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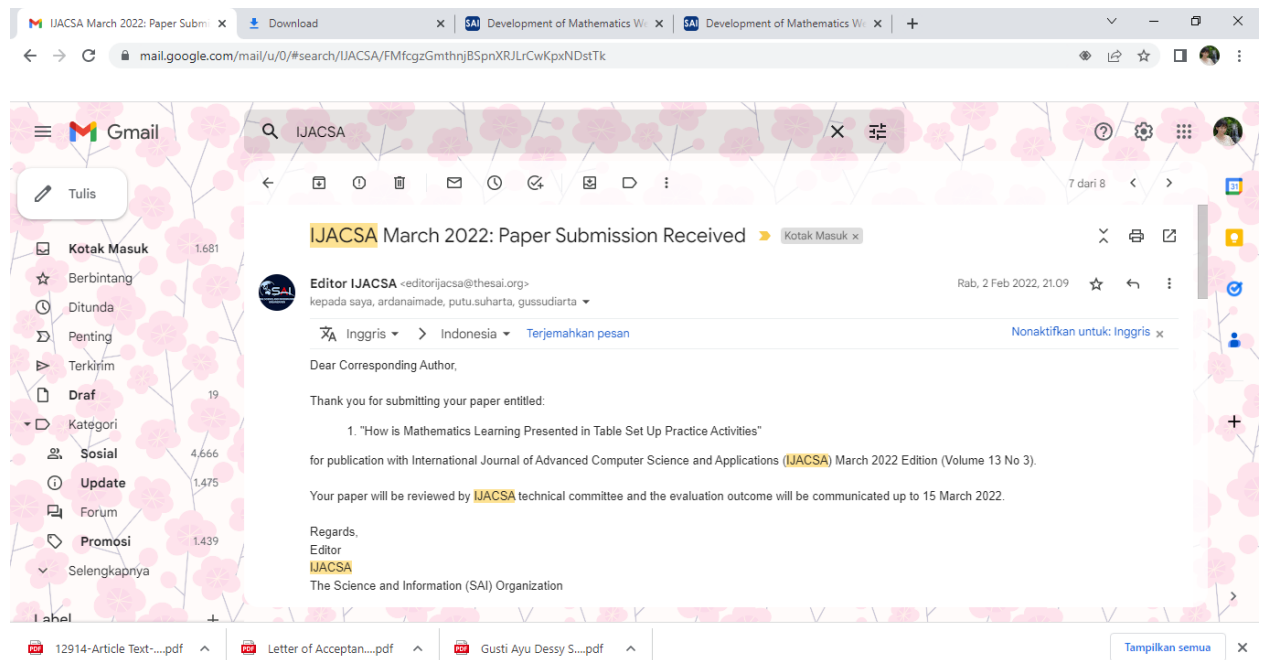
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How is Mathematics Web-based Learning Presented in Table Set Up Practice Activities

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Abstract— This paper aimed to discuss product design and expert validation of the mathematics learning application table set up activities in the hospitality industry. This research was a type of Research and Development, which aimed to develop a new product. The experts involved in this study were two experts in the field of learning technology as media validators and two experts in the field of mathematics education as material validators. In the process of validating the mathematics learning application in this study, using a questionnaire that had been prepared to evaluate it as a research instrument. This research had produced mathematics learning application which consists of five parts, namely: the initial part to recall about the Cartesian coordinates; the translation sub-material section; the reflection sub-material section; the rotation sub-material section; and the dilatation sub-material section. In the review activity by experts, the average percentage of material validators was eighty five percent, its means is very good and the average percentage of media validators was ninety five its means is very good also. So the resulting mathematics learning application can be said to meet the effectiveness standard to proceed to field trials.

Keywords— Mathematics; Web-based; Learning; Presented; Table Set-Up

I. INTRODUCTION

Mathematics subjects have a quite unique and important part in the competence learning of the tourism department [1][2]. Understanding the right concepts in learning mathematics can train transcendental reasoning, range of thinking, and solving a case[3][4]. This will make students accustomed to completing case studies in tourism in a more analytical and realistic manner[5]. In general, this is in accordance with the statement which stated that mathematics shows outstanding skills in a person, both in terms of concretizing something abstract, finding the right solution in a case, as well as the power of thinking on an object[6][7].

In reality, mathematics is one of the subjects that are less attractive to Tourism Vocational School students[8][9]. This is because it is considered a difficult subject to learn and most

students have not realized and understood the true meaning of mathematics[10]. This is in accordance with the opinion that most students do not want to focus on learning mathematics because of the assumption that mathematics is difficult, scary, boring and some people hate mathematics so that every time they take part in learning mathematics, someone immediately feels unwell[11]–[14].

Factors from students and teachers become the basis for the reason why many students are less interested in learning mathematics[15]. The factor from the students that became the basis for the reason was the classical view of students, namely that mathematics is a difficult subject to learn[16]. The factor from the teacher that became the basis for the reason was the difficulty of the teacher in finding the right method to lead students to participate in mathematics learning voluntarily without feeling coercion directly[17]. This difficulty causes students to feel bored and not enthusiastic to take part in learning mathematics[18]. This is supported by the opinion which stated that the difficulty in selecting methods that can be used to make students understand in learning mathematics is a teacher difficulty[19]. Another factor that causes students' lack of interest in learning mathematics is because the form of teaching materials has not been able to raise awareness of the importance of mathematics[20]. Teaching materials that still feature algorithms and formula derivations, raise students' assumptions about solid material, feel less clear and it is difficult to understand the material because of a dislike for math subjects[21]. This is supported by the results of research showing that: 1) learning by using textbooks is not liked by students, because it creates a sense of being lost in dense material and emphasizes algorithms so that students have difficulty accepting mathematics learning[22]; 2) The presentation of learning that is commonly done by teachers has not been able to arouse students' desire to learn, so students are not quite ready to receive lessons [23]; 3) students do not feel challenged to work on the questions available in mathematics learning, because the examples of questions and practice questions provided are difficult to understand [24].

In addition, Tourism Vocational School students only focus on the competencies of the majors they choose[25]. Many students think that Mathematics is not so applied in Business World or Industrial World where they carry out On the Job Training or their place to find work after graduating from Vocational High School[26]. Some explorations have also been carried out by Mathematics teachers, but the number of students who have an interest can still be counted on the fingers[27]. Students' understanding of the many mathematical concepts that can be applied in solving problems related to the tourism sector is still so minimal[28]. This causes the sinking of students' desire to study mathematics voluntarily[29].

Overcoming these problems requires the development of teaching materials that can make Tourism Vocational Schools' students interested in learning mathematics. The teaching materials is able to developed can be in the form of mathematics learning applications[30]. Applications in the form of colorful pictures with interesting characters and mathematical material treats in it[31]. The reality in the field is that there are many mathematical learning applications that have been developed. Some even carry applications with the STEM concept[32]. However, there is no mathematics learning application that carries the theme of tourism practice, so that Tourism Vocational School students understand that mathematics learning is also used in the work practice of the tourism industry.

Based on this, this research was conducted to develop an application for learning mathematics that was raised in industrial work practices in one part of the food and beverage service. The material used in the development of this mathematics learning application is Transformation material. Where this Transformation material is raised in the table set up, that is the one of tourism practice activity.

II. METHOD

This research was a type of Research and Development (R&D), which aimed to develop a new product. The development activities carried out in this research were focused on product design and expert validation. In this study, the manufacture and improvement of product prototypes was carried out as a problem-solving medium after finding problems in the learning process at the preliminary research stage. The stages carried out consist of designing design guidelines, optimizing prototypes, expert tests, and revisions.

A. Selection of Teaching Materials

In accordance with the findings in the preliminary study that there were problems in the mathematics learning process of XI grade[33], the researchers chose Transformation material to be used as a topic in application development. Next was studying Core Competencies and Basic Competencies in the curriculum syllabus to create learning objectives. The next stage was making evaluation questions. The last stage was making mathematics learning applications.

B. Mathematics Learning Application Concept Design

The design of the mathematics learning application created, equipped with 3D objects, 3D animation, audio, materials, and formulations in terms of display.

C. Media Software Design

The software used in making mathematics learning applications was Adobe Flash and web-based. Adobe Flash was used so that this mathematics learning application contains animations and videos that can open the way of thinking of Vocational High School students about mathematics which is also important to be applied in the tourism sector[34]. Then the web-based in order to create interactivity in the development of this mathematics learning application[35]. So that it can be developed a mathematics learning application that is self-instructional, self-contained, stand-alone, adaptive, and user friendly[36]-[40].

In this study the prototype was tested in several stages of evaluation, including[41]:

1) *Inspection*: Research team members examine the design using an important characteristics list of the intervention components.

2) *Expert Rating*: A group of experts provide responses related to the intervention prototype. The experts involved in this study were 2 (two) experts in the field of learning technology as media validators and 2 (two) experts in the field of mathematics education as material validators. Usually this is done using open and closed questionnaires or interviews.

III. RESULT

In the Prototyping stage, the researcher made a plan to determine the Basic Competence and Student Learning Experience and made a feasibility instrument. The selection of subject matter is done based on the consideration of the difficulties of teachers and students in learning mathematics. Transformation material in mathematics vocational high school XI grade was chosen because of the frequent delays in learning this material. This was because when these learning materials must have been given, students instead have to focus on vocational practice activities to face the On the Job Training (OJT) program. The students' too busy with vocational practice activities resulted in the Transformation material being missed and made students start to feel that mathematics was not important, the most important thing was a productive subjects.

This mathematics learning application was developed to make students more aware that mathematics can be found in productive subjects. And in order the cognitive load of students in learning mathematics can be reduced, so that students begin to feel that learning mathematics is interesting to understand. At this stage the researchers collaborated between vocational practice activities and mathematics learning, where mathematics learning material was inserted into several steps of vocational practice activities. The parts of the developed mathematics learning application can be explained as follows.

At the beginning section of the application before starting the Transformation lesson, students are invited to recall the Cartesian field. The initial part of this application can be seen in the form of Fig. 1.



Fig. 1. Given the Cartesian Coordinates

In this section, students are led to imagine the Cartesian coordinates on the table-set up practice. Students are stimulated to determine the correct Cartesian coordinates for placing flower vases and other table-set up practice equipment. As for the source code snippet of the application shown in Fig. 1 is as follows.

```
<!DOCTYPE html>
<html>
  <head>
    <meta name="viewport" content="width=device-width,
initial-scale=1.0">
    <meta charset="utf-8">
    <meta name="keywords" content="Koordinat
Kartesian">
    <meta name="description" content="">
    <meta name="page_type" content="np-template-header-
footer-from-plugin">
    <title>KOLABORASI PEMBELAJARAN
PERHOTELAN MATEMATIKA</title>
  </head>
  <body>
    <div class="u-container-layout u-container-layout-1">
      <span class="u-file-icon u-icon u-icon-1">
        
      </span>
      <p class="u-text u-text-1" data-animation-name="slideIn"
data-animation-duration="1000" data-animation-
direction="Left">
```

The second part of the application is the part where learning mathematics begins to enter the sub-section of the translation material. The second of this application can be seen in the form of Fig. 2.

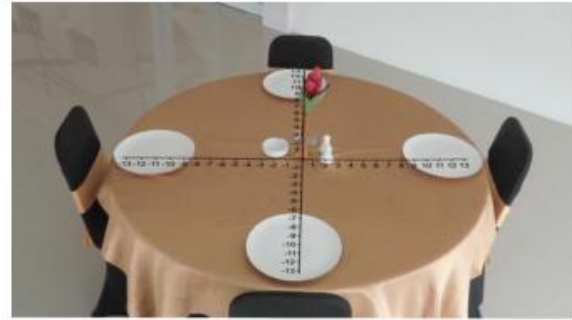


Fig. 2. Translation Sub-material Section

In this section, the table-set-up practice has reached the laying of plates. Here students are led to understand the concept of translation material with cases of shifting plates and shifting other table-set up practice equipment. Students are led to understand that shifts that occur in plates or other items will only change the point of position, not the size or shape of the item. As for the source code snippet of the application shown in Fig. 2 is as follows.

```
<!DOCTYPE html>
<html>
  <head>
    <meta name="viewport" content="width=device-width,
initial-scale=1.0">
    <meta charset="utf-8">
    <meta name="keywords" content="Koordinat
Kartesian">
    <meta name="description" content="">
    <meta name="page_type" content="np-template-header-
footer-from-plugin">
    <title>KOLABORASI PEMBELAJARAN
PERHOTELAN MATEMATIKA</title>
  </head>
  <body>
    <div class="u-container-layout u-container-layout-1">
      <span class="u-file-icon u-icon u-icon-1">
        
      </span>
      <p class="u-text u-text-1" data-animation-name="slideIn"
data-animation-duration="1000" data-animation-
direction="Left">
```

The third part of the application is the part where mathematics learning begins to enter the Reflection material sub-section. The third of this application can be seen in the form of Fig. 3.

