

DESIGNING MOODLE-BASED LEARNING MEDIA INTEGRATED WITH H5P INTERACTIVE ON CHEMICAL EQUILIBRIUM TOPIC

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Abstract: Chemical equilibrium is one of the learning materials that is difficult to understand in learning chemistry. To increase student understanding and participation in learning chemical equilibrium topics, research was conducted to design. This is because Moodle-based learning media combined with H5P on chemical equilibrium topics combines media that utilizes technology to produce an interactive learning experience. This research is included in educational design research using the Plomp development model, including the preliminary research stage by conducting need and context analysis, literature review, and theoretical framework and prototyping phase, including initial plan and self-evaluation. The research subjects were six teachers from SMAN 1 Pariaman, SMAN 2 Pariaman, and SMAN 3 Pariaman, and fifty students of SMAN 1 Pariaman. The object of this research is Moodle-based learning media integrated with H5P interactive. The instruments of this research are questionnaire sheets and interview sheets. For the results based on preliminary research data and the prototyping phase, it can be concluded that the design of Moodle-based learning media using the Plomp development model, which produces prototype II, has been successfully carried out according to the design based on the analysis results in preliminary research. I hope that the prototype in the form of Moodle-based learning integrated with H5P interactive can produce learning media that can be used in school to support chemistry learning and improve interactive learning experiences.

Keywords: *Designing, Interactive Learning Media, Moodle, H5P, Chemical Equilibrium*

INTRODUCTION

The use of technology in education has brought about significant changes in how learning is delivered. One technology that can improve the learning experiences and help students understand concepts is e-learning. The criteria for implementing learning using e-learning as a learning medium is pretty compelling, with a trend level of 77.27% [1]. An E-learning system is a form of applying technology in the learning process electronically or digitally. It requires web and internet-based facilities in its implementation and aims to create efficient, interactive learning and expand the reach of the teaching process [2]. E-learning has advantages such as cost-effectiveness, flexibility in time and place, and ease of use [3].

The existing e-learning platforms have many variations. For example is Moodle. Moodle (modular object-oriented dynamic learning environment) is an LMS (learning management system) application that allows students to enter digital classes and access digital learning in the form of web pages [4]. The research results of Muazizah & Nurhayati showed that Moodle learning is effective on learning outcomes [5]. The use of Moodle in the world of education can be applied to various subjects, including chemistry. With easy access and content modification, Moodle can help interactions between teachers and students run without space and time barriers. Using Moodle, teachers can present various interactive text, images, or audio content on specific sites to achieve learning objectives. Moodle is a platform that is easy to

manage and can enable students to strengthen their independence in learning [6].

Based on the interviews conducted by researchers at SMAN 1 Pariaman, it is known that the use of learning media in schools is limited to textbooks, PowerPoint, and LKPD. Teachers have not used Moodle as a learning media on chemical equilibrium topics. In fact, distributing questionnaires to students showed that 98% of students already had digital devices with good internet access. Teachers have not used media learning that utilizes technology such as e-learning Moodle and still use conventional and lecture methods, so students are less interested and lack participation in the learning process. Therefore, learning media is needed to increase student understanding and participation in chemical equilibrium topics through Moodle-based learning media.

Moodle can be combined with H5P, which has various interactive features that can guide students in discovering concepts. HTML5Packages (H5P) is content in the LMS that aims to design learning content that can attract user attention. The H5P feature allows teachers to develop and refine learning media to create interactive multimedia content that is interesting for learning [7]. Using Moodle-based learning integrated with H5P in chemistry learning, especially in chemical equilibrium topics, can create effective learning. Interactive videos, interactive presentations, and various game features combined with Moodle and H5P can help students improve critical thinking skills and understanding in learning

individually and in groups. H5P is very helpful in the learning process for students with different backgrounds, varying abilities, motivations, and goals [8]. Students can use electronic devices such as smartphones and tablets to access learning anytime and anywhere. That way, students can study chemical equilibrium topics more clearly and deeply. Based on research conducted by Mir showed an increase in students' interest in learning by using H5P features in Moodle. The ease of using H5P and the presence of interactive content helps students improve interest and participation in learning [9].

