



# Mathematics Book Innovation Based on Digital Literature

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## Mathematics Book Innovation Based on Digital Literature

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### Abstract

The development of the era that makes the use of technology lively. Especially during the Covid-19 pandemic. All learning activities in schools are carried out online by utilizing various technologies. Therefore, a study was conducted with the aim of making a Mathematics Book based on Digital Literacy with multimedia assistance, namely Media Powtoon, Augmented Reality (AR) and the Kahoot application, in addition to seeing the feasibility of the book, the attractiveness of the book and the effectiveness of using Mathematics Books based on Digital Literacy in learning in high school N 1 Stabat. The research method used in this research is the development of the ADDIE model which has five stages of research implementation, namely Analysis, Design, Develop, Implement, and Evaluate. The result of this research has been the development of a digital-based Mathematics book with the title Geometry for SMA. This digital book has been through validation and testing. In terms of feasibility, attractiveness and effectiveness. From the results of the validation to the two validators, it was obtained an assessment of "very feasible" meaning that digital books can be used and the results of the trial show that digital books are very interesting with the criteria of "Very Interesting" and are effective as seen from the results of the posttest calculations,

digital books are very effective in increasing the score students who learn to use a digital book with the title Geometry for this high school.

**KEYWORDS:** Technology, Mathematic Book, Digital Literacy.

## 1. Introduction

The year 2021 is a digital era, where all human activities must be related to what is called technology. The digital era is a time when information is easily obtained and distributed using digital technology. While digital technology itself is technology that uses a computerized system that is connected to the internet (Sukiman: 2018). With the emergence of various types of technology, all activities can be carried out in a more sophisticated way. In addition, the presence of technology can make it easier for humans to complete or carry out their activities. Of course, this is inseparable from the development of the 4.0 era. Humans are required to be more creative and innovative in order to survive and advance in life. To get this, humans need education. Both formal education and informal education.

Education is a very important life necessity for humans. Without going through the education process, it is impossible for humans to develop in line with their aspirations in the future. This is in accordance with the objectives of national education as stated in Law no. 20 of 2003, education is held to build the cognitive, affective, and psychomotor potential of students while still instilling character values to be able to adapt to future challenges. So it is clear, through education, humans can broaden their horizons and gain knowledge. One of the most important sciences to learn is Mathematics. Mathematics is one of the main subjects taught at every level of education. Mathematics is a subject that plays a major role in the development of the times. Because by studying mathematics, humans can become inventors of both the science of mathematics

itself and other sciences. Almost all subjects such as Physics, Chemistry, Accounting, and others use Mathematical calculations.

Since the beginning of 2020, the whole country has been affected by the Corona Virus. This pandemic has greatly affected all aspects of life. Education is no exception. All schools are not allowed to hold learning activities in schools. So that learning activities are carried out thoroughly from home. Of course this makes a mess. Where students who basically receive knowledge face-to-face, receive direct explanations, spend a lot of time studying with teachers at school, discuss with peers at school and many learning activities are carried out at school to gain knowledge and hone knowledge. However, in this pandemic era, all cannot be done. All learning activities are carried out online or online.

This kind of situation was never expected before. But life goes on, time goes on. Therefore, humans must be able to adapt to be able to get through the situation well. Teachers must be able to provide learning to their students online. Of course, this situation really needs the help of technology. However, not all teachers are able to use or utilize technology. So that the teacher has difficulty in providing learning. Teachers have difficulty in providing learning materials in digital form. The impact of this is that students also find it difficult to accept the knowledge that should be transferred by the teacher.

Based on the results of an interview with one of the teachers at SMA Negeri 1 Stabat, information was obtained that teachers are still not optimal in teaching-using technology, teachers are not able to provide teaching materials digitally, teachers only take photos of printed books and then send them to Google Classroom for further work. by students. Students who basically already have

the same textbook as the teacher, students find this learning very boring. Because students do not feel they accept something new if only the same material they have is given back to them. Conventional books (printed books) will not be read if there is no assignment. Therefore, the learning independence of students with situations like this is very low. Student interest in learning is very minimal. Play is the main choice for students. The following is an example of teaching materials shared by teachers in Google Classroom.