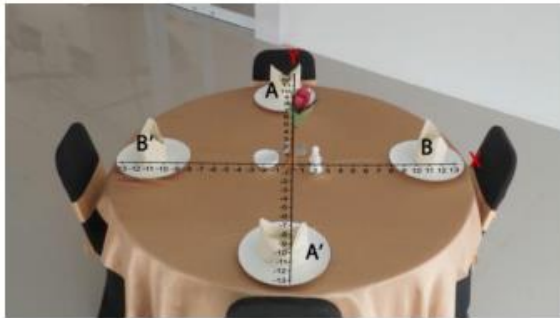


Fig. 3. Reflection Sub-material Section

In this section the table-set up practice has reached the laying of the napkin on the plate. Here students are led to understand the concept of Reflection material with the case of a flower vase as a mirror, where the distance from plate A to the flower vase is the same as the distance from plate A' to the flower vase. Students are led to understand the reflection that occurs on plate A and plate B and determine the position of the image according to the coordinates of the points. Students are also led to understand that the mirror in this reflection material can be a point and can also be a line. As for the source code snippet of the application shown in Fig. 3 is as follows.

```
<!DOCTYPE html>
<html>
  <head>
    <meta name="viewport" content="width=device-width,
initial-scale=1.0">
    <meta charset="utf-8">
    <meta name="keywords" content="Koordinat
Kartesian">
    <meta name="description" content="">
    <meta name="page_type" content="np-template-header-
footer-from-plugin">
    <title>KOLABORASI PEMBELAJARAN
PERHOTELAN MATEMATIKA</title>
  </head>
  <body>
    <div class="u-container-layout u-container-layout-1">
      <span class="u-file-icon u-icon u-icon-1">

      </span>
      <p class="u-text u-text-1" data-animation-name="slideIn"
data-animation-duration="1000" data-animation-
direction="Left">
```

The fourth part of the application is the part where mathematics learning begins to enter the Rotation material sub-

section. The fourth of this application can be seen in the form of Fig. 4.



Fig. 4. Rotation Sub-material Section

In this section, the table-set up practice is equipped with cutlery placement. Here students are led to understand the concept of material Rotation with cases, rotation of the knife on the B&B plate marked with the letter "S" with the knife on the B&B plate marked with the letter "R". This rotation occurs with the flower vase as the axis. Students are led to understand the rotation that occurs if it is rotated clockwise or counterclockwise at a certain angle. As for the source code snippet of the application shown in Fig. 4 is as follows.

```
<!DOCTYPE html>
<html>
  <head>
    <meta name="viewport" content="width=device-width,
initial-scale=1.0">
    <meta charset="utf-8">
    <meta name="keywords" content="Koordinat
Kartesian">
    <meta name="description" content="">
    <meta name="page_type" content="np-template-header-
footer-from-plugin">
    <title>KOLABORASI PEMBELAJARAN
PERHOTELAN MATEMATIKA</title>
  </head>
  <body>
    <div class="u-container-layout u-container-layout-1">
      <span class="u-file-icon u-icon u-icon-1">

      </span>
      <p class="u-text u-text-1" data-animation-name="slideIn"
data-animation-duration="1000" data-animation-
direction="Left">
```

The fifth part of the application is the part where mathematics learning has entered the Dilatation material sub-

section. The fifth of this application can be seen in the form of Fig. 5.



Fig. 5. Dilatation Sub-material Section

In this section the table-set up is complete, all the cutlery, crockery, glassware, and linen that are prepared on the table as a utensil to eat for a guest have been set up. Here students are led to understand the concept of Dilatation material with cases: replacement the show plate with B&B plate; And also with the replacement of other cutlery with the same shape but different sizes. Students are led to understand the enlargement or reduction that occurs if there is a replacement in the cutlery. As for the source code snippet of the application shown in Fig. 5 is as follows.

```
<!DOCTYPE html>
<html>
  <head>
    <meta name="viewport" content="width=device-width,
initial-scale=1.0">
    <meta charset="utf-8">
    <meta name="keywords" content="Koordinat
Kartesius">
    <meta name="description" content="">
    <meta name="page_type" content="np-template-header-
footer-from-plugin">
    <title>KOLABORASI PEMBELAJARAN
PERHOTELAN MATEMATIKA</title>
  </head>
  <body>
    <div class="u-container-layout u-container-layout-1">
      <span class="u-file-icon u-icon u-icon-1">
        
      </span>
      <p class="u-text u-text-1" data-animation-name="slideIn"
data-animation-duration="1000" data-animation-
direction="Left">
```

This developed mathematics learning application had been validated by educational technology experts and mathematics education experts. In the process of validating the application of mathematics learning in this study, using a questionnaire that had been prepared to evaluate it as a research instrument. Adjusting the objectives of each questionnaire was taken into consideration in the preparation of this instrument. The questionnaires were media expert evaluation questionnaires and material expert evaluation questionnaires. The activity of reviewing the mathematics learning application was carried out by distributing questionnaires to experts.

The results of the validation carried out by two material experts on the mathematics learning application can be seen in TABLE I.

TABLE I. RESULTS OF MATERIAL EXPERT VALIDATION ON MATHEMATICS LEARNING APPLICATIONS

No.	Evaluated Aspect	Number of Items	Validator		Percentage (%)	Revision
			I	II		
1	Learning Design	16	11	14	78	No revision
2	Teaching Material	6	6	5	92	No revision
Mean					85	

Although the percentage of calculations showed that there were no revisions to this developed mathematics learning application, there were several constructive revisions to improve this mathematics learning application. As for some inputs/revisions given by experts to the validated mathematics learning applications and the results of the revisions that had been made, it can be seen in full in TABLE II.

TABLE II. RESULTS OF THE REVISION OF MATHEMATICS LEARNING APPLICATIONS

No	Revised indicators	V	Before Revision	After Revision	Properness
1.	Clarity of learning objectives	I	Learning Objectives need to be written explicitly	Learning Objectives had been written explicitly	Proper to use
2.	Relevance of learning objectives with Curriculum	I	Learning Objectives need to be written explicitly	Learning Objectives had been written explicitly	Proper to use
3.	Scope and depth of learning objectives	I	Learning Objectives need to be written explicitly	Learning Objectives had been written explicitly	Proper to use
4.	Completeness and quality of study aid materials	II	Learning Objectives need to be written explicitly	Learning Objectives had been written explicitly	Proper to use
5.	The suitability of the material with the learning objectives	I	Learning Objectives need to be written explicitly	Learning Objectives had been written explicitly	Proper to use
6.	Providing feedback on the evaluation	I	There needs to be a facility to	There had been a facility to	Proper to use

	results		provide feedback on the evaluation results	provide feedback on the evaluation results	
7.	The accuracy of the answers to examples of practice questions on each material	II	There are no sample questions yet	There had been sample questions	Proper to use

Note: "V" is Validators

The results of the validation carried out by two media experts on the Mathematics learning application can be seen in TABLE III.

TABLE III. VALIDATION RESULTS OF MEDIA EXPERTS ON MATHEMATICS LEARNING APPLICATION

No.	Evaluated Aspect	Number of Items	Validator		Percentage (%)	Revision
			I	II		
1	Software engineering	10	10	10	100	No revision
2	Visual Communication	13	12	11	89	No revision
Mean					95	

Although the percentage of calculations showed that there were no revisions to this developed mathematics learning application, there were several constructive revisions to improve this mathematics learning application. As for some inputs/revisions given by experts to the validated mathematics learning applications and the results of the revisions that had been made, it can be seen in full in TABLE IV.

TABLE IV. RESULTS OF THE REVISION OF THE MATHEMATIC LEARNING APPLICATION

No.	Revised indicators	V	Before Revision	After Revision	Properness
1.	The clarity of the audio contained in the application	I and II	Need to add subtitle support	Subtitle support had been added	Proper to use
2.	Interactive Layout Compatibility	I and II	Need to add image/video rotation support	Image/video rotation support had been added	Proper to use

Note: "V" is Validators

IV. DISCUSSION

In the literature study activity, there was Transformation material that is included into the mathematics learning application. This section already contained the subject matter, learning materials and clear learning objectives. The validation of the mathematics learning application was carried out by two experts, namely an expert in the field of Learning Engineering education and an expert in the field of Mathematics Education. The evaluation carried out on the mathematics learning application used several aspects to measure it, including: software engineering, visual communication, learning design and teaching materials. In the aspect of "software engineering", first evaluator gave an assessment score = 1 (proper) on each

indicator which total number of indicators was 10. Evaluator II also gave an assessment score = 1 (proper) on each indicator which the total number of indicators was 10, so that a percentage of 100% was obtained. By matching the results of these percentages with the percentage level of achievement on the five-scale, the "software engineering" aspect was included in very good qualifications, so there was no need to revise this aspect. In the aspect of "visual communication" there were 13 indicator items, evaluator I gave an assessment score = 1 (proper) on 12 indicator items and 0 (not proper) on 1 indicator item. Evaluator II gave an assessment score of 1 (proper) on 11 indicator items and 0 (not proper) on 2 indicator items. So that obtained a percentage of 89%. By matching these percentage results with the level percentage of achievement on the five-scale, the "visual communication" aspect was included in the very good qualification, so there was no need to revise this aspect. However, for the sake of perfection in the development of this mathematics learning application, revision activities were still carried out in accordance with the directions of Validator I and Validator II.

There were several revisions given by the validator, particularly related to the aspect of "visual communication", namely the revision given by validator I and validator II has the same meaning as follows.

1) *Revision of the audio clarity contained*, in the mathematics learning application that needs to be added with subtitle support, and after the revision was made according to the input of validator I and validator II, the mathematics learning application developed in this study has additional subtitle support and is very feasible to use.

2) *Revision of the suitability of the interactive layout*, which needs to be added with image/video rotation supports. After the revision was made according to the input of validator I and validator II, the mathematics learning application developed in this study has additional image/video rotation support and is very feasible to use.

In the aspect of "learning design" which consists of 16 indicator items, evaluator I gave an assessment score = 1 (proper) on 11 indicator items and 0 (not proper) on 6 indicator items. Evaluator II gave an assessment score = 1 (proper) on 14 indicator items and 0 (not proper) on 2 indicator items. So that obtained a percentage of 78%. By matching the results of these percentages with the level percentage of achievement on a five-scale, the "learning design" aspect was included in good qualifications, so there was no need to revise this aspect. In the aspect of "teaching material" which consists of 6 indicator items, evaluator I gave an assessment score = 1 (proper) on all indicator items. Evaluator II gave an assessment score = 1 (proper) on 5 indicator items and 0 (not proper) on 1 indicator item. So that the percentage obtained was 92%. By matching the results of these percentages with the level percentage of achievement on a five-scale, the "teaching material" aspect was included in very good qualifications, so there was no need to revise this aspect. However, for the sake of perfection in the development of this mathematics learning application, revision activities were still carried out in accordance with the directions of Validator I and Validator II.

There were several revisions given by the validator, particularly related to the aspects of "learning design" and "teaching materials", namely the revisions given by validator I and validator II have the same meaning as follows.

1) *Revision of the need to explicitly write down the learning objectives*, in the mathematics learning application, and after revisions had been made in accordance with the directions of validator I and validator II, the learning objectives in the mathematics learning application developed in this study were written explicitly and are appropriate for use.

2) *Revision of the need to add sample questions*, in the mathematics learning application, and after revisions had been made according to the input of validator I and validator II, the mathematics learning application developed in this study had added sample questions and is suitable for use.

The results of this study support several previous studies. The following is the previous research. Bailey et al. with research title Finding Satisfaction: Intrinsic Motivation for Synchronous and Asynchronous Communication in the Online Language Learning Context. The results of the research showed that students' attention and motivation to learning arise when learning materials are associated with what students enjoy [42]. Ruder et al. with research title Getting Started with Team-Based Learning (TBL): An Introduction. The results of the research showed that stimulating student activity can be done by presenting learning challenges and direct involvement of students in learning practices [43]. Wares with research title A Gift Box Filled with Mathematics. The results of the research show that the relationship between feedback and reinforcement will be strengthened if it is used frequently and will decrease or even disappear if it is rarely or never used. [44]. Therefore, activities related to repetition are very necessary in learning. Furthermore, Chen et al. with research title Extending Cognitive Load Theory to Incorporate Working Memory Resource Depletion: Evidence from the Spacing Effect. The results of the research indicated that teachers must be able to regulate learning activities, starting from planning, the implementation process to the final stage, namely assessment or evaluation, so that students can participate in the learning process well without significant differences [45]. Based on the results of the research and several supporting theories, it can be concluded that in vocational mathematics learning there should be a collaboration of mathematics learning materials with vocational practice activities so that in addition to learning in theory students also get hands-on practical experience in learning mathematics.

V. CONCLUSION

This research has succeeded in developing a prototype of a mathematics learning application that carries the theme of table set-up industry practice in the Food and Beverage Service department. This mathematics learning application consists of five parts, namely: 1) the initial part to recall about the Cartesian coordinates; 2) the translational sub-material section; 3) the reflection sub-material section; 4) the rotation sub-material section; and 5) the dilatation sub-material section. In the review activity by experts, the average percentage of material validators was 85% (very good) and the average percentage of media validators was 95% (very good). This

means that this mathematics learning application is ready to be developed into the field trial stage.

