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Development of Mathematics Digital Creative (Magic) Book for Elementary School

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Abstract

The digitalization of education is a logical consequence of changing times. No one could have predicted that technology would be adopted so quickly by industry and society. The Covid-19 pandemic has cause students, teachers and schools to carry out teaching and learning activities by relying on digital technology. The use of e-book is becoming a trend because it is more environmentally friendly and more economical. The purpose of this research is to develop a 4C-oriented Mathematics Digital Creative (Magic) Book for elementary school students to determine the development process, feasibility, and effectiveness of its use. The results of the research show that the users gave a positive rating for the MAGIC Book. The use of digital modules provides benefits in learning, especially in online learning.

Keywords: *digital book; elementary school; mathematics digital creative; research and development*

1. INTRODUCTION

Technological advances affect all aspects of life, including education (Huda et al., 2018). Technology was change the way students learn, where students learn, and empowering them at every stage of their journey (Rowe et al., 2013). The development of science and technology has promoted the development of education and knowledge. Technological advances affect the quality of human resources (Angriani et al., 2020). Information and communication technologies have changed the way of learn , the character of the work, and the purpose of social relationships (Budiman, 2012). Teachers have an important role to achieve effective learning (Sugandi, 2021). By using the right media on learning process, students will achieve a good score in every subjects (Akrim, 2018).

Eight main indicators were set as a tool to measure the use and access of ICT in education. These indicators are: (1) the proportion of schools that use radio in teaching and learning activities; (2) the proportion of schools that use television in teaching and learning activities; (3) The proportion of schools

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that use telephones in teaching and learning; (4) the ratio of students who use computers; (5) the proportion of schools that have internet access according to the type of internet connection; (6) the proportion of students who access the internet at school; (7) the proportion of students who enter the postsecondary level in the sector of related information and communication technology; (8) the proportion of teachers who have qualifications in the sector of information and communication technology (Sutarsih & Hasyyati, 2018). These eight indicators have not been achieved optimally in 2018 (Napal Fraile, et al., 2018).

Student needs to be prepared to have competencies in welcoming technological advances in the 21st century (Ljubetić, 2012; Syafitri et al., 2020). 21st century skills are important to achieving transformation. The use of technology in learning such as internet is very low (Zubaidah, 2017). Technology as a tool for addressing challenges in teaching and learning (Rashmi, 2012). So it can be said that technology has a very important role in directing change and development of education.

The readiness of teachers at MI Hasanuddin Tebel, Gedangan, Sidoarjo in the new normal era is still limited, such as digital teaching materials that support distance learning are not available. So it is necessary to develop digital textbooks in these schools. In 2019, research has been carried out by Prayitno and Faizah (2019) on the development of learning media on Greatest Common Divisor (GCD) and Least Common Multiple (LCM) materials. So, to support the media that has been developed, we need to develop a digital teaching material on the same material. Although learning is carried out online, students need to be trained to think critically, creatively, communicatively, and collaboratively (4C) in mathematics subjects, especially Greatest Common Divisor (GCD) and Least Common Multiple (LCM) materials. 4C is a skill that can be applied to elementary school children, where these skills can be stimulated from several components of learning in mathematics (Kurniawan et al., 2021).

Fitri (2019) was explained that learning Greatest Common Divisor (GCD) and Least Common Multiple (LCM) using the discourse method, debriefing, and giving assignments, was in fact not effective. This can be seen in the students' scores which are still below the standard. Fitri (2019) also explained that the low learning outcomes of mathematics were caused by several factors including inappropriate and unattractive methods. Therefore, need a solution using appropriate learning methods and learning resources.

Technological advances towards digital are growing rapidly (Liu et al., 2021). The Digital Era has made positive changes. We can do all activities more practically and efficiently. By using technology, we got easier to access information through many ways, and can enjoy the facilities of digital technology unrestrained and under control (Setiawan, 2017). It is possible that in

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education, technology has used a lot, especially availability of ebooks. There are several advantages in using e-books in the digital era, which are more practical and easier to carry anywhere, environmentally friendly, durable, easy to duplicate, and easy to duplicate (Makdis, 2020).

The facilities of e-book can include animation, zoom in and out of the image on the screen, music, sound effects, highlighting the text, dictionaries built-in hotspot where readers can click to interact with characters or objects, translation of the foreign languages, and many others (Kesim & Yıldırım, 2017).

