

## CHAPTER 4

### DATA EXPOSURE AND RESEARCH FINDINGS

This chapter describes the findings obtained from the 3 stages of the implementation of development research which include:

1. Preliminary study stage, through literature studies and field studies to determine media needs according to teachers and students.
2. The development study stage, starting with the initial product design (*prototype*), to media and e-books.
3. The evaluation stage is to test the effectiveness of the implementation of the media and evaluate the feasibility of the digital text book based on the responses of stakeholders.

In the early stages, namely a definition phase (*define*) specification produced learning objectives, then on the next stage of the design stage (*design*) produced the initial design of digital teaching materials that use *software macromedia flash*. These digital teaching materials are arranged based on the material that has been determined and described in accordance with Competency Standards, Basic Competencies, Indicators and Learning Objectives.

This chapter will present research findings related to the games used by students, the level of success, the effectiveness of the learning process and the mistakes that are often made in learning to use digital text book, as well as the difficulties students often face in learning to use digital text book or e-books.

## 4.1. Data Exposure

### 4.1.1. General description of the object (research setting)

The general description of the research object is as follows:

This research was conducted at the MA Bilingual Muslimat NU Sidoarjo, in the even semester of the 2019/2020 school year.

The subjects in this study were all students of class XI MA Bilingual Muslimat NU Sidoarjo for the academic year 2019/2020 with a total of 28 students, the details of which can be seen in the table below.

Table 4.1. Recapitulation of the Number of Students in Class XI MINU Pucang Sidoarjo for the 2014/2015 academic year.

CLASS	NUMBER		TOTAL
	BOYS	GIRLS	
XI SCIENCE	9	19	28
SOCIAL XI	10	17	27

Because the research was conducted in a class where the teaching language used was full English, the study was conducted in class XI Science with a total of 28 students. Meanwhile, class XI Social uses a bilingual introduction with a total of 27 students. With each class taken a sampling of 10 students per class, so the research subjects amounted to 55 students.

## 4.2. Preliminary Stage

At this preliminary study stage, it begins with a literature study and field study to determine the needs of *e-book* media according to teachers and students, which include:

#### **4.2.1. Literature study and field study.**

Literature study is one of the pre-research stages in any type of research, including R&D. *Creswell*, in Iis Prasetyo, the definition of literature study is, “*literature review is a written summary of journal actions, books and other documents that describe the past and current state of informational; organize literature into topics; and documents a need for a proposed study*” (*creswell, 2008*)<sup>1</sup>

From this understanding, it is very clear that the literature review activity is the activity of writing conclusions contained in journals, books or other documents. Of course, the documents summarized are documents that are relevant to the study activities that will be carried out by the researcher. The following describes an analysis of the media used.

Researchers explore as much information as possible about the use of e-books which will later be used as the basis for making learning media. Next, dig up information from teachers and students which include: 1) teacher and student informants' responses to the media used; 2) the need for teaching materials according to teachers and students; 3) analyze the media that have been used by the teacher; and 4) a description of the findings of learning media needs.

##### **4.2.1.1. Informant responses from the results of interviews conducted with teachers and students on the media used.**

In class XI Science does not use media with learning outcomes in the form of a portfolio obtained from the JIGSAW learning model. In class XI Science using

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<sup>1</sup> Iis prasetyo, *Teknik Analisis Data Dalam Research And Development*, karya tulis, Universitas Negeri Yogyakarta, 2012, 1.

media in the form of *short cards*. Produce a portfolio in the form of material descriptions of Craft and Entrepreneurship.

1. The teacher's response to the media *role table* includes; a) media display, b) media benefits for learning, c) media advantages, d) media principles as a learning tool.

a. Media display

The media *role table* display is very simple. The teacher makes his own from buffalo paper or folio size cardboard. Give a certain size and then cut into several parts. The pieces of paper are given keywords, then described by students as completely as possible within the allotted time. Because you make your own, so the shape and appearance is very simple so that the media attracts students' interest.

b. Benefits of media for learning

Learning does not attract the attention of students so that it can not grow motivation to learn. Teaching materials or materials are simpler in form but have meaning so that they can be better understood by students and allow students to master teaching objectives better. This familiarizes students in describing and explaining the material more broadly.

c. Media advantages

*The role table* has not been able to accommodate students who are slow to receive lessons because students who are slow to receive subject matter usually only produce 2 to 3 rows per given time. The way this model works is individual but can achieve maximum results. Media *role tables* can provide a stimulus for students to learn more focused and efficiently considering that

there is a time limit and a minimum value limit as the final result of student work.

Control is in the hands of students so that the level of student learning speed can be adjusted to the level of mastery. In other words, students do not just listen to the teacher's description, but also experience and perform and demonstrate the learning materials that are being faced.

Lesson materials will be clearer in meaning, can be better understood by students, and allow students to master the objectives of the lesson well. Students do more learning activities, and not only listen to the teacher's description, but also observe, do and demonstrate themselves.

d. The principle of media as a learning tool.

In terms of simplicity, the *role table* media has elements contained in a visual with fewer elements making it easier for students to capture and understand the message presented visually. The information messages presented are not long or complicated and are easy to read.

2. Student responses regarding the *role table* media are about the appearance and learning outcomes.

The following summarizes the results of interviews from several students who were interviewed, namely Shealvin, Nabila, Rafianti, Angeli and Dewi about learning using digital systems.

a. Shealvin stated that the media used can hone the power of thinking more broadly. Because there is a time limiting the activity of describing while

students are required to describe as much as possible. Yulio himself wants to get good grades at the end of each Fiqh lesson.

- b. Nabila stated that the *media role table* can stimulate learning motivation because there is competition with her friends so that you want to achieve the best results. However, there are still obstacles in the language of instruction, namely English.
- c. Rafianti stated that the *media role table* can indeed stimulate learning motivation and improve learning outcomes, but it is less interesting because it is only in the form of pieces of paper with keywords.
- d. Angeli stated that the *media role table is* interesting. He can compete with his friends in getting the value he wants.
- e. Dewi stated that she had not been able to do the task optimally because the description for him took a long time while when he was working on it, time had run out while the resulting description was only two or three sentences. Because the language of instruction is English.

#### **4.2.1.2. Media needs according to teachers and students.**

Based on the results of interviews and observations made to teachers and students as informants in class XI MA Bilingual Muslimat NU Sidoarjo about media needs in the eyes of Entrepreneurship, the following data were obtained:

1. The results of interviews about the need for learning media for homeroom teachers of class XI, namely the need for media that can include; 1) mastery of student material, 2) use of interactive media, 3) habituation for students to the form of test and exam questions.

2. The results of interviews about the need for media to support the use of e-learning and learning e-books for class XI students are in need of media; 1) interesting, 2) stimulate learning motivation, 3) not boring, 4) improve learning outcomes.

#### **4.2.1.3. E-Learning as a Support for Learning and Application of Video Media and e-books**

##### 1. E-Learning

E-learning MA Bilingual Muslimat NU Sidoarjo is a form of official facility provided by school to all active students to support the teaching and learning process. The use of E-learning is specifically intended to realize one of the learning targets in madrasas, namely ASTEAM. Madrasa e-learning can be accessed through the official website:

<https://elearning.mabilingualmuslimat.sch.id>

##### a. Feature

Elearning MA Bilingual Muslimat NU Sidoarjo has several features, including:

##### 1. Task Menu

The task menu is used by administrators for management of all assignments created by teachers, used by teachers/teachers to create, edit, delete, and view assignments made by the teacher in question, and used by students to view a list of tasks opened by the teacher /administrator.

In this menu, there is a sub page, namely the correction page, which can only be seen by the teacher/administrator. The point is to correct students' answers if the form of the assignment is essay/upload or see the student's grades

if the assignment is multiple choice. In addition, on this page there is also another sub page, namely monitor exams, which can only be seen by teachers/administrators, used to monitor the process of running exams or completing assignments.

## 2. Material Menu

In the material menu, the teacher can input, edit, and delete materials related to the teacher. The form of material that can be entered is in the form of written material and material in the file (file upload).

## 3. Order

This feature is an additional feature in the e-learning application, where its function is to send messages to other users. Administrators, teachers, and students can send direct messages to one or more other users.

## 4. Announcement

This feature allows teachers and administrators to make announcements and publish them to other teachers or to all students. Announcements are scheduled so that they only appear on a predetermined date and time.

## 5. Student Search

This feature allows teachers, students, and administrators to search for student data. Administrators can edit usernames and passwords as well as profiles of all students through this feature. Meanwhile, teachers and students can only view student profile data.

## 6. Master Search



This feature allows teachers, students, and administrators to search for teacher data. Administrators can edit usernames and passwords as well as profiles of all teachers through this feature. Meanwhile, teachers and students can only view teacher profile data.

b. Sitemap

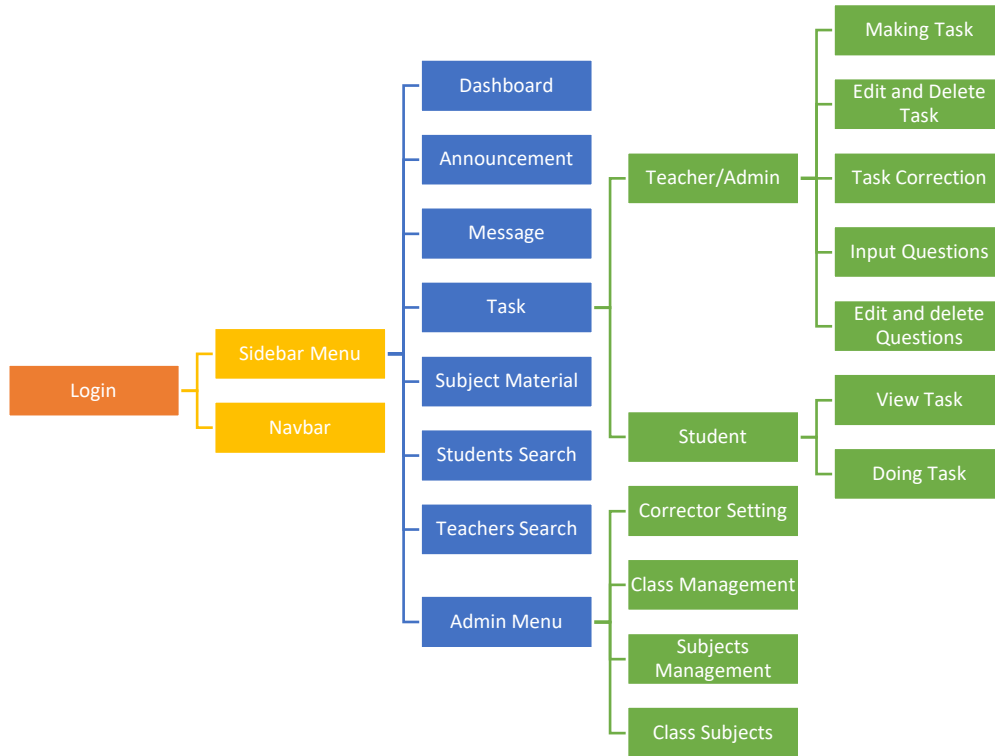


Chart 4.1. Sitemap of e-learning features

c. User Role Sharing

1. Administrator

This role is authorized to regulate/set several things, including:

a. Class Management

Starting from creating classes, creating groups, changing classes, changing groups, deleting classes, or deleting groups, administrators can do this.

b. Subject Management

Administrators can create/add existing subjects in the madrasa/school.

c. Class Subject Management

Administrators can set the active subjects in each class. Subject data is taken from subject data that has been inputted.

d. Student Data Management

The administrator is authorized to enter student data per class through direct input one by one student or multiple students through the provided excel template. Then edit the student data that has been entered and delete student data, either deleting one by one or deleting all data at once.

e. Teacher Data Management

In addition to being authorized to manage student data, administrators are also authorized to manage teacher data. These include entering teacher data, either one by one or at the same time entering data using the provided excel template; also authorized to edit and delete teacher data that has been inputted.

f. Material Management

Administrators can insert, edit, and delete self-made learning materials in the form of written materials or files that can be downloaded by students.

g. Task Management

Administrators are authorized to create, edit, view, and delete tasks. Administrators are also authorized to open/activate assignments, edit, delete, or correct student answers on assignments that have been made by

the teacher. In addition, the administrator is also authorized to input questions in the question bank.

h. Assignment Corrector Management

If the madrasa applies a cross system in making questions and their correctors, then this feature can be used by the administrator to change the correctors or question makers, so that assignments that have been made by the teacher can be corrected by other teachers or the corrector teacher.

i. Sending and Receiving Messages

Administrators are authorized to send messages to other users using the message menu. Messages can be directed to a single user or to multiple users at once.

j. Announcement Management

Administrators are authorized to create, edit, delete, and enable/disable announcements. Announcements can be set to be visible to the teacher, visible to students, or visible to both.

k. Edit Profile and password

Administrators can edit their own profiles and passwords or those of other users.

l. Reset Password and Username

Administrators can reset passwords or change other users' emails/usernames.

