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DEVELOPMENT OF HORMONE SYSTEM TEACHING MATERIAL FOR DISTANCE LEARNING TO IMPROVE STUDENTS DIGITAL LITERACY

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Abstract: This research aims to develop hormone system teaching material for distance learning DL through Moodle to improve students' digital literacy. This research uses the Research and Development (R&D) method with the ADDIE model, which has the stages of analysis, design, development, implementation, and evaluation. The developed teaching material was tested for feasibility on the material, media, and language aspects by six expert validators. Two biology teachers and students from senior high school SMAN 3 Bekasi also tested the developed teaching material. The results showed that the hormone system teaching material for DL through Moodle had an average value of 3.40 (very valid) on the material aspect, 3.30 (very valid) on the media aspect, and 3.03 (valid) on the language aspect. The Biology teacher's trial obtained an average value of 3.45 (very valid) and an average of 3.32 (very valid) for the students' trial. The hormone system teaching materials for DL through Moodle has a final average value of 3.30 from a maximum value of 4.00. It shows that the hormone system teaching material for DL through Moodle is very valid to be used as a learning medium for hormone systems in schools and is expected to improve students' digital literacy.

Keywords: *ADDIE, Teaching Material, Hormone System, Moodle, Digital Literacy*

INTRODUCTION

The COVID-19 pandemic has impacted almost all sectors of life, including education. One of the impacts on the world of education is the change in the face-to-face learning method to distance learning (DL) which applies to almost every region in Indonesia [1]. DL is difficult to learn, especially in scientific subjects such as Biology [2]. Biology subjects include much material that studies living things, the environment, and the interactions between living things and the environment [3]. One of the materials in Biology that has a high level of difficulty is the hormone system, this is due to the material on the hormone system having many concepts related to processes in the body that cannot be observed directly [4]. The hormone system material is one of the sub-materials of the humanitarian coordination system [5]. The hormone system is an applicable but intense material [6]. Hormone system material becomes material that students need help understanding because of its complicated nature and many new terms previously unknown to students [7]. In addition, the hormone system becomes material that is not easy to understand because it is abstract. The material in the hormone system that is abstract includes the mechanism of action of hormones and the process of hormone secretion from the endocrine glands [8]. One way to overcome students' difficulties in understanding hormone system material is to develop appropriate teaching materials [9].

Hormone system material during DL is studied through digital devices, so digital literacy skills are needed to understand the material well during DL [10]. Digital literacy skills can help students to understand abstract concepts in hormone system material taught through digital devices [11]. Good digital literacy skills can also improve the quality of using learning resources from digital devices [12]. In addition, digital literacy skills are relevant because students participate in the learning process in the digital era [13]. Digital literacy competence itself consists of functional, visual, scientific, technological, information, cultural, and global literacy abilities that are important to improve in the digital era [14].

Digital literacy skills are considered one of the critical competencies that need to be possessed in the era of the digital revolution. However, students' digital literacy skills still need to improve, especially in collecting information from digital devices [15]. In Biology learning, students are more interested in being listeners than actively thinking for themselves and finding the information they need for themselves. Furthermore, using digital technology, students' abilities are limited to accessing social networks and seeking information without knowing the truth of the information obtained [16]. One of the factors that cause students' low levels of digital literacy in Indonesia is the need for more application of digital technology in the implementation of learning [17].

Therefore, technology and digital devices need to be integrated into Biology learning. Improving digital literacy skills can be trained by familiarizing students with various digital devices

[18]. New, more innovative information technology strategies are essential for appropriate learning implementation [19]. One of the technology in digital device-based learning that can be used to train digital literacy skills is LMS (Learning Management System) [20]. LMS is a learning management system that combines pedagogical features with virtual learning technology and has a function to share information, record student data, and assess student learning outcomes online to create a dynamic learning environment [21]. One type of LMS that is developing the fastest in facilitating DL is Moodle [22]. In addition, Moodle can be used easily to create DL according to needs [23].

Moodle (Modular Object-Oriented Dynamic Learning Environment) is one type of LMS that can be used to develop systems and learning processes for Biology using digital devices such as computers, laptops, and other devices [24]. Through Moodle, teaching materials in soft files can be converted into the web form with an object-oriented model so students can learn dynamically [25]. Moodle can provide convenience for students in learning hormone systems because it has good quality in providing teaching materials and can improve students' skills to use digital devices, which is one of the essential aspects of digital literacy [26]. The application of LMS, such as Moodle, has been proven to provide an increased understanding of the importance of digital literacy [27]. Other research also proves that Moodle effectively develops students' digital literacy skills [22]. In addition, using Internet applications in the learning process has broad implications for developing student insight [28]. Based on the studies put forward, this study aims to develop teaching materials for the hormone system for DL through Moodle that are oriented toward increasing students' digital literacy.

