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# *Ethno-Flipped Learning* of Mathematics Lessons Based on Internalizing Data from *Tri Mandala* Concept on *Schoology* Platform

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**Abstract**

In the digital era like today, maximum Mathematics learning outcomes in the affective and psychomotor domains are difficult to obtain through full online learning. This difficulty is influenced by environmental and cultural factors inherent in students' lives. Therefore, an idea in the form of innovative learning model is needed to internalize cultural values and local wisdom in online learning. Based on the problems and needs of their solutions, the innovative model that emerged in this study is called *Ethno-Flipped learning* of Mathematics lessons based on internalizing data from *Tri Mandala* concept on the *Schoology* platform. The aim of this research is to demonstrate an *Ethno-Flipped Learning* design based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform. This research approach is development with a focus on development at several stages, including: research and field data collection, planning, design development, initial trials, and revision of initial trial results. The number of personnel involved in the initial trial was 104 respondents. The data collection tool for the initial trial results was a questionnaire consisting of 10 questions related to the model design. The analysis was carried out by comparing the percentage of model design quality with the five scale categorization standards. The findings or research results show that the *Ethno-Flipped learning* design especially for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform is classified as good quality by a quality percentage of 87.54%. The contribution of this research is that it provides new knowledge about an innovative learning model based on Balinese culture and local wisdom combined with an online learning platform. The novelty of this research is in the form of an innovative learning model design that combines the *Flipped Classroom* learning model, the *Ethno-Mathematics* approach, and the *Tri Mandala* concept.

*Keywords: Etno-Flipped Learning*, Internalizing Data, *Tri Mandala* Concept, *Schoology*, Platform.

## 1. Introduction

The rolling out of the independent learning policy along with advances in time and technology, has given students the opportunity and freedom to be creative and innovate as widely as possible by utilizing technology, especially information technology [1]. Even though the IT-based learning process is easy to carry out, the learning process is expected to be able to improve student learning outcomes in the cognitive, affective and psychomotor domains. The reality shows that the online learning process is currently unable to achieve maximum results, especially in the affective and psychomotor domains [2]. This is because the implementation and assessment process is difficult to measure objectively, because teachers cannot directly see students' attitudes and performance like face to face in class. This problem also occurs in Mathematics learning at the tourism vocational school level in Bali, which of course makes it very difficult for teachers to assess students' character and performance if the process is carried out fully online.

In response to this problem, a new innovation/breakthrough is needed in the form of an innovative learning model that can package the learning and assessment process in these three domains optimally through a combination of face-to-face and online. One innovation that can be carried out is developing *Ethno-Flipped Learning* of Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform. This learning model will later be able to provide effective learning based on local Balinese culture and can be done face-to-face or online via the *Schoology* platform. The assessment process is carried out accurately/carefully in the cognitive, affective, and psychomotor domains. All of these domains are measured in the form of instruments/tests which are packaged in stages

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from simple to complex thinking areas based on the *Tri Mandala* concept which is inserted in the *Schoology* platform. *Ethno-Flipped Learning* is the integration between the *Ethno-Mathematics* approach and the flipped classroom learning model [3]. *Tri Mandala* is a local *Balinese* cultural concept, which has three levels: *Utama*/upper (underlying complex thinking space), *Madya*/middle (underlying intermediate thinking space), and *Nista*/lower (underlying simple thinking space) [4], [5]. *Schoology* is a combination of e-learning and social networking on a website to facilitate the learning process [6].

There are several previous studies that provide the background to the emergence of this research. Research conducted by Nguyen et al. [7] related to the process of measuring students' level of success in learning English after using the *Schoology* platform. The results of the research show a significant increase in learning outcomes in the cognitive domain, but there has not been a significant increase in the affective and psychomotor domains. This obstacle occurs because lecturers and students in Vietnam have difficulty carrying out broad and in-depth communication in the learning process if it is only done in conventional classes for limited time duration.

Research by Sari et al. [8] related to measuring the results of students' understanding of learning text material after using the *Schoology* platform. The results of the research show that students understand the learning text material because they can interact with the teacher through the *Schoology* platform. However, the assessment of student learning outcomes in the affective and psychomotor domains has not been clearly demonstrated, because the learning process focuses more on measuring the cognitive domain. This obstacle occurs because many students are embarrassed to express opinions or discuss in front of the class conventionally. Campillo-Ferrer and Miralles-Martínez's research [9] related to measuring students' motivation levels in participating in the online learning process during the Covid-19 pandemic. The results of the research show that students are motivated to learn using the *flipped classroom* model. This is proven by the increase in learning outcomes in the cognitive domain. However, student learning outcomes in the affective and psychomotor domains have not been clearly demonstrated. This obstacle occurs because there is no innovative learning model that can be used to increase student learning motivation.