2. Teacher

This role is authorized to regulate matters related to the learning process, including:

a. Material Management

Teachers can enter, edit, and delete self-made learning materials in the form of written materials or files that can be downloaded by students.

b. Question Management in Question Bank

Input questions can use the templates that have been provided or input one by one without using a template. The form of the questions entered can be in the form of multiple choice questions, essays, or uploaded questions. Questions have been inputted in the e-learning is not one ias visible to other teachers or students. In addition, teachers can also edit and delete their own questions.

c. Assignment Management for Students

Teachers/teachers can create and edit assignments to be assigned to students. Teachers can also activate/deactivate or delete their own assignments that have been created.

d. Correction/Assessment of Student Assignments

The teacher can make corrections to students' answers on the assignments they have made. The forms of assignments that can be corrected are assignments in the form of essays and uploads, because for multiple-choice assignments, the value will automatically appear after students submit answers.

e. Sending and Receiving Messages

Teachers are authorized to send messages to other users using the message menu. Messages can be directed to a single user or to multiple users at once.

f. Announcement Management

Guru authorized to create, edit, delete, and activate / deactivate the announcement of its own. Announcements can be set to be visible to other teachers, visible to students, or visible to both.

g. Edit Profile and password

Teachers can edit their own profiles and passwords.

3. Student

This role is authorized to see/do things related to the learning process, including:

a. View Materials and Leave Comments

All materials intended for a student's class, can be seen and read by the students of that class.

b. Viewing and Doing Tasks

All assignments that have been activated/displayed by teachers or administrators, can be seen by students. Students can also work on assignments that are still active or have not been closed by the teacher/administrator.

c. Sending and Receiving Messages

Students are authorized to send messages to other users using the message menu. Messages can be directed to a single user or to multiple users at once.

d. Seeing the Announcement

Students can see active announcements from teachers or administrators.

e. Edit Profile and password

Students can edit their own profile and password.

#### 4. Technology

Broadly speaking, this e-learning application is made in a website-based Programming Language, so it can be more *multiplatform* when compared to mobile applications (Android/iOS). The programming structure is divided into two, namely programming on the *backend* and programming on the *frontend*.

In the *backend* section , the technology used is to use the PHP programming language version 7 which is packaged in *the* CodeIgniter version 3 *framework* as a bridge between the database and the *frontend* programming section, and MySQL as a container for managing data in the database. In addition, the JavaScript Programming Language which is packaged in *the* jQuery *framework* is also used to handle *Asynchronous* data exchange processes or better known as *AJAX (Asynchronous JavaScript and XML)*.

In the design section or the *frontend* of this application, CSS (*Cascading Style Sheet* ) is used which is packaged in *the* Bootstrap *framework* version 4 to support *responsive* features in the application, so that it still looks *user-friendly* when accessed from *devices* with any screen size. In addition, this application also uses the PHP language writing model in HTML. So the writing of the code is slightly different from most used by other programmers.

This application is made in the form of a *compact* application or *plug and play* , so that it can be used or installed easily by others. In addition, the writing structure has also been adjusted so that you can easily add other features in the form of plugins.

## 2. Online Exam Application

The MA Bilingual Muslimat NU Sidoarjo online exam application is a development of an existing e-learning application. This application is used by madrasas in the implementation of exams in madrasas. This application can be accessed through the page: <https://ah1.mabilingualmuslimat.sch.id>, or <https://ah2.mabilingualmuslimat.sch.id>, or <https://pat.mabilingualmuslimat.sch.id>, depending on the type of exam being administered.

### a. FEATURE

The MA Bilingual Muslimat NU Sidoarjo online exam application has several features, including:

#### 1. Exam List Menu

The exam list menu is used by administrators to manage all exams that are being/will be implemented. It is used by administrators to create, edit, delete exam maps that will be or are being tested, used by question makers or correctors to input questions and correct answers to exam results, and are used by students to view a list of ongoing exams.

In this menu, there is a sub page, namely the correction page, which can only be seen by the teacher/administrator. The point is to correct students' answers if the form of the exam is essay/upload or see student scores if the exam is multiple choice. In addition, on this page there is also another sub page, namely monitor the exam, which can only be seen by the teacher/administrator, which is used to monitor the ongoing process of the exam.

## 2. Announcement

This feature allows teachers and administrators to make announcements and publish them to other teachers or to all students. Announcements are scheduled so that they only appear on a predetermined date and time.

## 3. Student Search

This feature allows teachers, students, and administrators to search for student data. Administrators can edit usernames and passwords as well as profiles of all students through this feature. Meanwhile, teachers and students can only view student profile data.

## 4. Master Search

This feature allows teachers, students, and administrators to search for teacher data. Administrators can edit usernames and passwords as well as profiles of all teachers through this feature. Meanwhile, teachers and students can only view teacher profile data.



## b. Sitemap

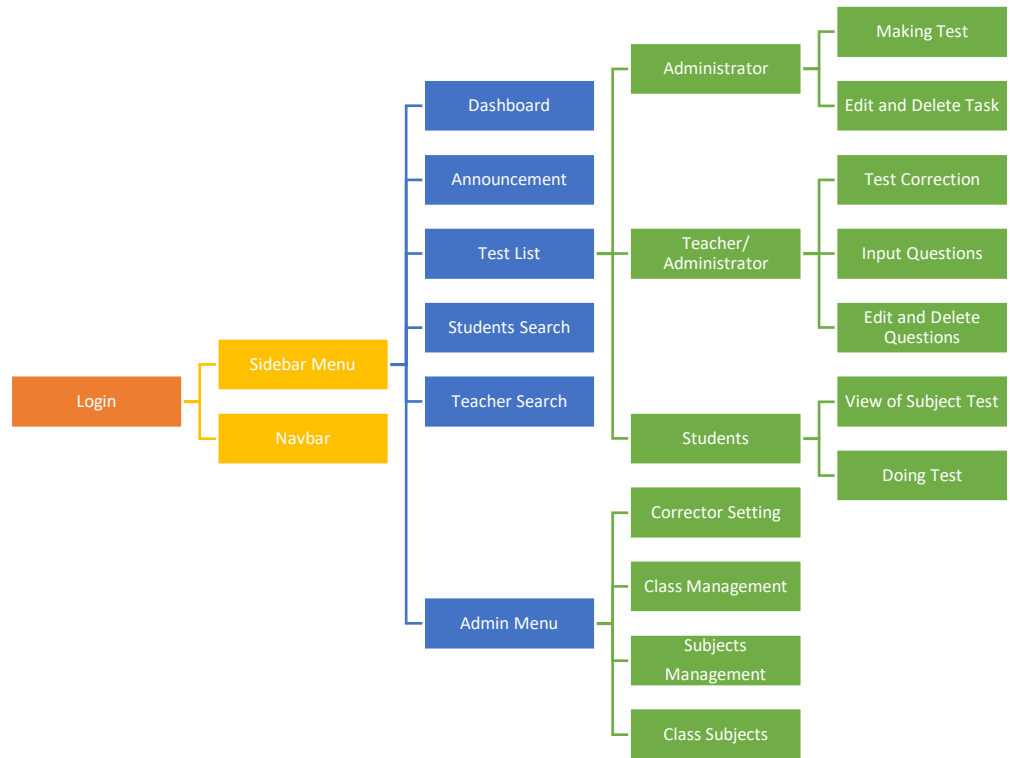


Chart 4.2. Sitemap of online exam application features

## 3. User Role Share

### a. Administrator

This role is authorized to regulate/set several things, including:

### b. Class Management

Starting from creating classes, creating groups, changing classes, changing groups, deleting classes, or deleting groups, administrators can do this.

### c. Subject Management

Administrators can create/add existing subjects in the madrasa/school.

### d. Class Subject Management

Administrators can set the active subjects in each class. Subject data is taken from subject data that has been inputted.

e. Student Data Management

The administrator is authorized to enter student data per class through direct input one by one student or multiple students through the provided excel template. Then edit the student data that has been entered and delete student data, either deleting one by one or deleting all data at once.

f. Teacher Data Management

In addition to being authorized to manage student data, administrators are also authorized to manage teacher data. These include entering teacher data, either one by one or at the same time entering data using the provided excel template; also authorized to edit and delete teacher data that has been inputted.

g. Exam Management

Administrators are authorized to create, edit, view, and delete tasks. Administrators are also authorized to open/activate exam folders, edit, delete, or correct student answers on assignments that have been made by the teacher. In addition, the administrator is also authorized to input questions in the question bank.

h. Exam Corrector Management

If the madrasa applies a cross system in making questions and their correctors, then this feature can be used by the administrator to change the correctors or question makers, so that assignments that have been made by the teacher can be corrected by other teachers or the corrector teacher.

i. Announcement Management

Administrators are authorized to create, edit, delete, and enable/disable announcements. Announcements can be set to be visible to the teacher, visible to students, or visible to both.

j. Edit Profile and password

Administrators can edit their own profiles and passwords or those of other users.

k. Reset Password and Username

Administrators can reset passwords or change other users' emails/usernames.

4. Teacher

This role is authorized to regulate matters related to the learning process, including:

a. Question Management in Question Bank

Input questions can use the templates that have been provided or input one by one without using a template. The form of the questions entered can be in the form of multiple choice questions, essays, or uploaded questions. Questions that have been entered in e-learning cannot be seen by other teachers or students.

In addition, teachers can also edit and delete their own questions.

b. Input Questions in the Exam Map

Teachers/teachers can create and edit questions in the exam folder that will be given to students.

c. Correcting / Assessing Student Exam Results

The teacher can make corrections to student answers on the exams that have been carried out. The form of the exam that can be corrected is in the form of essays

and uploads, because for multiple-choice exams, the scores will automatically appear after students submit answers.

d. Announcement Management

Teachers are authorized to create, edit, delete, and enable/disable their own announcements. Announcements can be set to be visible to other teachers, visible to students, or visible to both.

e. Edit Profile and password

Teachers can edit their own profiles and passwords.

5. Student

This role is authorized to see/do things related to the learning process, including:

a. Watching and Taking Exams

All exams that have been activated/displayed by the administrator, can be seen by students. Students can also take exams on a predetermined schedule.

b. Viewing the Announcement

Students can see active announcements from teachers or administrators.

c. Edit Profile and password

Students can edit their own profile and password.

6. Technology

Broadly speaking, this online exam application is made in a website-based Programming Language, so it can be more *multiplatform* when compared to a mobile application (Android/iOS). The programming structure is divided into two, namely programming on the *backend* and programming on the *frontend*.

In the *backend* section, the technology used is to use the PHP programming language version 7 which is packaged in *the* CodeIgniter version 3 *framework* as a bridge between the database and the *frontend* programming section, and MySQL as a container for managing data in the database. In addition, the JavaScript Programming Language which is packaged in *the* jQuery *framework* is also used to handle *Asynchronous* data exchange processes or better known as *AJAX* (*Asynchronous JavaScript and XML*).

In the design section or the *frontend* of this application, CSS (*Cascading Style Sheet*) is used which is packaged in *the* Bootstrap *framework* version 4 to support *responsive* features in the application, so that it still looks *user-friendly* when accessed from *devices* with any screen size. In addition, this application also uses the PHP language writing model in HTML. So the writing of the code is slightly different from most used by other programmers.

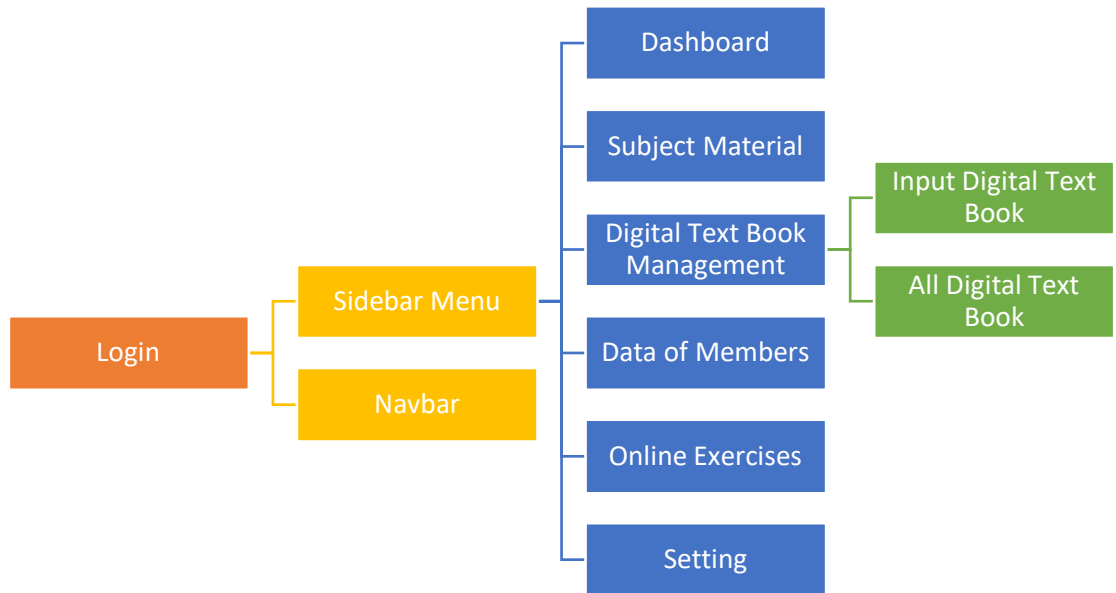
This application is made in the form of a *compact* application or *plug and play* , so that it can be used or installed easily by others. In addition, the writing structure has also been adjusted so that you can easily add other features in the form of plugins.