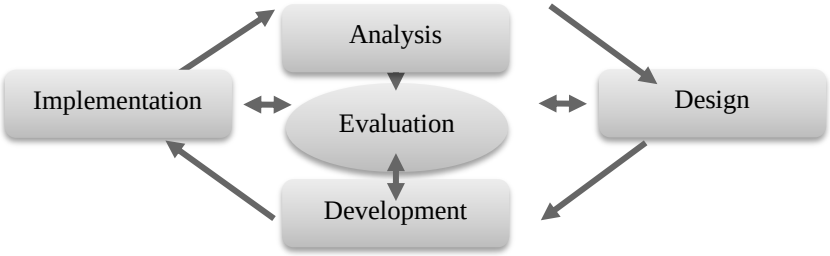

Figure 1. ADDIE model research stage [29]

RESEARCH METHOD

Research Design

This research is research on the development of hormone system teaching materials for DL through Moodle, which is oriented towards increasing students' digital literacy, this research was carried out in September 2020 - July 2021. The research and development method with the ADDIE model refers to Branch (2009), which can be seen in the illustration in Figure 1.

Research Procedure

At the analysis stage, the student and teacher observation instruments were distributed. The distribution of observation instruments was carried out to know the problems in learning the hormone system in schools. The teacher's observation instrument was intended for the eleventh-grade Biology teacher, and the student's observation instrument was aimed at 36 students. At the design stage, it seeks to analyze the material used in teaching materials for the hormone system and making storyboards. At the development stage, the hormone system teaching materials were developed, and product validation tests were carried out by experts consisting of material experts, media experts, and language experts. Early stages of material development using the Canva app. At this stage, hormone system material, as well as images and videos relevant to hormone system learning, will be entered into Canva and designed in such a way as to have an attractive appearance. The hormone system teaching materials produced in Canva are in PDF format. After making the hormone system teaching materials, the next step is to enter the teaching materials into Moodle. Products that have been developed will then be validated by material, media, and language experts.

At the implementation stage, implementation is carried out by testing the hormone system teaching materials. In this study, the implementation phase was limited to small group trials of Biology students and teachers to know the responses of students and teachers to the hormone system teaching materials that had been developed. Formative and summative evaluations were carried out. Formative evaluation is carried out at the end of the analysis, design, and development stages to improve the needs of the product to be developed. The summative evaluation was carried out at the end of the implementation phase based on the responses and suggestions from Biology students and teachers to improve the hormone system

teaching materials. The final result of this stage is teaching materials through Moodle that are feasible and ready to be used in DL on hormone systems material.

Research Instruments

In this study, several data need to be collected. The first data gathered is the result of student and teacher observations. The data collected next is the result of product validation from experts consisting of material experts, media experts, and language experts. After validation, the product development was tested on Biology students and teachers to know the responses of students and teachers to the Use of the hormone system teaching materials that had been developed. The techniques and instruments used in data collection can be seen in table 1.

Table 1. Data Collection Techniques and Instruments.

No	Stage	Technique	Instrument	Target
1.	Analysis	Observation	Questionnaire	Students and teacher
2.	Design	No data collection		
3.	Development	Material feasibility test	Questionnaire	Material experts
		Media feasibility test	Questionnaire	Media experts
		Language feasibility test	Questionnaire	Language experts
4.	Implementation	Limited trial	Questionnaire	Small group students and teachers
5.	Summative Evaluation	No data collection		

Data Analysis

The results of the validity scores of the instrument of feasibility test, Biology teacher trials, and student trials were analyzed using quantitative analysis techniques. The percentage of data obtained was then converted based on the BSNP scale in table 2.

Table 2. Feasibility Test Assessment Scale.

Criteria	Score
Strongly agree	4
Agree	3
Disagree	2
Strongly disagree	1

The value of the feasibility quality of hormone system teaching materials is obtained based on the overall average value or can be obtained using the following formula:

$$\text{Value} = \frac{\text{Score earned}}{\text{Number of questions}}$$

After the quality value is obtained, the results of the feasibility of the hormone system teaching materials can be known based on the interpretation of the feasibility test value adapted from Ratumanan & Laurens (2011). The table of interpretation of the value of the feasibility test can be seen in table 3.

Table 3. Feasibility Test Score Interpretation.

Category Interval	Criteria	Description
$3.25 > x < 4.00$	Very Valid	It can be used without revision
$2.50 > x < 3.25$	Valid	It can be used with minor revisions
$1.75 > x < 2.50$	Less Valid	It can be used with multiple revisions
$1.00 > x < 1.75$	Not Valid	It cannot be used yet and needs consultation

[30]

RESULT AND DISCUSSION

The results of this research and development are discussed based on each stage that has been carried out, including the stages of analysis, design, development, implementation, and evaluation [31].