Lin's research [10] is related to measuring increased student learning outcomes in the cognitive, affective and psychomotor domains. The results of the research show that student learning outcomes in the cognitive domain can be easily measured in flipped classroom learning even though it is done online. However, measuring the affective and psychomotor domains is more difficult to do online and requires a local cultural wisdom approach that is adapted to student characteristics. This obstacle occurs because there has not been a comprehensive measurement of student learning outcomes in the cognitive, affective and psychomotor domains. Research by Farizi et al. [11] related to measuring student interest and the quality of history learning using the *Schoology* platform. The results of the research show that students have high cognitive abilities in participating in history learning through *Schoology*. This can be seen from the very significant increase in student learning completion in the cognitive domain. However, completeness of learning in the affective domain has not been demonstrated. This obstacle occurs because students' learning attitudes have decreased and are still low.

Referring to the problems or facts found in the field and the innovations that emerged to address the problems, the formulation of this research problem was obtained. The formulation of the research problem is: "What is the *Ethno-Flipped Learning* design especially for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform?" The aim of this research is to demonstrate an *Ethno-Flipped Learning* design especially for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform.

## 2. Method

### 2.1. Research Approach

This research uses a development approach with a research development model, namely Borg and Gall. Specifically for research in 2024, only five development stages were carried out. The development stages referred to include [12], [13], [14]: 1) research and field data collection; 2) planning; 3) design development; 4) initial trial; and 5) revision of the initial trial results. The detailed development stages can be seen in the form of a flowchart in figure 1.

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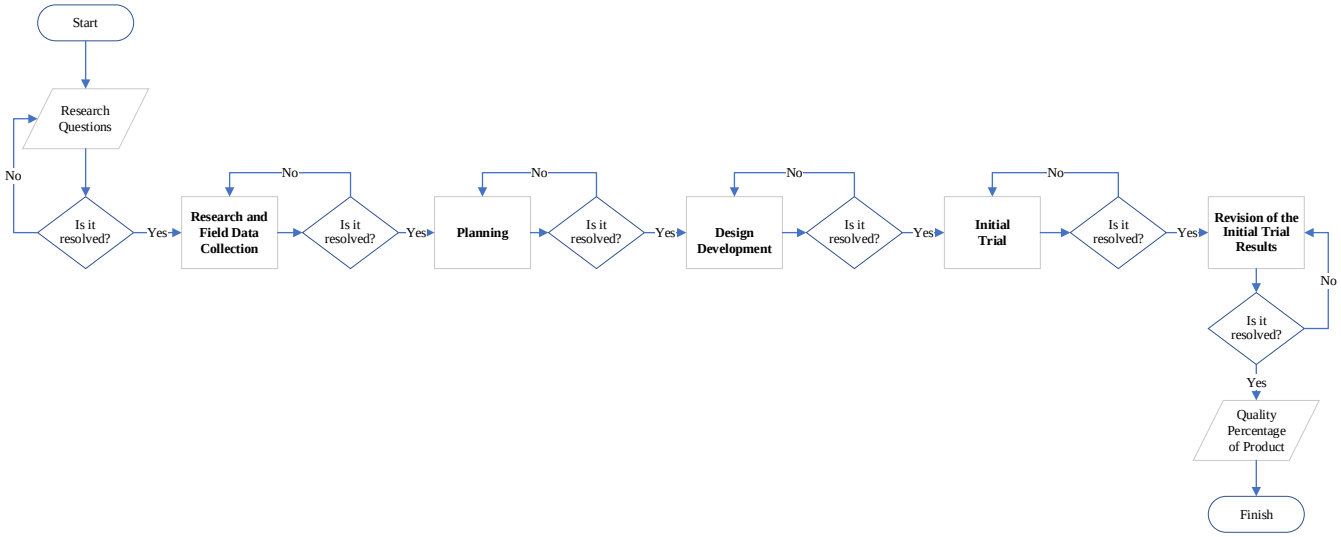


**Figure 1.** Flowchart about Development Stages in this Research

## 2.2. Subjects, Object, and Location of Research

The subjects in this research were determined using the purposive sampling technique, namely selecting research subjects who were determined from the start based on the direct connection between the subjects and the *Etno-Flipped learning* model for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform which was implemented at tourism vocational schools in Bali. The number of subjects involved in the 2024 research is two education experts, two informatics experts, 40 tourism vocational school teachers in Bali, and 60 tourism vocational school students in Bali who will later be involved in conducting initial trials. The research object is the main topic that must be studied and researched in depth. The object of this research is the *Etno-Flipped learning* model of Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform. This research was carried out at several tourism vocational schools spread across 6 districts in Bali Province. The six districts include *Gianyar*, *Tabanan*, *Buleleng*, *Klungkung*, *Badung*, and *Denpasar*.