### 3. Digital Library

The Digital Library of MA Bilingual Muslimat NU Sidoarjo is a form of digital library that can be used by all active students to support the student learning process. In this digital library, there are several digital modules in the form of pdf, ppt, or learning videos, so that students can freely choose according to their way of learning. The madrasa digital library can be accessed through the official website:

<http://digilib.mabilingualmuslimat.sch.id>

### a. Sitemap



### 4.3. Sitemap Digital Library

### b. Feature

The Digital Library of MA Bilingual Muslimat NU Sidoarjo has several features, including:

#### 1. Dashboard Menu

The dashboard menu is used by all users (teachers, students, and administrators) to view the latest materials/modules uploaded by teachers and can be used to search modules based on the keywords entered.

#### 2. Material Menu per Map

In this menu, teachers and students can see directly the material based on the subjects in the madrasa. Within each subject, the material is grouped into three grade levels, namely grades X, XI, and XII. Also in this menu page, students and teachers can choose to view materials/modules in the form of videos, ppt, or pdf.

### 3. Menu Manage Teaching Materials

This menu is divided into 2 sub menus, namely the input of teaching materials and all teaching materials. This menu is used by teachers to input learning materials/modules into the madrasa digital library.

### 4. Member Data Menu

Contains data for all members / students who have joined the madrasa digital library. In this menu also, teachers and students can see the number of visits of each member.

### 5. Menu Practice Questions Online

In this menu, students can work on practice questions for each subject and the results of the exercise are immediately displayed, so that it can be a forum for student self-evaluation.

### 6. Settings Menu

This feature is used by administrators to add users, edit users, delete users, and change user roles.

#### c. User Role Sharing

##### 1. Administrator

This role is authorized to regulate/set several things, including:

##### a. User Management

Starting from adding users, editing users, resetting user passwords, or deleting and deleting users can be done by administrators.

##### b. User Role Management

Administrators can change the roles of all users, except administrators.

c. Teaching Material Management

Administrators can add teaching materials, edit teaching materials, and delete their own teaching materials

d. Student Data Management

The administrator is authorized to enter student data per class through direct input one by one student or multiple students through the provided excel template. Then edit the student data that has been entered and delete student data, either deleting one by one or deleting all data at once.

e. Teacher Data Management

In addition to being authorized to manage student data, administrators are also authorized to manage teacher data. These include entering teacher data, either one by one or at the same time entering data using the provided excel template; also authorized to edit and delete teacher data that has been inputted.

d. Teacher/Teacher

This role is authorized to regulate matters relating to teaching materials, including:

1. Teaching Material Management

Teachers can insert, edit, and delete homemade learning materials in the form of videos, ppt, or pdf.

2. See the teaching materials inputted by other teachers

Teachers can see teaching materials that have been inputted by other teachers

3. Practice Question Management

Teachers/teachers can create, edit, and delete their own practice questions.



e. Student

This role is authorized to see/do things related to the learning process, including:

1. View Teaching Materials

All teaching materials that have been uploaded by the teacher can be accessed by all students.

2. Doing Practice Questions

All students can work on practice questions that have been uploaded by the teacher.

f. Technology

Broadly speaking, this digital library application is made in a website-based programming language, so it can be more *multi-platform* when compared to mobile applications (Android/iOS). The programming structure is divided into two, namely programming on the *backend* and programming on the *frontend*.

In the *backend* section, the technology used is the PHP programming language version 7 which is packaged in *the CodeIgniter version 3 framework* as a bridge between the database and the *frontend* programming section, and MySQL as a container for managing data in the database. In addition, the JavaScript Programming Language which is packaged in *the jQuery framework* is also used to handle *Asynchronous* data exchange processes or better known as *AJAX (Asynchronous JavaScript and XML)*.

In the design section or the *frontend* of this application, CSS ( *Cascading Style Sheet* ) is used which is packaged in *the Bootstrap framework* version 4 to support *responsive* features in the application, so that it still looks *user-friendly* when accessed from *devices* with any screen size.

Before conducting the research, the researcher conducted an observation stage in class XI Science and XI Social. Researchers need to know the learning used by homeroom teachers when teaching Entrepreneurship subjects when in the learning process in class.

### **4.3. Development Stage**

#### **4.3.1. Planning Phase (*Planning*)**

##### **1. Define the Scope**

The selection of interactive teaching materials took into account some of the results from observations and interviews with subject teachers at MA Bilingual Muslimat NU Sidoarjo. Based on the results of initial observations obtained some information that will be developed in teaching materials in the form of e-books. According to the teacher of Entrepreneurship of grade XI declare that student difficulties in understanding the material that is abstract and visually. This can be seen from the results of the second semester report cards for the 2018/2019 school year which are classified as unsatisfactory.

This difficulty is also supported by the lack of teaching materials used. Teaching materials used by students in class only use textbooks. Where the standard presentation, the presentation of images is less attractive, and not yet interactive which results in students having less or difficulty understanding the concept.

##### **2. Identify Learner Characteristics**

At this stage, it is to identify the characteristics of students with the aim that the results of product development are right on target and in accordance with user needs. Identification of student characteristics was obtained from

theory, interview results, and initial observations at MA Bilingual Muslimat NU Sidoarjo.

Characteristics of high school students have on average have 15-18 years of age, student motivation is increased when using the media in the form of digital (Mawarni & Muhtadi, 2017), each student has different speeds in understanding the material there is a fast, medium and slow, often answers the teacher's questions with short answers, students remember what they see more than what they hear and like to imagine and try new things.

Based on these characteristics, students need to be facilitated in the development of interactive teaching materials. One of them is using interactive teaching materials that support the speed of students in learning (Macarandang, 2009).

For this reason, interactive teaching materials are packaged in digital form in which they can present material visually so that students are able to imagine and think critically.

#### 4. Produce a Planning Document

The process in this stage is making planning documents, consisting of teaching needs, material scripts, test documents, and assessment documents. The need for material scripts includes syllabus, Lesson Plan and material scripts in the form of text, animation, video, and images. The test script document includes a question grid consisting of *pretest* and *posttest*, practice questions, answer keys and discussion of questions. While the

assessment documents are in the form of grids and questionnaires for material experts, media experts and student responses .

#### 5. Determine and Collect Resources

At this stage, the collection of supporting sources in developing interactive teaching material products in the form of software, learning resources, as well as facilities and infrastructure is carried out. The process starts from identifying the syllabus in the form of competency standards and basic competencies that are in accordance with the needs analysis during initial observations and interviews with subject teachers and students.

After determining competency and competency standards, then proceed with making a learning implementation plan. The lesson plans were developed using the assignment method, where these interactive teaching materials will be used independently by students.

The next identification relates to the supporting facilities and infrastructure needed to operate the interactive teaching material product that will be developed. This interactive teaching material product will be in digital form, which is read on a computer or laptop screen.

The next process relates to the content of the material that will be used in interactive teaching material products. In general, the material is obtained from various sources such as textbooks and the *internet*. The material obtained is then designed to be presented in interactive teaching material products. The material is presented in the form of text, images, animations and videos.

## 6. Conduct Initial Brainstorming

At this stage the developer conducts discussions with the class XI subject teachers for the breadth of the material aspects, regarding the determination of learning objectives, indicators for achieving goals, sample questions, practice questions, and evaluation questions and so on. In addition, the developer discusses with Learning Technology about aspects of developing interactive teaching materials to get suggestions and input. The process is also consulted with supervisors, material and media experts.

### **4.3.2. Design Stage ( *Design* )**

At this stage, several activities are carried out including developing ideas, conducting concept and task analysis, making initial program descriptions, and making *flowcharts* and *storyboards*. Each of these activities is described as follows:

#### **4.3.2.1. Develop Initial Content Ideas**

The process in this stage is that all ideas are developed. The idea is about the display, programming and form of interactive teaching materials that can present text content, images, animations, videos. The form of interactive teaching materials that can contain the content is in digital form that can be used/read on computers and laptops.

#### **4.3.2.2. Conduct Task and Concept Analysis**

At this stage is to analyze the material in accordance with the purpose of subjects which have been determined in the syllabus and lesson plans. The next stage is compiling the coverage of the material according to

the learning objectives. In addition, write a concept map as a flow of material to be studied, a grid of questions to measure the achievement of learning objectives, and a test script in the form of *pretest* and *posttest questions* that are used to measure students' conceptual understanding abilities. All documents produced must first be assessed to be suitable for use at the time of data collection, so it is necessary to consult a material expert.

#### **4.3.2.3. Prepare Create Flowchart and Storyboard**

At this stage, a program planning design is made in the form of *flowcharts* and *storyboards*. *Flowchart* is a workflow product of interactive teaching materials that will be developed when used by students. Furthermore, the preparation of this flowchart is used as the basis for making *storyboards*. The developed *flowchart* can be seen in appendix 3a. *Storyboards* created for manyusun design good product design the look, color, buttons, text, video, animation and others. In general, the processes contained in the *storyboard* include cover pages, introductions, descriptions, instructions, objectives and concept maps, material descriptions, summaries, practice questions, answer keys / discussion questions and reference lists.

#### **4.3.3. Development Phase (*Development*)**

The process in this development stage includes the development of the content contained in interactive teaching materials consisting of text, images, animations, practice questions, and videos so that they are easy to read on a computer/laptop or in digital form. The components of interactive teaching materials are the same as the module components in general which consist of:

cover page, module identity, introduction, table of contents, glossary, user goals, descriptions, learning objectives, interactive teaching materials learning instructions, concept maps, criteria for interactive teaching materials, learning activities, competency tests, and answer keys.

The cover page of the interactive teaching materials product is the title page and user identification. To attract students' attention, the title page is equipped with animation. In addition, the provision of animated cubes on the title page describes the contents of interactive teaching materials.

Components of contents, glossary, target users, descriptions, instructions ingredient interactive teaching and map concept is an important component in a product. Concept maps are given so that students have an overview of the scope of the material presented. While the content in interactive teaching material is presented to facilitate student access to pages in accordance with his wishes.

In the description of the material, the material is presented in the form of text, images, animations, videos and is equipped with examples of questions in each sub-chapter. These contents were developed by applying the principles of multimedia design by Mayer (2009), the principle of *nine events of instruction* according to Gagne (1977) and module design guidelines.

The material is presented using simple, clear language so that it is easily understood by students. The presentation of the text is equipped with the use of color, bold and italics to emphasize material keywords such as sub-chapter titles. The *font* size and typeface in this interactive teaching material is *Cambria* with a font size of 14 pt on.

The resulting video content is a video that contains a summary of the material presented in each learning activity. Videos consist of text and graphic content explaining the material. Text and images are presented close together on one page while text and images that are not related to the material are not included in the video.

Furthermore, to make it easier for students to recognize objects in text and images, colors are given. In addition, the video material is equipped with instrumental music so that students do not get bored watching the video.

The product of interactive teaching materials is equipped with practice questions. Practice questions are presented in each learning activity.

1. Initial design / prototype.

The initial design of the media was in the form of a learning video using the video scribe application. The font design uses High tower text, arial narrow, and book antiqua with a font size of 16 pt. The text colors used are black, blue, red, and purple. Dark brown wall background color.



The following is an image of the initial design (prototype):



Figure 4 .4. Initial design (prototype) of learning video.

After the prototype design has been completed and can be used in learning, then the trial phase can be started by being tested in the class on a small scale, which is carried out by several students, namely 3 to 5 students as an initial step before moving on to the next stage.

## 2. Initial design preparation stage.

At this stage, the book cover is made first.



Figure 4.1. Initial design Entrepreneurship E-book cover

- a. Validity/correction of design by waka curriculum, homeroom teacher for class XI Sciene and XI Social.

1. Design correction by the skill division curriculum of skill head master

Ma'am Ummayatul Aziza, S.Pd, as head of the curriculum and skills division. Through interviews, she stated that Entrepreneurship teaching materials are still ordinary like books in general, but their existence is enhanced

by e-books that are maximized in e-learning and video learning media. Her response was positive. She only corrected some of the cover designs, namely the logo and title layout.

## 2. Design correction by homeroom XI Science

Mr. Saifuddin, as the guardian class XI Science interviewed after the trial's first phase of the use of e-books and videos using e-learning, she stated that the functions of e-books and videos have been nice with a note to be more take the attention of the students and be more active.