Analysis

At the analysis stage, observations were made on Biology students and teachers to discover the problems in learning carried out at schools, especially on hormone system material [32]. The analysis stage was done by distributing questionnaires at SMAN 3 Bekasi via Google Forms. The observation questionnaire was distributed in February 2021, and the conditions of the Covid-19 pandemic, so it was carried out online.

Students Observation

Student observations were carried out by distributing questionnaires to 36 respondents. The

questionnaire is intended for students who have previously received material on the hormone system. The results of student observations that have been made can be seen in Figure 2.

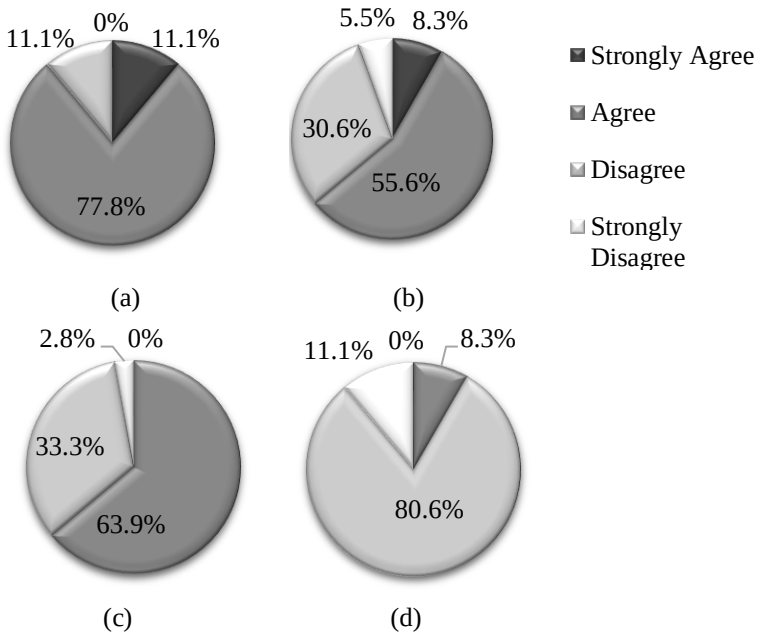

Figure 2. Students' perceptions related to (a) The material on the hormone system is abstract and contains many new terms; (b) The topic of the material mechanism of hormone action and hormone secretion is abstract; (c) The topic of material types of hormones and types of endocrine glands which are new terms; (d) Use of hormone system teaching materials through Moodle

Figure 2 shows that the hormone system material is one of the difficult materials in Biology because it is abstract and has many new terms that students did not previously know. It is supported by previous research stating that the hormone system is a material with several Latin terms and a complicated mechanism of action [33]. The Latin term contained in the hormone system material is one of the factors that cause students to experience misconceptions regarding the hormone system material [34]. The results of the observations also show that the topic of the mechanism of hormone action and hormone secretion is a difficult subject. It is in accordance with previous research, hormone system material is difficult material, especially in the concept of hormone regulation and secretion [35]. In addition, the topic of hormone types and types of endocrine glands is considered to have many new terms. The hormone system material is also rated as one of Biology's five most difficult topics [36].

At the time of DL, the material on the hormone system was taught through digital devices, so it was increasingly difficult to carry out the learning process because the material presented by the teacher could not be understood properly [2]. Digital literacy skills are needed to understand the material through DL [10] properly. It is because digital literacy is understanding and using information from various digital sources [37]. In addition, digital literacy is also a particular skill needed to use digital technology efficiently [38].

Online-based learning using digital devices can be used to improve students' digital literacy skills [39]. One of the media that can support online-based learning is Moodle. Previous research stated that Moodle is a collaborative and communicative medium that is appropriate to be used as a medium for DL [40]. However, based on observations, it can be seen that the majority of students at SMAN 3 Bekasi have never used Moodle as a learning medium. It is one of the reasons for making Moodle a new learning medium for students that can be used to support DL, especially on hormone system material. Hormone system teaching materials have various features that present hormone system material in pictures, diagrams, and videos and present actual and interesting facts to facilitate students in learning the hormone system. In addition, based on the results of student observations, it can also be seen that the majority of students need Biology learning media that has an attractive visual appearance, can be used anytime and anywhere, contains the latest information, and has many features that can support the Biology learning process, especially on hormone system material. The teaching materials desired by students are teaching materials that have attractive designs, comprehensive materials, and

language that is easy to understand and easy to use [41]. Based on the results of student observations that have been carried out, it can be seen that there is a need for the development of hormone system teaching materials through Moodle.

