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# The Development of an Ebook Integrated with Learning Management System to Improve Student's Metacognition Ability

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**Abstract.** This study aims to develop an ebook that is integrated with a Learning Management System (LMS) to improve students' metacognition skills. The research uses the ADDIE development model (Assumption, Design, Development, Implementation, Evaluation). The research data were obtained from 40 students who filled out the questionnaire and took the pretest and posttest. The effectiveness of the ebook on improving metacognitive skills used N-Gain analysis and to determine the difference between the experimental and control classes, a T-test was performed, using One Group Pretest and Post-test Design. The results showed that ebook development was very good. The development of ebooks integrated with LMS can significantly improve students' metacognitive abilities. Thus, this study recommends that lecturers use ebooks that are integrated into the learning management system so that learning can run effectively to improve students' metacognitive abilities.

**Keywords:** Ebook, Flip PDF, Metacognitive Ability

## INTRODUCTION

In order to face the era of disruption of the 21st century and the industrial revolution 4.0, educators are required to be able to adapt to the changes and developments of extraordinary knowledge so that educators are needed who can compete not only in intelligence but creativity and intelligence in acting. The development of science and technology in the 21st century has changed the characteristics of students so that they require orientation and innovative ways of learning.

The learning process that only relies on textbooks and teachers as the only primary source becomes difficult for the latest learning to occur following the development of science. The utilization of big data as a learning resource is a necessity for 21st-century learning. Students must learn how to track, analyze, synthesize, transform, deconstruct and even create and share knowledge with others. The teacher's focus is providing opportunities for students to connect the material being studied with the real world. One of the significant effects of technology on 21st-century learning is the ease of access or accessibility to digital learning resources. For the achievement of these learning activities, the activities in learning must be able to develop cognitive abilities,

Online-based learning during the COVID-19 pandemic faces many obstacles and challenges. All students may not necessarily understand the content of the material delivered online. Because the content of this material is usually presented in the form of powerpoints or learning videos presented by lecturers or

assigned to students to be presented using various applications such as Whatsapp, zoom meeting, google meet, google classroom. The possibility of presenting material/content using the media can be understood, but students' understanding is not comprehensive. To make content/materials more comprehensive, one of them is selecting effective media and learning resources and online learning based on the use of information technology (Budiyono, 2020).

One of the electronic learning media that can be used in online learning is an e-book. (Wijayanti et al., 2015) suggests that e-books, electronic books, or digital books are electronic books. E-books are learning media containing learning materials displayed attractively with various supporting features such as images, videos, and audio (Daniel et al., 2018). E-books can be included in the flipbook maker application to help produce learning media with a more varied display, not only in the form of text but also images, videos, and audio can be inserted in the media (Sugianto, 2013). E-books can build competence and assess the need for learning (Putra & Anggraini, 2016).

Based on the results of the needs analysis regarding the development of media as a learning resource for learning animal development courses by distributing questionnaires to students who programmed animal development courses for the 2019 batch during the covid-19 pandemic, 50 student respondents stated that 95% supported the development of e-book learning media. Which is integrated into the Learning Management System (LMS). Students' expectations regarding the development of e-book learning resource media, the top three results of the questionnaire are 63% of learning media that can be accessed anytime and anywhere, 50% of media that can report the results of using media either assignments or tests,

The content of the material in the animal development course, is difficult to understand based on the results of the questionnaire distributed to students, 87% stated that some materials are difficult to understand, including the male animal reproductive system. It is hoped that the development of e-books integrated with LMS can improve students' metacognitive abilities. Thus students will be able to think at a higher level. As stated by Zammi et al. (2018), good metacognitive abilities will make the student learning process more meaningful by selecting strategies to improve cognitive abilities in the future.

Dunning (2003) suggests that metacognition is an essential determinant of academic success. According to Flavell (1979), metacognition is a person's awareness of how he learns, the ability to assess the difficulty of a problem, the ability to observe his level of understanding, the ability to use various information to achieve goals, and the ability to assess his learning progress. Besides students needing the ability to understand strategies in learning, students also need to improve their mastery of concepts. Indicators of achieving metacognitive improvement are when students can optimize thinking skills, identify learning strategies well, and consciously direct learning strategies (Fitriana, 2016).