## 3. Design correction by homeroom XI Social

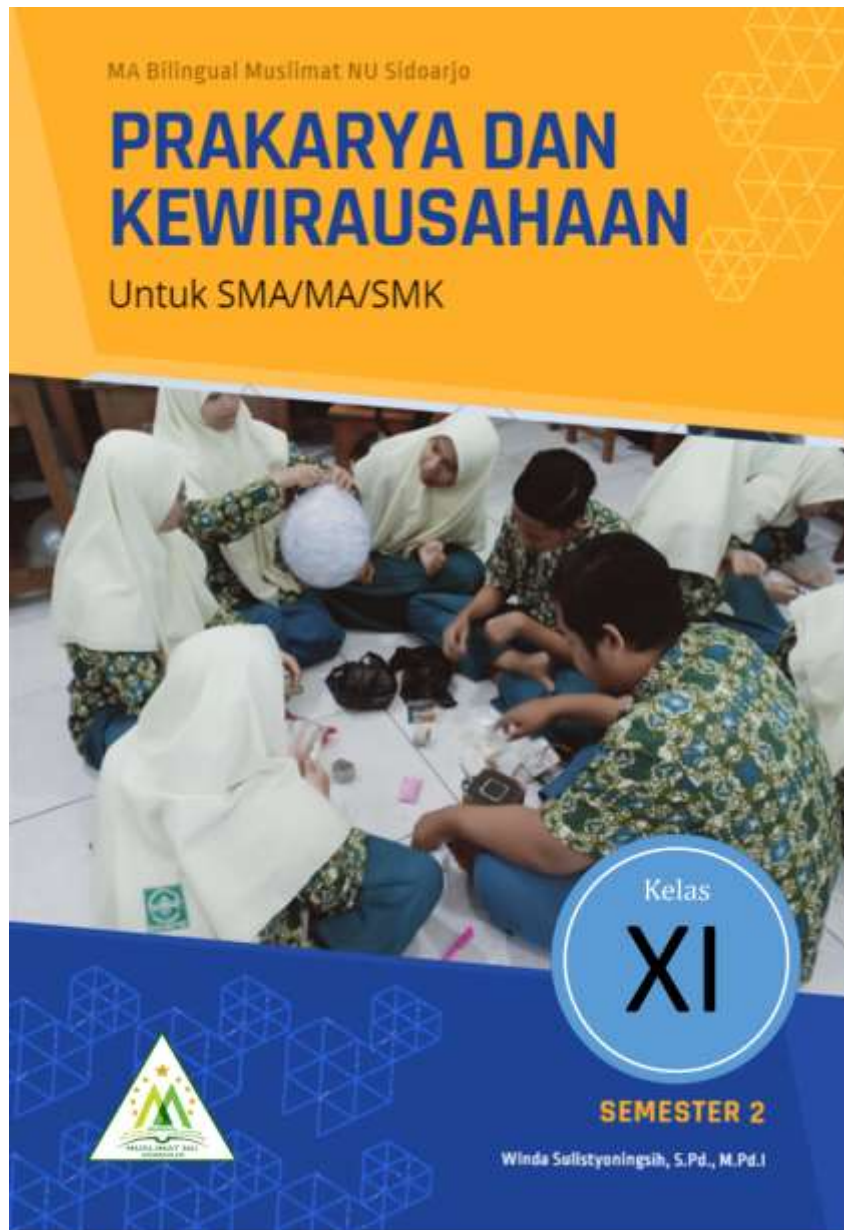
From the results of interviews with Mr. Soniful Ulum, homeroom teacher of class XI Social. He stated that the existence of an e-book that had been made by the teacher was enough to help children in learning activities. Especially for the subject of entrepreneurship because there has never been this textbook in English.

From the results of the correction of the head master of curriculum, a new design was obtained which added some changes, especially in the layout, font types, and templates.

### b. Initial design correction results.

The initial design of the cover and content at first was ordinary. Considering that the researcher does not have a graphic design background and arranges book layouts. However, with good cooperation between the parties concerned, finally the teaching materials can be resolved properly.

The following is an image of the cover design after the first revision of the head master of curriculum and skills division.



Picture 4.2 . Revised cover design I

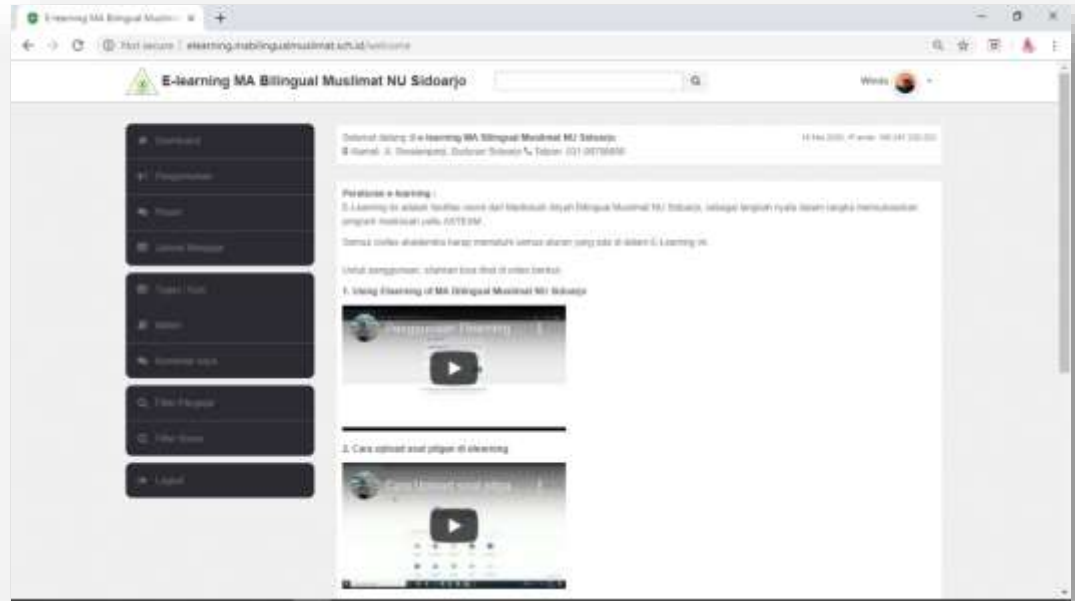
From the picture you can see the difference between the covers. There is a picture of MA Bilingual Muslimat NU students as the school's identity in the teaching materials. The logo has also changed to a new logo. The layout is also different.

### 3. Trial I (initial)

At this stage, the first trial of the use of e-books and learning videos using e-learning begins. Initial trials have weaknesses in teaching time. Researchers are wrong in applying the calculation of learning time so that the practice questions are not optimal.



Picture. 4.3 e-learning login



Picture. 4.4 e-learning display

The following are pictures of Entrepreneurship learning activities on the Processing and Entrepreneurship of International Food.



Figure 4.5. Group 1 cooking practice activity after getting theory.



Figure 4.6. Group 2 cooking practice activity after getting the theory.



Figure 4.7. The results of the cooking practice activity from one of the groups.

The following is the appearance of e-learning learning during the pandemic.

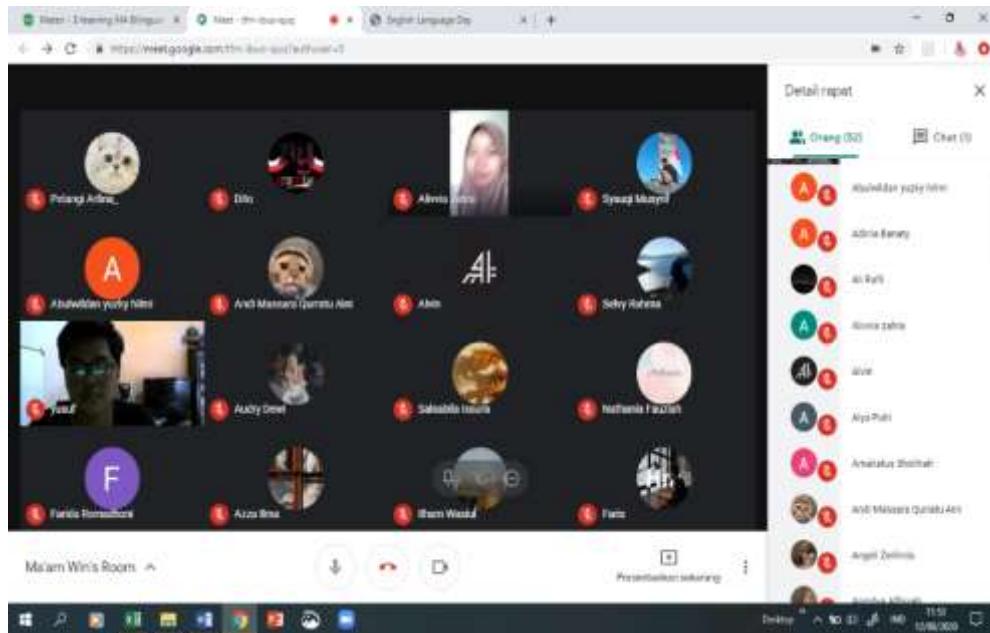


Figure 4.8. Entrepreneurship learning during a pandemic.

Before the pandemic period, e-learning was used for classroom learning that requires a learning process using informatics because in this school every learning uses IT.

E-learning is used to do assignments, announcements, important messages, and all learning activities that involve IT.

#### 1. Design revision II Improvement

In design revision II, it was carried out by material expert, book experts and media experts. There are several changes in this second revision, including the size of teaching materials which previously used the size of F4 to A4 , and several changes including layout, illustrations, arrangement of images and photos, and others . The explanation of some of these changes is as follows:



## 2. A material and book expert

Mr. Adi Bandonono, Researcher proposes his *expert judgment*, as a lecturer at the Master's Degree of Education Technology faculty, UNESA, Researcher proposes *expert judgment* to Dr. Adi Bandonono, as a media expert to validate the physical teaching materials and e-books, as well as display videos. Following are the results of the submission of *expert judgment* to Dr. Adi Bandonono, M.Pd.

### a. Material Test

The results of material testing me n yatakan that, 1) the material presented is in accordance with the standards of competence, 2) basic competencies and indicators, media learning has learning objectives clear, 3) teaching materials contain material appropriate curriculum Entrepreneurship , 4) have a clear concept , 5) accompanied by practice questions or tests, 6) provide facilities for students to more easily learn with the language of instruction in English, 7) attract and encourage students to be more active in working on questions, 8) the media is covered.

### b. Physical Book Test and E-book

The results of the manual test by experts stated that; 1) the presentation of the guidebook is good, 2) the content of the book and the learning indicators are appropriate, 3) it has clear goals, 3) it is equipped with practice questions, 4) the content of the material is easy to understand, 5) uses language that is easy to understand, 6) systematically arranged, 7) contains the data needed in special learning in learning using e-learning media, 8) contains indicators of success.

In testing this teaching material, there were several changes. Among them are book covers and additional writing references about *Entrepreneurship*. It is hoped that this change can improve the appearance and content of teaching materials.

- c. Due to time constraints, the researcher also proposed *expert judgment* to him, as a media expert to validate the teaching materials and learning videos. Following are the results of the submission of *expert judgment* to Dr. Adi Bandono, M.Pd. And Mr. Dr. Suroso, M.Pd., as a media expert as student assistant at SMUN 1 Porong, Sidoarjo.

He explained that; 1) the use of clear colors and facilitate the learning process, especially in the use of its functions in e-learning, 2) the character letters used by the media are appropriate, 3) the way of learning in e-learning is not complicated and interesting to listen to, 4) the material is in accordance with the teaching materials, namely about Processing and Entrepreneurship of Vegetable and Animal Materials into International Food, 5) the content or flow of the media is in accordance with the material presented, 6) has a combination with making questions so that the game helps students' memory, 7) can attract students' interest in learning, 8) can stimulate active and creative teachers, 9) stimulate students to actively learn, 10) stimulate students' exploration power, 11) the making of teaching materials is in accordance with the principles of learning media, 12) is in accordance with the objectives of learning media, 13) effective for students' understanding of given material.

e. Design revision II

There are no corrections for the cover, except for the content in the layout, the content of the material, and removing some parts that are considered unnecessary.

2. Trial II (Main)



Figure 4.9. Entrepreneurship learning during a pandemic.

**4.2. Trial Results of Interactive Teaching Materials**

Based on the model of development Allesi & Trollip (2001), product testing activities are divided into two phases, namely a test alpha and test the beta. The alpha test was carried out by two media experts and two material experts, while the beta test consisted of two stages, namely beta test 1 conducted by 5 students of MA Bilingual Muslimat NU Sidoarjo and beta test 2 conducted by 55 students of class XI MA Bilingual Muslimat NU Sidoarjo. The next step is to stage the test try that conducted by two experts materials and expert media which aims to assess the feasibility of the product and make revisions if there are criticisms and suggestions from the experts.

#### **4.2.1. Alpha Test Results**

The alpha test was carried out by 2 experts, namely material experts and media experts. Test alpha is done by using a questionnaire that has been validated by a validator instruments. Each validation result from two material experts and two media experts is explained.

##### **4.2.1.1 Material Expert Validation Results**

The material validator for interactive teaching materials was carried out by the Marine Colonel (KH) Dr. Adi Bandono KAPOKDOS Naval Technology College. The purpose of this material expert validation is to measure the level of accuracy and quality of the material presented in interactive teaching material products. In addition, the purpose of this material expert validation is to obtain a feasible product from every aspect.