## 2.3. Data Collection Instruments

The instruments/tools used to collect data in this research were questionnaires. Questionnaires are used to obtain primary data in the form of quantitative data from respondents. Quantitative data is used as a basis for making decisions regarding the percentage level of quality of the *Etno-Flipped learning* model design for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform in several tourism vocational schools in Bali. The targeted data amounted to 104 data sourced from 4 experts, 40 teachers, and 60 students. The data that has been obtained is complete, with as many as 104 data from the initial trial process of the initial design of *Ethno-Flipped learning* for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform. The targeted data amounted to 104 data sourced from 4 experts, 40 teachers, and 60 students. The data that has been obtained is complete, with as many as 104 data from the initial trial process of the initial design of *Ethno-Flipped learning* of Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform

## 2.4. Data Analysis Techniques

The technique used to analyze the data that has been collected is a quantitative descriptive technique through descriptive percentage calculations. The results of the descriptive percentage calculations are used as a basis for interpreting the results of research regarding the development of a design for an *Ethno-Flipped learning* model for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform as a form of embodiment of the independent learning policy at several tourism vocational schools in Bali. The descriptive percentage calculation formula can be seen in equation (1) [15], [16], [17]. The percentage results obtained from the formula are then converted into a five-scale categorization table which can be seen in table 1 [18], [19], [20].

$$P = (f/N) \times 100\% \quad (1)$$

Notes: P= the quality percentage; f = total acquisition value; N = maximum total value.

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**Table 1.** Quality Standard of Five's Scale

| Category of Quality | Percentage of Quality (%) | Follow-up |
|---|---|---|
| Poor | 0-54 | Revision |
| Less | 55-64 | Revision |
| Moderate | 65-79 | Revision |
| Good | 80-89 | No Revision |
| Excellence | 90-100 | No Revision |

## 3. Result and Discussion

### 3.1. Results

Several research results in 2024 will focus on the five stages of Borg and Gall. The five stages include: 1) research and field data collection stage, 2) planning, 3) design development, 4) initial trial, and 5) revision of initial trial results. The research results based on those four stages can be shown as follows.

#### 3.1.1. Result on the research and field data collection stages

At this stage, data is obtained related to several things that support *Ethno-Flipped learning* in Mathematics learning. The data referred to includes: 1) digital format mathematical material content provided to students, 2) examples of practice questions with a tiered arrangement of difficulty levels by adopting the *Tri Mandala* concept, and 3) the features needed in the *Schology* platform to support the occurrence of *Ethno-Flipped learning* in Mathematics learning. The data related to the content of Mathematics material in digital format can be seen in table 2. Examples of graded test questions adopting the *Tri Mandala* concept can be seen in table 3. The features needed in the *Schology* platform to support *Ethno-Flipped learning* in Mathematics can be seen in table 4.

**Table 2.** Mathematical Material Contents in Digital Format

| No | Material Contents |
|---|---|
| 1 | Linear Program |
| 2 | Matrix |
| 3 | Composition of Functions and Inverse Functions |
| 4 | Infinite Sequences and Series |
| 5 | Relationship Between Lines |
| 6 | Triangle Formulas |
| 7 | Statistics |
| 8 | Enumeration Rules |
| 9 | Circle Equations |
| 10 | Geometry Transformation |

**Table 3.** Example of Graded Test Questions Based on the *Tri Mandala* Concept

| No | Material Contents | Test Questions | |
|---|---|---|---|
| 1 | Linear Program | *Utama* Mandala | Made is 20 years older than Nyoman. Ketut is 5 years younger than Made. If the sum of the ages of Made, Ketut, and Nyoman is 116 years, then the sum of the ages of Nyoman and Ketut is...years. |
| | | *Madya* Mandala | Explain the characteristic of Linear Program! |
| | | *Nista* Mandala | What is Linear Program? |
| 2 | Matrix | *Utama* Mandala | Mrs. Made will make 2 types of cakes and has prepared 3 kg of flour and 2 kg of sugar. Type A cake requires 150 grams of flour and 50 grams of sugar, while type B cake requires 100 grams of flour and 100 grams of sugar. How many type A cakes and type B cakes can be made with the available ingredients? |
| | | *Madya* Mandala | Mention types of matrix and its examples! |
| | | *Nista* Mandala | What is matrix? |
| 3 | Composition of Functions and Inverse Functions | *Utama* Mandala | A garment company really takes the welfare of its employees into account by providing monthly allowances in the form of "wife and child allowances" and "health allowances". The amount of the wife and child allowance is 20% of the basic salary + Rp. 100,000.00. Meanwhile, the amount of health benefits is 50% of the employee's wife and child benefits. How much is the health benefit for an employee who has a basic salary of Rp. 3,000,000.00? |
| | | *Madya* Mandala | Write down the properties of the inverse function using the formula! |
| | | *Nista* Mandala | What is meant by composition function and inverse function? |