Based on the problems above, it is necessary to develop learning media in soft files and online, namely e-books. In this study, the creation of the e-book will use the Flip pdf Corporate application, which can include videos, pictures, animations, and quizzes so that the learning process will not be monotonous. For this reason, the teaching materials used by researchers are technology-based and developed into electronic products, which are expected to improve student metacognition. The teaching materials to be developed are e-books containing one unit of material concepts that can be displayed with electronic devices. The reason for choosing e-books is because this media can be used as a learning medium with the advantages that it can be accessed anywhere and integrated content by video, and audiovidio.

## METHOD

The research method used in this study refers to the R&D (Research and Development) model with the ADDIE model consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation (Tegeh, 2014).

The steps that must be carried out in research in the ADDIE model as described by Tegeh (2014) are as follows:

a) Analysis

At this stage, the main activity is to analyze the need for e-book development and the feasibility and requirements of ebook development. The development of the ebook was initiated by the problem of using teaching materials in learning that had been applied. The problem occurs because the existing teaching materials are no longer relevant to the needs of

the target, the learning environment, technology, and learning conditions when done online.

b) Design

This activity is a systematic process that starts with setting goals and designing an ebook using the Flip PDF Corporate application. This design is still conceptual and will underlie the following development process.

c) Development

Development in the ADDIE model contains the realization of product design activities. In the design stage, it has been compiled in the form of an ebook. In the development stage, the conceptual framework is realized into a product ready to be implemented, then Validation, revision, small-scale, and large-scale tests are carried out.

d) Implementation

At this stage, the ebook design developed is implemented in an actual situation, namely in a class (small scale) using the Learning Management System. During implementation, the e-book design that has been developed is applied to actual conditions. After the implementation, an initial evaluation is carried out to provide feedback on implementing the following e-book.

e) Evaluation

At this stage, the ebook design developed in an actual situation, namely in class (small scale), is then retested on a large scale. After the implementation, an evaluation is carried out to provide feedback on the following implementation. At the evaluation stage, the effectiveness of the e-book was also tested to increase students' cognitive abilities.

The research subjects in this development research were students of the Biology Education Study Program, FKIP Tadulako University, who programmed the Animal Development course in the Even Semester of the 2020/2021 Academic Year.

Data analysis used quantitative analysis techniques. Quantitative data in this study were obtained from validator input at the validation stage, input from material experts, media experts, and data from small-scale and large-scale trials. To determine the quality and level of usefulness of the resulting product based on user opinions. The conversion of scores into assessment requirements can be seen in Table 1.

To determine how big the size of the effectiveness of ebooks is in improving metacognitive abilities and mastery of the concept of the male animal reproductive system in students. Then the N-Gain analysis was carried out.

To prove the significance of the value of the N-Gain scores of the experimental and control classes, the T-test was carried out with the steps used are to provide a pretest, treatment, posttest using the One Group Pre-test, Posttest design.

**Table 1**. Feasibility Scale for developing ebooks using Flip PDF Corporate.

| Percentage score (%) | Interpretation |
|---|---|
| 81% - 100% | Very Worthy |
| 61% - 80% | Worthy |
| 41% - 60% | Decent enough |
| 21% - 40% | Not worth it |
| 0% - 20% | Very Not worth it |

## RESULTS AND DISCUSSION

### Result

The results of the analysis of the needs of respondents in the animal development course as many as 40 students can be seen in the following table 2.

**Table 2**. Results of Needs Analysis on 40 students

| No | Indicator | Questionnaire analysis |
|---|---|---|
| 1 | Learning Methods used | Still using the lecture and question and answer method with ppt presentation media in helping the delivery of material |
| 2 | Learning Tools | Supporting facilities are adequate |
| 3 | Learning Media used | There is a need for media development |
| 4 | Expected media developed | Media that can make it easier to understand learning accompanied by animations/videos Learning. |

In general, from the results of the questionnaire analysis above, the needs for developing learning media are easy to use and easy to access anytime and anywhere. The material presented is easy to understand and equipped with learning simulations/ animations/ videos.