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BUKTI HASIL REVIEW (2 dan 14 MARET 2022)

Reviewer Feedback Form

Date March 2, 2022

International Journal of Advanced Computer Science and Applications (IJACSA)

Paper Title

Mathematics web-based learning presented in table set up practice activities

Reviewer Recommendation

Neutral

Reviewer Ratings

The authors contribution to the paper	Fair
Potential interest to research community	Poor
Originality of the work	Fair
Use of examples and illustrations	Fair
Quality of questions or problems raised by the Author	Poor
Reader's confidence in Author's knowledge	Poor
Formatting and Presentation	Poor
Awareness of related work	Fair
Scientific Impact or Practical Utility	Poor
Citations and References	Fair
Paper Organization	Poor

Detailed Comments:

The paper has been poorly written - both technically and grammatically

The title of the paper need to be changed

The Technical content of the paper to made more relevant and novelty of the proposed method to be stressed upon

Suggested to completely rewrite the paper taking into consideration the points mentioned above.

The keyword "Presented" did not appear in the abstract.

Add one paragraph for organisation of the paper at the end of introduction section.

Separate section on Related works need to be mentioned so that it is easy to get information about any solutions that have been made by other researchers as well as problems that still need to be studied further. The author must be able to show the position of the research he is doing compared to other existing solutions.

The author should also discuss how the limitations affect the interpretation of their results.

Methodology is one of the most critical parts of the paper that reviewers found lacking detail. The methods should be adequately described to show how the research was conducted to improve clarity and transparency.

Future work is missing. You may add this to conclusion If you're actively engaged in follow-up this work or any recommendation for further improvement.

Grammar, punctuation, or spelling errors:

Lots of mistakes are present.

Delete the text box of sponsors from the second page.

Reviewer Feedback Form

Date March 14, 2022

International Journal of Advanced Computer Science and Applications (IJACSA)

Paper Title How is Mathematics Web-based Learning Presented in Table Set Up Practice Activities

Reviewer Recommendation Neutral

Reviewer Ratings

The authors contribution to the paper	Fair
Potential interest to research community	Poor
Originality of the work	Fair
Use of examples and illustrations	Very Poor
Quality of questions or problems raised by the Author	Poor
Reader's confidence in Author's knowledge	Poor
Formatting and Presentation	Poor
Awareness of related work	Poor
Scientific Impact or Practical Utility	Poor
Citations and References	Fair
Paper Organization	Very Poor

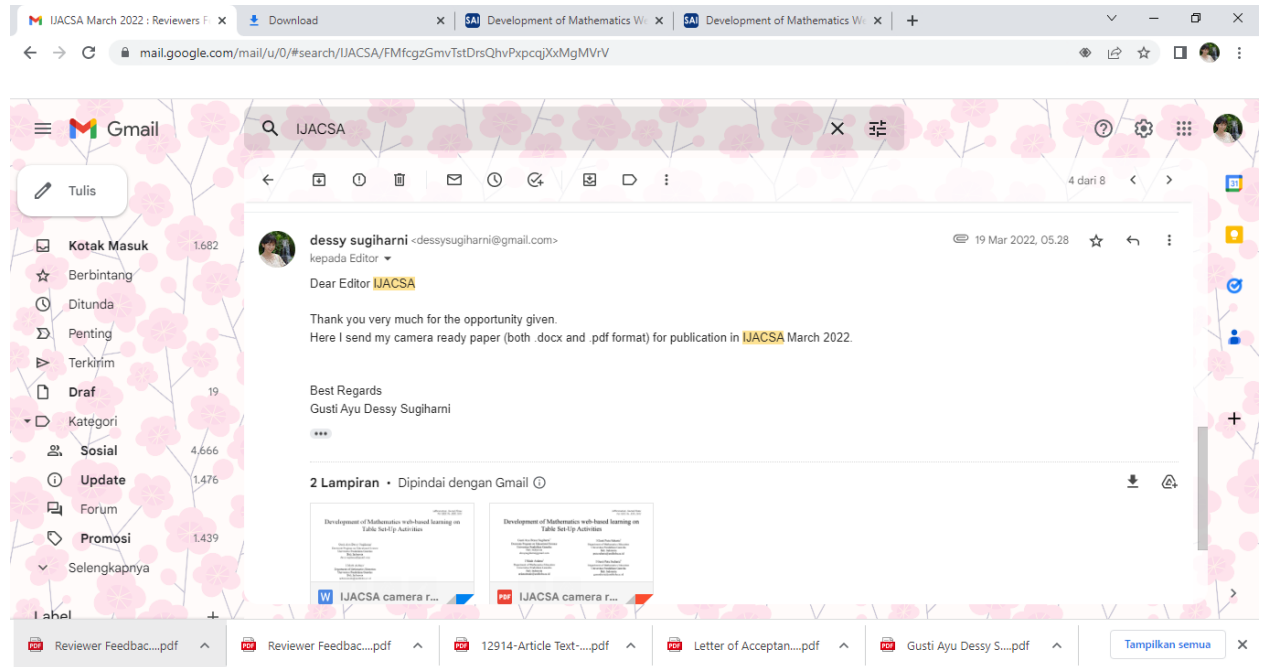
Detailed Comments:

Abstract- give some introduction line before going straight to the paper's aim/objective.
The paper still looks like a development of prototype rather than focusing on research aspect.
If to be accepted- paper needs to be majorly revised to focus on the contributions from research perspective.
The sharing of code snippet as figures conflict with the numbering of figures (photos) in the paper.
Overall the organization of figures are bad and confusing. What is the purpose of the snippet shared? any explanation?
For results, Validation was done by only 2 validators? This seems questionable number for a research validation. Where is the justification.
Table II- How the revised indicators are chosen/taken?
Discussion of related work is all over the place in this paper. Advised to have a proper section such as Related work.

Grammar, punctuation, or spelling errors:

language style- acceptable

BUKTI SUDAH UPLOAD REVISI (19 MARET 2022)



Development of Mathematics web-based learning on Table Set-Up Activities

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Abstract— This paper aimed to discuss product design and expert validation of the mathematics web-based learning table set up activities in the hospitality industry. This research was a type of Research and Development, which aimed to develop a new product. The experts involved in this study were four experts. There were two experts in the field of learning technology as media validators and two experts in the field of mathematics education as material validators. In the process of validating the mathematics web-based learning in this study, using a questionnaire that had been prepared to evaluate it as a research instrument. This research had produced mathematics web-based learning which consists of five parts, namely: the initial part to recall about the Cartesian coordinates; the translation sub-material section; the reflection sub-material section; the rotation sub-material section; and the dilatation sub-material section. In the review activity by experts, the average percentage of material validators was eighty five percent, its means is very good and the average percentage of media validators was ninety five its means is very good also. It showed that this mathematics web-based learning can be said to be proper to use.

Keywords— Development; Web-based Learning; Mathematics; Table Set-Up; Activities

I. INTRODUCTION

Mathematics subjects have a quite unique and important part in the competence learning of the tourism department [1]-[2]. Understanding the right concepts in learning mathematics can train transcendental reasoning, range of thinking, and solving a case[3]-[4]. This will make students accustomed to completing case studies in tourism in a more analytical and realistic manner[5]. In general, this is in accordance with the statement which stated that mathematics shows outstanding skills in a person, both in terms of concretizing something abstract, finding the right solution in a case, as well as the power of thinking on an object[6]-[7].

In reality, mathematics is one of the subjects that are less attractive to Tourism Vocational School students[8]-[9]. This is because it is considered a difficult subject to learn and most

students have not realized and understood the true meaning of mathematics[10]. This is in accordance with the opinion that most students do not want to focus on learning mathematics because of the assumption that mathematics is difficult, scary, boring and some people hate mathematics so that every time they take part in learning mathematics, someone immediately feels unwell[11]-[14].

Factors from students and teachers become the basis for the reason why many students are less interested in learning mathematics[15]. The factor from the students that became the basis for the reason was the classical view of students, namely that mathematics is a difficult subject to learn[16]. The factor from the teacher that became the basis for the reason was the difficulty of the teacher in finding the right method to lead students to participate in mathematics learning voluntarily without feeling coercion directly[17]. This difficulty causes students to feel bored and not enthusiastic to take part in learning mathematics[18]. This is supported by the opinion which stated that the difficulty in selecting methods that can be used to make students understand in learning mathematics is a teacher difficulty[19]. Another factor that causes students' lack of interest in learning mathematics is because the form of teaching materials has not been able to raise awareness of the importance of mathematics[20]. Teaching materials that still feature algorithms and formula derivations, raise students' assumptions about solid material, feel less clear and it is difficult to understand the material because of a dislike for math subjects[21]. This is supported by the results of research showing that: 1) learning by using textbooks is not liked by students, because it creates a sense of being lost in dense material and emphasizes algorithms so that students have difficulty accepting mathematics learning[22]; 2) The presentation of learning that is commonly done by teachers has not been able to arouse students' desire to learn, so students are not quite ready to receive lessons [23]; 3) students do not feel challenged to work on the questions available in mathematics learning, because the examples of questions and practice questions provided are difficult to understand [24].

In addition, Tourism Vocational School students only focus on the competencies of the majors they choose[25]. Many students think that Mathematics is not so applied in Business World or Industrial World where they carry out On the Job Training or their place to find work after graduating from Vocational High School[26]. Some explorations have also been carried out by Mathematics teachers, but the number of students who have an interest can still be counted on the fingers[27]. Students' understanding of the many mathematical concepts that can be applied in solving problems related to the tourism sector is still so minimal[28]. This causes the sinking of students' desire to study mathematics voluntarily[29].

Overcoming these problems requires the development of teaching materials that can make Tourism Vocational Schools' students interested in learning mathematics. The teaching materials is able to developed can be in the form of mathematics web-based learning[30]-[31]. Applications in the form of colorful pictures with interesting characters and mathematical material treats in it[33]-[32]. The reality in the field is that there are many mathematical learning applications that have been developed. Some even carry applications with the STEM concept[34]. However, there is no mathematics web-based learning that carries the theme of tourism practice, so that Tourism Vocational School students understand that mathematics learning is also used in the work practice of the tourism industry.

Based on this, this research was conducted to develop an application for learning mathematics that was raised in industrial work practices in one part of the food and beverage service. The material used in the development of this mathematics web-based learning is Transformation material. Where this Transformation material is raised in the table set up, that is the one of tourism practice activity.

II. METHOD

This research was a type of Research and Development (R&D), which aimed to develop a new product. The development activities carried out in this research were focused on product design and formative evaluation. The stages carried out consist of the Preliminary Research and Prototyping Stage.

A. Preliminary Research

The steps taken at this stage were literature studies to look for problems related in schools learning as well as deficiencies in existing mathematics learning. Field surveys to complement and strengthen the findings in the literature study also taken. This stage aimed to obtain information on problems in mathematics material and deficiency of previous instructional media. The field survey consisted of interviews with three teachers and distributing questionnaires to one hundred and eighteen students.

B. Prototyping Stage

The manufacture and improvement of product prototypes as a problem-solving medium obtained earlier was carried out at this stage, after finding problems in the learning process at the preliminary research stage. This stage consists of designing design guidelines, optimizing prototypes, formative evaluations. In the formative evaluation activity, it is the product evaluation

stage (prototype) that had been made previously[35]. The prototype was tested in several stages of formative evaluation, including: 1) Research team members examined the design using a list of important characteristics from the intervention components; 2) A group of experts provide responses related to the intervention prototype. The experts involved in this study were 2 (two) experts in the field of learning technology as media validators and 2 (two) experts in the field of mathematics education as material validators. Usually this is done using open and closed questionnaires or interviews; 3) Walkthrough: through face-to-face researchers together with users (teachers and students) reviewing the intervention prototype; 4) Micro Evaluation was intended to evaluate a small group of users (students) to use the intervention section in normal situations; 5) Try-out a number of user groups (students) using the intervention. On the focus of effectiveness evaluation, evaluators did it by test.

Expert validation questionnaires, student response questionnaires, and teacher response questionnaires were analyzed using a multilevel scale. The data obtained was quantitative data which was then translated into qualitative data. Respondents did not answer one of the qualitative answers on the multilevel scale model, but answered one of the quantitative answers which were provided. Five alternative answers were provided on a graded scale with a range of values from 0 to 4, which are shown in TABLE I.