Moodle-based learning media integrated with H5P presents various interactive content, such as interactive videos, interactive presentations, interactive games, and quizzes, that helps students understand concepts better. Students can be actively involved and collaborate in groups, increasing student participation in learning. This can create a fun learning experience and motivate students to learn chemistry. Based on the opportunity provided by the combination of Moodle technology with H5P, research was carried out to design an interactive learning media prototype using Moodle integrated with H5P as a solution to increase student understanding and student participation in learning through interactive content in Moodle learning media. As in research, Dandulana states that Moodle-based learning media on chemical equilibrium topics meets the validity criteria and gets positive responses from teachers and students on chemical equilibrium learning [10]. However, the media developed does not yet contain the H5P plugin. Therefore, this research aims to design a Moodle-based learning media integrated with H5P interactive on chemical equilibrium topic, which guides students in discovering concepts and increases student participation in learning through interactive content such as interactive presentations, videos, games, and quizzes, creating.

RESEARCH METHODS

This research includes Educational Design Research using the Plomp development model. Educational design research aims to develop and produce a product that can help overcome problems in the learning process and improve knowledge about product characteristics and ways to build products [11]. The product developed is Moodle-based learning integrated with H5P interactive on chemical equilibrium topics. This learning media development model uses the Plomp model, which includes 2 stages: preliminary research and prototyping. Primary research aims to determine and define the requirements for the development product—initial research stage by conducting need and context analysis, literature review, and theoretical framework. Prototype formation is the design stage by realizing the intervention of the product being developed. Prototyping phase including initial plan and self-

evaluation This research is limited to self-evaluation activities to produce prototype II.

Need and Context Analysis

This stage aims to see the views of teachers and students regarding the situation, including what has gone well, what needs to be changed, and the expected characteristics of the problem. The methods used to analyze needs and context are distributing questionnaires to students and interviewing teachers.

Literature Review

This stage aims to find related references with research plans and understanding connections to obtain and increase knowledge about the developed products. References used include books, journals, theses, and other online sources.

Theoretical Framework

The need, context analysis, and literature review results are outlined in the theoretical framework by identifying and compiling the main concepts of designing Moodle-based learning integrated with H5P on chemical equilibrium topics.

Initial Plan

At this stage, the design of learning media begins, starting from creating the website, the appearance of the site, and the systematics of its use. This initial plan stage produces results in prototype I.

Self Evaluation

Self-evaluation is carried out using a checklist system for essential components that must be in learning media to see the completeness of prototype I. This stage produces prototype II.

The subjects of this study were six chemistry teachers at SMAN 1 Pariaman, SMAN 2 Pariaman, and SMAN 3 Pariaman, and fifty students of SMAN 1 Pariaman. The object of this research is Moodle-based learning integrated with H5P interactive on chemical equilibrium topic for phase F SMA/MA. The data collection instruments of this research used were questionnaire sheets and interview sheets. The evaluation results based on self-evaluation activities are analyzed, and revisions are carried out to improve the quality of the prototype to produce a prototype II that can run properly.

RESULTS AND DISCUSSION

This research includes Educational Design Research to produce a product in the form of Moodle-based learning media integrated with H5P interactive content with domains <http://kelascerdas.tech> on chemical equilibrium topic for phase f SMA/MA. This research uses the Plomp development model, including the preliminary study and prototyping phase. This research is limited to forming prototype II to produce media design based on primary research

analysis. The research results obtained from each stage are described below.