In general, the material expert assessment questionnaire consists of 5 aspects, namely preliminary aspects, content aspects, learning aspects, summary aspects, and task/exercise aspects. In addition, about the *pretest* and *posttest*. Each aspect of material validation is described in the following tables:

1. Introductory Aspect

Table 4.2. Validation Results of Two Material Experts on Preliminary Aspects

No	Rating Points	Material Expert		Average	Category
		I	II		
1	Clarity of instructions for use of materials teach	3	4	3.5	Very Worthy
2	The relationship of the previous material with studied material	3	3	3.0	Very Worthy
3	Clarity of learning objectives	3	4	3.5	Very Worthy
4	Clarity of concept map drawing material to be studied	3	3	3.0	Very Worthy
	Average Score			3.25	Very Worthy

Based on the data from the material expert's assessment on the preliminary aspect, it shows that the item clarity of instructions for teaching materials has the highest average of 3.5 which is categorized as very feasible. This implies that the provision of instructions for the use of teaching materials is easily understood by students, so that students can learn and carry out well the material presented.

Furthermore, the indicator item related to the previous material with the material being studied is considered feasible with an average of 3.0. The material that is presented in interactive teaching material products related to one another. For indicators of the clarity of the concept map depiction of the

material to be studied, the material expert gave a proper assessment with an average score of 3.0. This implies that it can provide convenience to students regarding the order of the material to be studied. Thus, the overall average score for the four items is 3.25 which qualitatively belongs to the very feasible category (X 3.0).

## 2. Content Aspect

Table 4.3. Validation Results of Two Material Experts on Content Aspects

No	Rating Points	Material Average			Category
		Expert			
		I	II		
1	The breakdown of material content	3	4	3.5	Very Worthy
2	Coverage (breadth and depth) content	3	3	3.0	Very Worthy
3	Clarity provides examples to clarify the content	2	4	3.0	Very Worthy
4	Clarity and appropriateness of language used	3	3	3.0	Very Worthy
5	Interesting material content	3	3	3.0	Very Worthy
6	Emphasis on important points content	3	3	3.0	Very Worthy
Average Score				3.08	Very Worthy

Based on the data from the assessment results of two material experts on the content aspect, it shows that of the 6 items, the material content item has the highest average of 3.5. The presentation of content is adjusted to the competency standards and basic competencies contained in the syllabus and lesson plans. The second indicator item is the scope

of the material content , the material expert gives a very decent assessment with an average score of 3.0. This shows that the scope of the content of the material is relevant to the standard competence and basic competence in the three-dimensional space material, and is considered complete, detailed and clear.

In the third indicator item, namely the clarity of providing examples to clarify the material, material experts provide a very decent assessment with an average score of 3.0. This means that the sample questions are in accordance with the material presented. Examples of questions on interactive teaching material products are presented in each sub-topic.

The fourth indicator is the clarity and suitability of the language used, the material expert assesses it very feasible with an average score of 3.0. This means that the language used is simple and clear, so that the language used is easy for students to understand. The fifth indicator item is the attractiveness of the material content, the two material experts gave a very decent assessment with an average score of 3.0. This is because the presentation of material content is not only presented in text form, but is also equipped with image, animation and video content.

The sixth indicator item is emphasizing important points on the content of the material. Both experts gave a very decent assessment with an average score of 3.0. This means that the presentation of material content in interactive teaching materials includes a note column (remember) and the use of bold and italics. Based on the material expert's assessment on the content aspect, the

overall average score was 3.08 which was qualitatively categorized as very feasible (X 3.0).

### 3. Learning Aspect

Table 4.4 . Material Expert Validation Results on Learning Aspects

No	Rating Points	Material Average Expert		Category	
		I	II		
1	The suitability of the material with Characteristics of class X students	3	4	3.5	Very Worthy
2	Clarity of learning objectives	3	4	3.5	Very Worthy
3	Clarity of title for each activity learning	3	4	3.5	Very Worthy
4	Material structure suitability	3	3	3.0	Very Worthy
5	Conformity between learning objectives with examples of consistent questions	3	3	3.0	Very Worthy
6	Conformity between learning objectives with practice questions consistently	3	3	3.0	Very Worthy
7	Clarity of material description	3	3	3.0	Very Worthy
8	Ease of understanding the material	3	3	3.0	Very Worthy
9	The suitability of the image with the material	2	4	3.0	Very Worthy
10	Animation suitability with material	2	4	3.0	Very Worthy
11	The suitability of the video with the material	2	4	3.0	Very Worthy
12	The difficulty level of the material is adjusted with the characteristics of class XI students	3	3	3.0	Very Worthy
13	The sequence of exercises according to material	3	3	3.0	Very Worthy
Average Score				3.12	Very Worthy



Based on the validation results matter experts on aspects of learning shows that of 13 items, there are 3 items that are categorized as very feasible with an average score of 3.5, while 10 other items categorized as very feasible with an average score of 3. The three items that are conformity material with the characteristics of class XI students, clarity of learning objectives, and clarity of titles in each learning activity. Pertaman indicator implies that the presentation of material tailored to the capabilities that are owned student. Those abilities are like rational, abstract, hypothetical, and critical thinking. So that the presentation of material on interactive teaching materials is assessed according to the characteristics of MA students in class XI.

The second indicator is about the clarity of learning objectives. Delivering learning goals before the learning begins very important to do, in order to determine what course which will be controlled and accomplished after studying the three-dimensional space. The third indicator item is the clarity of the title in each learning activity, it is also very important to do so that students know what material will be studied.

The fourth indicator is the suitability of the material structure. The material expert's assessment for this indicator is very feasible with an average score of 3.0. This means that the structure of the material for the three learning activities is in accordance with the systematics of the module. The fourth and fifth indicator items, both material experts rated very feasible with an average score of 3.0. This implies that

giving examples and exercise problems tailored to the objectives of learning are to be achieved.

The seventh indicator is the clarity of the material description, the material expert gives a very decent assessment with an average score of 3.0. This implies that the description of the material presented in interactive teaching materials is very complete because it is equipped with examples of questions in each sub-topic.

The eighth to eleventh indicators are related, including the ease of understanding the material, the suitability of the image with the material, the suitability of the animation with the material and the suitability of the video with the material. Material experts give an assessment for the four items is very feasible with an average score of 3.0. In the Indicator there are pictures, animations, and videos that can help students in facilitating their understanding of the concept of three-dimensional space as a whole. This is in accordance with the focus of research that wants to use media in learning.

For indicators of the level of material difficulty according to the characteristics of class XI students, material experts gave a very decent assessment with an average score of 3.0. This means that the difficulty of the material is in accordance with the characteristics of MA students in class XI. The presentation of the material in it requires students to be able to understand the concept of the material presented in the product being developed.

The thirteenth indicator item, namely the sequence of exercises according to the material can hone students' conceptual understanding skills, material

experts provide a very decent assessment with an average score of 3.0. This means that the presentation of practice questions is found in each learning activity and the questions are sorted based on the material studied first. Based on expert judgment on the learning aspect, the overall average score was 3.12 which was categorized as very feasible (X 3.0).

#### 4) Aspects of Tasks/Practice

Table 4.5. Validation Results of Two Material Experts on Aspects of Tasks/Exercises

No	Rating Points	Material Expert		Average	Category
		I	II		
1	Clarity of practice instructions arranged questions	3	3	3.0	Very Worthy
2	The sequence of practice questions presented comprehensive	3	3	3.0	Very Worthy
3	Question difficulty level	3	3	3.0	Very Worthy
4	The suitability of practice questions with goals learning	3	4	3.5	Very Worthy
5	The accuracy of giving feedback or review answers	3	3	3.0	Very Worthy
6	The accuracy of giving the answer key	3	4	3.5	Very Worthy
7	The accuracy of giving the discussion of the question	3	3	3.0	Very Worthy
Average Score				3.14	Very Worthy

In the task/practice aspect, there are six indicators, namely the first indicator regarding the clarity of the instructions for working on the practice

questions, the material expert gave a very decent assessment with an average score of 3.0. It contains the sense that the work instructions are easy to understand exercises. Thus students will know how to do or operate the practice questions.

Furthermore, the indicator item for providing *feedback* from students' answers, the material expert gave a very decent assessment with an average score of 3.0.

This implies that providing *feedback* on student responses is appropriate and informative. Giving *feedback* aims so that students know the answers are wrong and right, so that students know the level of understanding in mastering the material presented.

Indicator items for providing answer keys and discussing questions are very important in developing a module. The material expert's assessment for the two items respectively with an average of 3.5 and 3.0 which is categorized as very feasible. This means that the provision of answer keys and discussion of questions is correct and correct. So that students can learn and match their answers with the keys and discussion of questions that have been provided on interactive teaching material products .

Based on the results of the assessment of the two material experts on the training aspect, an overall average score of 3.14 was obtained which qualitatively was categorized as very feasible. Thus, it can be concluded that the product of interactive teaching materials is very suitable to be used for field trials with recommended revisions. The results of the assessment

of two material experts on the five aspects obtained an average score of 3.15 which was qualitatively categorized as Very Appropriate. The following are the results of the assessment of the two material experts on the five aspects, which are presented in the following table :

Table 4.6. Results of the Assessment of 2 Material Experts on the Five Aspects

Aspect	Material Expert		Amount	Average Score
	I	II		
Preliminary	3	3.5	6.5	3.25
Contents	2.83	3.33	6.17	3.08
Learning	2.77	3.46	6.23	3.12
Summary	3	3.33	6.33	3.17
Tasks/Practice	3	3.29	6.29	3.14
Total number			31.52	
Average Overall Score				3.15
Category				Very Worthy

Based on the data from the material expert validation above, it is known that the Preliminary has the highest average score (3.25), while the content aspect has the lowest score (3.08) compared to other aspects. In the learning aspect, the material expert gave a "Very Appropriate" assessment consisting of 4 indicators, namely clarity of instructions for using teaching materials, linkage of previous material to the material being studied, clarity of learning objectives, and clarity of depiction of the concept map of the material to be studied. In the content aspect the score is considered low on the clarity indicator providing examples to clarify the material, but the category for the content aspect is still classified as "very decent". Some of the comments and suggestions submitted by material experts include:

- a. Products of interactive teaching materials, as much as possible are given illustrations/animations, so it's not just like a book.
- b. Too many questions, need to be reduced. Some issues need to be fixed both in terms of content and language.
- c) In the product of interactive teaching materials, it is better to add one package of competency test questions.

#### **4.2.1.2 Media Expert Validation Results**

The process of assessing the media for interactive teaching materials is carried out by two media experts. The two validators were chosen as media validators on the grounds on the that both of them are experts in learning media.

Rate product interactive teaching materials by media experts I held on March 16, 2019, while the media Expert II carried on 25 March 2019.

The second assessment of media experts is intended to measure the feasibility of media materials teaching interactive before it is used to test try fields. Assessment of media experts is comprised of three aspects, namely the display, use, and utilization. The results of the assessment of the three aspects can be seen in the following tables:

## 1. Display Aspect

Tabel 4.7 . Validation Results of Two Media Experts on Display Aspect

No	Rating Points	Media Expert		Average	Category
		I	II		
1	Clarity of the title of interactive teaching materials	4	4	4.0	Very Worthy
2	Clarity of instructions for using teaching materials Interactive	4	4	4.0	Very worth it
3	Readability of sentence structure makes it easy students to study	3	4	3.5	Very Worthy
4	Appropriate use of color proportions	3	3	3.0	Very Worthy
5	The accuracy of the <i>background</i> color selection	4	3	3.5	Very Worthy
6	Suitability of font selection	3	3	3.0	Very Worthy
7	Suitability of font size selection	3	3	3.0	Very Worthy
8	Clarity of supporting image display material	4	3	3.5	Very Worthy
9	The clarity of the supporting animation display material	4	3	3.5	Very Worthy
10	Clarity of video display supporting material	4	3	3.5	Very Worthy
11	The attractiveness of images in the content of teaching materials interactive	3	3	3.0	Very Worthy
12	The attractiveness of animation in the content of teaching materials interactive	4	3	3.5	Very Worthy
13	The attractiveness of video in the content of teaching materials interactive	4	3	3.5	Very Worthy

14	The attractiveness of the <i>cover</i> view	3	4	3.5	Very Worthy
15	The suitability of the <i>cover</i> design with the material	3	4	3.5	Very Worthy
16	Display clarity ( <i>exit</i> , <i>help</i> , and table of contents)	3	4	3.5	Very Worthy
17	Navigation button conformity	3	4	3.5	Very Worthy
18	Appearance consistency	3	3	3.0	Very worth it
	Average Score			3.42	Very Worthy

---

Based on the data obtained from two media experts on the display aspect, it shows that interactive teaching materials are very feasible to use. It is seemingly the item indicators of the first on the clarity of the title of the material taught interactively, both experts the media gave a very decent rating with an average score of 4.0. This means that the display of the title of the teaching material is easy to read and clear.