TABLE I. CRITERIA FOR GRADED SCALE

Score	Criteria
4	Very Good
3	Good
2	Enough
1	Bad
0	Very Bad

The percentage of answers for each question indicator can be calculated using the following formula.

$$\text{Percentage} = \frac{\sum \text{all respondents score}}{\sum \text{respondents} \times 4} \times 100\%$$

The percentage of answers to all aspects of the question can be calculated using the following formula.

$$\text{Percentage} = \frac{\sum \text{overall score of respondent criteria}}{\sum \text{respondents} \times \sum \text{item} \times 4} \times 100\%$$

In addition to using a multilevel scale in the expert validation questionnaire, the answers to the conclusions from the validation results used the Guttman scale. The Guttman scale yields an unequivocal "yes-no" answer. The "adequate-not eligible" scale was used in this questionnaire. Drawing conclusions about the properly of the media used the following formula.

$$\text{Percentage} = \frac{\sum \text{answers of proper from respondents}}{\sum \text{respondents}} \times 100\%$$

III. RESULT AND DISCUSSION

A. Preliminary Research

In the Preliminary Research stage, several potentials and problems faced by students were found based on the results of the preliminary research questionnaire presented in TABLE II. The potential and the problem was that students were less interested in learning mathematics because of the assumption that mathematics has nothing to do with tourism activities. According to them, productive learning activities are more important and more fun to carry out than learning mathematics. Students feel lazy and find it difficult to learn mathematical material contained in textbooks. And there was no mathematics learning media that can link productive learning with mathematics learning. This was supported by the results of interviews with mathematics subject teachers which can be concluded as follows. 1) Most students feel lazy and have difficulty in learning mathematics; 2) Some students feel less helped by the teaching materials which they use in learning mathematics; 3) The teaching materials used in learning mathematics are quite varied, it's just that there are no learning media that can be collaborated with productive learning; 4) When applying mathematics learning media that can be downloaded from the internet, students play with their cellphones instead of studying; 5) The mathematics material that they should have learned, especially in XI grade, was simply missed when they had carried out the On the Job Training program; 6) Educators expect mathematics material to be linked and collaborated with vocational practice activities; 7) Some students who think that mathematics is not important prefer to participate in vocational activities, even though they already know that they are lagging behind in learning mathematics.

TABLE II. RESULTS OF PRELIMINARY RESEARCH QUESTIONAIRE

No.	Subject	Item										Total	Percentage (%)	
		1	2	3	4	5	6	7	8	9	10			11
1	P1S1	1	0	1	0	1	0	1	0	1	1	0	6	54.55
2	P1S2	1	0	1	1	0	0	1	1	1	0	1	7	63.64
3	P1S3	0	1	1	0	1	0	1	0	0	1	1	6	54.55
4	P1S4	0	1	0	0	1	1	1	0	1	1	1	7	63.64
5	P1S5	1	0	0	1	1	0	1	0	0	1	0	5	45.45
6	P1S6	0	1	0	1	1	1	1	1	0	0	7	63.64	
7	P1S7	1	1	1	0	1	1	0	1	0	1	0	7	63.64
8	P1S8	0	0	0	1	0	1	1	1	1	0	0	5	45.45
9	P1S9	1	1	1	0	0	1	1	0	1	0	0	6	54.55
10	P1S10	0	1	0	1	0	0	1	0	0	1	4	36.36	
11	P1S11	1	0	0	1	1	1	1	0	1	0	1	7	63.64
12	P1S12	0	1	0	1	0	1	1	1	0	1	1	7	63.64
13	P1S13	1	1	1	0	1	1	1	0	0	1	0	7	63.64
14	P1S14	0	1	0	1	0	1	0	1	1	0	0	5	45.45
15	P1S15	1	0	0	1	1	0	0	1	0	1	0	5	45.45
16	P1S16	0	1	0	1	0	1	0	0	1	1	1	6	54.55
17	P1S17	1	0	0	1	1	0	0	1	0	0	1	5	45.45
18	P1S18	0	1	1	1	0	1	1	0	0	1	1	7	63.64
19	P1S19	1	0	1	0	1	1	0	1	0	1	1	7	63.64
20	P1S20	1	1	0	0	1	0	1	1	1	1	1	8	72.73
21	P1S21	0	0	1	0	1	1	0	1	0	1	0	5	45.45
22	P1S22	1	0	1	0	1	1	1	0	1	0	1	7	63.64
23	P1S23	1	1	0	1	0	1	1	0	1	0	1	7	63.64
24	P1S24	0	1	0	1	1	1	1	1	0	0	0	6	54.55
25	P1S25	1	0	0	1	1	1	1	0	1	0	1	7	63.64
26	P1S26	0	1	0	1	0	1	0	1	0	1	1	6	54.55
27	P1S27	1	1	1	0	1	0	0	1	0	1	0	6	54.55

28	P1S28	1	1	0	1	0	1	0	1	1	0	0	6	54.55
29	P1S29	1	0	1	0	0	1	1	1	0	1	0	6	54.55
30	P1S30	1	1	0	1	0	1	1	0	0	1	1	7	63.64
31	P2S1	1	0	1	0	0	0	1	0	1	1	0	5	45.45
32	P2S2	1	1	0	0	1	1	0	0	1	1	1	7	63.64
33	P2S3	1	0	1	0	1	0	1	0	0	1	1	6	54.55
34	P2S4	1	1	1	0	0	1	0	0	1	0	1	6	54.55
35	P2S5	0	1	1	1	1	0	0	1	0	0	1	6	54.55
36	P2S6	1	1	1	1	0	1	0	0	1	0	0	6	54.55
37	P2S7	1	0	0	1	0	1	0	1	1	1	1	7	63.64
38	P2S8	0	1	1	0	0	1	1	0	1	0	1	6	54.55
39	P2S9	1	1	0	1	0	1	1	1	0	0	1	7	63.64
40	P2S10	1	1	0	1	1	0	1	0	1	0	1	7	63.64
41	P2S11	0	1	0	1	1	1	1	1	0	1	0	7	63.64
42	P2S12	1	0	0	0	1	1	1	1	1	0	0	6	54.55
43	P2S13	0	1	0	1	1	1	0	0	0	1	0	5	45.45
44	P2S14	0	1	0	1	0	1	1	1	1	0	1	7	63.64
45	P2S15	1	1	1	0	0	0	1	0	1	0	1	6	54.55
46	P2S16	1	0	0	1	0	1	1	1	0	0	0	5	45.45
47	P2S17	0	1	0	1	0	1	0	1	0	1	0	6	54.55
48	P2S18	1	0	0	1	1	1	0	1	0	1	1	7	63.64
49	P2S19	0	1	0	1	0	1	0	0	1	0	1	5	45.45
50	P2S20	1	1	1	1	1	0	0	1	0	1	0	7	63.64
51	P2S21	1	0	1	0	0	1	0	1	1	0	0	5	45.45
52	P2S22	1	1	1	1	0	0	1	0	0	1	0	6	54.55
53	P2S23	1	1	1	1	0	1	0	1	0	1	1	8	72.73
54	P2S24	1	0	0	1	1	0	0	1	1	0	1	6	54.55
55	P2S25	1	1	1	1	0	1	0	1	0	1	0	7	63.64
56	P2S26	0	1	0	0	1	1	1	1	1	0	0	6	54.55
57	P2S27	1	0	0	1	1	1	1	0	0	1	0	6	54.55
58	P2S28	0	1	0	1	1	1	0	0	1	0	1	6	54.55
59	P2S29	0	1	1	0	1	1	1	1	0	0	1	7	63.64
60	P2S30	1	0	1	0	1	0	1	0	1	0	1	6	54.55
61	P3S1	1	1	1	1	0	0	0	1	1	0	1	7	63.64
62	P3S2	0	1	1	0	1	0	1	1	0	1	1	7	63.64
63	P3S3	0	1	0	1	1	0	1	0	1	1	1	7	63.64
64	P3S4	1	0	0	1	1	1	0	0	1	0	1	6	54.55
65	P3S5	0	1	0	0	0	0	1	0	1	1	1	5	45.45
66	P3S6	1	1	1	1	1	0	1	0	0	1	0	7	63.64
67	P3S7	0	1	0	1	1	1	0	1	1	0	0	6	54.55
68	P3S8	1	1	1	0	0	1	0	1	0	1	0	6	54.55
69	P3S9	0	1	0	1	1	0	0	1	1	1	1	7	63.64
70	P3S10	1	0	0	1	0	1	0	1	1	1	1	7	63.64
71	P3S11	0	1	0	1	1	1	1	0	1	0	0	6	54.55
72	P3S12	1	1	1	1	0	0	1	0	0	1	0	7	63.64
73	P3S13	1	1	1	0	1	1	1	0	0	1	1	8	72.73
74	P3S14	0	1	1	1	1	1	0	1	0	1	0	7	63.64
75	P3S15	1	0	0	0	1	0	1	1	1	1	1	7	63.64
76	P3S16	1	1	1	1	0	0	1	1	0	1	1	8	72.73
77	P3S17	0	1	1	0	1	0	1	0	1	1	1	7	63.64
78	P3S18	0	1	0	0	0	1	1	1	1	1	1	7	63.64
79	P3S19	1	0	0	1	1	1	1	1	1	1	0	8	72.73
80	P3S20	0	1	0	1	1	1	0	1	1	0	1	7	63.64
81	P3S21	1	1	1	1	1	1	1	1	0	1	0	9	81.82
82	P3S22	1	0	0	1	1	1	1	0	1	0	0	6	54.55
83	P3S23	0	1	1	0	1	1	0	1	0	1	0	6	54.55
84	P3S24	1	1	1	1	0	1	1	1	1	1	1	10	90.91
85	P3S25	1	0	0	0	1	0	1	0	1	1	0	5	45.45
86	P3S26	1	1	1	1	0	0	1	1	1	1	1	9	81.82
87	P3S27	1	1	1	0	1	0	1	1	0	1	1	8	72.73
88	P3S28	0	0	1	0	1	0	1	0	1	1	1	6	54.55
89	P3S29	1	1	0	0	0	1	0	0	1	1	1	6	54.55
90	P4S1	1	0	1	0	1	0	1	0	1	1	1	7	63.64
91	P4S2	1	1	0	1	1	0	1	0	0	1	0	6	54.55
92	P4S3	1	0	1	0	1	0	1	1	1	0	0	6	54.55
93	P4S4	1	1	1	1	0	0	1	1	0	1	0	7	63.64
94	P4S5	0	1	0	0	1	0	0	1	1	1	1	6	54.55
95	P4S6	1	0	0	1	1	1	1	1	1	0	0	7	63.64

96	P4S7	0	1	0	1	1	1	1	0	0	1	0	6	54.55
97	P4S8	1	0	0	1	1	1	1	1	1	0	0	7	63.64
98	P4S9	1	1	1	0	1	0	1	1	0	1	0	7	63.64
99	P4S10	0	1	0	1	0	0	1	0	1	1	1	6	54.55
100	P4S11	1	0	0	0	1	0	1	1	1	1	1	7	63.64
101	P4S12	0	1	0	1	1	1	0	1	0	0	0	5	45.45
102	P4S13	1	1	0	1	0	1	1	0	0	1	1	7	63.64
103	P4S14	0	1	0	1	1	1	0	1	0	1	1	7	63.64
104	P4S15	1	0	0	0	1	1	0	1	1	1	0	6	54.55
105	P4S16	0	1	0	1	1	0	1	0	0	1	1	6	54.55
106	P4S17	1	1	1	1	1	1	0	1	0	0	1	8	72.73
107	P4S18	1	1	1	0	0	1	1	0	0	1	1	7	63.64
108	P4S19	1	1	0	1	0	1	0	1	0	1	1	7	63.64
109	P4S20	1	1	1	0	0	1	1	1	0	1	0	7	63.64
110	P4S21	1	0	0	1	0	1	1	1	1	0	0	6	54.55
111	P4S22	0	1	1	0	1	0	1	1	0	1	0	6	54.55
112	P4S23	1	1	0	1	0	0	0	1	1	1	1	7	63.64
113	P4S24	1	1	1	0	1	0	1	0	1	1	0	7	63.64
114	P4S25	0	0	1	0	1	1	1	1	0	1	1	7	63.64
115	P4S26	1	1	0	0	1	0	0	1	1	1	1	7	63.64
116	P4S27	1	0	1	0	1	0	1	0	1	0	1	6	54.55
117	P4S28	1	1	1	1	1	1	0	0	1	1	1	9	81.82
118	P4S29	1	1	1	0	0	0	1	0	1	1	1	7	63.64

B. Prototyping Stage

In the Prototyping stage, the researcher made a plan to determine the Basic Competence and Student Learning Experience and made a feasibility instrument. The selection of subject matter is done based on the consideration of the difficulties of teachers and students in learning mathematics. Transformation material in mathematics vocational high school XI grade was chosen because of the frequent delays in learning this material. This was because when these learning materials must have been given, students instead have to focus on vocational practice activities to face the On the Job Training (OJT) program. The students' too busy with vocational practice activities resulted in the Transformation material being missed and made students start to feel that mathematics was not important, the most important thing was a productive subjects.

This mathematics web-based learning was developed to make students more aware that mathematics can be found in productive subjects. And in order the cognitive load of students in learning mathematics can be reduced, so that students begin to feel that learning mathematics is interesting to understand. At this stage the researchers collaborated between vocational practice activities and mathematics learning, where mathematics learning material was inserted into several steps of vocational practice activities. The parts of the developed mathematics web-based learning can be explained as follows.

At the beginning section of the application before starting the Transformation lesson, students are invited to recall the Cartesian field. The initial part of this application can be seen in the form of Fig. 1.



Fig. 1. Given the Cartesian Coordinates

In this section, students are led to imagine the Cartesian coordinates on the table-set up practice. Students are stimulated to determine the correct Cartesian coordinates for placing flower vases and other table-set up practice equipment.

The second part of the application is the part where learning mathematics begins to enter the sub-section of the translation material. The second of this application can be seen in the form of Fig. 2.