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| No | Material Contents | Test Questions | |
|---|---|---|---|
| 4 | Infinite Sequences and Series | *Utama* Mandala | There are 80 tourism vocational school students class of 2023/2024 forming a line. The first row consists of 3 students, and each subsequent row always increases by 2 students. There are many lines that can be formed by all tourism vocational school students, namely... |
| | | *Madya* Mandala | Explain when a sequence is said to be: ascending monotone, non-decreasing monotone, descending monotone, and non-decreasing monotone? |
| | | *Nista* Mandala | What is meant by infinite sequences and series? |
| 5 | Relationship Between Lines | *Utama* Mandala | Determine the path of a runner in the form of a line parallel to the line 5x-y+12=0 and through the intersection point between the lines y=2x-5 and y=3x-7! |
| | | *Madya* Mandala | Name and explain the amount of relationships between lines that exist? |
| | | *Nista* Mandala | What is meant by the relationship between lines? |
| 6 | Triangle Formulas | *Utama* Mandala | Putu has 3 pieces of stick with a length of 4 cm, 7 cm and 12 cm respectively. If the ends of the stick are brought together, can they form a triangle? Explain your answer! |
| | | *Madya* Mandala | A right triangle has lengths of 6, 8 and 10 length units. Determine the length of the line segment connecting the vertex of the right angle with the middle of the hypotenuse! |
| | | *Nista* Mandala | Write down the formula for the Pythagorean Theorem in a right triangle! |
| 7 | Statistics | *Utama* Mandala | Nyoman is a class A student. The mathematics teacher has carried out several daily tests in this class. If Nyoman gets a score of 75 in the next test then the average score is 82. However, if Nyoman gets a score of 91 then the average score is 84. Determine the number of daily tests that Nyoman has taken! |
| | | *Madya* Mandala | The average of 5 pieces of data is 7. If each data is reduced by 1, determine the average value! |
| | | *Nista* Mandala | The given data is $x$ , $\frac{1}{2}x$ , $\frac{3}{2}x$ , $\frac{3}{5}x$ and $\frac{1}{5}x$ . Determine the average value of the data! |
| 8 | Enumeration Rules | *Utama* Mandala | On a plane figure there are 10 different points names A, B, C, … , J. Also known for any three dots, the three dots are not in line. (Only two pairs points that lie in a line). Determine the number of lines that do not pass through A or J! |
| | | *Madya* Mandala | Explain the difference between permutations and combinations! |
| | | *Nista* Mandala | If $C_a^b$ represents a combination of **a** object from **b** existing object, determine the value of $\binom{10}{2}$ ! |
| 9 | Circle Equations | *Utama* Mandala | Determine the diameter of the circle that passes through the points (1,2), (5,2) and (4,5) ! |
| | | *Madya* Mandala | Given a circle with the equation $x^2 + y^2 - 6x + 4y - 12 = 0$. Determine the center of the circle! |
| | | *Nista* Mandala | Determine the equation of the circle centered at (3,2) and radius 2! |
| 10 | Geometry Transformation | *Utama* Mandala | Triangle ABC has vertices A(1, -1), B(2,2) and C(-2,1). If triangle ABC is transformed with a matrix, $\begin{pmatrix} 2 & -3 \\ 4 & 1 \end{pmatrix}$, determine the area of the image region of triangle ABC! |
| | | *Madya* Mandala | If point A(1, -1) is transformed with a matrix, $\begin{pmatrix} 2 & -3 \\ 4 & 1 \end{pmatrix}$, determine the image of point A! |
| | | *Nista* Mandala | If the point (x, y) is transformed with a matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$, it will produce the point (x', y'). Express the point (x', y') in matrix multiplication form! |

**Table 4.** Features Needed in a *Schology* Platform to Support *Ethno-Flipped Learning* in Mathematics

| No | Features' Name |
|---|---|
| 1 | Course |
| 2 | Material |
| 3 | Add folder |
| 4 | Add assignment |
| 5 | Add quiz/test |
| 6 | Add files/links |
| 7 | Discussions |
| 8 | Media albums |
| 9 | Resources |
| 10 | Access code |

### 3.1.2. Planning Stage

At this stage, data was obtained regarding the number of personnel involved, personal job descriptions, and the time required to complete this research. The total time prepared from data collection to revising the trial results of the *Ethno-Flipped learning* design for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform was 32 days. Complete data related to this research planning can be seen in table 5.