Product design is carried out at this stage, namely designing a product in the form of an e-book using a corporate flip pdf. The following are the steps in preparing a product design: 1) Creating a material concept from an e-book that is adapted to the RPS for animal development courses, 2) Creating an e-book cover using the Microsoft Publisher application, 3) Typing animal development material on an e-book using Microsoft Office Word 2010. 4) Provide free space on the Microsoft Word sheet, which will later be used to add videos/images and save the document in pdf format.

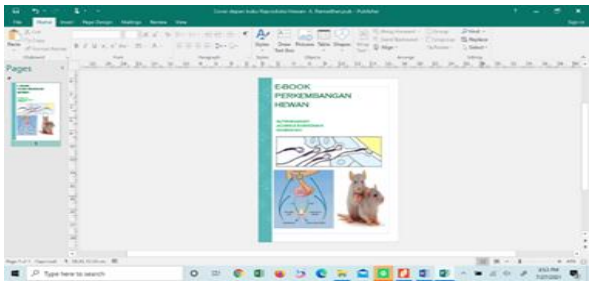

**Figure 1**. Design Ebook

The product design results are validated by material experts and media experts (Table 3 and 4).

**Table 3.** Results of Validation by Material Experts

| No | Aspects of assessment | Initial Validation (%) | Final Validation (%) |
|---|---|---|---|
| 1 | Presentation | 80 | 86.67 |
| 2 | Contents | 80 | 88 |
| 3 | Language | 81.11 | 88.89 |
| 4 | Material Depth | 84 | 90 |

Based on the table above, the initial validation assessment by material experts in the presentation aspect obtained a percentage of 80%, the content assessment aspect was 80%, the language aspect was 80.11%, and the material deepening aspect was 84%. The average initial assessment of material expert validation obtained a percentage of 81.27% with excellent criteria. After the revision, the percentage of material expert validation assessment has increased, namely in a presentation by 86.67%, content aspect by 88%, language aspect by 88.89%, and material deepening aspect by 90%. After the revision, the average result of the material expert validation assessment obtained a percentage of 88.39% with excellent criteria

**Table 4**. Analysis of Media Expert Validation Results

| No | Aspects of assessment | Initial Validation (%) | Final Validation (%) |
|---|---|---|---|
| 1 | Visual Display | 74.28 | 92.5 |
| 2 | Use of Letters | 72.5 | 88 |
| 3 | Physical Criteria | 80 | 86.66 |
| 4 | Voice | 80 | 90 |
| 5 | Ease of use | 80 | 95 |

Based on the table above, it appears that the initial Validation carried out by media experts on the visual display aspect obtained a percentage of 74.28%, the aspect of the use of letters by 72.5%, the aspect of the physical criteria by 80%, the excellent aspect by 80% and the ease of use aspect of 80%. The average initial assessment of media expert validation obtained a percentage of 77.35% with good criteria. The percentage of media expert validation assessment after the revision has increased, namely, in the visual display aspect it gets a percentage of 92.5%, the letter usage aspect is 88%, the physical criteria aspect is 86.66%, the sound aspect is 90%, and the ease of use aspect is 95%. After the revision, the average result of the media expert's validation assessment obtained a percentage of 90.43% with very good criteria.

The revised ebook has been implemented for Biology Education students at Tadulako University. The results of these trials can be seen in Figure 3 and Figure 4.

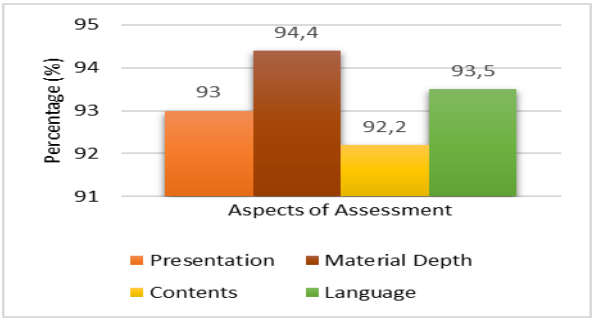


**Figure 2**. Comparison of assessment results by ten students in each aspect

The average percentage of the results of small-scale trials on the four aspects was 93.29%, with a very good category.