**Figure 1** – Printed Books photographed and uploaded on GCR.

Furthermore, the researchers conducted preliminary research by distributing questionnaires to 20 students related to the learning process so far, the results were:

- Students who have difficulty learning mathematics online are 65% or equal to 13 students. This means that more than half of the students surveyed have difficulty learning mathematics online as it is today.
- Students are not very interested in the existing Mathematics textbooks. In fact, none of the students expressed their interest in the books that had been distributed to students. Especially during this pandemic, students are very reluctant to open books in their spare time.
- Students who have never repeated their Mathematics lessons are 60% or

equivalent to 12 students or more than half of the students surveyed. The rest of the students stated that sometimes as many as 35% or 7 students. And one student stated that he often repeated Mathematics lessons. After being re-confirmed, one student stated that he would repeat Mathematics only when he was about to take a test or exam.

The information obtained states that students have difficulty with online learning that is currently being undertaken. Students seem less interested in conventional or printed books. The percentage of students who study independently is very small and almost no one repeats mathematics lessons independently. Meanwhile, students' independent learning abilities are very important in online learning and must be owned by all students. Learning independence is not depending on others (Ahmadi, 2014). Learning independence is self-awareness, self-driven, the ability to learn to achieve its goals (Stephen Brookfield, 2010). In conclusion, learning independence is the behavior of individuals who are able to take the initiative, are able to overcome obstacles/problems, have self-confidence and do not require direction from others to carry out learning activities. Therefore, it is very important to cultivate this sense of wanting to learn independently in students.

This situation must be ended immediately. In accordance with current developments, to solve these problems digital literacy is needed, both for teachers and students. Understanding digital literacy according to Maul Gilster (Miftahussururi, 2017: 07) is the ability to understand and use all information with various forms of sources and types that can be accessed through computer technology devices. By utilizing information related to learning that contains digital literacy and the requirements for educational science, it can be a solution for teachers and students so that they can carry out the learning process well (Cahyati, et al (2019:35)). From this explanation, it is clear that digital literacy is important for teachers and students in the learning process.

In the learning process, teaching materials are needed as a guide and assistance in learning. Both for the teacher as a successor of learning instructions and for students as information on the learning process. One of them is a book. Books are bound sheets of paper, which contain writing or are blank (KBBI). While digital books are electronic forms of existing printed books. With digital literacy through this digital book, teachers and students can practice their ability to understand and use information from various sources (Wakhidah, et al, 2020).

To solve the problems that have been stated above, researchers developed an innovative Digital Mathematics book. A digital book, or often called an e-book, is a publication consisting of text, images, video, and sound and published in digital form that can be read on computers or other electronic devices.

In 2019, researchers and their team conducted research by developing PowToon-assisted learning videos. The result is the ability to understand is increased and the subject matter information can be conveyed properly. Furthermore, in 2020, the researcher and the team have also developed Augmented Reality (AR) based subject matter and developed a learning evaluation using the Kahoot application. The result is very satisfying. All participants were very happy and gave a positive response to the use of media that we have developed. As well as attracting interest in learning so that independent learning abilities increase.

Based on the experience of research that has been carried out by previous researchers, the researchers developed an innovative math book in digital form, where the digital book will contain PowToon-assisted learning videos, Augmented Reality (AR)-based animation and evaluation tools which are also digitally assisted by the Kahoot application.

This book is very useful for teachers and students in the learning process as well as digital literacy. With this digital math book, teachers can convey information clearly and students can develop their independent learning abilities. So that even though

learning is done online, all learning objectives are still achieved well.

## 2. Research Method

The research method used is the ADDIE model development method (Analysis, Design, Develop, Implement, and Evaluate) developed by Reiser and Mollenda. In this ADDIE development design model, there are five stages of research implementation, namely as follows:



Figure 2 – ADDIE Model Stage.

