2 lecturers of Mathematics Education at Sanata Dharma University who were experts in the field of ethnomathematics. Subjects for limited implementation were 5 of 6th semester Mathematics Education students of Sanata Dharma University and 2 lecturers of Mathematics Education at Sanata Dharma University. The subjects for field implementation are students, teachers and lecturers in mathematics who will be captured online through social media. The study was conducted on Campus 3 USD and in cyberspace. Research time is planned from May to November 2019.

Data collection techniques in this study were carried out by collecting supporting documents and compiling virtual classes, observing the implementation process through observation and digital track records, working on project assignments on-line and feedback provided, interviews with virtual class participants through forums or forms other online interactions.

Data analysis was carried out qualitatively by paying attention to the results of data collection that had been done and comparing observations during the learning process in virtual classrooms with HLT that had been prepared. From the data collected, a data analysis is performed with the following steps: 1) reducing the data in accordance with the research objectives and classifying the data into several categories, 2) presenting data in the form of tables, charts, or diagrams, 3) concluding that the data presented has been synthesized by verifying the data evidence.

3. Result and discussion

After studying the literature, analyzing the context of prospective online class participants and targets to be achieved, competencies to be achieved, indicators to be met, activities to be carried out, tasks to be done and evaluations to be carried out by the instructor, as in the table below.

Table 1. Competencies, Indicators, Activities, Tasks dan Evaluations

Weeks	Competence	Indicator	Activities	Task	Evaluation
1	Understand the theory and method of ethnomathematics studies	Can mention a number of cultures in the area that can be examined in terms of mathematics	Introduction to online learning and ethnomathematics	Make a concise description of several local cultures that have the potential to study the mathematical aspects	The instructor provides feedback and helps choose which culture to study next

2		Can choose ethnomathematics studies that best suit the chosen local culture.	Study of ethnomathematics theory	Select and describe the reasons for choosing an ethnomathematics study that best fits the local culture chosen	Instructors provide feedback and help complement or sharpen arguments
3		Can collect literature and research results that are relevant to the chosen topic of study, so that the updated aspects of the research topic will be obtained	Study of relevant research	M collects literature and research results that are relevant to the chosen topic of study, so that the updated aspects of the research topic will be obtained	The instructor checks the assignments given and gives suggestions to be more complete and helps to find out the new aspects
4		Can choose ethnomathematics research methods that best suit the selected local culture.	Study of research methods, write the study framework	Write down the study framework, which includes: Title, Principles of mind: Background, Literature Review, Research Objectives, Foundation Theory, Research Methods along with the steps.	The instructor checks the task of drawing up the framework of the study provided and provides suggestions for more complete and sharper
5	Conduct an Ethnomathematics study in the area	Can complete the framework of studies that have been compiled, into a study proposal in the format of scientific articles, according to the situation in the field	Field exploration, writing a proposal	Completing the framework of the study that has been prepared, becomes a study proposal in the format of scientific articles, according to the situation in the field	The instructor examines the task of compiling the proposal and gives suggestions to be more complete and sharper
6		Can collect materials, materials, data from the field that supports the study	Field exploration, collecting materials	Collect materials, materials, data from the field that supports the study	The instructor checks the results of the collection of materials, materials, data from the field that supports the study and provides suggestions to be more complete
7		Can analyze material, data that has been collected from the field to answer the research objectives	Field exploration, analyzing study material	Analyze the material, data that has been collected from the field to answer the research objectives	The instructor checks the results of the study material analysis and gives suggestions to be more complete and sharper
8	Communicate and write the results of the study into scientific articles	Can complete and write study proposals with the results obtained along with the discussion, into a draft article complete with bibliography	Write the draft article	complete and write the study proposal with the results obtained along with the discussion, into a draft article complete with bibliography	The instructor checks the results of the draft articles and gives suggestions to be more complete and sharper

9		Can communicate draft articles to the forum of fellow participants and instructors	Presentation of findings (via web conference)	Presenting and discussing draft articles to the forum of fellow participants and instructors	The instructor and participants provide input and comments for improvement
10		Can provide comments and suggestions for improvement to fellow participants	Draft article comments	Provide comments and suggestions for improvement to fellow participants	The lecturer gave comments or reinforcement for suggestions that were delivered between participants
11		Can complete and revise draft articles in accordance with suggestions from friends and instructors	Complete and revise and collect articles that are ready to edit to be compiled into books with other participants	Complete and revise the draft article in accordance with suggestions from friends and instructors	The instructor monitors the collection process and ensures that all gather and provide assistance if needed
12		Can reflect experiences during the review and writing process above	Make brief videos of reflection of experiences during the review and writing process above	Reflect on the experience during the review and writing process above in the form of a short video	Instructors provide feedback and reinforcement on reflections that have been collected and provide assistance if needed.

From the above design, then online classes are arranged in Learning Management Systems (LMS) *Moodle*. The online class is entitled *"12 Minggu Mengkaji dan Menulis Artikel Etnomatematika"* (12 Weeks Studying and Writing Ethnomathematics Articles). The web address is https://etnomatematikausd.moodlecloud.com/. While the online class web display in the introduction is as follows.

Figure 1. Display the beginning of the developed online class

In the left-hand column of the lecture agenda, week after week appears. In addition to providing lecture material that must be studied, this online class also provides a forum for discussion, both discussion with instructors and with fellow lecturers, as shown in the following display in Figure 2.