**Table 5.** Details of Data from the *Tri Mandala* Concept on the *Schoology* Platform

| No | Number of Personals | Personal Job Description | Time (Day) |
|---|---|---|---|
| 1 | 6 | Field data collection | 6 |
| 2 | 3 | Creating an *Ethno-Flipped learning* design for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform | 10 |
| 3 | 104 | Initial testing of the model design | 12 |
| 4 | 3 | Revision of initial trial results | 5 |
| **Total** | **116** | | **33** |

### 3.1.3. Design Development Stage

Referring to several features needed in the *Schology* platform to support *Ethno-Flipped learning* in Mathematics, and the research planning, then the initial design for *Ethno-Flipped learning* in Mathematics based on internalizing data from the *Tri Mandala* concept can be carried out on the *Schoology* platform. The development of this learning model design was made using the *Balsamiq Mockup* application. The results of the development of the initial *Ethno-Flipped learning* design for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform can be seen in Figure 2 to Figure 5. Figure 2 shows the course class design display. The main menu in this design is 'materials'. In the 'materials' menu, there are several sub-menus. These sub-menus include updates, grade book, grade setup, badges, attendance, and members. Figure 3 shows add material design display. The main menu 'materials' is still displayed on the left side of the layout. There is one 'add materials' combo box. This combo box is used to add materials to the course class.

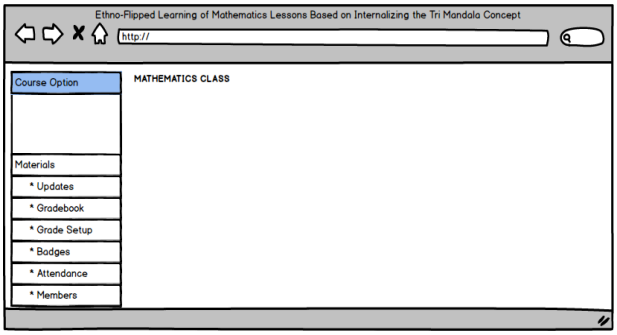


**Figure 2.** Design of Course Class

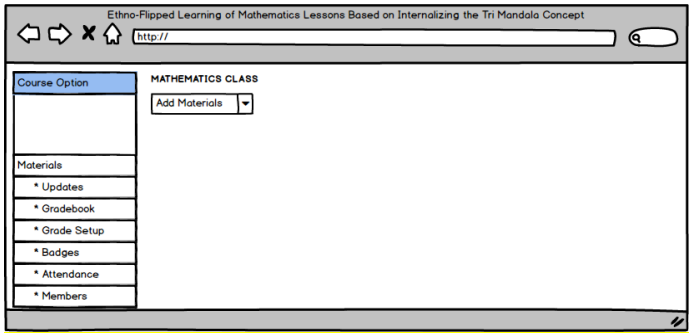


**Figure 3.** Design of Add Material Design

Figure 4 shows the design of add folder, add assignment, add test/quiz, add file/links, add discussion, add media album, and find resources. There is one 'add materials' combo box and one 'options' combo box. In the 'add materials' combo box there are several features. The feature used to add a folder is 'add folder' (shown in the gray block). Next is the 'Add Assignment' feature to add assignments. The feature used to add a test/quiz is 'add test/quiz'. The feature used to add files/links is 'add file/link/external'. The feature used to add discussion is 'add discussion'. The feature used to add media album is 'add media album'. The feature used to find resources is 'find resources'. The 'options' combo box is used to execute the feature selected in the 'add materials' combo box. Figure 5 shows the access code design display. The main menu 'materials' is still displayed on the left side of the layout. In addition, there is also an 'access code' menu. The 'access code' menu contains a unique code. This code is used by students to access the course class.