Teachers Observation

Biology teacher observations were conducted by distributing questionnaires to Biology teachers in class XI at SMAN 3 Bekasi. Based on the observations, the Biology teacher believes that learning media is necessary to help understand the material on the hormone system. In addition, the Biology teacher also believes that the teaching of hormone system materials at the school has used the help of effective learning media such as textbooks and PowerPoint. The role of learning media in the teaching and learning process in schools is considered very important. Still, in the opinion of Biology teachers, the hormone system learning media used at SMAN 3 Bekasi has not varied, and inadequate infrastructure is one of the obstacles experienced when learning the hormone system at school. In addition, based on observations, it can be seen that the Biology teacher at SMAN 3 Bekasi has never used teaching materials through Moodle for DL material on hormone systems. Biology teachers at SMAN 3 Bekasi support the development of hormone system teaching materials through Moodle, which is oriented toward increasing students' digital literacy.

Design

After observing the students and Biology teachers at the analysis stage, the next step that needs to be done is design [42]. At this stage, all planning is done through material analysis and storyboarding [43]. The results of the material analysis of the hormone system are adjusted to the essential competencies, learning objectives, learning indicators, observation results, and suggestions and guidance from the supervisor. In general, the material contained in the hormone system teaching materials consists of (1) endocrine gland characteristics, (2) hormone derivatives and working mechanisms, (3) glands and hormones produced, and (4) hormonal system abnormalities. The complete topic on the hormone system material can be seen in Figure 3.

In addition to material analysis, storyboarding is also carried out at the design stage. The storyboard is prepared to provide a visual description of the product to be produced [44]. The storyboard of the hormone system teaching materials through Moodle displays existing features on Moodle, the hormone system DL class on Moodle, and the display of Moodle when accessing the hormone system teaching materials. In addition, the storyboard also displays the cover of the hormone system teaching material, a concept map, an introduction to the hormone system teaching material, and interesting facts about the hormone system in the teaching material. Various interesting features in learning media can increase students' attractiveness to the developed learning media [45].

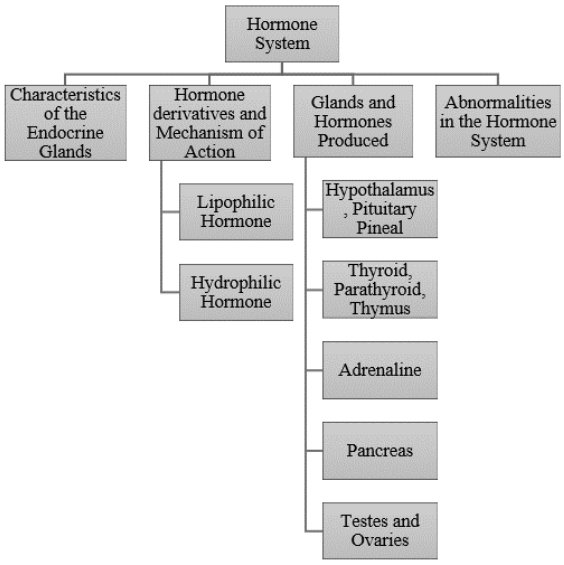

Figure 3. Hormone system material analysis concept map

Development

The development stage is carried out after the design process is complete and the product to be produced begins to be developed [46]. At this stage, hormone system teaching materials were developed, and product validation tests were carried out by experts consisting of material experts, media experts, and language experts. In the early stages of developing teaching materials for the hormone system, the basic components such as texts, pictures, and videos relevant to learning the hormone system are arranged. The preparation of these components is done using the Canva application. Canva was chosen to develop hormone system teaching materials because it is easy to design learning media and contains many templates to create engaging material content [47]. After making the hormone system teaching materials in PDF format, the next step is to enter the teaching materials into Moodle. There are obstacles experienced in developing teaching materials. The Canva account is still free, so it can only access some of the existing features. It can be overcome by purchasing a Canva Pro account which can access all the available features to maximize the process of developing teaching materials.

The hormone system material and other supporting resources that have been prepared are then compiled in the form of teaching materials using the Canva application and produced in PDF format. The teaching materials used in the preparation stage were adapted from teacher

handbooks and other Biology books that cover material on the hormone system.

In addition to developing hormone system materials, Moodle set other supporting features such as discussion forums and quizzes to evaluate hormone system materials. Overall, the hormone system teaching materials and the features provided on Moodle can be accessed using digital devices such as gadgets, laptops, or computers, so accessing the hormone system teaching materials through Moodle is one way to improve students' digital literacy skills. The teaching materials that have been completed are validated to assess their feasibility based on the material, media, and language aspects. The validation of the hormone system teaching materials was carried out by six validators with the provision that two validators assessed one aspect of the assessment.

a. Material Feasibility Test

The material feasibility test is based on the suitability of the hormone system teaching materials with essential competencies, learning indicators, and learning objectives by the 2013 curriculum. The validators in the material feasibility test are carried out with the help of two expert validators. The results of the feasibility test for hormone system teaching materials can be seen in table 4.

Table 4. Material Feasibility Test Results.