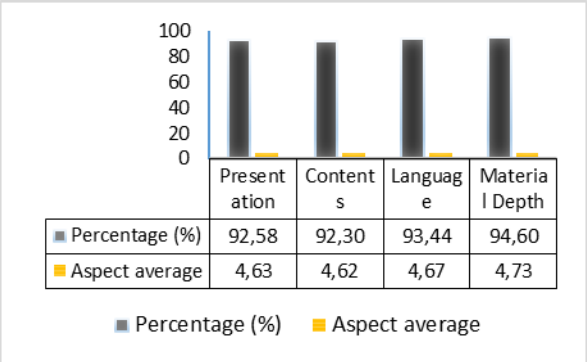


**Figure 4**. Percomparison of the results of the assessment by 40 students in each aspect.

The picture above shows the average percentage of the results of large-scale trials on the four aspects obtained by 93.23%, with a very good category.

Evaluation is carried out at the end of the program to determine the improvement of students' metacognitive abilities in animal development courses. The steps taken are to give pretest, treatment, posttest, using One Group Pretest, Post-test Design. The results of the analysis can be seen in the following table.

**Table 5.** Average N-Gain Score for the experimental class and the control class

| | Experiment Class N-Gain Score | | Control Class N-Gain Score |
|---|---|---|---|
| Average | 72.02 | Average | 24.68 |
| Minimum | 20 | Minimum | 0 |
| Maximum | 100 | Maximum | 62.50 |

Based on the calculation of the N-Gain score test, it shows that the average value of the N-Gain Score for the Experiment class (given an E-book) is 72.02 or 72.02% is included in the category quite effective with the N-Gain Score a minimum of 20% and a maximum of 100%. Meanwhile, the average N-Gain Score for the control class (not given an E-book) is 24.64 or 24.64 %. This percentage is included in the ineffective category, with a minimum N-Gain score of 0% and a maximum of 62.50%. Next, the Independent T-Test for the N-Gain Score was carried out. The results can be seen in the following table.

**Table 6**. Independent T-Test for N-Gain Score

| | | Levene's Test for Equality of Variances | | | | |
|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) |
| NGain_Percent | Equal variances assumed | 1,73 | .193 | 10,41 | 55 | .000 |

Based on the output table, it is known that the value of Sig. on Levene's Test for Equality of Variances is 0.193 > 0.05. It can be concluded that the variance of the N-Gain data (%) for the experimental class and control class data is homogeneous. Thus, the independent T-test for the N-Gain Score is guided by the value of Sig. Contained in the table Equal variances assumed. Based on the table above, it is known that the value of Sig. (2-tailed) is 0.00 < 0.05. Thus, it can be concluded that there is a significant difference between the class that was given the E-book and the class that was not given the E-book in improving the metacognitive ability of students who program animal development courses.

**Discussion**

Based on the results of the needs questionnaire analysis in the Animal Development Course, the Biology Education Study Program, FKIP Tadulako University, it is known that lecturers in learning still use the lecture and question and answer method with ppt presentation media in assisting the delivery of material, supporting facilities are adequate, but it is necessary to develop media that can make it easier for students to understand the learning material.

Students revealed that they needed learning media in which there was material and pictures, animations, and learning videos (audiovisual media). Lecturers also have never developed an e-book, so that researchers

develop an e-book that contains material, pictures, simulations, and learning videos packaged using the corporate flip pdf application. The developed e-book is then validated by material expert validators, media experts who aim to determine the validator's assessment of the e-book using a corporate flip pdf before the product is tested. The results of the material validation show that the e-book developed using the flip pdf of the integrated corporate Learning Management System (LMS) obtained a percentage of 88.39% with very good criteria. Likewise, the results of media validation obtained a participant of 90.43% with very good criteria. The results of this Validation prove that students very well use the feasibility of the E-book in terms of material and media in studying the material for the male animal reproductive system in animal development courses. This result is in line with the results of research conducted by Rosida et al. (2017), which states that the presentation of practical e-books can attract students because it has a display and format that displays images/photos so that it has a higher meaning than just reading or listening to the video. Animation, as well as phenomena that are by the material. The same thing was also stated by (Suparno 2018) that E-books as learning multimedia are exciting because they provide ideas, information, and learning material according to the level of students' thinking. As part of the information contained in a flash-based e-book, it includes; Video, sound, music, text, animation, film, graphics, images, and data. E-books are feasible if they meet the theoretically and empirically feasible requirements (Ristanti and Rachmadiarti, 2018).