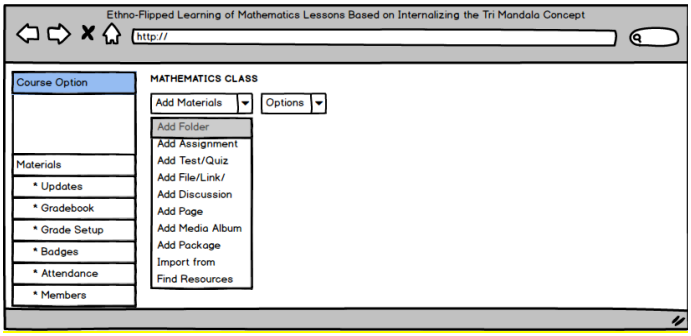


**Figure 4.** Design of features to add, and Find Resources

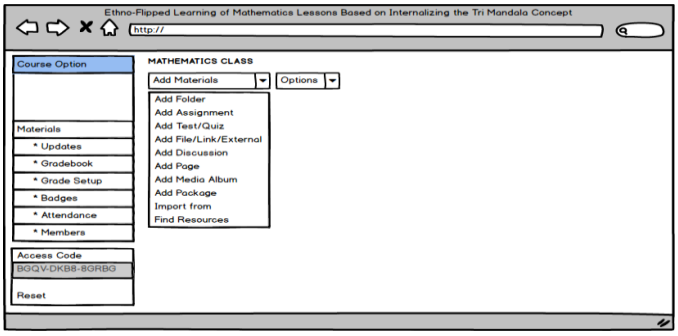


**Figure 5.** Design of Access Code

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### 3.1.4. Initial Testing Stage

Based on the initial design that was completed at the design development stage, an initial trial was then carried out on the initial design of *Ethno-Flipped learning* for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform. The initial trial was carried out by two education experts, two informatics experts, 40 tourism vocational school teachers, and 60 tourism vocational school students in Bali. The initial trial results can be seen in table 6.

**Table 6.** Initial Trial Results of Ethno-Flipped Math Lessons on Schoology

| Respondents | Items- | | | | | | | | | | ∑ | Percentage of Quality (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| Education Expert-1 | 5 | 4 | 5 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 43 | 86.00 |
| Education Expert-2 | 4 | 5 | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 5 | 45 | 90.00 |
| Informatics Expert-1 | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | 43 | 86.00 |
| Informatics Expert-2 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 5 | 42 | 84.00 |
| Teacher-1 | 4 | 5 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 42 | 84.00 |
| Teacher-2 | 5 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 45 | 90.00 |
| Teacher-3 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | 5 | 44 | 88.00 |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| Teacher-38 | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 5 | 5 | 45 | 90.00 |
| Teacher-39 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 5 | 4 | 43 | 86.00 |
| Teacher-40 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 5 | 42 | 84.00 |
| Student-1 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 5 | 43 | 86.00 |
| Student-2 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 47 | 94.00 |
| Student-3 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | 4 | 5 | 4 | 44 | 88.00 |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . |
| Student-58 | 4 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 45 | 90.00 |
| Student-59 | 5 | 4 | 5 | 5 | 4 | 4 | 4 | 5 | 5 | 4 | 45 | 90.00 |
| Student-60 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 41 | 82.00 |
| | | | | | | | | | | | **Average** | **87.54** |

Apart from quantitative data, respondents also provided several suggestions during the initial trial of the initial design of *Ethno-Flipped learning* mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform. These suggestions are used as qualitative data in order to improve the initial design of the learning model. Some of the suggestions referred to can be seen in table 7.

**Table 7.** Initial Ethno-Flipped Learning Suggestions on Tri Mandala Data via Schoology

| No. | Respondent | Suggestions |
|---|---|---|
| 1 | Education Expert-1 | Add facilities to create *Tri Mandala*-based test questions for each material content |
| 2 | Education Expert-2 | Add facilities to upload learning device files into *Schoology* in digital format |
| 3 | Informatics Expert-1 | It is recommended that facilities be provided to import *Tri Mandala*-based test questions |
| 4 | Informatics Expert-2 | Create a design that shows the facility for uploading learning device files in zip form |
| 5 | Teacher-7 | Prepare a design form that shows the facilities for creating *Tri Mandala*-based test questions for each material content |
| 6 | Teacher-27 | Add facility to enter *Tri Mandala*-based test questions |
| 7 | Student-21 | Add facilities to indicate where to upload learning device files into *Schoology* in digital format |
| 8 | Student-60 | Create a design that shows the facilities for creating *Tri Mandala*-based test questions |

### 3.1.5. Revision Stage of Initial Trial Result

Based on the respondents' suggestions shown in Table 7, it is necessary to revise the initial design of *Ethno-Flipped learning* for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform. Revisions were carried out by three members of research teams. The results of the revision of the initial design of

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*Ethno-Flipped learning* for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform, can be seen in Figure 6 to Figure 8.