Assessment Indicators	Statement	Expert Validator		Average
		1	2	
Conformity of product contact with the curriculum	1. The suitability of the content of hormone system teaching materials for DL through Moodle with basic competencies in the current curriculum	4.00	4.00	3.60
	2. List the contents of the basic competence of the hormone system clearly	3.00	4.00	
	3. The suitability of the content of hormone system teaching materials for DL through Moodle to learn the hormone system.	3.00	4.00	
	4. Hormone system teaching materials for DL through Moodle contain aspects of skills found in basic competence	3.00	4.00	
	5. The hormone teaching materials for DL through Moodle show examples of the application of the hormone system by KD	3.00	4.00	
Substance accuracy with learning media	6. The facts presented are a reality and are effective in improving students' digital literacy skills	3.00	2.00	2.75
	7. Hormone system teaching materials for DL through Moodle can enrich students' information about the right hormone system material	3.00	3.00	
Legibility	8. Hormone system teaching materials for DL through Moodle using standard words	3.00	4.00	3.50
	9. The suitability of the material with the thinking level of students in class XI	4.00	4.00	
	10. The accuracy of the structure and grammar used (no writing errors)	3.00	4.00	
	11. Accuracy in the Use of the Biology	3.00	3.00	
General description	12. The description of the material of the hormone system by the latest developments in endocrinology	3.00	3.00	3.50
	13. The presentation of pictures, illustrations, and videos is presented	4.00	4.00	
Material presentation effectiveness	14. The effectiveness of the facts presented in improving students' digital literacy	3.00	3.00	3.50
	15. The systematic layout of the presentation of the hormone system material is in order and neat	4.00	4.00	
Attractiveness and Motivation	16. The variety of features presented in the hormone system teaching materials for DL through Moodle	3.00	4.00	
	17. The diversity of scientific facts related to the material of the hormone system	3.00	3.00	
	18. The variety of images, illustrations, and videos	3.00	4.00	

	presented in the hormone system teaching materials for DL through Moodle			3.33
Conformity to the target (Students)	19. The pictures and illustrations presented are by the level of thinking development of class XI high school students	3.00	3.00	3.25
	20. The hormone system material presented can actively involve students and focus learning on students	4.00	3.00	
Average		3.25	3.55	3.40
Category		Very Valid	Very Valid	Very Valid

The material feasibility test assessment results from the validator show an average value of 3.40 and are included in the very valid category that can be used without revision. In the material feasibility test, the highest average score was obtained in the conformity of the product content with the curriculum, which got an average score of 3.60. It is because the material in the hormone system teaching materials is by the learning objectives of the hormone system. In addition, the content presented in the teaching materials includes aspects of knowledge and skills contained in basic competence, so it is relevant to the hormone system material taught in schools. The suitability and diversity of the hormone system material presented can help students understand the hormone system material well. In addition, students can also select the correct information related to hormone system material to avoid conceptual errors. It can train one aspect of digital literacy, namely media literacy. Media literacy ability is the ability to handle and select information obtained from digital devices [48]. In addition, this is also by previous research, which states that using learning media as a source of information can improve students' digital literacy skills, especially in gathering information [15].

However, in the material feasibility test, some things could still be improved, such as the material presented as a video considered inadequate by one of the expert validators. In addition, material related to the difference between hormones and neurotransmitters has yet to be explained in the teaching materials. Based on this, a revision was made to add videos and materials related to differences in hormones and neurotransmitters in teaching materials. Based on previous research, video is one form of media students often use to find information [49]. Adding videos to teaching materials can help students get more new information related to hormone system material. In addition, interesting learning videos can increase students' motivation to learn so that students' learning abilities increase.

b. Media Feasibility Test

The media feasibility test is based on the quality and completeness of the features and the general appearance of the system's teaching materials. The validator on media feasibility test was carried out with the help of two expert validators. The results of the feasibility test of the hormone system teaching material media can be seen in table 5.

Table 5. Media Feasibility Test Results.

Assessment Indicators	Statement	Expert Validator 1	Expert Validator 2	Average
Overview	1. Selection of the background and layout of the hormonal system teaching material features for DL through Moodle in general	3.00	3.00	3.00
	2. The suitability of the choice of color composition on the hormone system teaching materials for DL through Moodle	3.00	3.00	
Complete features of hormone system teaching materials through Moodle	3. Diversity of illustrations supporting the hormone system material	4.00	4.00	3.37
	4. The diversity of video addresses contained in the hormone system teaching materials for DL through Moodle	4.00	3.00	
	5. Diversity of website addresses for hormone system supplement materials	4.00	2.00	
	6. Diversity of illustration diagrams and tables supporting the material of the hormone system	4.00	2.00	
Interactivity	7. The unique appearance of each page on the hormone system teaching materials for DL through Moodle	4.00	4.00	

attraction	8. Diversity of interesting features for students	3.00	2.00	3.25
General description	9. The accuracy of choosing the type of font and font size so that it can be read clearly	3.00	3.00	3.00
	10. The sentences used are by the general Indonesian guideline	3.00	3.00	
	11. The accuracy of writing words or sentences (no writing errors)	3.00	3.00	
Quality features of hormone system teaching materials through Moodle	12. Image quality doesn't break when zoomed in	3.00	4.00	3.62
	13. Pictures and other illustrations are placed in the appropriate places	4.00	4.00	
	14. The accuracy of presenting the website address with the intended website	4.00	3.00	
	15. The accuracy of presenting the video address with the intended video	4.00	3.00	
Average		3.53	3.07	3.30
Category		Very Valid	Valid	Very Valid