The research was carried out at SMA Negeri 1 Stabat in the 2021/2022 academic year in the Odd Semester. In this study, the instruments used in data collection were Material Expert validation sheets, Media expert validation sheets, Response Questionnaires and Posttest Questions.

## 3. Results

The results of the development of this Digital Book are as follows:

### 1. Analysis Phase (Analyze)

This stage is the first stage of the ADDIE model development process. This analysis activity is adjusted to the needs of the teaching materials to be developed. The analysis is carried out in the form of surveys and filling out a needs questionnaire. From the information obtained during the survey, it was found that sometimes students still find it difficult to understand mathematics learning, not to mention the monotonous use and presentation of teaching materials or textbooks and the lack of use of learning

media. This is reinforced by the results of filling out a questionnaire which states that 74% of students feel that the textbooks used so far are mediocre. This fact makes the writer interested in providing media or other teaching materials that are expected to be able to attract students' interest in learning mathematics. And Digital Books are other options or alternatives that are used as choices in developing products in the form of teaching materials. In the analysis of learning materials, the 2013 curriculum has been set at SMA Negeri 1 Stabat. In this series of semester 1, class XI students learn material that is in accordance with the content of mathematical literacy which is indeed the focus in the development of this Digital Book. One of these content is Geometry.

### 2. Stage of Design (Design)

The beginning of this stage is to design the cover, the contents of the book and the cover. This digital book developed has advantages that other books rarely have. Where the cover is interesting, the content is complete with added Powtoon-based videos. In addition, augmented reality (AR)-based animations are added and in the final stage there is an evaluation using the Kahoot application.

### 3. Development

#### • Trial Phase 1

After the digital book is developed, the next step is to validate the validators in the fields of media experts and material experts. Based on the results of validation by experts, there are several suggestions given. For more details can be seen in the following table.

Table 1. Stage 1 Media Expert Validation Results

No	Validator 1	Validator 2
1	The cover doesn't show the advantages of this book	Pay attention to the standard writing procedure
2	Check the example again	Pay attention to the font

Table 2. Material Expert Validation Results Phase 1

No	Validator 1	Validator 2
1	Example question 3 is not in accordance with the material	More examples of questions
2	The questions given are too long	Increase the number of questions

Furthermore, in addition to the input, validation questionnaires were also given to the validators. The results can be seen as follows.



Figure 3. Stage 1 Media Expert Validation Results

Based on the table and graph above, the highest score is 2.8 with proper criteria. However, it is still in the revision stage until it gets a very decent score.



Figure 4. Stage 1 Material Expert Validation Results

The picture above states that the material is still inadequate and even there is an inappropriate assessment. For this reason, revisions must be made so that the digital book is very suitable for use.

Based on the evaluation of the experts in the validation phase 1, a revision was made to

the digital book according to the suggestions given.

After being given input, the cover was changed according to the reviewer's request, which is to complete the cover with the entire conspicuous core of this book. The goal is for readers to know what is in the book and what makes it different from other books. Here the cover fixes by adding to bring up complete sentences with Assessment.



4 Figure 5. Cover before Revision



Figure 6. Cover after Revision

- Trial Phase 2

The results of the assessment given by the validator in the second stage can be seen in the following

graph.

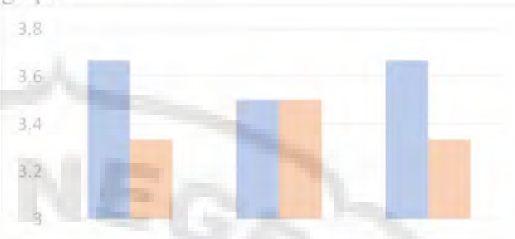


Figure 7. Stage 2 Media Expert Validation Results

In this second stage, the validator gives a higher or even close to perfect rating. Where the results say the product is very feasible and can be tested. The results of the validator at stage 2 from material experts can be seen in the graph below.