The second indicator item regarding instructions for using interactive teaching materials, the two media experts gave a very decent assessment with an average score of 4.0. This shows that the menu contained in the product is easily understood by students. The use of instructions in learning media is very important, so that students are not confused in operating the product.

Furthermore, the third indicator item regarding the legibility of sentence structure makes it easier for students to learn. On these indicator items, the two media experts gave a very decent assessment with an average score of 3.5. This shows that the arrangement of sentences in the product of interactive



teaching materials makes it easier for students to understand the material. The arrangement of sentences presented clearly and easily/simple will help students in learning.

In the fourth indicator regarding the suitability of the use of color proportions. Both media experts gave a very decent assessment with an average score of 3.0. This means that the use of color in interactive teaching material products, be it images, animations and videos, has a high level of contrast with the *background* color, so that students can easily understand the material presented.

In the *background* color selection indicator, the two experts gave a very decent assessment with an average score of 3.5. It that shows the use of the color of *the background*, text, images, animation (matter) readable by the user. Furthermore, the indicators of the suitability of the selection of type and font size, the two material experts provide a very decent assessment with an average score of 3.0. This means that the type and size of the letters are easy to read by students.

On indicators of suitability and attractiveness of displays such as images, animations and videos, the two media experts gave a very decent rating with an average score of 3.5, while the attractiveness of the image of the two experts gave a very decent assessment with an average score of 3.0. It it shows that the attractiveness of the display image, animation, and video is very clear, and easy for students to understand the messages conveyed by the contents are.

Furthermore, the indicators of the attractiveness of the *cover* display, the suitability of the *cover* design, the clarity of the menu display (*exit*, table of contents and *help*), the conformity of the shape of the navigation buttons, and the consistency of the display. The two experts gave a very decent rating for the five indicator items with an average score of 3.5. This means that the display and *cover* design of interactive teaching materials is attractive and describes the material presented. So that from the *cover* display students will know what they will learn. For indicators of display clarity and conformity of the shape of the navigation buttons are very consistent, because the menu display and navigation buttons always appear on every page of the module.

The display consistency indicator item of the two experts gave a very decent assessment with an average score of 3.0. This implies that interactive teaching materials are consistent in terms of appearance. The consistent display of teaching materials does not interfere with students' concentration in learning. Thus, the results of the expert assessment media on the aspect of display obtained an overall average score of 3.42 which is categorized as very feasible.

## 2. Usage Aspect

Table 4.8 . Validation of Two Media Experts on Aspects of Use

No	Rating Points	Media Expert		Average	Category
		I	II		
1	Ease of Use of the product	4	2	3.0	Very Worthy
2	The accuracy of the use of buttons and navigation	3	3	3.0	Very Worthy
3	Ease of accessing the product menu (back to desired page)	3	2	2.5	Worthy
4	Ease of interacting with product	3	3	3.0	Very Worthy
5	Easy access out of the product	4	3	3.5	Very worth it
6	Completeness of module identity	4	3	3.5	Very worth it
	Average Score			3.08	Very Worthy

Based on the results of the validation of two media experts on the aspect of use which consists of six items including the product ease of use indicator items, an average score of 3.0 is obtained in the very feasible category. This shows that the product of interactive teaching materials is easy to use by students, because it is equipped with instructions for using the product.

Furthermore, the item on the accuracy of the use of buttons and navigation received an average score of 3.0 with a very decent category. It is to contain the sense that the keys and the navigation function properly. The item of ease of accessing the product menu gets an average score of 2.5 with a decent category. This shows that the use of *links* and table of contents is very helpful for students to the product page they want, while the item of ease of interaction with the product gets an average score 3.0 with a very decent category. This means that in the presentation there are interactive elements, namely providing *feedback* and additional buttons (*play* and *stop*) contained in animations and videos.

The items of ease of access out of the product and the completeness of the identity of the module obtained the highest average score of 3.5 with a very decent category. The exit menu is very much needed in learning media. In the development of teaching material products in the form of interactive learning modules so that the module identity indicator is needed. Thus, it can be concluded that the product of interactive teaching materials in the aspect of use with an overall average score for the six items is 3.08 which is categorized as very feasible to use.

### 3. Aspects of Utilization

Table 4.9. Validation of two media experts of utilization aspects

No	Assessment Points	Media Expert		Rates	Category
		I	II		
1	Compatibility of interactive teaching material components with module systematics (front page, preface, list) content, concept map, content, answer key, reference list, glossary)	4	3	3.5	Very Worthy
2	The suitability of the language used communicative	3	3	3.0	Very Worthy
3	Current material	3	3	3.0	Very Worthy
4	Have power pull visual which includes color, pictures, illustrations, font shape and size (bold, italics, underline)	3	3	3.0	Very Worthy
5	The accuracy of giving <i>feedback</i> on student input	3	3	3.0	Very Worthy
6	Possibility of students doing <i>self assessment</i>	4	3	3.5	Very Worthy
Average Score				3.17	Very Worthy

The results of the validation of two media experts on the aspect of utilization which consisted of six items including the item indicator of the suitability of interactive teaching materials components with module systematics obtained an average score of 3.5 with a very decent category. This shows that the preparation of interactive teaching materials is adjusted to the systematics of the module. Furthermore, the indicator item for the use of language used communicatively obtained an average score of 3.0 with a very decent category, because the language used was simple and communicative. The goal is that students easily understand the concepts presented in interactive teaching material products.

In the current material indicator (*up to date*) an average score of 3.0 is obtained in the very feasible category. This shows that the material presented in the interactive teaching material product is in accordance with standard competence dan basic competence. Indicator items that have visual appeal include colors pictures, illustrations and font size, obtaining an average score of 3.0 with a very decent category. This means that the use of colors, pictures, illustrations/animations, font sizes and fonts makes it easier for students to understand the concepts of the material and emphasize the important points of the material.

On the item indicator of the accuracy of *providing feedback* on student input, the average score was 3.0 with a very decent category. It is to contain the sense that the language used informative. The goal is for students to know whether what is done is correct or not. Furthermore, the indicator item is the possibility of students doing *self-assessment* to get an average score of 3.5 with a very decent

category. This shows that students can do their own assessment of the level of mastery of the material because there are answer keys, discussion of questions and success criteria.

Students can match their own answers with the discussion of the questions that have been provided. Thus, the results of the media expert's assessment of the utilization aspect obtained an overall average score of 3.17 with a very decent category.

Based on the results of the assessment of the two media experts on the three aspects, the overall average score was 3.22 which was qualitatively categorized as Very Eligible. So, it can be concluded that the product of interactive teaching materials is very suitable to be used for field trials in accordance with the recommended revision.

The following are the results of the assessment of the two media experts on the three aspects presented in the following table:

Table 4.10 . Results of the Assessment of 2 Media Experts on the Three Aspects

Aspect	Media Expert		Amount	Average Score
	I	II		
Appearance	3.44	3.39	6.83	3.42
Use	3.50	2.67	6.17	3.08
Utilization	3.33	3.00	6.33	3.17
Total number			19.33	
Average Overall Score				3.22
Category				Very Worthy

The results of the assessment of the three aspects by 2 media experts can be seen visually in the diagram below:

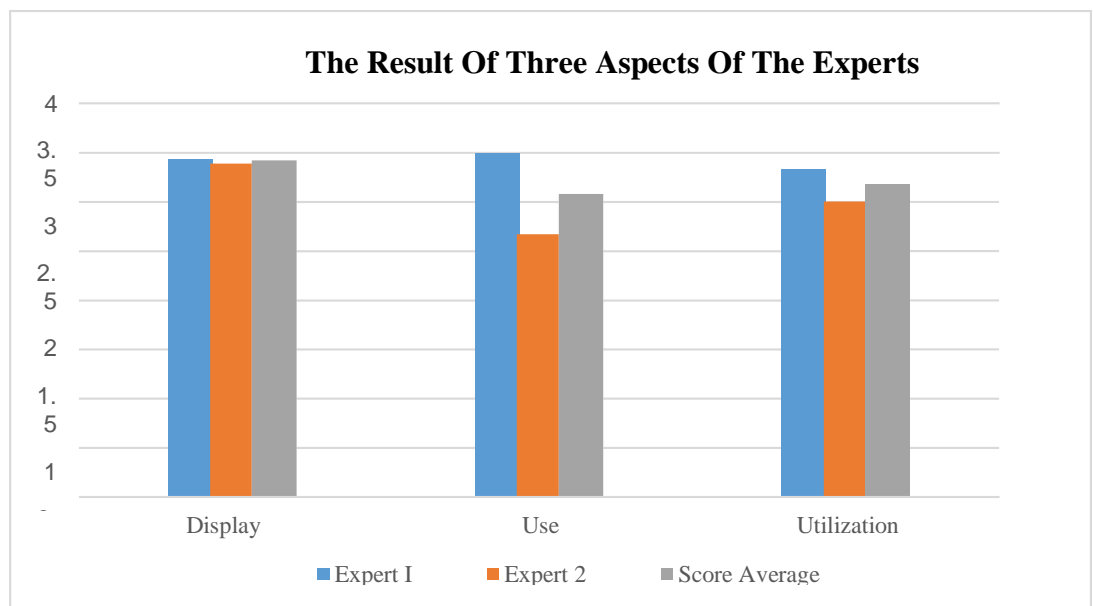


Figure 4.3 . Bar Chart of Media Expert Assessment Results

Based on the diagram above, the results of the assessment of two media experts on interactive teaching material products show that the display aspect consisting of 18 indicators has the highest average score (3.42) compared to the aspect of use and utilization, while the aspect of use which consists of 6 indicators has an average the lowest score is 3.08. Of the 6 indicators, there



are 2 indicators including: ease of use of the product; ease of accessing the product menu (returning to the desired page) which was considered less feasible by media expert II, while media expert I gave a very decent and decent rating, but after being averaged and converted on a scale of 4 the results were still in the very feasible category. Some of the comments and suggestions submitted by media experts include:

- a. Videos presented in interactive teaching materials, if obtained from YouTube, must mention the source, and if the video is made by yourself, include the name at the beginning of the video.
- b. On page 3 and other pages are animations, not images.
- c. On page 32 there are instructions for doing practice questions, but the problem is not there (make sure the questions can appear for all three chapters).
- d. For practice questions in Chapter 1, it is better to give a discussion of the questions.
- e. Less compatible/not just any computer can access/open
- f. Preferably auto run.

#### **4.2.2 Beta Test Results**

At the Alessi & Trollip development model stage, beta testing was carried out in 2 (two) stages, namely beta 1 test (small group trial) and beta 2 test (large group trial). The purpose of this beta test is to determine student responses to interactive teaching material products that were developed before being tested in large groups. The beta test assessment questionnaire (student responses) to the

developed interactive teaching material products contained 3 aspects including aspects of learning, display and programming.

#### **4.2.2.1. Beta Test 1 ( small group trial )**

The small group trial was conducted on 29 April 2019. Beta test process 1 (group of small) on product ingredients teaching interactive carried out by 6 the students from class XI directly elected by teachers of Entrepreneurship grade XI. Interest selecting students from class XI Science in the test try to group small it is has come a previous three-dimensional space material.

These six students were asked to explore all the menus and features contained in the interactive teaching materials. At the end of the small group trial, the six students were asked to fill out a response questionnaire that had been provided. Below, the results of the small group trial assessment for six students can be seen in the following table:

a. Learning Aspect

Table 4 .11. Small Group Test Assessment Results on Learning Aspects

<b>No</b>	<b>Rating Points</b>	<b>Average Score</b>	<b>Category</b>
1	Clarity of title in each learning activity	3.17	Very Worthy
2	Clarity of learning objectives	3.17	Very Worthy
3	Ease of material to learn	3.50	Very Worthy
4	Conformity of learning objectives with descriptions material	3.50	Very Worthy
5	Accuracy in the explanation of the material that is picture	3.33	Very Worthy
6	The accuracy of using interactive teaching materials in apply self-study	3.33	Very Worthy
7	Current material	2.83	Worthy
8	Accuracy provides practice questions to measure student understanding	3.83	Very Worthy
9	The sequence of material presented in each activity learning	3.17	Very Worthy
10	The accuracy of the type of practice questions with the characteristics class X students	3.00	Very Worthy
	Average Score	3.28	Very Worthy

Based on the results of the small group test assessment on the learning aspect, it shows that the overall average score is 3.28 in the "very feasible" category. In table 23, it can be seen that the item providing practice questions to measure students' understanding got the highest average score of 3.83 with the "very feasible" category. This is based on the reflective component contained in constructivist theory according to Simon (Ivers & Baron, 2002), providing practice questions in interactive teaching materials aimed at measuring students' understanding abilities.

b. Display Aspect

Table 4.12 . Small Group Test Assessment Results on Display Aspect

No	Rating Points	Total score	Average score	Category
1	Clear instructions for using the product	19	3.17	Very Worthy
2	Clarity of the main menu button display ( <i>exit</i> , <i>help</i> , and table of contents)	20	3.33	Very Worthy
3	Readability of sentence structure makes it easy students to study	18	3.00	Very Worthy
4	Appropriate use of color proportions	19	3.17	Very Worthy
5	Clarity of supporting image display material	19	3.17	Very Worthy
6	The clarity of the supporting animation display material	20	3.33	Very Worthy
7	Clarity of video display supporting material	21	3.50	Very Worthy
8	The suitability of the <i>cover</i> with the content of the material	18	3.00	Very Worthy

9	The attractiveness of <i>fonts</i> in teaching materials interactive	18	3.00	Very Worthy
10	The attractiveness of images in teaching materials interactive	19	3.17	Very Worthy
11	The attractiveness of animation in teaching materials interactive	19	3.17	Very worth it
12	The attractiveness of video in teaching materials interactive	19	3.17	Very worth it
13	The attractiveness of the <i>cover</i> display (cover)	18	3.00	Very Worthy
	Total Score	247	41.17	
	Average overall score		3.17	Very Worthy

---

The data obtained from the assessment results in table 24 are categorized as very feasible. From the results of the beta 1 test on the display aspect, the total score obtained is 247 with an overall average score of 3.17 with a very decent category.