Fig. 2. Translation Sub-material Section

In this section, the table-set-up practice has reached the laying of plates. Here students are led to understand the concept of translation material with cases of shifting plates and shifting other table-set up practice equipment. Students are led to understand that shifts that occur in plates or other items will only change the point of position, not the size or shape of the item.

The third part of the application is the part where mathematics learning begins to enter the Reflection material sub-section. The third of this application can be seen in the form of Fig. 3.

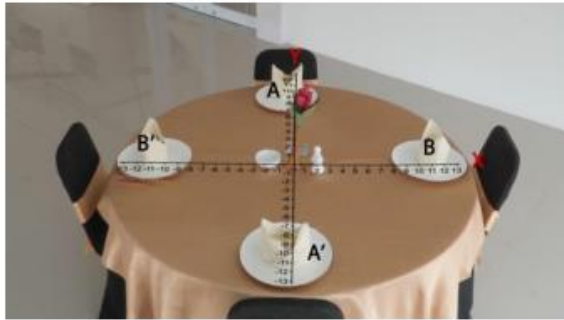


Fig. 3. Reflection Sub-material Section

In this section the table-set up practice has reached the laying of the napkin on the plate. Here students are led to understand the concept of Reflection material with the case of a flower vase as a mirror, where the distance from plate A to the flower vase is the same as the distance from plate A' to the flower vase. Students are led to understand the reflection that occurs on plate A and plate B and determine the position of the image according to the coordinates of the points. Students are also led to understand that the mirror in this reflection material can be a point and can also be a line.

The fourth part of the application is the part where mathematics learning begins to enter the Rotation material subsection. The fourth of this application can be seen in the form of Fig. 4.



Fig. 4. Rotation Sub-material Section

In this section, the table-set up practice is equipped with cutlery placement. Here students are led to understand the concept of material Rotation with cases, rotation of the knife on the B&B plate marked with the letter "S" with the knife on the B&B plate marked with the letter "R". This rotation occurs with the flower vase as the axis. Students are led to understand the rotation that occurs if it is rotated clockwise or counterclockwise at a certain angle.

The fifth part of the application is the part where mathematics learning has entered the Dilatation material subsection. The fifth of this application can be seen in the form of Fig. 5.



Fig. 5. Dilatation Sub-material Section

In this section the table-set up is complete, all the cutlery, crockery, glassware, and linen that are prepared on the table as a utensil to eat for a guest have been set up. Here students are led to understand the concept of Dilatation material with cases: replacement the show plate with B&B plate; And also with the replacement of other cutlery with the same shape but different sizes. Students are led to understand the enlargement or reduction that occurs if there is a replacement in the cutlery.

This developed mathematics web-based learning had been validated by educational technology experts and mathematics education experts. In the process of validating the application of mathematics learning in this study, using a questionnaire that had been prepared to evaluate it as a research instrument. Adjusting the objectives of each questionnaire was taken into consideration in the preparation of this instrument. The questionnaires were media expert evaluation questionnaires and material expert evaluation questionnaires. The activity of reviewing the mathematics web-based learning was carried out by distributing questionnaires to experts.

The results of the validation carried out by two material experts and two media experts on the mathematics web-based learning can be seen in TABLE III and TABLE IV.

TABLE III. VALIDATION RESULTS OF MATERIAL EXPERT VALIDATION ON MATHEMATICS WEB-BASED LEARNINGS

No.	Evaluated Aspect	Number of Items	Validators		Percentage (%)	Revision
			I	II		
1	Learning Design	16	11	14	78	No revision
2	Teaching Material	6	6	5	92	No revision
Mean					85	

TABLE IV. VALIDATION RESULTS OF MEDIA EXPERTS ON MATHEMATICS WEB-BASED LEARNING

No.	Evaluated Aspect	Number of Items	Validators		Percentage (%)	Revision
			III	IV		
1	Software engineering	10	10	10	100	No revision
2	Visual Communication	13	12	11	89	No revision
Mean					95	

The validation of the mathematics web-based learning was carried out by four experts, namely two experts in the field of

Learning Engineering education and two experts in the field of Mathematics Education. The evaluation carried out on the mathematics web-based learning used several aspects to measure it, including: software engineering, visual communication, learning design and teaching materials. In the aspect of "software engineering", evaluator III assigned an assessment score "1 (proper)" on each indicator with the total number of indicators was 10. Evaluator IV also gave an assessment score "1 (proper)" on each indicator with the total number of indicators was 10. So that obtained a percentage of 100%. By matching the results of these percentages with the percentage level of achievement on a five scale, the "software engineering" aspect was included in very good qualifications, so there was no need to revise this aspect. In the aspect of "visual communication" there were 13 indicator items, evaluator III gave an assessment score "1 (proper)" on 12 indicator items and "0 (it was not proper)" on 1 indicator item. Evaluator IV gave an assessment score of "1 (proper)" on 11 indicator items and "0 (they were not proper)" on 2 indicator items. So that obtained a percentage of 89%. By matching the results of these percentages with the percentage level of achievement on a five scale, the "visual communication" aspect was included in the very good qualification, so there was no need to revise this aspect. In the aspect of "learning design" which consists of 16 indicator items, evaluator I gave an assessment score "1 (proper)" on 11 indicator items and "0 (they were not proper)" on 6 indicator items. Evaluator II gave an assessment score "1 (proper)" on 14 indicator items and "0 (they were not proper)" on 2 indicator items. So that obtained a percentage of 78%. By matching the results of these percentages with the percentage level of achievement on a five scale, the "learning design" aspect is included in good qualifications, so there is no need to revise this aspect. In the aspect of "teaching material" which consists of 6 indicator items, evaluator I gave an assessment score "1 (proper)" on all indicator items. Evaluator II gave an assessment score "1 (proper)" on 5 indicator items and "0 (it was not proper)" on 1 indicator item. So that the percentage obtained was 92%. By matching the results of these percentages with the percentage level of achievement on a five scale, the "teaching material" aspect is included in very good qualifications, so there is no need to revise this aspect.

In addition to the results of the expert validity test, walkthrough activities were also carried out. In this case the author used it as a guide for revising the mathematics web-based learning. The results of the walkthrough activities can be seen in TABLE V.

TABLE V. WALKTHROUGH RESULTS OF MATHEMATICS WEB-BASED LEARNINGS

No.	Evaluated Aspect	Students			Quantity	Percentage (%)	Note
		I	II	III			
1.	Content	4	4	3	11	92	Very Good
2.	Learning Design	4	4	3	11	88	Very Good
3.	Implementation	3	4	3	10	83	Very Good
4.	Technical Quality	4	4	4	12	94	Very Good
Mean						89	Very Good

The results of the pretest and posttest of students who were included in the Walkthrough activity can be seen in TABLE VI.

TABLE VI. PRETEST AND POSTTEST RESULTS ON WALKTHROUGH ACTIVITIES

No.	Students	Pretest	Posttest
1	SPW01	65	80
2	SPW02	70	85
3	SPW03	60	75
Mean		65	80

In the walkthrough activity involving 3 students, the average increase in student learning outcomes was obtained which in the pretest the average learning outcome was 65% and in the posttest the average learning outcomes increased to 80%. The average student response questionnaire results were also obtained by 89%. If the average value is matched with the percentage level of achievement on a five scale, the walkthrough activity was considered to be running very well. Based on the results of the expert validation and walkthrough activities, it can be concluded that the developed mathematics web-based learning is proper to be used. After the formative evaluation of mathematics web-based learning passed through expert validation and walkthrough activities, it was continued with Micro Group Evaluation with a larger number of students. The Micro Group Evaluation results of the Mathematics web-based learning can be seen in Table VII.

TABLE VII. THE MICRO GROUP EVALUATION RESULT OF MATHEMATICS WEB-BASED LEARNING

Students	Efficiency	Content	Learning Design	Implementation	Mean
S1	4	4	3	4	3.75
S2	4	4	4	4	4.00
S3	3	3	4	4	3.50
S4	4	4	4	4	4.00
S5	3	4	4	4	3.75
S6	4	4	4	4	4.00
S7	4	4	4	3	3.75
S8	4	4	4	4	4.00
S9	4	4	3	4	3.75
S10	4	4	4	4	4.00
S11	4	4	4	3	3.75
S12	4	4	4	4	4.00
S13	4	4	3	4	3.75
S14	4	4	4	4	4.00
S15	4	4	4	4	4.00
Quantity	58	59	57	58	58.00
Percentage (%)	97	98	95	97	97
Note	Very Good	Very Good	Very Good	Very Good	Very Good

The results of the pretest and posttest of students who were included in the Micro Group Evaluation activity can be seen in TABLE VIII.

TABLE VIII. PRETEST AND POSTTEST RESULTS ON MICRO GROUP EVALUATION ACTIVITIES

No.	Students	Pretest	Posttest
1	SPEM01	60	75
2	SPEM02	75	82

3	SPEM03	70	80
4	SPEM04	70	84
5	SPEM05	65	76
6	SPEM06	75	84
7	SPEM07	70	78
8	SPEM08	65	80
9	SPEM09	65	75
10	SPEM10	75	85
11	SPEM11	60	76
12	SPEM12	70	79
13	SPEM13	75	81
14	SPEM14	75	84
15	SPEM15	70	75
Mean		69.3	79.6

In the micro-evaluation activity that involved 15 students, it was found the average increase in student learning outcomes. The average learning outcome in the pretest was 69.3 and in the posttest the average learning outcomes increased to 79.6. The average student response questionnaire results of 97% also obtained. If the average value was matched with the percentage level of achievement on a scale of five, the micro-evaluation activity was considered to be running very well. Based on the results of the evaluation of the micro group, it can be concluded that the developed mathematics web-based learning was proper to use. Furthermore, the flow of formative evaluation continues to the last part, namely the Try-out. The Try-out results of the Mathematics web-based learning can be seen in TABLE IX.

TABLE IX. THE TRY-OUT RESULT OF MATHEMATICS WEB-BASED LEARNING

Students	Evaluated Aspect			
	Implementation	Sustainability	Appropriateness	Acceptance and attraction
S1	4	4	3	4
S2	4	3	4	4
S3	3	3	4	4
S4	4	3	4	4
S5	3	4	4	4
S6	4	4	4	4
S7	4	4	4	4
S8	4	4	4	4
S9	4	3	3	4
S10	4	3	4	4
S11	4	3	4	4
S12	4	4	4	4
S13	4	4	3	4
S14	4	4	4	4
S15	4	4	4	4
S16	4	4	4	3
S17	4	4	4	4
S18	4	3	3	3
S19	4	4	4	3
S20	4	3	4	4
S21	4	3	4	4
S22	3	4	4	4
S23	3	4	4	4
S24	3	4	4	3
S25	4	4	3	4
S26	4	3	4	4
S27	4	3	4	4
S28	3	3	4	3
S29	3	4	4	4
S30	3	4	4	4

Quantity	112	108	115	115
Percentage (%)	93	90	96	96
Note	Very Good	Very Good	Very Good	Very Good

The results of the pretest and posttest of students who were included in the Try-out activity can be seen in TABLE X.

TABLE X. PRETEST AND POSTTEST RESULTS ON TRY-OUT ACTIVITIES

No.	Students	Pretest	Posttest
1	SPTO01	75	85
2	SPTO02	75	86
3	SPTO03	70	84
4	SPTO04	65	78
5	SPTO05	70	80
6	SPTO06	60	75
7	SPTO07	75	85
8	SPTO08	70	82
9	SPTO09	70	80
10	SPTO10	60	76
11	SPTO11	70	84
12	SPTO12	70	81
13	SPTO13	70	84
14	SPTO14	70	80
15	SPTO15	65	78
16	SPTO16	60	82
17	SPTO17	75	85
18	SPTO18	70	80
19	SPTO19	70	84
20	SPTO20	60	76
21	SPTO21	65	77
22	SPTO22	75	85
23	SPTO23	70	82
24	SPTO24	65	80
25	SPTO25	60	76
26	SPTO26	65	79
27	SPTO27	65	81
28	SPTO28	70	84
29	SPTO29	60	75
30	SPTO30	70	80
Mean		67.83	80.8

In the Try-out activity involving 30 students, the average increase in student learning outcomes was obtained which in the pretest the average learning outcome was 67.8 and in the posttest the average learning outcome increased to 80.8. The average student response questionnaire results were also obtained by 93.8%. If the average value was matched with the percentage level of achievement on a five scale, the Try-out activity had been running very well. Based on the results of the Try-out activity, it can be concluded that the developed mathematics web-based learning was proper to use.