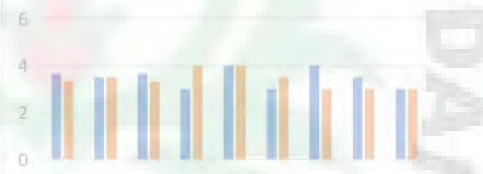


Figure 8. Stage 2 Material Expert Validation Results

Stage 2 assessment of the material expert validator is shown in the graph where the validator assesses it very well or in other words the product is "very feasible" and can be tested.

#### 4. Implementation Phase

After two revisions were made to the media expert validator and the material expert validator, the next step was to implement it by testing the product on students of SMA Negeri 1 Stabat Class XI. This implementation was carried out by conducting small-scale trials involving 7 students and large-scale trials involving 30 students of class XI at SMA Negeri 1 Stabat. The purpose of implementing this implementation is to see the attractiveness and effectiveness of the developed product, in this case the SMA Geometry E-Book. The implementation was carried out in two classes that were given different treatments. One uses the E-Book and the other does not (control class) the purpose is to see the

effectiveness of the E-Book product.

- E-Book Attractiveness Test

Table 3. Feasibility Test

Trial	Questionnaire	Category
Small scale	3,65	Very interesting
Large scale	3,72	Very interesting

The results in the table above are the results of large-scale and small-scale trials by distributing response questionnaires given to students. The results show that both trials met the "very feasible" criteria. The point is that the product developed, namely the E-Book, is very interesting for students and can help improve mathematical literacy for students, especially in Geometry.

- E-Book Effectiveness Test

To determine the ability of student learning outcomes, a Post Test is carried out. After going through data reduction, the results of the Post Test were obtained in both classes. In the control class, the maximum score obtained is 90 and in the experimental class the maximum score is 100. This means that students in the experimental class who use the E-Book, learn better than the class without the E-Book. Furthermore, at the end of the calculation with the T-test, it was concluded that  $t_{count} > t_{table}$ . This shows that the average test scores of students who use the Geometry E-Book are not the same as the average score of students who do not use the E-Book. There are different and quite significant results between classes that use E-Books and classes without E-Books. So it can be emphasized that the E-Book developed with multimedia is effective and can be used in the teaching and learning process in high school, especially on Geometry material.

## 5. Evaluation

After carrying out the implementation, the last series in this development is evaluation. At

this stage, researchers conducted interviews with teachers and students as users of the Geometry E-Book for SMA. As a result, teachers and students feel very happy with the presence of this digital book. And they do not provide any input on the product being developed. Therefore, the book that was revised in phase 2 is the final product of the Geometry digital book for high school.

The development of the Digital Book or what is often referred to as the E-Book has gone through all the stages in the ADDIE method, namely Analysis, Design, Develop, Implement, and Evaluate. The results obtained, the book is feasible to use and effectively used in learning Geometry material.

## Conclusion

Based on the research results that have been described previously, conclusions can be drawn including:

1. This research begins with the creation of a Digital Literacy-based Mathematics Book with the help of Powtoon Media, Augmented Reality (AR) and the Kahoot application in improving students' independent learning abilities. Development is carried out using the ADDIE method. The product developed has gone through the revision stage twice by two expert validators, then tested.
2. After carrying out the trial, it can be seen the feasibility of a Digital Literacy-based Mathematics Book. This can be seen from the results of the distribution of the questionnaire to the students of SMA Negeri 1 Stabat.
3. From the implementation of the Post test, it was obtained data that the results were different and quite significant between the class using the E-Book and the class without the E-Book. So it can be emphasized that the E-book developed with multimedia is effective and can be used in the teaching and learning process in high school, especially on Geometry material.

The research team's suggestions that can be submitted to further researchers are:



1. E-Books that are developed can still be maximized again
2. It is hoped that schools can use this product that has been developed.

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