Need and Context Analysis

This stage aims to see the views of teachers and students regarding the situation, including what has gone well, what needs to be changed, and the expected characteristics of the problem. The methods used to analyze needs and context are distributing questionnaires to students and interviewing teachers. The data to be analyzed was obtained from six chemistry teachers from SMAN 1 Pariaman, SMAN 2 Pariaman, and SMAN 3 Pariaman and fifty students of SMAN 1 Pariaman. Through this need and context analysis, developers can design a Moodle learning media that is functional, interactive, effective, and enjoyable.

Chemistry is a subject that has abstract concepts and analogies, as well as specific models that require pretty high reasoning power to learn [12]. This makes chemistry one of the lessons quite tricky for students because it contains concepts, facts, theories, and calculations related to chemical reactions [13]. The distribution of a questionnaire conducted on fifty students of SMAN 1 Pariaman showed that 84% of students stated that learning chemistry was complex. Chemical equilibrium is one of the most challenging materials to understand in chemistry learning. The difficulty in understanding this material is based on the student's understanding of macroscopic and microscopic concepts. Incomprehension of tiny concepts can result in misunderstandings and, if going on consistently, cause a wrong concept in the material [14].

One effort that can be used to assist students in understanding learning is by using learning media. Instructional media is also a tool that delivers learning information from learning sources, namely teachers, to recipients of learning messages, namely students [15]. Learning media significantly contributes to the learning process because it functions as a tool and learning resource for students [4]. Using learning media can foster students' interest in learning new things so that it helps students understand learning materials [16].

Based on the results of interviews conducted by researchers at SMAN 1 Pariaman, it is known that the use of learning media in schools is limited to textbooks, PowerPoint, and LKPD. Teachers have not used E-learning as a learning medium on chemical equilibrium topics. Distributing questionnaires to students showed that 98% of students already had digital devices with good internet access. This indicates that internet use in learning is not yet optimal due to the unavailability of internet-based learning media. Teachers have not used the media learning that utilizes technology, such as e-learning, and still use conventional and lecture methods. Hence, students are less interested and lack participation in the learning process. Raguwan states that traditional

learning uses the lecture method causes students to appear passive in the learning process, so students are less responsive to the teacher's explanation. Learning interactions only occur in one direction, so learning activities are less than optimal [17]. Therefore, learning media is needed to increase student activity, especially in chemical equilibrium topics such as Moodle-based learning media integrated with H5P.

Literature Review

This stage aims to find references related to the research plan and understand the connections to obtain and improve knowledge about the product being developed. The results of this stage are supporting concerns related to research.

Moodle learning media on chemical equilibrium topics is valid and gets a positive response. This is supported by the research of Dandulana, which shows that the Moodle learning media on chemical equilibrium topics meets the validity criteria, and this media received positive responses from teachers and students [10]. Moodle-based learning integrated with H5P has validity criteria. This is supported by the research of Juliati, which shows that media developed using LMS Moodle with H5P on molecular shape topics meets the validity criteria. This media increases student interest in learning [18]. Moodle integrated with H5P increases students' interest in learning. This is supported by Mir's research, which shows an increase in student interest in learning by using the H5P features in the Moodle LMS. The ease of using H5P and the interactive content help students increase interest and participation in learning [9]. Moodle is effective for online learning. This is supported by the research of Megayanti, which shows that 68% of students stated that Moodle was effective for managing online learning because education was more neatly organized and less confusing and scheduled [19].

Theoretical Framework

The need and context analysis results, along with the literature review results, are outlined in a conceptual framework. The theoretical framework is given in Figure 1.

Initial Plan

The development of this learning media uses the Moodle application. After that, we added several plugins, such as H5P, Level Up!, and others. H5P is a plugin that provides various features that can be used to create exciting learning media. Level Up! It is a plugin that displays students' activity and participation in accessing learning on Moodle sites. It is essential to design a flowchart to understand the design of this learning media. The flowchart is given in Figure 2.

In addition to the flowchart, a storyboard of media was designed in the initial. This storyboard functions to visualize the concepts and flow of media

being created and to identify and test the media being developed. The storyboard is given in Table 1.