The results of this study support several previous studies. The following is the previous research. Bailey et al. with research title Finding Satisfaction: Intrinsic Motivation for Synchronous and Asynchronous Communication in the Online Language Learning Context. The results of the research showed that students' attention and motivation to learning arise when learning materials are associated with what students enjoy[36]. Ruder et al. with research title Getting Started with Team-Based Learning (TBL): An Introduction. The results of the research showed that stimulating student activity can be done by

presenting learning challenges and direct involvement of students in learning practices[37]. Ardana et al. with the research title "The expansion of sociocultural theory-oriented mathematical learning model. The results of the study indicate that learning mathematics must consider 4 pillars (learning to know, learning to do, learning to be, and learning to live together in peace and harmony) [38]. Wares with research title A Gift Box Filled with Mathematics. The results of the research show that the relationship between feedback and reinforcement will be strengthened if it is used frequently and will decrease or even disappear if it is rarely or never used[39]. Therefore, activities related to repetition are very necessary in learning. Sudiarta et al. with the title Investigation on students' mathematical online discussion: A case study in grade 8 SMPN 1 Denpasar. The research result showed that online discussions are able to create very significant mathematical abilities (conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition) and communication skills (clarification, advice). So in this case web-based learning is needed to support discussion activities. Furthermore, Chen et al. with research title Extending Cognitive Load Theory to Incorporate Working Memory Resource Depletion: Evidence from the Spacing Effect. The results of the research indicated that teachers must be able to regulate learning activities, starting from planning, the implementation process to the final stage, namely assessment or evaluation, so that students can participate in the learning process well without significant differences[40]. Based on the results of the research and several supporting theories, it can be concluded that in vocational mathematics learning there should be a collaboration of mathematics learning materials with vocational practice activities so that in addition to learning in theory students also get hands-on practical experience in learning mathematics.

IV. CONCLUSION

This research has succeeded in developing a prototype of a mathematics web-based learning that carries the theme of table set-up industry practice in the Food and Beverage Service department. In the expert test activities, the average percentage of material validators was 85% (very good) and the average percentage of media validators was 95% (very good). In the walkthrough activity, an average increase in student learning outcomes was obtained, which in the pretest was 65 and in the posttest increased to 80. The average student response questionnaire results were also obtained by 89% (very good). In the micro-evaluation activity, it was found that the average increase in student learning outcomes. The average in the pretest was 69.3 and in the posttest increased to 79.6. The average student response questionnaire results of 97% (very good) also obtained. In the Try-out activity, an average increase in student learning outcomes was obtained, which in the pretest was 67.8 and in the posttest increased to 80.8. The average student response questionnaire results were also obtained by 93.8% (very good). Thus it can be concluded that the mathematics web-based learning developed in this study has met the standards of validity, practicability and effectiveness to be said to be proper for use. Future work that can be done is to analyze the factors that are influenced by the use of this mathematics web-based learning and perform a comparative analysis with other equivalent learning applications.

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BUKTI ACCEPTED (11 MARET 2022)

The screenshot shows a Gmail interface with a pink floral background. The search bar at the top contains "IJACSA". The left sidebar shows the "Kotak Masuk" (Inbox) with 1,682 messages. The main content area displays an email from "Editor IJACSA" dated "Jun, 11 Mar 2022, 20.54". The subject is "IJACSA Acceptance Notification - Volume 13 No 3 March 2022". The email body contains the following text:

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Development of Mathematics Web-based Learning on Table Set-Up Activities

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Abstract—This paper aimed to discuss product design and expert validation of the mathematics web-based learning table set up activities in the hospitality industry. This research was a type of Research and Development, which aimed to develop a new product. The experts involved in this study were four experts. There were two experts in the field of learning technology as media validators and two experts in the field of mathematics education as material validators. In the process of validating the mathematics web-based learning in this study, using a questionnaire that had been prepared to evaluate it as a research instrument. This research had produced mathematics web-based learning which consists of five parts, namely, the initial part to recall about the Cartesian coordinates; the translation sub-material section; the reflection sub-material section; the rotation sub-material section; and the dilatation sub-material section. In the review activity by experts, the average percentage of material validators was eighty five percent, its means is very good and the average percentage of media validators was ninety five its means is very good also. It showed that this mathematics web-based learning can be said to be proper to use.

Keywords—Development; web-based learning; mathematics; table set-up; activities

I. INTRODUCTION

Mathematics subjects have a quite unique and important part in the competence learning of the tourism department [1]-[2]. Understanding the right concepts in learning mathematics can train transcendental reasoning, range of thinking, and solving a case[3]-[4]. This will make students accustomed to completing case studies in tourism in a more analytical and realistic manner[5]. In general, this is in accordance with the statement which stated that mathematics shows outstanding skills in a person, both in terms of concretizing something abstract, finding the right solution in a case, as well as the power of thinking on an object[6]-[7].

In reality, mathematics is one of the subjects that are less attractive to Tourism Vocational School students[8]-[9]. This is because it is considered a difficult subject to learn and most students have not realized and understood the true meaning of mathematics[10]. This is in accordance with the opinion that most students do not want to focus on learning mathematics because of the assumption that mathematics is difficult, scary, boring and some people hate mathematics so that every time they take part in learning mathematics, someone immediately feels unwell[11]-[14].

Factors from students and teachers become the basis for the reason why many students are less interested in learning

mathematics[15]. The factor from the students that became the basis for the reason was the classical view of students, namely that mathematics is a difficult subject to learn[16]. The factor from the teacher that became the basis for the reason was the difficulty of the teacher in finding the right method to lead students to participate in mathematics learning voluntarily without feeling coercion directly[17]. This difficulty causes students to feel bored and not enthusiastic to take part in learning mathematics[18]. This is supported by the opinion which stated that the difficulty in selecting methods that can be used to make students understand in learning mathematics is a teacher difficulty[19]. Another factor that causes students' lack of interest in learning mathematics is because the form of teaching materials has not been able to raise awareness of the importance of mathematics[20]. Teaching materials that still feature algorithms and formula derivations, raise students' assumptions about solid material, feel less clear and it is difficult to understand the material because of a dislike for math subjects[21]. This is supported by the results of research showing that: 1) learning by using textbooks is not liked by students, because it creates a sense of being lost in dense material and emphasizes algorithms so that students have difficulty accepting mathematics learning[22]; 2) The presentation of learning that is commonly done by teachers has not been able to arouse students' desire to learn, so students are not quite ready to receive lessons [23]; 3) students do not feel challenged to work on the questions available in mathematics learning, because the examples of questions and practice questions provided are difficult to understand [24].

In addition, Tourism Vocational School students only focus on the competencies of the majors they choose[25]. Many students think that Mathematics is not so applied in Business World or Industrial World where they carry out On the Job Training or their place to find work after graduating from Vocational High School[26]. Some explorations have also been carried out by Mathematics teachers, but the number of students who have an interest can still be counted on the fingers[27]. Students' understanding of the many mathematical concepts that can be applied in solving problems related to the tourism sector is still so minimal[28]. This causes the sinking of students' desire to study mathematics voluntarily[29].

Overcoming these problems requires the development of teaching materials that can make Tourism Vocational Schools' students interested in learning mathematics. The teaching materials is able to developed can be in the form of mathematics web-based learning[30]-[31]. Applications in the form of colorful pictures with interesting characters and

mathematical material treats in it[33]-[32]. The reality in the field is that there are many mathematical learning applications that have been developed. Some even carry applications with the STEM concept[34]. However, there is no mathematics web-based learning that carries the theme of tourism practice, so that Tourism Vocational School students understand that mathematics learning is also used in the work practice of the tourism industry.

Based on this, this research was conducted to develop an application for learning mathematics that was raised in industrial work practices in one part of the food and beverage service. The material used in the development of this mathematics web-based learning is Transformation material. Where this Transformation material is raised in the table set up, that is the one of tourism practice activity.

II. METHOD

This research was a type of Research and Development (R&D), which aimed to develop a new product. The development activities carried out in this research were focused on product design and formative evaluation. The stages carried out consist of the Preliminary Research and Prototyping Stage.

A. Preliminary Research

The steps taken at this stage were literature studies to look for problems related in schools learning as well as deficiencies in existing mathematics learning. Field surveys to complement and strengthen the findings in the literature study also taken. This stage aimed to obtain information on problems in mathematics material and deficiency of previous instructional media. The field survey consisted of interviews with three teachers and distributing questionnaires to one hundred and eighteen students.

B. Prototyping Stage

The manufacture and improvement of product prototypes as a problem-solving medium obtained earlier was carried out at this stage, after finding problems in the learning process at the preliminary research stage. This stage consists of designing design guidelines, optimizing prototypes, formative evaluations. In the formative evaluation activity, it is the product evaluation stage (prototype) that had been made previously[35]. The prototype was tested in several stages of formative evaluation, including: 1) Research team members examined the design using a list of important characteristics from the intervention components; 2) A group of experts provide responses related to the intervention prototype. The experts involved in this study were 2 (two) experts in the field of learning technology as media validators and 2 (two) experts in the field of mathematics education as material validators. Usually this is done using open and closed questionnaires or interviews; 3) Walkthrough: through face-to-face researchers together with users (teachers and students) reviewing the intervention prototype; 4) Micro Evaluation was intended to evaluate a small group of users (students) to use the intervention section in normal situations; 5) Try-out a number of user groups (students) using the intervention. On the focus of effectiveness evaluation, evaluators did it by test.

Expert validation questionnaires, student response questionnaires, and teacher response questionnaires were analyzed using a multilevel scale. The data obtained was quantitative data which was then translated into qualitative data. Respondents did not answer one of the qualitative answers on the multilevel scale model, but answered one of the quantitative answers which were provided. Five alternative answers were provided on a graded scale with a range of values from 0 to 4, which are shown in Table I.

TABLE I. CRITERIA FOR GRADED SCALE

Score	Criteria
4	Very Good
3	Good
2	Enough
1	Bad
0	Very Bad

The percentage of answers for each question indicator can be calculated using the following formula.

$$\text{Percentage} = \frac{\sum \text{all respondents score}}{\sum \text{respondents} \times 4} \times 100\%$$

The percentage of answers to all aspects of the question can be calculated using the following formula.

$$\text{Percentage} = \frac{\sum \text{overall score of respondent criteria}}{\sum \text{respondents} \times \sum \text{item} \times 4} \times 100\%$$

In addition to using a multilevel scale in the expert validation questionnaire, the answers to the conclusions from the validation results used the Guttman scale. The Guttman scale yields an unequivocal "yes-no" answer. The "adequate-not eligible" scale was used in this questionnaire. Drawing conclusions about the properly of the media used the following formula.

$$\text{Percentage} = \frac{\sum \text{answers of proper from respondents}}{\sum \text{respondents}} \times 100\%$$

III. RESULT AND DISCUSSION

A. Preliminary Research

In the Preliminary Research stage, several potentials and problems faced by students were found based on the results of the preliminary research questionnaire presented in Table II. The potential and the problem was that students were less interested in learning mathematics because of the assumption that mathematics has nothing to do with tourism activities. According to them, productive learning activities are more important and more fun to carry out than learning mathematics. Students feel lazy and find it difficult to learn mathematical material contained in textbooks. And there was no mathematics learning media that can link productive learning with mathematics learning. This was supported by the results of interviews with mathematics subject teachers which can be concluded as follows. 1) Most students feel lazy and have

difficulty in learning mathematics; 2) Some students feel less helped by the teaching materials which they use in learning mathematics; 3) The teaching materials used in learning mathematics are quite varied, it's just that there are no learning media that can be collaborated with productive learning; 4) When applying mathematics learning media that can be downloaded from the internet, students play with their cellphones instead of studying; 5) The mathematics material

that they should have learned, especially in XI grade, was simply missed when they had carried out the On the Job Training program; 6) Educators expect mathematics material to be linked and collaborated with vocational practice activities; 7) Some students who think that mathematics is not important prefer to participate in vocational activities, even though they already know that they are lagging behind in learning mathematics.