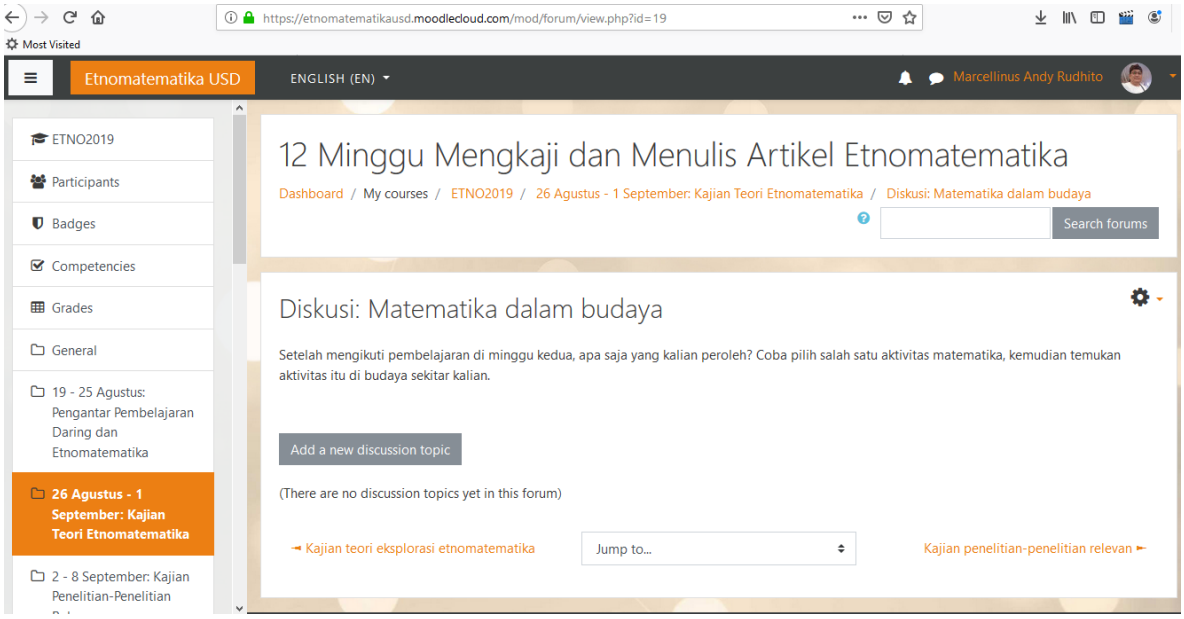

Figure 2. Display page that contains discussion facilities

In evaluation activities we also make peer assessment activities. Participants can give comments and suggestions to each other. The appearance of the peer assessment menu can be seen in the display in Figure 3 below.

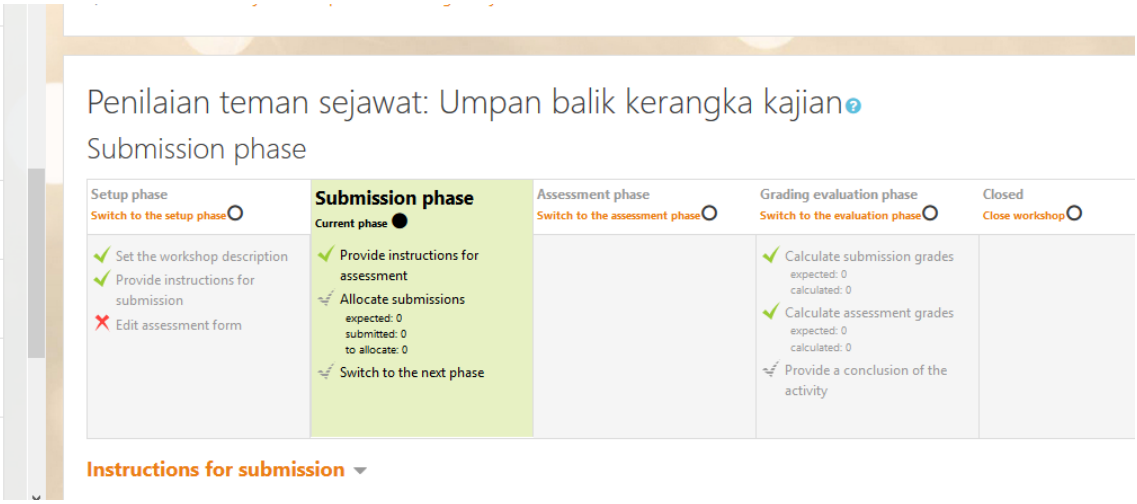

Figure 3. Display page that contains peer assessment

The FGD activities were carried out by researchers together with two lecturer colleagues in the study program. The activity begins with an explanation of the intent and purpose of holding online classes. Then proceed with an explanation of the design of the activities and class demonstrations that have been made with LMS Moodle. From the results of this FGD some of the important points generated were as follows.

1. Trials with USD students are still not fully online. As for the general public, they will be fully online. So, this is a difference. This will be considered and offline meetings are expected to provide faster and clearer feedback.
2. The article writing section is predicted to require a lot of time and the instructor's attention to the article can be completed as expected.
3. Content can be made more attractive, so students/participants can be more interested and not seem monotonous. Can be added images, videos.

As a follow up from this FGD we have started making lecture introductory videos which will be uploaded in the online classes that have been compiled above. Another explanatory video is in the process of being completed.

4. Conclusion

From the discussion above, some things that can be concluded are as follows. The online class design intended for the purpose was successfully compiled, by writing down competencies, indicators, activities, assignments and evaluations. From this design, an online class has been developed which is suitable to use Moodle LMS. This online class is expected to achieve the expected goals, by utilizing and optimizing the available features. From the FGD obtained input-ins to perfect and be aware of the possibility that will occur when the implementation. Where one of the suggestions is to add video content and has tried to follow up.

Furthermore, this online class will be tested with students in the study program, and then it will be opened to the public by first inviting colleagues who are interested in promoting it on social media.

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