The media feasibility test assessment results from the validator show an average value of 3.30 and are included in the very valid category that can be used without revision. In the media feasibility test, the highest average value was obtained in the feature aspect of the hormone system teaching materials, with an average value of 3.62. It shows that the owned features are considered appropriate and of high quality. Hormone system teaching materials are deemed high quality because they have image features that stay intact when enlarged, proper layout of images and illustrations, and video and website links listed are considered appropriate. Hormone system teaching materials are easily accessible and can be downloaded for offline study. In addition, using hormone system teaching materials through Moodle can improve one aspect of digital literacy, namely information literacy skills. It is my previous research the activity of downloading and using the content contained in Moodle can contribute directly to the aspect of information literacy [50]. Moodle is also equipped with a forum feature that can be used to discuss material on the hormone system that is available in teaching materials so that students are expected to be more active during the learning process. In addition, the forum feature can enable information exchange and collaboration activities, which are important indicators for improving students' communication and collaboration skills [51]. Communication and collaboration are aspects of digital literacy that can allow students to participate in online discussion activities [52].

Based on the results of the media feasibility test, it can be seen that there are several shortcomings in the teaching materials, such as the lack of references presented, more illustrations such as tables and diagrams needed, improvements to some of the writing colors are required and the addition of the quiz feature to Moodle is needed. Revisions were made regarding the results of the media feasibility test by adding references and illustrations in the form of tables and diagrams, in addition, improvements were made to the writing color, and added a quiz feature to Moodle. The quiz feature helps determine the level of understanding of students regarding the material of the hormone system that has been studied. Using online-based quizzes can also build students' knowledge regarding integrating ICT into the learning process [11].

c. Language Feasibility Test

The last assessment was assessing the hormone system teaching materials from the language aspect. The language feasibility test is based on displaying the type and size of the letters used, the accuracy of the Use of Biological terms, and the Use of good and correct language by the KBBI. The validator on the language feasibility test was carried out with the help of two expert validators. The language feasibility test assessment results from the validator showed an average value of 3.03. They were included in the valid category and could be used with slight revisions. The results of the language feasibility test for hormone system teaching materials can be seen in table 6.

The lowest average value in the language feasibility test is in the straightforwardness aspect of the sentence, with an average value of 2.75. It is because, in the hormone system teaching materials, there is still the Use of sentences that have yet to be effective. In addition, the shortcomings found in the language aspect, among others, are still seeing errors in writing words in teaching materials, and many foreign terms still need to be discovered by students, according to one of the expert validators. Revisions are made to correct mistakes in writing words or in writing sentences that are considered inaccurate. In addition, revisions were also made

by adding a glossary to the teaching materials. The glossary can make it easier for students to find scientific terms that are difficult to understand [53]. The final result of the development stage is the hormone system teaching materials through Moodle, which are ready to be tested.

Table 2. Language Feasibility Test Results.

Assessment Indicators	Statement	Expert Validator 1	Expert Validator 2	Average
Conformity to the level of development of students	1. The Use of sentences according to the level of thinking of students in Class XI	3.00	3.00	3.00
	2. The sentences used in the hormone system teaching materials for DL through Moodle do not have a double meaning	3.00	3.00	
Writing system	3. The arrangement of sentences in paragraphs can be understood easily and clearly	3.00	3.00	3.00
	4. Writing sentences according to the general Indonesian guideline	3.00	3.00	
Legibility	5. Accuracy in choosing fonts and font sizes	4.00	3.00	3.33
	6. Accuracy in choosing fonts and font sizes in descriptions of pictures and other illustrations	3.00	3.00	
	7. The accuracy of choosing the color of the letters that match the background-color	3.00	4.00	
Sentence succinctness	8. The accuracy of writing sentences in good and correct Indonesian	3.00	3.00	2.75
	9. Use short, concise, and clear sentences	2.00	3.00	
Use of terms and symbols	10. Consistency of using symbols in sentences	3.00	3.00	2.87
	11. Consistency of using terms in sentences	3.00	3.00	
	12. Consistency of using numbers in numbering	2.00	3.00	
	13. Accuracy in the Use of Terms in Biology	3.00	3.00	
Giving motivation	14. The sentences used can encourage students' curiosity	4.00	2.00	3.25
	15. The Use of sentences in the hormone system teaching materials for DL through Moodle is not boring	4.00	3.00	
Average		3.07	3.00	3.03
Category		Valid	Valid	Valid

Implementation

Products that expert validators have validated will then be implemented through trial activities [54]. This study's implementation phase was limited to small group trials for Biology students and teachers. According to previous research, the implementation phase can be limited to small-scale trials to get responses from students and teachers to learning media that have been developed [55]. The small group trial was conducted with the help of 38 respondents who were students of class XI science at SMAN 3 Bekasi. The results of student trials can be seen in table 7.