### 3. Programming Aspect

Table 4.13 . Small Group Test Assessment Results on Programming Aspects

No	Rating Points	Total score	Average score	Category
1	Ease of using the product	22	3.67	Very Worthy
2	Key function accuracy and navigation with link	20	3.33	Very Worthy
3	Ease of accessing the menu in ingredients interactive teaching	18	3.00	Very Worthy
4	Ease of interacting with the product	18	3.00	Very Worthy
5	Ease of interacting with the product	17	2.83	Worthy
6	Completeness of the identity of interactive teaching materials (title, author, publishing agency, and year rise)	22	3.67	Very Worthy
	Total Score	117	19.50	
	Average overall score		3.25	Very Worthy

The results of the small group test on the programming aspect in table 25 obtained an overall score of 117 of the six items with an overall average score of 3.25 which was categorized as "very feasible". The items of ease of

using the product and the completeness of the identity of interactive teaching materials obtained the highest average score of 3.67 with a very decent category.

Based on the assessment table of small group test results by 6 students on these three aspects, it can be concluded that this interactive teaching material product is very suitable to be used for beta 2 test (large group test) in accordance with the recommended revision. The mean score of the whole of the third aspect of the is at 3.22 which is qualitatively categorized as "very decent". The following table presents the assessment of the small group test on the three aspects of the assessment:

Table 4.14 . Small Group Test Assessment Results on the Three Aspects

<b>Aspect</b>	<b>Average Score</b>
Learning	3.28
Appearance	3.17
Programming	3.25
Total number	9.70
Average Overall Score	3.22
Category	Very Worthy

The results of the small group test assessment on three aspects can be seen visually in the diagram below:

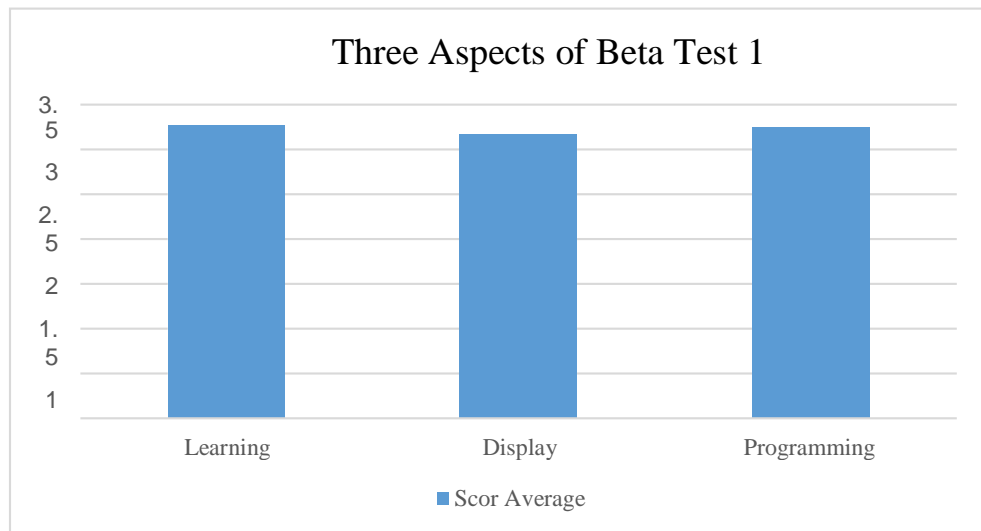


Figure 4.4 . Bar Diagram of Beta Test Assessment Results 1

Based the diagram above, in the learning aspect, the average score is obtained much higher compared to the second aspect of sharing. It is caused due to the learning aspect, the average score obtained qualitatively categorized as "very viable", while aspects of the display and programming also get a mean score overall still in the high category, respectively 3.17 and 3.25. As for some comments and suggestions for the improvement of



interactive teaching material products before being used in the beta 2 test (large group test) are as follows:

- a. Overall this interactive teaching material is quite interesting and very good
- b. This interactive learning media is very interesting and easy to use by students.
- c. With interactive teaching materials, it can facilitate and speed up learning, but the questions with language and words are poorly understood.
- d. Need a direct explanation from the teacher.
- e. Overall good, good animation, interesting videos because there are supporting material explanations through animations that make it easier for users.

#### **4.2.2.2. Beta Test 2 ( Large group Trial )**

Trials 2 on the development of interactive teaching materials carried on the students of class XI MA Bilingual Muslimat NU Sidoarjo which involves 55 students.

Test beta 2 is held on 29 April 2019 on subjects Entrepreneurship. In the beta 2 test process there are 2 types of data collected, first, data collection on student response questionnaires to interactive first, data collection on student response questionnaires to interactive teaching material products, the second instrument about the essay as much as 8 a matter which is given at the time of *the pretest* (before using interactive teaching materials)

and *posttest* (after using interactive teaching materials). The student response questionnaire consists of 3 aspects including aspects of learning, display, and programming. The learning aspect consists of 10 assessment items, the display aspect has 13 assessment points, and the programming aspect has 6 assessment items. The following is an explanation of each aspect of the assessment of the beta 2 test, which can be seen in the following table .

1) Learning Aspect

Table 4.15 . Beta Test 2 Assessment Results on Learning Aspects

No	Rating Points	Total Score (X)	Average Score	Category
1	Clarity of title for each activity learning	111	3.47	Very Worthy
2	Clarity of learning objectives	105	3.28	Very Worthy
3	Ease of material to learn	97	3.03	Very Worthy
4	Conformity of learning objectives with material description	104	3.25	Very Worthy
5	Accuracy in the explanation of the material that pictorial	101	3.16	Very Worthy
6	The accuracy of the use of teaching materials interactive in applying independent learning	93	2.91	Worthy
7	Current material	98	3.06	Very Worthy
8	The accuracy of giving practice questions to measure students' understanding	102	3.19	Very Worthy
9	The breakdown of the material presented on each learning activity	102	3.19	Very Worthy
10	The accuracy of the type of practice questions with Characteristics of students	102	3.19	Very Worthy
	Amount	1015	31.72	
	Average Score		3.17	Very Worthy

In the judgment of the beta test 2 on aspects of learning that consists of 10 items indicators, 9 of them are clear title, the clarity of the purpose of learning, ease of material to be studied, the suitability of the material with the purpose of learning, the accuracy of the description of matter is an image, the accuracy provides practice questions to assess understanding students, the continuity of the material, the accuracy of the type of practice questions with the characteristics of class XI students are categorized as very feasible. This means that interactive teaching materials attract students' attention, because these indicators are developed as attractive as possible so that students can easily learn them.

Then for the item on the accuracy of the use of interactive teaching materials in applying independent teaching materials, the lowest average score of 2.91 is in the appropriate category, because students still need teacher guidance. Thus, the results of the beta 2 test assessment on the learning aspect obtained an overall average score of 3.17 with a very decent category.

## 2) Display Aspect

Table 4.16 . Beta Test 2 Assessment Results on Display Aspects

<b>No</b>	<b>Rating Points</b>	<b>Total score</b>	<b>Average Score</b>	<b>Category</b>
1	Clear instructions for using the product	99	3.09	Very Worthy
2	The clarity of the main menu button display ( <i>exit, help</i> , and table of contents)	105	3.28	Very Worthy
3	Readability of sentence structure make it easier for students to learn	95	2.97	Worthy
4	Appropriate use of color proportions	100	3.13	Very Worthy
5	Clarity of supporting image display material	101	3.16	Very Worthy
6	The clarity of the supporting animation display material	109	3.41	Very Worthy
7	Supporting video display clarity material	103	3.22	Very Worthy
8	The suitability of the <i>cover</i> with the content of the material	104	3.25	Very Worthy
9	The attractiveness of <i>fonts</i> in teaching materials interactive	101	3.16	Very Worthy
10	The attractiveness of images in teaching materials interactive	104	3.25	Very Worthy

11	The attractiveness of animation in teaching materials interactive	104	3.25	Very worth it
12	The attractiveness of video in teaching materials interactive	102	3.19	Very worth it
13	The attractiveness of the <i>cover</i> display (cover)	102	3.19	Very Worthy
	Total Score	1329	41.53	
	Average overall score		3.19	Very Worthy

---

Based on the results of the beta 2 test assessment on the display aspect which consists of 13 indicator items including the item clarity of product usage instructions, the average score is 3.09 with a very decent category. It shows that the manual use of the products that are developed easily understood by students. Another indicator, namely the display of images, animations, and videos as supporting items, is considered very feasible, because the content of images, animations and videos supports the process of understanding the concept of material presented in interactive teaching material products. Thus, the results of the beta 2 test assessment response on the display aspect obtained an overall average score of 3.19 with a very decent category.

### 3) Programming Aspect

Table 4.17 . Beta Test 2 Assessment Results on Programming Aspects

<b>No</b>	<b>Rating Points</b>	<b>Amount Score</b>	<b>Average Score</b>	<b>Category</b>
1	Ease of using the product	98	3.06	Very Worthy
2	Key function and navigation accuracy with link	98	3.06	Very Worthy
3	Ease of accessing the menu in interactive teaching materials	101	3.16	Very Worthy
4	Ease of interacting with the product	100	3.13	Very Worthy
5	Ease of interacting with the product	109	3.41	Very Worthy
6	Completeness of the identity of teaching materials interactive (title, author, publisher, and year of publication)	111	3.47	Very Worthy
	Total Score	577	19.28	
	Average overall score		3.21	Very Worthy

Based on the results of the beta 2 test assessment on the programming aspect, which consists of six items, it is considered very feasible. The ease of using the product and the function of buttons and navigation items obtained an average score lower than

the other four items, which was 3.06. The overall average score on the programming aspect is 3.21 which is categorized as very decent.

Thus the results of the assessment on the beta 2 test can be concluded that the product of interactive teaching materials is said to be "very feasible" with an overall average score from these three aspects is 3.19 qualitatively included in the category of very decent. The following table presents the results of the assessment of the three aspects by beta test 2:

Table 4.18 . Results of the Assessment of the Three Aspects by Beta Test 2

<b>Aspect</b>	<b>Average Score</b>
Learning	3.17
Appearance	3.19
Programming	3.21
Average Overall Score	3.19
Category	Very Worthy

The results of the beta 2 test assessment on three aspects can be seen visually in the diagram below:

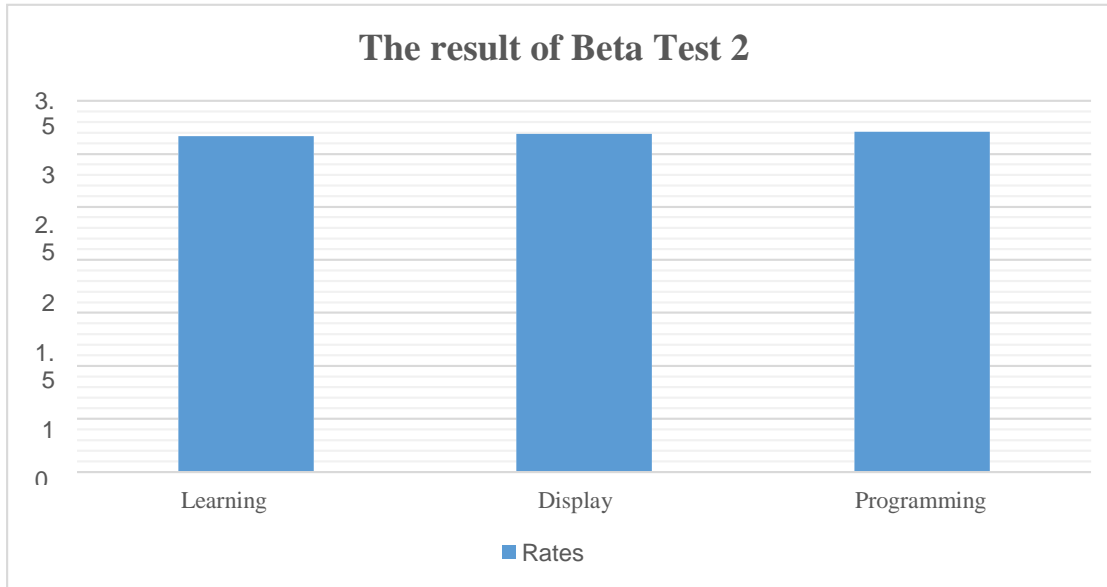


Figure 4.6 . Beta Test Result 2 Bar Chart

Based on the results of the beta 2 test assessment on three aspects, it is known that the programming aspect has the highest average score (3.21) compared to the other two aspects. In the programming aspect, the item completeness of the identity of interactive teaching materials (title, author, publishing agency, and year of publication) has the highest average score of 3.47, followed by the item of ease of access to exit the product at 3.41. In the programming aspect, there are 2 items that have low scores compared to other items, namely the ease of using the product and the accuracy of the function of buttons and navigation with *links*, which are 3.06.