TABLE II. RESULTS OF PRELIMINARY RESEARCH QUESTIONNAIRE

No.	Subject	Item										Total	Percentage (%)	
		1	2	3	4	5	6	7	8	9	10			11
1	P1S1	1	0	1	0	1	0	1	0	1	1	0	6	54.55
2	P1S2	1	0	1	1	0	0	1	1	1	0	1	7	63.64
3	P1S3	0	1	1	0	1	0	1	0	0	1	1	6	54.55
4	P1S4	0	1	0	0	1	1	1	0	1	1	1	7	63.64
5	P1S5	1	0	0	1	1	0	1	0	0	1	0	5	45.45
6	P1S6	0	1	0	1	1	1	1	1	1	0	0	7	63.64
7	P1S7	1	1	1	0	1	1	0	1	0	1	0	7	63.64
8	P1S8	0	0	0	1	0	1	1	1	1	0	0	5	45.45
9	P1S9	1	1	1	0	0	1	1	0	1	0	0	6	54.55
10	P1S10	0	1	0	1	0	0	0	1	0	0	1	4	36.36
11	P1S11	1	0	0	1	1	1	1	0	1	0	1	7	63.64
12	P1S12	0	1	0	1	0	1	1	1	0	1	1	7	63.64
13	P1S13	1	1	1	0	1	1	1	0	0	1	0	7	63.64
14	P1S14	0	1	0	1	0	1	0	1	1	0	0	5	45.45
15	P1S15	1	0	0	1	1	0	0	1	0	1	0	5	45.45
16	P1S16	0	1	0	1	0	1	0	0	1	1	1	6	54.55
17	P1S17	1	0	0	1	1	0	0	1	0	0	1	5	45.45
18	P1S18	0	1	1	1	0	1	1	0	0	1	1	7	63.64
19	P1S19	1	0	1	0	1	1	0	1	0	1	1	7	63.64
20	P1S20	1	1	0	0	1	0	1	1	1	1	1	8	72.73
21	P1S21	0	0	1	0	1	1	0	1	0	1	0	5	45.45
22	P1S22	1	0	1	0	1	1	1	0	1	0	1	7	63.64
23	P1S23	1	1	0	1	0	1	1	0	1	0	1	7	63.64
24	P1S24	0	1	0	1	1	1	1	1	0	0	0	6	54.55
25	P1S25	1	0	0	1	1	1	1	0	1	0	1	7	63.64
26	P1S26	0	1	0	1	0	1	0	1	0	1	1	6	54.55
27	P1S27	1	1	1	0	1	0	0	1	0	1	0	6	54.55
28	P1S28	1	1	0	1	0	1	0	1	1	0	0	6	54.55
29	P1S29	1	0	1	0	0	1	1	1	0	1	0	6	54.55
30	P1S30	1	1	0	1	0	1	1	0	0	1	1	7	63.64
31	P2S1	1	0	1	0	0	0	1	0	1	1	0	5	45.45
32	P2S2	1	1	0	0	1	1	0	0	1	1	1	7	63.64
33	P2S3	1	0	1	0	1	0	1	0	0	1	1	6	54.55
34	P2S4	1	1	1	0	0	1	0	0	1	0	1	6	54.55
35	P2S5	0	1	1	1	1	0	0	1	0	0	1	6	54.55
36	P2S6	1	1	1	1	1	0	1	0	0	1	0	6	54.55
37	P2S7	1	0	0	1	0	1	0	1	1	1	1	7	63.64
38	P2S8	0	1	1	0	0	1	1	0	1	0	1	6	54.55
39	P2S9	1	1	0	1	0	1	1	1	0	0	1	7	63.64
40	P2S10	1	1	0	1	1	0	1	0	1	0	1	7	63.64
41	P2S11	0	1	0	1	1	1	1	1	0	1	0	7	63.64
42	P2S12	1	0	0	0	1	1	1	1	1	0	0	6	54.55
43	P2S13	0	1	0	1	1	1	0	0	0	1	0	5	45.45
44	P2S14	0	1	0	1	0	1	1	1	1	0	1	7	63.64
45	P2S15	1	1	1	0	0	0	1	0	1	0	1	6	54.55
46	P2S16	1	0	0	1	0	1	1	1	0	0	0	5	45.45
47	P2S17	0	1	0	1	0	1	1	0	1	0	1	6	54.55
48	P2S18	1	0	0	1	1	1	0	1	0	1	1	7	63.64
49	P2S19	0	1	0	1	0	1	0	0	1	0	1	5	45.45
50	P2S20	1	1	1	1	1	0	0	1	0	1	0	7	63.64
51	P2S21	1	0	1	0	0	1	0	1	1	0	0	5	45.45
52	P2S22	1	1	1	1	0	0	1	0	0	1	0	6	54.55
53	P2S23	1	1	1	1	0	1	0	1	0	1	1	8	72.73
54	P2S24	1	0	0	1	1	0	0	1	1	0	1	6	54.55

55	P2S25	1	1	1	1	0	1	0	1	0	1	0	7	63.64
56	P2S26	0	1	0	0	1	1	1	1	1	0	0	6	54.55
57	P2S27	1	0	0	1	1	1	1	0	0	1	0	6	54.55
58	P2S28	0	1	0	1	1	1	0	0	1	0	1	6	54.55
59	P2S29	0	1	1	0	1	1	1	1	0	0	1	7	63.64
60	P2S30	1	0	1	0	1	0	1	0	1	0	1	6	54.55
61	P3S1	1	1	1	1	0	0	0	1	1	0	1	7	63.64
62	P3S2	0	1	1	0	1	0	1	1	0	1	1	7	63.64
63	P3S3	0	1	0	1	1	0	1	0	1	1	1	7	63.64
64	P3S4	1	0	0	1	1	1	0	0	1	0	1	6	54.55
65	P3S5	0	1	0	0	0	0	1	0	1	1	1	5	45.45
66	P3S6	1	1	1	1	1	0	1	0	0	1	0	7	63.64
67	P3S7	0	1	0	1	1	1	0	1	1	0	0	6	54.55
68	P3S8	1	1	1	0	0	1	0	1	0	1	0	6	54.55
69	P3S9	0	1	0	1	1	0	0	1	1	1	1	7	63.64
70	P3S10	1	0	0	1	0	1	0	1	1	1	1	7	63.64
71	P3S11	0	1	0	1	1	1	1	0	1	0	0	6	54.55
72	P3S12	1	1	1	1	1	0	0	1	0	0	1	7	63.64
73	P3S13	1	1	1	0	1	1	1	0	0	1	1	8	72.73
74	P3S14	0	1	1	1	1	1	0	1	0	1	0	7	63.64
75	P3S15	1	0	0	0	1	0	1	1	1	1	1	7	63.64
76	P3S16	1	1	1	1	0	0	1	1	0	1	1	8	72.73
77	P3S17	0	1	1	0	1	0	1	0	1	1	1	7	63.64
78	P3S18	0	1	0	0	0	1	1	1	1	1	1	7	63.64
79	P3S19	1	0	0	1	1	1	1	1	1	1	0	8	72.73
80	P3S20	0	1	0	1	1	1	0	1	1	0	1	7	63.64
81	P3S21	1	1	1	1	1	1	1	1	0	1	0	9	81.82
82	P3S22	1	0	0	1	1	1	1	0	1	0	0	6	54.55
83	P3S23	0	1	1	0	1	1	0	1	0	1	0	6	54.55
84	P3S24	1	1	1	1	0	1	1	1	1	1	1	10	90.91
85	P3S25	1	0	0	0	1	0	1	1	1	0	0	5	45.45
86	P3S26	1	1	1	1	0	0	1	1	1	1	1	9	81.82
87	P3S27	1	1	1	0	1	0	1	1	0	1	1	8	72.73
88	P3S28	0	0	1	0	1	0	1	0	1	1	1	6	54.55
89	P3S29	1	1	0	0	0	1	0	0	1	1	1	6	54.55
90	P4S1	1	0	1	0	1	0	1	0	1	1	1	7	63.64
91	P4S2	1	1	0	1	1	0	1	0	0	1	0	6	54.55
92	P4S3	1	0	1	0	1	0	1	1	1	0	0	6	54.55
93	P4S4	1	1	1	1	0	0	1	1	0	1	0	7	63.64
94	P4S5	0	1	0	0	1	0	0	1	1	1	1	6	54.55
95	P4S6	1	0	0	1	1	1	1	1	1	0	0	7	63.64
96	P4S7	0	1	0	1	1	1	1	0	0	1	0	6	54.55
97	P4S8	1	0	0	1	1	1	1	1	1	0	0	7	63.64
98	P4S9	1	1	1	0	1	0	1	1	0	1	0	7	63.64
99	P4S10	0	1	0	1	0	0	1	0	1	1	1	6	54.55
100	P4S11	1	0	0	0	1	0	1	1	1	1	1	7	63.64
101	P4S12	0	1	0	1	1	1	0	1	0	0	0	5	45.45
102	P4S13	1	1	0	1	0	1	1	0	0	1	1	7	63.64
103	P4S14	0	1	0	1	1	1	0	1	0	1	1	7	63.64
104	P4S15	1	0	0	0	1	1	0	1	1	1	0	6	54.55
105	P4S16	0	1	0	1	1	0	1	0	0	1	1	6	54.55
106	P4S17	1	1	1	1	1	1	0	1	0	0	1	8	72.73
107	P4S18	1	1	1	0	0	1	1	0	0	1	1	7	63.64
108	P4S19	1	1	0	1	0	1	0	1	0	1	1	7	63.64
109	P4S20	1	1	1	0	0	1	1	1	0	1	0	7	63.64
110	P4S21	1	0	0	1	0	1	1	1	1	0	0	6	54.55
111	P4S22	0	1	1	0	1	0	1	1	0	1	0	6	54.55
112	P4S23	1	1	0	1	0	0	0	1	1	1	1	7	63.64
113	P4S24	1	1	1	0	1	0	1	0	1	1	0	7	63.64
114	P4S25	0	0	1	0	1	1	1	1	0	1	1	7	63.64
115	P4S26	1	1	0	0	1	0	0	1	1	1	1	7	63.64
116	P4S27	1	0	1	0	1	0	1	0	1	0	1	6	54.55
117	P4S28	1	1	1	1	1	1	0	0	1	1	1	9	81.82
118	P4S29	1	1	1	0	0	0	1	0	1	1	1	7	63.64

B. Prototyping Stage

In the Prototyping stage, the researcher made a plan to determine the Basic Competence and Student Learning Experience and made a feasibility instrument. The selection of subject matter is done based on the consideration of the difficulties of teachers and students in learning mathematics. Transformation material in mathematics vocational high school XI grade was chosen because of the frequent delays in learning this material. This was because when these learning materials must have been given, students instead have to focus on vocational practice activities to face the On the Job Training (OJT) program. The students' too busy with vocational practice activities resulted in the Transformation material being missed and made students start to feel that mathematics was not important, the most important thing was a productive subjects.

This mathematics web-based learning was developed to make students more aware that mathematics can be found in productive subjects. And in order the cognitive load of students in learning mathematics can be reduced, so that students begin to feel that learning mathematics is interesting to understand. At this stage the researchers collaborated between vocational practice activities and mathematics learning, where mathematics learning material was inserted into several steps of vocational practice activities. The parts of the developed mathematics web-based learning can be explained as follows.

At the beginning section of the application before starting the Transformation lesson, students are invited to recall the Cartesian field. The initial part of this application can be seen in the form of Fig. 1.

In this section, students are led to imagine the Cartesian coordinates on the table-set up practice. Students are stimulated to determine the correct Cartesian coordinates for placing flower vases and other table-set up practice equipment.

The second part of the application is the part where learning mathematics begins to enter the sub-section of the translation material. The second of this application can be seen in the form of Fig. 2.

In this section, the table-set-up practice has reached the laying of plates. Here students are led to understand the concept of translation material with cases of shifting plates and shifting other table-set up practice equipment. Students are led to understand that shifts that occur in plates or other items will only change the point of position, not the size or shape of the item.



Fig. 1. Given the Cartesian Coordinates.

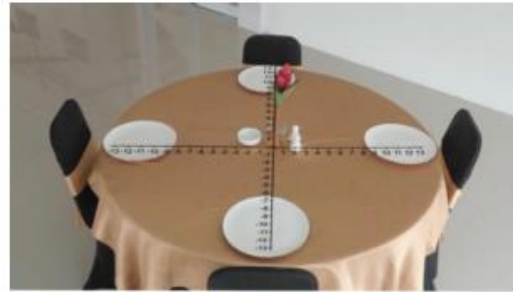


Fig. 2. Translation Sub-Material Section.

The third part of the application is the part where mathematics learning begins to enter the Reflection material sub-section. The third of this application can be seen in the form of Fig. 3.

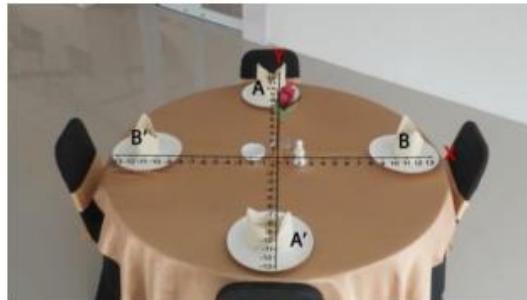


Fig. 3. Reflection Sub-Material Section.

In this section the table-set up practice has reached the laying of the napkin on the plate. Here students are led to understand the concept of Reflection material with the case of a flower vase as a mirror, where the distance from plate A to the flower vase is the same as the distance from plate A' to the flower vase. Students are led to understand the reflection that occurs on plate A and plate B and determine the position of the image according to the coordinates of the points. Students are also led to understand that the mirror in this reflection material can be a point and can also be a line.

The fourth part of the application is the part where mathematics learning begins to enter the Rotation material sub-section. The fourth of this application can be seen in the form of Fig. 4.

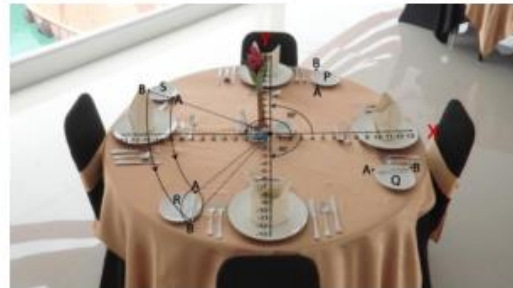


Fig. 4. Rotation Sub-Material Section.

In this section, the table-set up practice is equipped with cutlery placement. Here students are led to understand the concept of material Rotation with cases, rotation of the knife on the B&B plate marked with the letter "S" with the knife on the B&B plate marked with the letter "R". This rotation occurs with the flower vase as the axis. Students are led to understand the rotation that occurs if it is rotated clockwise or counterclockwise at a certain angle.

The fifth part of the application is the part where mathematics learning has entered the Dilatation material sub-section. The fifth of this application can be seen in the form of Fig. 5.



Fig. 5. Dilatation Sub-Material Section.