Based on the data from the small and large scale trials conducted in the Biology Education Study program, the average percentage of assessments from the four aspects was obtained at 93.29% with a very good category (small scale trials), while in large scale trials, the average 93.23% with very good category.

From the results of the small and large scale trials, the researchers analyzed that the results obtained were almost the same in terms of operation. Based on these results, it can be assumed that students feel that an e-book using a corporate flip pdf can be used easily because, with the help of a laptop/computer, this e-book can be accessed offline. In addition to containing material, it also contains images, audio, and videos that help understand the material. The results of another study conducted by Arini and Kustijono (2017) showed that an interactive electronic book (BUDIN) using a professional flip pdf application received a very good response from students and was suitable for use to train students' higher-order thinking skills. In addition, Sardiman (2006) suggests that a good learning media can be used to stimulate students' thoughts, feelings, concerns, and interests so that the learning process occurs well. Complementary elements in the E-book include the activities in the exercise activities and the tasks carried out inside or outside the classroom and then enhanced with pictures or illustrations and a glossary (Schader et al., 2008).

Based on the results of the pretest and posttest as well as the N-Gain calculations that have been carried out, it is obtained that the N-Gain for the experimental class is 72.02 or 72.02%, the percentage is in the effective category while for the average N-Gain Score for the control class (which is not given E-book) is 24.64 or 24.64 %. This percentage is included in the ineffective category. Furthermore, a t-test was conducted to determine the significance of increasing students' metacognitive abilities who were given e-books. The results of the t test carried out show that the value of Sig. (2-tailed) is $0.00 < 0.05$, it can be concluded that there is a significant difference between the class that was given the E-book and the class that was not given the E-book to increase students' metacognitive abilities. Students in the class who were given the e-book (experiment) had better cognitive abilities than those not given the e-book. E-books are very helpful for students in the learning process both outside the classroom and outside the classroom. Students who have internet access at home can download the E-book from the site. The use of E-Books is expected to increase knowledge and mastery of the subject matter given in the classroom. However, the presentation of E-Books should be innovated to be attractive to students. Restiyowati (2012) and Hidayat (2017) suggested that the development of E-Books be varied with various animations, videos related to the material. By using multimedia, students are easier to understand and able to understand the material presented.

Nugent (1982) argues that the highest learning is obtained when students receive various multimedia presentations. The more senses used

to receive and process information, the more likely it is that the information is received and absorbed quickly and well in the form of messages in the material presented.

In the metacognitive ability pretest, students in the experimental and control classes had a low average score. After being given treatment (using e-books), the average Score of posttest metacognition results for experimental class students experienced a higher increase than control class students who did not use e-books. The increase in students' metacognitive abilities was due to learning in the control class, not using e-book media (only using media in printed books), while in experimental class learning using e-book media.

According to Sadiah (2008), e-books are different from printed books (conventional books) because they can contain multimedia content to present more interesting teaching materials and make learning more fun. As a comparison from the results of previous research conducted by Rohmah (2016), the application of e-book media can significantly increase student learning motivation in the metacognitive aspect.

The results of the analysis of the data obtained, the value of pretest and posttest in the experimental class is higher than the control class. The average n-Gain value of the experimental class is higher than the control class; this is because if the students' metacognitive abilities are good, the student's mastery of learning and learning outcomes will be much better. As suggested by Danial (2010), this is supported by previous studies, showing a positive correlation between metacognitive skills and concept mastery.

## CONCLUSIONS AND SUGGESTIONS

Based on the results of research and discussion of the developed ebook product, it is effective in increasing the metacognitive ability of Biology Education students at Tadulako University. These results prove that the use of ebooks that are integrated with Learning Management Systems can help improve students' metacognitive abilities. This research still needs to be developed as a follow-up study by conducting research using ebooks that are integrated with the Problem-based learning model (PBL), with the hope that the use of the PBL model will result in better learning.

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