The learning aspect obtained the lowest mean score (3.17) compared to the other two aspects. The item on the accuracy of using interactive teaching materials in implementing independent learning got the lowest average score (2.91) compared



to other items. The mean score as a whole against these three aspects is 3.19 qualitatively included in the category of "very decent". As for some comments and suggestions for beta 2 testing on interactive teaching material products as follows:

- a. Learning using interactive teaching materials is easy to access, the presentation is interesting. However, it is not understood because it is not explained directly.
- b. More details about the material description.
- c. Learning to use interactive teaching materials is very interesting because it is equipped with visuals.
- d. Very good learning
- e. There is an unreadable image on the video.
- f. Navigation and animation should be improved again, so that students do not get bored.
- g. Improved the appearance.

#### **4.2.2.3. Results *pretest* and *posttest* on Beta Test 2**

Giving *pretest* and *posttest* aims to determine the level of effectiveness of interactive teaching material products developed in improving students' understanding of mathematical concepts by looking at the difference in scores before and after using interactive teaching material products. The *pretest* and *posttest activities* were carried out after the beta 2 test and the interactive teaching material product had been revised based on suggestions from two material experts, two media experts, and 6 students on the alpha test.

The test instruments ( *pretest* and *posttest* ) were conducted on all students of class XI MA Bilingual Muslimat NU Sidoarjo consisting of classes Science and Social. The *pretest* and *posttest* were carried out in each class with a total of 33 students. *Pretest* held on Wednesday, 29<sup>th</sup> April 2019, while post test held on the date 12<sup>th</sup> May 2019 at the moment pre test no 4 the students do not attend one due to illness. In the *posttest* there were 3 students who did not attend with the excuse that 2 people had permission and 1 other student was absent without explanation. Thus, from the total number of students in class X, 28 were successfully taken.

Students are given 8 essay questions. The questions used have gone through a material expert validation process. The number of questions used is based on the considerations of supervisors, material experts , and subject teachers of class XI MA Bilingual Muslimat NU Sidoarjo .

The following is the data from the *pretest* and *posttest* results before and after using interactive teaching material products:

**Table 32. Comparison of results of *pretest* and *posttest***

No	Name	Class	<i>Pretest</i>	<i>Posttest</i>
			Score	Score
1	Student 1	A	20	70
2	Student 2	A	15	70
3	Student 3	A	20	82
4	Student 4	A	20	79
5	Student 5	A	30	81
6	Student 6	A	30	88
7	Student 7	A	15	70
8	Student 8	A	20	70

9	Student 9	A	20	65
10	Student 10	A	30	80
11	Student 11	A	20	70
12	Student 12	A	20	65
13	Student 13	A	20	70
14	Student 14	A	15	65
15	Student 15	A	15	70
16	Student 16	B	30	80
17	Student 17	B	29	80
18	Student 18	B	15	75
19	Student 19	B	15	80
20	Student 20	B	20	75
21	Student 21	B	20	70
22	Student 22	B	30	80

No	Name	Class	<i>Pretest</i>	<i>Posttest</i>
			Score	Score
23	Student 23	B	25	75
24	Student 24	B	25	70
25	Student 25	B	20	72
26	Student 26	B	50	78
	Average		22.65	74.23

Based on the table, it can be seen that the average *pretest* score is 22.65 and the *posttest* average score is 74.23. This shows an increase. There are 3 students who have not reached the KKM of 70. Apart from being seen from the average obtained from the *pretest* and *posttest*, it is also seen from the *gain* score, which is as follows:

$$g = \frac{S_{post} - S_{pre}}{}$$

$$\begin{aligned}
 & S_{maks} - S_{pre} \\
 &= \frac{74,23 - 22,65}{100 - 22,65} \\
 &= \frac{51,58}{77,35} \\
 &= 0,71
 \end{aligned}$$

Based on the above calculation, the *gain* score obtained from the comparison of the average *pretest* and *posttest* values in learning using interactive teaching materials is 0.71 with the "high" category (*N-Gain* 0.7). The increase in the *posttest* average value shows that in general interactive teaching materials are effective in increasing concept understanding after students use the product in learning.

Problem *pretest* and *posttest* used have a language problem and the same amount of grain that is composed of 14 grains of matter. Of the 14 items about those represented by 8 indicators about the table 9. The first item is used to measure students' ability to define the position between two fields. Figure 9 shows an average increase of 0.26. This shows that the ability students in defining the position of the field increased after using interactive teaching materials.

The indicator of concept understanding in this study consisted of 4 indicators represented by 8 questions, both *pretest* and *posttest*. However, from the 4 indicators, 14 items were applied to the *pretest* and *posttest*.

The first item is used to measure students' ability to define the position between two fields. Figure 9 shows an average increase of 0.26. This shows that students' ability to define the position of the field increases after using interactive teaching materials.

In the second question which consists of 5 items, it is used to measure students' ability to identify the position of points, lines, and planes according to the properties that have been studied previously. The difference between the average *pretest* and *posttest* scores as a whole showed an increase of 1.69. This means that students' ability to identify increases after using interactive teaching materials. This ability is shown by students by mentioning the position of points, lines and planes in three-dimensional space.

At about 3 and 4 are used for the ability of calculating the distance of the point and line, point and field in the wake of space. Compute capability in this case students can solve problems with the appropriate measures or procedures. The average The average score that is obtained from the difference in scores between the *pretest* and *posttest* of question number 3 and 4 respectively as follows; 10.46 and 7.65. This shows that the use of interactive teaching materials can improve students' counting ability. The increase was shown by students being able to solve problems with the right steps/using the right procedures.

Question number 5 is the same as question number 3 and 4 because it is used for the ability to determine the distance between two lines, a line to a plane and two planes in a geometric shape. Based on the difference between the results of the average *pretest* and *posttest* scores obtained a score of 5.65. It is showing the use of materials of teaching interactive can improve students' ability to determine the distance in space. This increase is shown that students can solve problems correctly.

In questions number 6a, 6b, 7a, 7b, and 8 the increase in the average score obtained from the *pretest* and *posttest* is different. This increase shows that students' understanding of concepts increases so that students are able to calculate, determine and identify a

concept that is learned by students. Based on the difference in the average scores seen in Figure 9, the students' understanding ability increased after using interactive teaching materials in entrepreneurship learning . So it can be concluded that the use of interactive teaching material products is effective in improving students' conceptual understanding skills.

#### **4.2.3. Revision of Interactive Teaching Materials**

Revision of interactive teaching material products was carried out 3 times based on criticism and suggestions from material experts and media experts. Here, each revision process is explained as follows:

##### **4.2.3.1. Material Expert Revision**

The following are comments and suggestions from two material experts on the products developed, including the following:

1. Problem too much, need to be reduced. Several issues were fixed both in terms of content and language. In the previous question there were 10 questions so that reduced to 8 questions. The invalid questions have been corrected and the discussion of the questions has also been fixed.
2. As much as possible in the media is given animation, so it is not just like a book. Based on the suggestion that, then added animated by the developer.
3. Added 1 package of competency test questions. In products that have not been revised, there is no package of questions for competency tests, only

practice questions for each learning activity. This package of questions consists of 40 questions covering the three materials, namely the position of points, lines, and planes, determining distances in space, and angles in space.

#### **4.2.3.2. Media Expert Revision**

The revisions made to the interactive teaching material product were based on comments and suggestions from two media experts including the following:

1. The source of the video must be stated, if the video was made by the developer, put the name at the beginning of the video. Interactive teaching materials on products previously not found the name of the developer and the source when in obtained from the internet, so it needs to be added on the advice that is given.
2. In the product before it was revised, the developer made a mistake in providing suggestions to users, so it needed to be changed.
3. On page 32 there is a hint, but the question does not appear. In the product of interactive teaching materials before being revised there were 3 practice questions, of which the three practice questions did not appear. After being revised, it is confirmed that the three practice questions can appear; (a) Appearance Before Revision (b) Display After Revision.
4. In chapter 1 there is no discussion of questions, chapters 2 and 3 have discussion of questions. Based on comments and suggestions from media

experts, it is necessary to add a discussion of the questions in chapter 1, because the product before it was revised only presented the answer key so that it was not consistent with the other two chapters.

The results of interviews with students obtained that the student needs a material resource that requires a picture that is interesting and animated. By because the product material interactive teaching is expected to be one of the alternatives that can help students understand the concepts presented. The scope of the material developed is three-dimensional space which consists of (1) the position of points, lines, and planes, (2) determining the distance in space, and (3) angles in three-dimensional space. To facilitate the visualization of the material, students' interactive teaching materials are packaged in digital form. The goal is that students can control themselves both navigation and the material. Students can freely move between pages, watch, pause, and replay animated and video content (Nugent, Kohmetsher, Deana, Guretzky, Murphy, & Lee, 2016).

Product material teaching interactive that developed was tested alpha by two experts of material and two expert media that dominate the field. Based on the results of the material expert's assessment, an average score of 3.15 was obtained with a very decent category, so the material who served in the product material of teaching interactive otherwise decent used with appropriate revision of the advice given. Next, the product validation process by two media experts.



The results of the product assessment obtained an average score of 3.22 with a very feasible category, so that the interactive teaching material product was declared suitable for use in accordance with the revision suggested by media experts.

Beta testing is carried out after the product has been approved by an expert. The beta test is divided into two stages, namely beta 1 test (small group trial) involving 6 students. From the results of the beta 1 test response assessment, an average score of 3.22 was obtained which qualitatively included in the "very feasible" category.

The next trial is in beta 2 test (large group trial). Beta 2 test (large group trial) was tested on 55 students. The score of the test products were obtained by testing the beta 2 with an average score as a whole amounted to 3.19 with a very decent categorize. The average score shows the student's response to the use of interactive teaching material products in learning.

The feasibility of interactive teaching material products can be achieved because it meets the criteria for evaluating interactive teaching material products consisting of material accuracy, *learner control*, material according to the curriculum, *up to date* material, using clear discussions, can generate student motivation, students can participate in it, provide instructions use (Heinich, 1996: 47). In addition, interactive teaching material products apply multimedia criteria according to Alessi & Trollip (2001), namely the breadth of the material, the order of the material, the clarity of the language used, the

suitability of the material with the learning objectives, the presence of learning instructions, conclusions/summaries, *navigation*, *interface* and a glossary.

Furthermore, the criteria of assessment materials interactive teaching is based according Romiszowski (1986: 406-407) that materiiri validated by expert material, supported by a media that is appropriate, examples and exercises about appropriate premises purpose of learning, and the level of difficulty about customized with the ability of students.

In addition to being based on these assessment criteria, interactive teaching material products also apply module characteristics, namely 1) *self-instruction*, 2) *self contained*, 3) *stand alone*, 4) *adaptive* , 5) *user friendly*, and the 7 principles of Mayer (2009) multimedia design for presentation. material in the form of animation and video. These principles are the principle, multimedia, the principle of proximity of time, the principle of coherence, the principle of modality, the principle of redundancy, and the principle of individual differences.

Product effectiveness test was conducted to determine the effect of the developed product on concept understanding. Based on the results of the *pretest* and *posttest* , the gain score was 0.71. The gain score obtained shows that there is an increase in concept understanding in the high category.

The product of interactive teaching materials is considered effective in improving understanding of concepts, because the material presented in addition to using text and images, is also equipped with animation and video material that visualizes three-dimensional material. This is supported by the

opinion of Rogness (2011), which states that the use of visualization can help students in increasing understanding of concepts.

The visual form can be in the form of animation or video (Gamabri, Falode, & Adegbenro, 2014). This is also supported by research that conducted by Lasmiyati & Harta (2014) that teaching materials in the form of modules can improve understanding of concepts.

After conducting trials and studies on interactive teaching material products, There are several aspects of the weakness of the product, including the following:

1. Product materials teaching interactive in which there is a practice problem that developed with iSpring Suite 7 software, but sometimes impaired in appearance. Where the display can change position depending on the *spec of the* computer used.
2. Interactive teaching materials have not been supported by the use of smartphone devices, only available in computer or laptop reading format.
3. The interactive teaching material product .exe file can only be run on a computer with a *Windows* operating *system* that has a high *spec* and if it is used on a computer with a low *spec*, the interactive teaching material product cannot be opened. This is due to the large size of the resulting file.
4. Interactive teaching materials are not supported by *worksheets*, only practice questions in the form of multiple choice are available.