In this section the table-set up is complete, all the cutlery, crockery, glassware, and linen that are prepared on the table as a utensil to eat for a guest have been set up. Here students are led to understand the concept of Dilatation material with cases: replacement the show plate with B&B plate; And also with the replacement of other cutlery with the same shape but different sizes. Students are led to understand the enlargement or reduction that occurs if there is a replacement in the cutlery.

This developed mathematics web-based learning had been validated by educational technology experts and mathematics education experts. In the process of validating the application of mathematics learning in this study, using a questionnaire that had been prepared to evaluate it as a research instrument. Adjusting the objectives of each questionnaire was taken into consideration in the preparation of this instrument. The questionnaires were media expert evaluation questionnaires and material expert evaluation questionnaires. The activity of reviewing the mathematics web-based learning was carried out by distributing questionnaires to experts.

The results of the validation carried out by two material experts and two media experts on the mathematics web-based learning can be seen in Table III and Table IV.

TABLE III. VALIDATION RESULTS OF MATERIAL EXPERT VALIDATION ON MATHEMATICS WEB-BASED LEARNINGS

No.	Evaluated Aspect	Number of Items	Validators		Percentage (%)	Revision
			I	II		
1	Learning Design	16	11	14	78	No revision
2	Teaching Material	6	6	5	92	No revision
Mean					85	

TABLE IV. VALIDATION RESULTS OF MEDIA EXPERTS ON MATHEMATICS WEB-BASED LEARNING

No.	Evaluated Aspect	Number of Items	Validators		Percentage (%)	Revision
			III	IV		
1	Software engineering	10	10	10	100	No revision
2	Visual Communication	13	12	11	89	No revision
Mean					95	

The validation of the mathematics web-based learning was carried out by four experts, namely two experts in the field of Learning Engineering education and two experts in the field of Mathematics Education. The evaluation carried out on the mathematics web-based learning used several aspects to measure it, including: software engineering, visual communication, learning design and teaching materials. In the aspect of "software engineering", evaluator III assigned an assessment score "1 (proper)" on each indicator with the total number of indicators was 10. Evaluator IV also gave an assessment score "1 (proper)" on each indicator with the total number of indicators was 10. So that obtained a percentage of 100%. By matching the results of these percentages with the percentage level of achievement on a five scale, the "software engineering" aspect was included in very good qualifications, so there was no need to revise this aspect. In the aspect of "visual communication" there were 13 indicator items, evaluator III gave an assessment score "1 (proper)" on 12 indicator items and "0 (it was not proper)" on 1 indicator item. Evaluator IV gave an assessment score of "1 (proper)" on 11 indicator items and "0 (they were not proper)" on 2 indicator items. So that obtained a percentage of 89%. By matching the results of these percentages with the percentage level of achievement on a five scale, the "visual communication" aspect was included in the very good qualification, so there was no need to revise this aspect. In the aspect of "learning design" which consists of 16 indicator items, evaluator I gave an assessment score "1 (proper)" on 11 indicator items and "0 (they were not proper)" on 6 indicator items. Evaluator II gave an assessment score "1 (proper)" on 14 indicator items and "0 (they were not proper)" on 2 indicator items. So that obtained a percentage of 78%. By matching the results of these percentages with the percentage level of achievement on a five scale, the "learning design" aspect is included in good qualifications, so there is no need to revise this aspect. In the aspect of "teaching material" which consists of 6 indicator items, evaluator I gave an assessment score "1 (proper)" on all indicator items. Evaluator II gave an assessment score "1 (proper)" on 5 indicator items and "0 (it was not proper)" on 1 indicator item. So that the percentage obtained was 92%. By matching the results of these percentages with the percentage level of achievement on a five scale, the "teaching material" aspect is included in very good qualifications, so there is no need to revise this aspect.

In addition to the results of the expert validity test, walkthrough activities were also carried out. In this case the author used it as a guide for revising the mathematics web-based learning. The results of the walkthrough activities can be seen in Table V.

TABLE V. WALKTHROUGH RESULTS OF MATHEMATICS WEB-BASED LEARNINGS

No.	Evaluated Aspect	Students			Quantity	Percentage (%)	Note
		I	II	III			
1.	Content	4	4	3	11	92	Very Good
2.	Learning Design	4	4	3	11	88	Very Good
3.	Implementation	3	4	3	10	83	Very Good
4.	Technical Quality	4	4	4	12	94	Very Good
Mean						89	Very Good

The results of the pretest and posttest of students who were included in the Walkthrough activity can be seen in Table VI.

TABLE VI. PRETEST AND POSTTEST RESULTS ON WALKTHROUGH ACTIVITIES

No.	Students	Pretest	Posttest
1	SPW01	65	80
2	SPW02	70	85
3	SPW03	60	75
Mean		65	80

In the walkthrough activity involving 3 students, the average increase in student learning outcomes was obtained which in the pretest the average learning outcome was 65% and in the posttest the average learning outcomes increased to 80%. The average student response questionnaire results were also obtained by 89%. If the average value is matched with the percentage level of achievement on a five scale, the walkthrough activity was considered to be running very well. Based on the results of the expert validation and walkthrough activities, it can be concluded that the developed mathematics web-based learning is proper to be used. After the formative evaluation of mathematics web-based learning passed through expert validation and walkthrough activities, it was continued with Micro Group Evaluation with a larger number of students. The Micro Group Evaluation results of the Mathematics web-based learning can be seen in Table VII.

The results of the pretest and posttest of students who were included in the Micro Group Evaluation activity can be seen in Table VIII.

In the micro-evaluation activity that involved 15 students, it was found the average increase in student learning outcomes. The average learning outcome in the pretest was 69.3 and in the posttest the average learning outcomes increased to 79.6. The average student response questionnaire results of 97% also obtained. If the average value was matched with the percentage level of achievement on a scale of five, the micro-evaluation activity was considered to be running very well. Based on the results of the evaluation of the micro group, it can be concluded that the developed mathematics web-based learning was proper to use. Furthermore, the flow of formative evaluation continues to the last part, namely the Try-out. The

Try-out results of the Mathematics web-based learning can be seen in Table IX.

TABLE VII. THE MICRO GROUP EVALUATION RESULT OF MATHEMATICS WEB-BASED LEARNING

Students	Efficiency	Content	Learning Design	Implementation	Mean
S1	4	4	3	4	3.75
S2	4	4	4	4	4.00
S3	3	3	4	4	3.50
S4	4	4	4	4	4.00
S5	3	4	4	4	3.75
S6	4	4	4	4	4.00
S7	4	4	4	3	3.75
S8	4	4	4	4	4.00
S9	4	4	3	4	3.75
S10	4	4	4	4	4.00
S11	4	4	4	3	3.75
S12	4	4	4	4	4.00
S13	4	4	3	4	3.75
S14	4	4	4	4	4.00
S15	4	4	4	4	4.00
Quantity	58	59	57	58	58.00
Percentage (%)	97	98	95	97	97
Note	Very Good	Very Good	Very Good	Very Good	Very Good

TABLE VIII. PRETEST AND POSTTEST RESULTS ON MICRO GROUP EVALUATION ACTIVITIES

No.	Students	Pretest	Posttest
1	SPEM01	60	75
2	SPEM02	75	82
3	SPEM03	70	80
4	SPEM04	70	84
5	SPEM05	65	76
6	SPEM06	75	84
7	SPEM07	70	78
8	SPEM08	65	80
9	SPEM09	65	75
10	SPEM10	75	85
11	SPEM11	60	76
12	SPEM12	70	79
13	SPEM13	75	81
14	SPEM14	75	84
15	SPEM15	70	75
Mean		69.3	79.6

TABLE IX. THE TRY-OUT RESULT OF MATHEMATICS WEB-BASED LEARNING

Students	Evaluated Aspect			
	Implementat ion	Sustainabil ity	Appropria teness	Acceptance and attraction
S1	4	4	3	4
S2	4	3	4	4
S3	3	3	4	4
S4	4	3	4	4
S5	3	4	4	4
S6	4	4	4	4
S7	4	4	4	4
S8	4	4	4	4
S9	4	3	3	4
S10	4	3	4	4
S11	4	3	4	4
S12	4	4	4	4
S13	4	4	3	4
S14	4	4	4	4
S15	4	4	4	4
S16	4	4	4	3
S17	4	4	4	4
S18	4	3	3	3
S19	4	4	4	3
S20	4	3	4	4
S21	4	3	4	4
S22	3	4	4	4
S23	3	4	4	4
S24	3	4	4	3
S25	4	4	3	4
S26	4	3	4	4
S27	4	3	4	4
S28	3	3	4	3
S29	3	4	4	4
S30	3	4	4	4
Quantity	112	108	115	115
Percenta ge (%)	93	90	96	96
Note	Very Good	Very Good	Very Good	Very Good

The results of the pretest and posttest of students who were included in the Try-out activity can be seen in Table X.

In the Try-out activity involving 30 students, the average increase in student learning outcomes was obtained which in the pretest the average learning outcome was 67.8 and in the posttest the average learning outcome increased to 80.8. The average student response questionnaire results were also obtained by 93.8%. If the average value was matched with the percentage level of achievement on a five scale, the Try-out activity had been running very well. Based on the results of the Try-out activity, it can be concluded that the developed mathematics web-based learning was proper to use.

TABLE X. PRETEST AND POSTTEST RESULTS ON TRY-OUT ACTIVITIES

No.	Students	Pretest	Posttest
1	SPTO01	75	85
2	SPTO02	75	86
3	SPTO03	70	84
4	SPTO04	65	78
5	SPTO05	70	80
6	SPTO06	60	75
7	SPTO07	75	85
8	SPTO08	70	82
9	SPTO09	70	80
10	SPTO10	60	76
11	SPTO11	70	84
12	SPTO12	70	81
13	SPTO13	70	84
14	SPTO14	70	80
15	SPTO15	65	78
16	SPTO16	60	82
17	SPTO17	75	85
18	SPTO18	70	80
19	SPTO19	70	84
20	SPTO20	60	76
21	SPTO21	65	77
22	SPTO22	75	85
23	SPTO23	70	82
24	SPTO24	65	80
25	SPTO25	60	76
26	SPTO26	65	79
27	SPTO27	65	81
28	SPTO28	70	84
29	SPTO29	60	75
30	SPTO30	70	80
Mean		67.83	80.8

The results of this study support several previous studies. The following is the previous research. Bailey et al. with research title Finding Satisfaction: Intrinsic Motivation for Synchronous and Asynchronous Communication in the Online Language Learning Context. The results of the research showed that students' attention and motivation to learning arise when learning materials are associated with what students enjoy[36]. Ruder et al. with research title Getting Started with Team-Based Learning (TBL): An Introduction. The results of the research showed that stimulating student activity can be done by presenting learning challenges and direct involvement of students in learning practices[37]. Ardana et al. with the research title "The expansion of sociocultural theory-oriented mathematical learning model. The results of the study indicate that learning mathematics must consider 4 pillars (learning to know, learning to do, learning to be, and learning to live together in peace and harmony) [38]. Wares with research title A Gift Box Filled with Mathematics. The results of the research show that the relationship between feedback and reinforcement will be strengthened if it is used frequently and

will decrease or even disappear if it is rarely or never used[39]. Therefore, activities related to repetition are very necessary in learning. Sudiarta et al. with the title Investigation on students' mathematical online discussion: A case study in grade 8 SMPN 1 Denpasar. The research result showed that online discussions are able to create very significant mathematical abilities (conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition) and communication skills (clarification, advice). So in this case web-based learning is needed to support discussion activities. Furthermore, Chen et al. with research title Extending Cognitive Load Theory to Incorporate Working Memory Resource Depletion: Evidence from the Spacing Effect. The results of the research indicated that teachers must be able to regulate learning activities, starting from planning, the implementation process to the final stage, namely assessment or evaluation, so that students can participate in the learning process well without significant differences[40]. Based on the results of the research and several supporting theories, it can be concluded that in vocational mathematics learning there should be a collaboration of mathematics learning materials with vocational practice activities so that in addition to learning in theory students also get hands-on practical experience in learning mathematics.

IV. CONCLUSION

This research has succeeded in developing a prototype of a mathematics web-based learning that carries the theme of table set-up industry practice in the Food and Beverage Service department. In the expert test activities, the average percentage of material validators was 85% (very good) and the average percentage of media validators was 95% (very good). In the walkthrough activity, an average increase in student learning outcomes was obtained, which in the pretest was 65 and in the posttest increased to 80. The average student response questionnaire results were also obtained by 89% (very good). In the micro-evaluation activity, it was found that the average increase in student learning outcomes. The average in the pretest was 69.3 and in the posttest increased to 79.6. The average student response questionnaire results of 97% (very good) also obtained. In the Try-out activity, an average increase in student learning outcomes was obtained, which in the pretest was 67.8 and in the posttest increased to 80.8. The average student response questionnaire results were also obtained by 93.8% (very good). Thus it can be concluded that the mathematics web-based learning developed in this study has met the standards of validity, practicability and effectiveness to be said to be proper for use. Future work that can be done is to analyze the factors that are influenced by the use of this mathematics web-based learning and perform a comparative analysis with other equivalent learning applications.

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