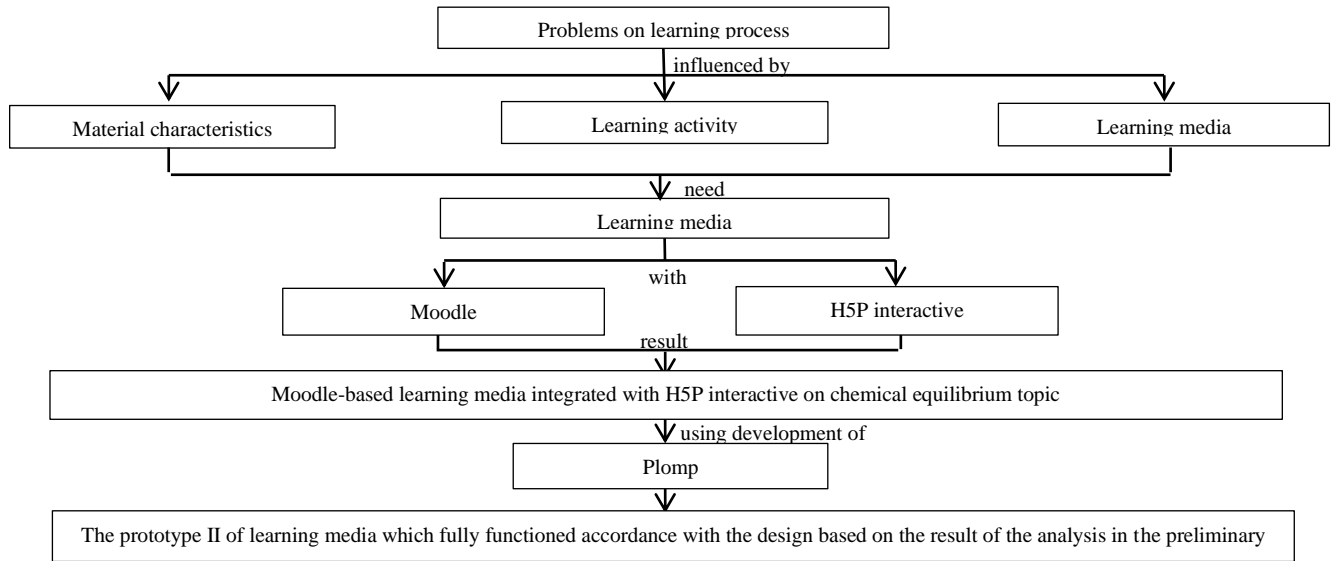


Figure 1. Theoretical Framework

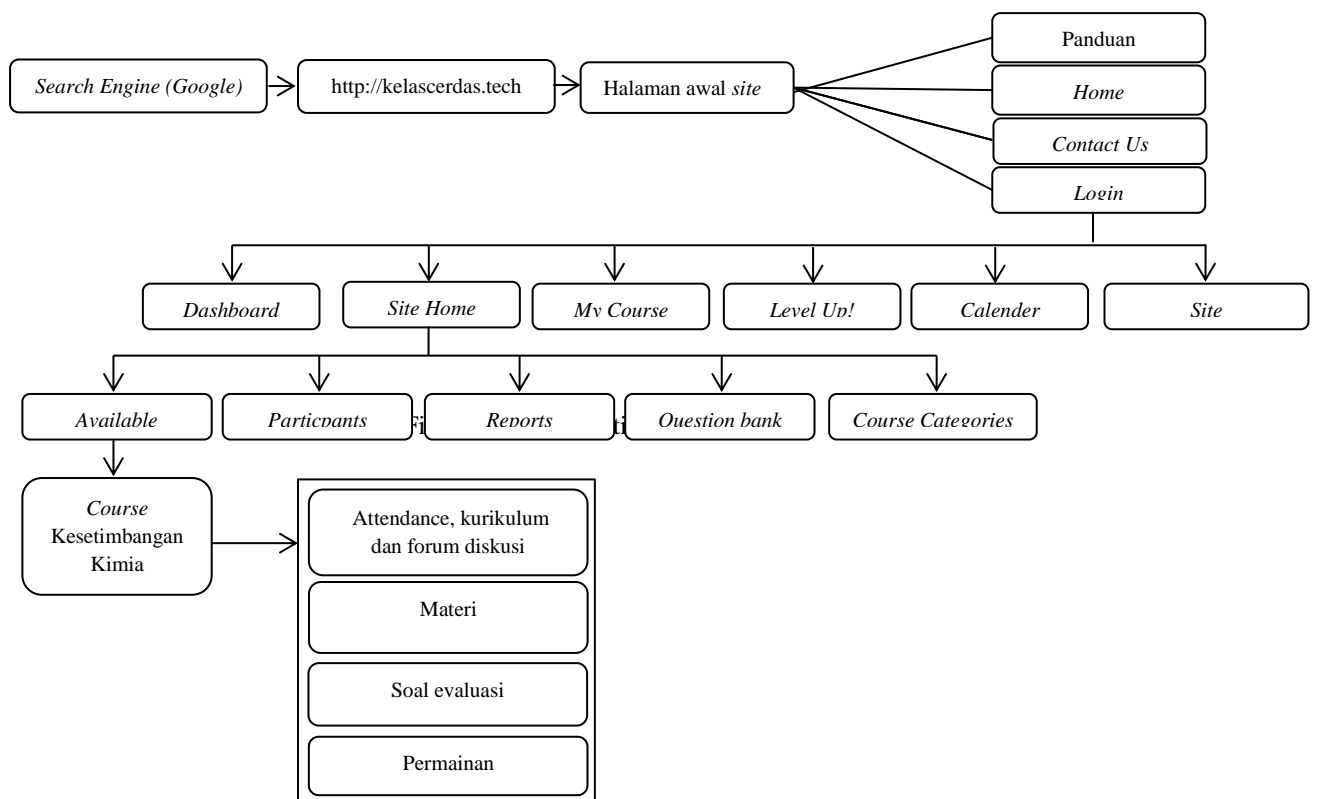


Figure 2. The design of this learning media

Table 1. The Media Storyboard

Page	Design	Description
E-learning (http://kelascerdas.tech)		
Front Page		<p>The Front Page consists of several menus, including.</p> <ol style="list-style-type: none"> 1. Login 2. Welcome text and user guide 3. Contact us <p>There is also information about the developer's profile, logos, mottos, number of students, and classes.</p> <p>The user must click the login menu from this Front Page to continue.</p>
Login Page		<p>This Login page has a background image and a box to enter a username and password.</p>
Dashboard		<p>Several features on the Dashboard include Home, My Courses, Profile, Courses, Level up!, Calendar, Online users, Events, and Contact Us.</p> <p>Description</p> <ol style="list-style-type: none"> (1)Fun chemistry (2)Home (3)Dashboard (4)My course (5)Notifications (6) Messages (7)Profile <p>To access learning materials, users can go to the Courses menu.</p>
Home		<p>There are several features on the Home Page, including Dashboard, My Courses, Profile, Available Courses, Courses Categories, and Contact Us.</p> <p>Description</p> <ol style="list-style-type: none"> (1)Fun chemistry (2)Home (3)Dashboard (4)My course (5)Notifications (6) Messages (7)Profile

Page	Design	Description
Course Chemical Equilibrium		There are several menus on page Courses Chemical Equilibrium, including: (1) Information (contains Developer Profile, Curriculum, About Media, Attendance and Discussion Forum) (2) Learning Material (Interactive Book) (3) Quiz (4) Games (Crosswords, Drag and Drop)