Figure 6 is the result of a design revision based on suggestions from several respondents, including education expert-1, teacher-7, and student-60. The revision was carried out by adding a feature to create test questions based on *Tri Mandala*. There are three types of questions included in this feature which refer to each material content. The three types of questions intended include questions categorized as *Utama Mandala*, questions categorized as *Madya Mandala*, and questions categorized as *Nista Mandala*.

Figure 7 is the result of a design revision based on suggestions from several respondents, including education expert-2, informatics expert-2, and student-21. The revision was done by adding a feature to upload learning device files in zip format. The feature to upload the file is placed under the 'options' combo box in the form of an 'import files' button. After the user clicks the button, a 'file' symbol will appear which functions to execute the learning device file that is ready to be uploaded.

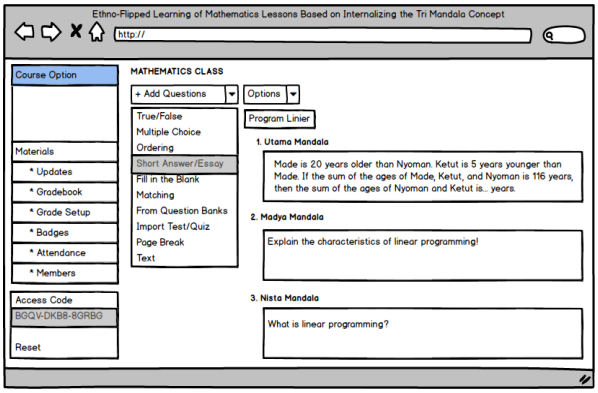


**Figure 6.** Design of Facilities for Creating *Tri Mandala*-Based Test Questions

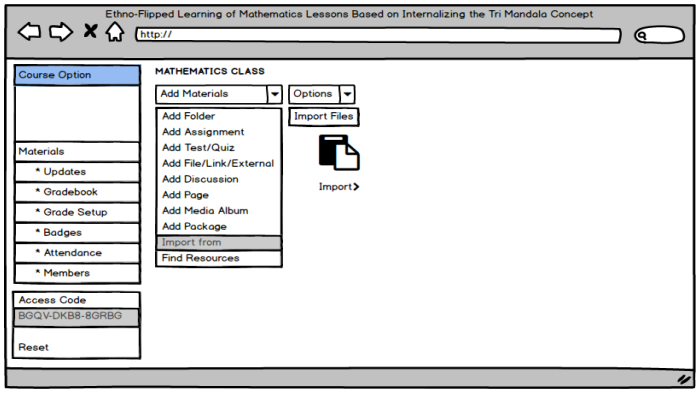


**Figure 7.** Design of Facility for Uploading Learning Device Files in .Zip Form

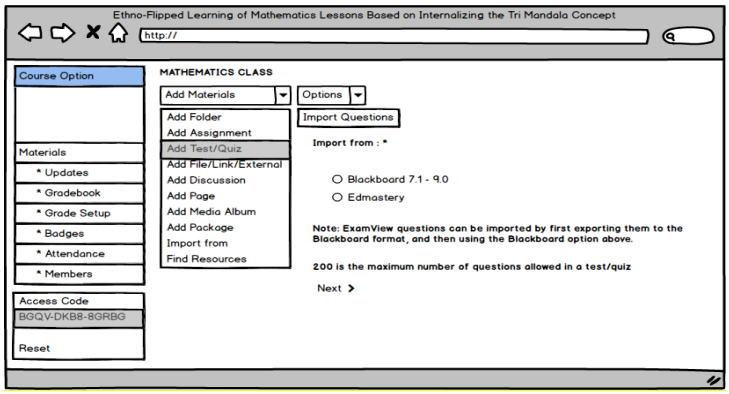


**Figure 8.** Design of Facility for Importing Tri Mandala-Based Test Questions

Figure 8 is the result of a design revision based on suggestions from several respondents, including informatics expert-1, and teacher-27. The revision was done by adding a feature to import *Tri Mandala*-based test questions. The feature to import test questions is placed under the 'options' combo box in the form of an 'import questions' button. After the user clicks the 'import questions' button, two radio buttons will appear to upload test questions. The two radio buttons are a radio button to import questions in *Blackboard 7.1-9.0* format and a radio button to import questions in *Edmastery* format. The creation of the two question formats can use the *ExamView* application or a feature that is directly available on the *Schoology* platform.

## 3.2. Discussion

The most significant finding is quality of the *Ethno-Flipped learning* design for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform is included in the good category. This is because the average quality percentage is 87.54%. If analyzed more deeply by referring to the five scale categorizations in Table I, it is true that the average percentage of quality is included in the good category.