Table 3. Students Trial Results.

Component	Statement	Score Average	Component Average	Category
Contents	1. The order of the hormone system material provided in the hormone system teaching materials for DL through Moodle makes it easier to understand the material.	3.29	3.31	Very Valid
	2. The hormone system material presented is by the learning objectives to be achieved.	3.29		
	3. Complete illustrations make it easier to learn	3.37		
	4. Overall, the display of hormone system teaching materials for DL through Moodle is	3.24		

	interesting			
Appearance	5. The font size and type used are clear and easy to read	3.40	3.30	Very Valid
	6. The layout of the descriptions and illustrations is appropriate and easy to read	3.37		
	7. Matching color and shape layout	3.26		
	8. The terms used in the hormone system teaching materials for DL through Moodle are by the language of Biology	3.24		
Benefit	9. Hormone system teaching materials for DL through Moodle add information to students about the right hormone system material.	3.47	3.38	Very Valid
	10. Hormone system teaching materials for DL through Moodle increase curiosity about hormone system materials.	3.29		
Overall Average		3.32	3.32	
Category		Very Valid	Very Valid	

Based on the student's trial results, an average value of 3.32 was obtained, classified as a very valid category. In the student's trial, the highest assessment was found in the benefit aspect, with an average value of 3.38. It is because the hormone system teaching materials provide benefits for adding information about the hormone system material and increasing students' curiosity regarding the hormone system. High curiosity and the character of students who want to continue to grow their knowledge and information from digital devices are characteristics possessed by digitally literate individuals [56]. In addition, using Moodle can also increase the independence of students in the learning process [57].

Besides being implemented on students, limited trials were also conducted on Biology teachers. In this trial, two biology teachers in class XI filled out a questionnaire to determine the teacher's response to the hormone system teaching materials. Like the student's trial, the Biology teacher's trial was also completed by completing online questionnaires using Google Forms. The results of the Biology teacher's trial can be seen in Table 8.

Table 8. Biology Teachers Trial Results.

Assessment Indicators	Statement	Biology Teacher		Average
		1	2	
Conformity of product content with curriculum	1. Conformity of hormone system teaching material content for DL through Moodle with basic competencies with the current curriculum	4.00	3.00	3.50
	2. Compatibility of hormone system teaching material content for DL through Moodle with hormone system learning indicators	4.00	3.00	
	3. The suitability of the content of hormone system teaching materials for DL through Moodle to learn the hormone system	4.00	3.00	
Product accuracy with the development of science and technology	4. Hormone system teaching materials for DL through Moodle can be accessed anytime and anywhere	2.00	3.00	3.25
	5. Hormone system teaching materials for DL through Moodle can be accessed through various digital devices	4.00	4.00	
Completeness of the material of the hormone system	6. Complete hormone system material by the learning objectives to be achieved	3.00	3.00	3.33
	7. Descriptions, facts, and examples on the hormone system teaching materials for DL through Moodle are relevant to the hormone system material	4.00	3.00	
	8. The material presented in the hormone system teaching materials for DL through Moodle covers the	4.00	3.00	

	entire hormone system material			
Clarity of hormone system material	9. The hormone system material in the hormone system teaching materials for DL through Moodle is clear	4.00	3.00	3.50
Suitability of layout	10. The accuracy of the selection of supporting image layout	4.00	3.00	3.50
	11. The accuracy of the selection of supporting image illustrations	4.00	3.00	
	12. The accuracy of the shape and size of the layout	4.00	3.00	
Compatibility of type, color, and display size	13. The accuracy of the background color selection	4.00	3.00	3.50
	14. The accuracy of the selection of the font size and type used	4.00	3.00	
Use sentences that are easy to understand	15. The Use of Terms in the Language of Biology	4.00	3.00	3.50
Impression of media use	16. Hormone system teaching materials for DL through Moodle give an interesting impression of learning	4.00	3.00	3.50
Giving motivation to learning	17. Hormone system teaching materials for DL through Moodle encourage curiosity about hormone system materials	4.00	3.00	3.50
	18. Learning hormone system material with hormone system teaching materials for DL through Moodle is not boring	4.00	3.00	
Improve understanding of hormone system material	19. The scientific facts presented open up new insights about the material of the hormone system	4.00	3.00	3.50
	20. Through the hormone system teaching materials for DL through Moodle, students can learn independently	4.00	3.00	
Average		3.85	3.05	3.45
Category		Very Valid	Valid	Very Valid