Self Evaluation

Self-evaluation is carried out using a check list system for the essential components in learning media to see completeness prototype I. The media functions are designed following the analysis results in preliminary research according to what the user needs. In contrast, in general media, there are the front page, login page, Dashboard, home page, courses, learning materials, games, and quizzes. In the previous research, Dandulana stated that the Moodle learning media on chemical equilibrium topics is successfully built, can run well, and gets positive responses from teachers and students due to learning media assisted by Moodle learning media [10]. However, the learning media are not yet equipped with H5P interactive features that can guide students to find concepts. H5P can help teachers to create active learning through the content provided. With more than 40 types of content, it can make it easier for teachers to create content that attracts student learning interest [20]. Therefore, this research designs a learning media with materials that can guide students



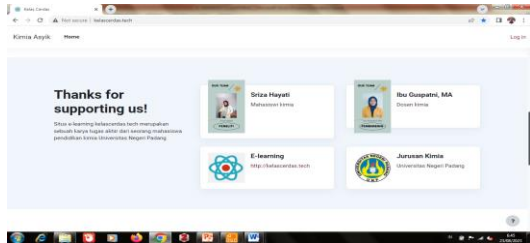
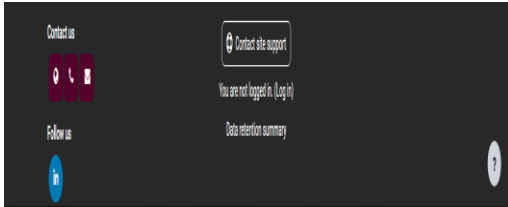
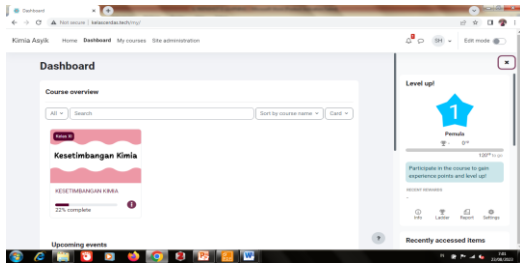
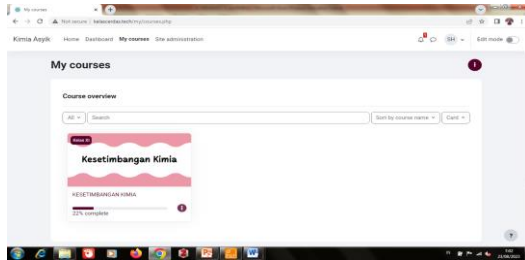
to discover concepts and increase students' interest and learning participation through interactive content.