There were 10 questions used in the initial trial of the *Ethno-Flipped learning* design for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform. Question-1 is related to the suitability of the design form which indicates the existence of facilities for class courses. Question-2 is related to the suitability of the design form which indicates that there are facilities for inserting material. Question-3 is related to the suitability of the design form which indicates that there is a facility to add folders. Question-4 is related to the suitability of the design form which shows that there are facilities for adding assignments. Question-5 is related to the suitability of the design form which shows that there are facilities for adding quizzes/tests. Question-6 is related to the suitability of the design form which shows that there is a facility for adding files/links. Question-7 is related to the suitability of the design form which shows that there are facilities for including discussions. Question-8 is related to the suitability of the design form which indicates that there are facilities for inserting media albums. Question-9 is related to the suitability of the design form which shows that there are facilities for inserting resources. Question-10 is related to the suitability of the design which shows that there is a facility for viewing the access code.

The results of this research are able to solve problems found in previous studies, such as research by Nguyen et al. [7], research by Sari et al. [8], research by Campillo-Ferrer and Miralles-Martínez [9], research by Lin [10], and research by Farizi et al. [11]. Problem-solving is carried out by showing the existence of a learning and assessment process in the cognitive, affective, and psychomotor domains through the Schoology platform is integrated with the Tri Mandala concept as a uniqueness. The novelty of this research is in the form of an innovative learning model design that combines the ethno-mathematics approach, the *flipped classroom learning* model, and local Balinese wisdom. The *Ethno-Flipped learning* design for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform is a form of embodiment of the *Merdeka Belajar* policy in supporting the improvement of learning outcomes for tourism vocational school students in Bali. Even though there is novelty, this research also has limitations. The limitation of this research is that it has not shown the physical form of the *Schoology* platform, because the research is focused only on design. Assessment of student competence is more in the cognitive and psychomotor direction, because the test questions are dominant in the direction of measuring knowledge and skills domains. Affective assessments tend to lead to subjective assessments, but few carry out objective affective assessments. In principle, this research has the same concept and characteristics as the research of Hikmawati et al. [21], Yulianto et al. [22], Ramdhani et al. [23], Fajri and Saputri [24], Arvianti and Wahyuni [25], and Supiatman et al. [26], which internalizes local wisdom into information technology-based learning processes.

## 4. Conclusions

In general, the results of this research have produced an *Ethno-Flipped learning* design for Mathematics lessons based on internalizing data from the *Tri Mandala* concept on the *Schoology* platform with good quality. This model design shows a learning model that inserts the concept of local Balinese wisdom in the learning and assessment process. The unique contribution of this research is that it provides new knowledge about an innovative learning model based on Balinese culture and local wisdom combined with an online learning platform. Future work that needs to be done to overcome the obstacles to this research includes: 1) creating a *Schoology* platform that has been internalized with the *Tri Mandala* concept to support *Ethno-Flipped learning* in Mathematics; and 2) create a more accurate affective assessment instrument so that the assessment process is more objective. The impact of this research for stakeholders in the field of education is that there is new information regarding the existence of a learning model based on local Balinese wisdom. The broader impact of this learning model is that stakeholders in the field of education can use effective learning based on local Balinese culture through the *Schoology* platform as an appropriate facility to support the learning and assessment process in the cognitive, affective, and psychomotor domains.

## 5. Declarations

### 5.1. Author Contributions

Conceptualization: I.M.A., I.M.S., and I.G.W.S.; Methodology: I.M.A., I.M.S., and M.S.L.A.; Software: I.G.W.S., and D.G.H.D.; Validation: I.M.A., I.M.S., and M.S.L.A.; Formal Analysis: I.M.A., I.M.S., and I.G.W.S.; Investigation: I.M.A., I.M.S., I.G.W.S., and D.G.H.D.; Resources: I.M.A., I.M.S., and I.G.W.S.; Data Curation: I.M.A., I.M.S., I.G.W.S., M.S.L.A., and D.G.H.D.; Writing Original Draft Preparation: I.M.A., M.S.L.A., and D.G.H.D.; Writing

Review and Editing: I.M.A., I.M.S., and I.G.W.S., and D.G.H.D.; Visualization: I.M.A., I.M.S., I.G.W.S., and D.G.H.D.; All authors have read and agreed to the published version of the manuscript.

## 5.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

## 5.3. Funding

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## 5.4. Institutional Review Board Statement

Not applicable.

## 5.5. Informed Consent Statement

Not applicable.

## 5.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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