Based on the results of the Biology teacher test, it can be seen that the hormone system teaching materials are very valid, with an average value of 3.45. In the Biology teacher trial, it can be seen that every aspect of the assessment has a very valid category, this shows that the hormone system teaching materials have advantages in every aspect of the assessment. The lowest assessment results are in the aspect of product accuracy with the development of science and technology, which gets an average value of 3.25. It is because the hormone system teaching materials cannot be accessed anytime and anywhere. After all, they require a good internet connection. However, this can be minimized with the feature of teaching materials that can be downloaded so that teaching materials can be accessed anywhere and anytime offline.

Evaluation

Evaluation is the final stage of the ADDIE development model. At this stage, the hormone system teaching materials are perfected. The evaluation stage consists of formative and summative evaluations. Formative evaluation is carried out at the end of each stage of the model to improve things that need to be revised so that maximum results can be obtained from each stage. Summative evaluation is carried out at the end of the implementation phase based on input and suggestions from Biology teachers and students. The overall assessment of hormone system teaching materials through Moodle can be seen in figure 4.

Figure 4 shows that the highest score was obtained in the Biology teacher's trial and material feasibility test with a value of 3.45 and 3.40, respectively. The average value obtained based on the overall assessment that has been carried out is 3.30, with a very valid category. It makes the hormone system teaching materials through Moodle suitable for use in DL for hormone system materials in schools without needing revision.

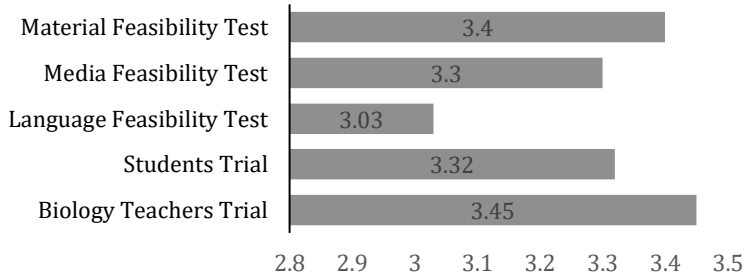

Figure 4. Overall Product Rating Chart

The hormone system teaching materials developed are oriented towards increasing students' digital literacy. It is because applying hormone system teaching materials through Moodle can integrate the Use of digital devices in the learning process. Improving digital literacy skills can be trained by familiarizing students with various digital devices [18]. The results of other studies also state that independent learning activities through multiple media, such as Moodle, are a stage of habituation that aims to improve students' digital literacy skills [58]. In addition, the various features of the hormone system teaching materials through Moodle can improve students' digital literacy skills through multiple competencies. It is supported by previous research that the file-giving feature in the form of teaching materials can increase students' information literacy competence, and the forum feature on Moodle can contribute to communication and collaboration competencies and problem-solving abilities [50]. The Use of Moodle during DL can improve students' learning abilities so that every learning activity can be carried out well, even though it is done online [59].

Furthermore, using Moodle in learning can also increase student satisfaction in the learning process [60]. Hormone system teaching materials through Moodle that have been developed have advantages and disadvantages as a learning medium. Based on the results of a series of feasibility tests and trials that have been carried out, the benefits of hormone system teaching materials include having an attractive appearance and various features such as images, illustrations, and videos that vary and are presented in actual terms. Hormone system teaching materials can be downloaded for students to study without requiring an internet connection, teaching materials have an orderly and neat layout, and the material presented is judged by the discussion of the hormone system studied at school. In addition, the hormone system teaching materials through Moodle are oriented towards increasing digital literacy competence to assist students in understanding the hormone system material during DL.

The weakness of the hormone system teaching materials through Moodle is that it requires an internet connection to visit the developed Moodle site. The display of Moodle on the device is not so good when compared to the display when using a laptop or computer, besides that, there has not been an effectiveness test related to hormone system teaching materials through Moodle, which can improve students' digital literacy skills so that this teaching material can only be said to be oriented towards improving students' digital literacy. These advantages and disadvantages are obtained based on the conversion of assessments from a series of feasibility tests and trials that have previously been carried out. These advantages and disadvantages can be used as a reference for conducting better further research related to hormone system teaching materials through Moodle so that better learning media can be produced.

CONCLUSION

The hormone system teaching material for DL through Moodle has been successfully developed. It is feasible to learn hormone system material because it has a very valid category based on the assessments of the validators, Biology teachers, and students. Hormone system teaching materials can provide a solution to the availability of hormone system learning media which is currently unavailable. Hormone system teaching materials through Moodle have attractive looks and features that can encourage students to learn independently. Teaching materials can be downloaded and studied offline. The material in teaching materials follows the material on the hormone system studied at school and can be oriented to improving students' digital literacy.

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