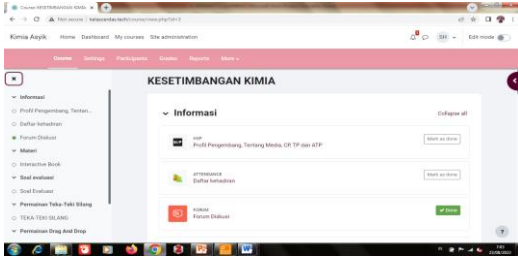

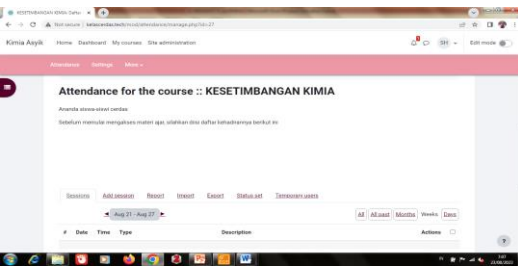
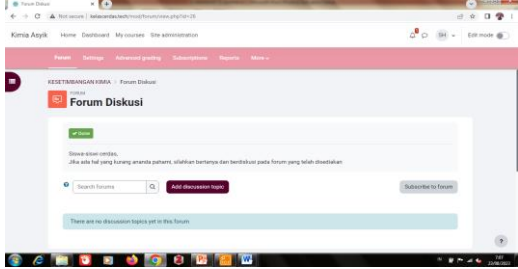
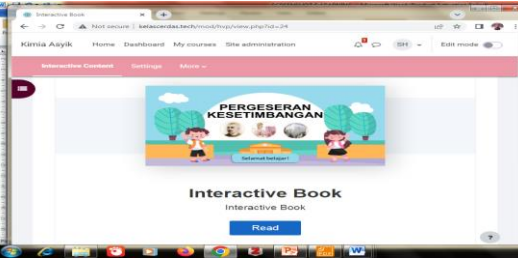
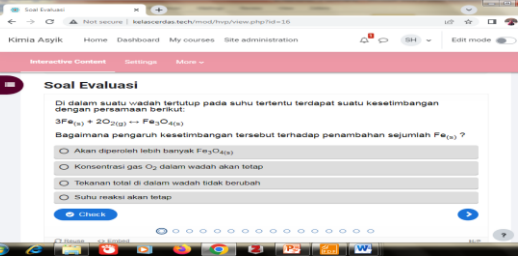
The learning media complementing the research design provides a main page with information such as the User Guide, Introduction of Media Components, About Media, and Developer Profile. After logging in, multiple blocks were on the dashboard page, such as Level Up!, Calendar, Upcoming Events, Online Users, and My Courses. On the course page, several options are available such as Curriculum information, Attendance, Discussion Forums, Learning Materials, Quiz and Games. The material displayed is oriented to guide students in discovering concepts independently through various interactive content created using H5P. In addition, each question is also equipped with feedback so that students understand the concept better. So, the result is that Moodle-based learning media integrated with H5P interactive is successfully implemented according to the expected functions and designs.

This stage will produce prototype II. The results of the self-evaluation are given in Table 2.

Table 2. Self Evaluation Result

No	Page	Description	Display	Conclusion
1	Front Page	The Front Page is successfully displayed with information such as the User Guide, Introduction of Media Components, About Media, Profile, and Contact Us. On the top right side, there is a Login menu.		Succeed

2	User Guide	User Guide is successfully displayed with instructions to help users access the site.		Succeed
3	Introduction of Media Components	The introduction of Media Components is successfully displayed with some information about the functions of the menus on the site.		Succeed
4	Profile Page	The profile page is successfully displayed		Succeed
5	Contact Us	Contact Us is successfully displayed. Each icon clicked will direct the user to a contact from the developer, who can be contacted.		Succeed
6	Dashboard	The dashboard page is successfully displayed. Several blocks exist, such as Level Up!, Upcoming Events, Online User, and Calendar.		Succeed
7	My Courses	My Courses are successfully displayed. When clicked, a chemical equilibrium material will appear.		Succeed

8	Material Selection Page	Material Selection Page is successfully displayed with a vertical view		Succeed
9	Curriculum Page	The curriculum page, including CP, TP, and ATP, is successfully displayed. If you slide it, About Media and Developer Profile will appear.		Succeed
10	Attendance Page	The attendance page is successfully displayed. Students must fill in the attendance before accessing the learning.		Succeed
11	Discussion Forum Page	The discussion Forum page is successfully displayed. Users can interact with each other by leaving messages or comments on this page.		Succeed
12	Learning Material	The Learning Material page is successfully displayed with text, images, interactive videos, and quizzes guiding you to discover concepts.		Succeed
13	Quiz Page	The quiz page is successfully displayed with an options button		Succeed

14 Games Page

The game page, such as Crosswords Drag and Drop, is successfully displayed



Succeed

CONCLUSION

Based on preliminary research data and the prototyping stage, it can be concluded that the design of Moodle-based learning media integrated with H5P on chemical equilibrium topic using the Plomp development model, which produced prototype II, has been successfully carried out under the requirements design and preliminary analysis. This Moodle-based learning with H5P interactive is a solution to help students understand the concept of chemical equilibrium and increase students' participation in education.

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