What applications will be used in making e-books, it can choose applications that are certainly very easy for users, Aviyanti, S. D., & Widiaty, I. (2021). There are some applications as like zinepal, calibre, epubee, ibook and so on. It is believed that e-books are one of the easiest digital platforms to acquire and use.

2. METHOD

The aim of this research was to develop an e-module entitled MAGIC (Mathematics Digital Creative) Book which is oriented to 4C (Creativity, Critical Thinking, Collaboration, and Communnication). It developed by using Plomp Model which consist of 5 stages, Initial investigation, Design, Realization/construction, Test, evaluation and revision, and Implementation. The first stage is initial investigation which is focused on gathering information and planning further activities. At this stage, a needs analysis is carried out which includes student analysis, analysis of teaching materials, and analysis of technology readiness. The second stage is design. In this design stage, an initial draft or MAGIC BOOK will be designed based on the results of the initial investigation conducted by the researcher. In this design stage, the contents of the material that will be comprised in the MAGIC BOOK digital book are also prepared according to the material analysis in the early stages of development.

After designing and compiling the book material, the MAGIC BOOK digital book is then developed/compiled using *Kvsoft flipbook maker pro* according to the initial design in the previous stage. The digital book produced in this Realization/construction stage will be labeled as draft 1. At this stage, research instruments such as validation sheets, observation sheets, and student response questionnaires were also developed. At the fourth stage, Test, evaluation and revision stage, will carry out several main activities, i.e. validation, limited trial, evaluation and revision of draft 1. Draft 1 will be validated by two experts, then will be revised based on the suggestion given by the experts and will be labeled as draft 2. A limited trial class was carried out on 10 students as user of the MAGIC BOOK. In this limited trial class, a book readability test also students and teachers rensponse was carried out. The data from the limited trial class, the researcher evaluates the MAGIC BOOK.

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To get the final draft of MAGIC BOOK there are some steps as like doing revised according to the result of the evaluation. Then, it will be ready to be implemented in classes.

3. RESULTS

This research focuses on the development of the MAGIC (Mathematics Digital Creative) Book using the Plomp development model. The research stages defined by Plomp are Initial investigation; Design; Realization/Construction; Test, Evaluation and Revision; and Implementation. The steps of the activities that have been carried out can be explained as follows.

a. Initial Investigation

This stage focused on analysis of student characteristic, analysis of teaching materials, and analysis of technology readiness. Based on the analysis of student characteristics by using interview and portfolio of the students' achievement, 70% of students have not achieved a score that meets the minimum passing standard for mathematics subjects during online learning. In addition, based on Piaget (1976) fourth grade students are still in the concrete operational phase, so that textbooks or learning media are needed to give an illustration and make mathematical concepts more concrete.

The Application of Greatest Common Divisor (GCD) and Least Common Multiple (LCM) can be found in everyday life. However, many students did not achieve a good score during online learning. In 2019, GCD and LCM learning media have been developed by Prayitno and Faizah, in this research will be developed an e-module to support online learning.

From the results of interviews with the teacher and direct observations at schools, information was obtained that schools had good technology readiness. The teacher's ability to use technology is already at sufficient criteria. During online learning, teachers have used video conferencing to deliver learning materials. The majority of teachers use Google Meet or Zoom. For assessment, the teachers have also used Google Form.

b. Design

In this stage, the researcher compiles the design of the MAGIC (Mathematics Digital Creative) Book in accordance with the results in the Initial Investigation Phase that has been carried out. The results of this stage are still limited to the preparation of the layout and the initial design of the textbook to be developed. It is started by choosing the format of the MAGIC (Mathematics Digital Creative) Book. Designing the MAGIC (Mathematics Digital Creative) Book using this following steps.

1. Designing templates, characters, and other attributes using Photoshop and Corel software
2. Compiling and Submitting material content using the power point application
3. Converting to the pdf format

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4. Converting the format from pdf to flipbook using the kvsoft flipbook maker pro application
5. In kvsoft flipbook maker pro additional content is provided such as animation, sound, and other instruments

c. Realization/ Construction

In this Realization/Construction stage, researchers begin to compile material that will be included in the MAGIC (Mathematics Digital Creative) Book, GCD and LCM in fouth grade. In this phase, various animated images are also constructed which are useful for illustrating the concepts of GCD and LCM materials (Figure 1, Figure 2, Figure 3). The initial layout of the MAGIC (Mathematics Digital Creative) Book is as follows.

Figure 1. Cover MAGIC Book

Figure 2. MAGIC Book Content

Figure 3. Illustration of the Problem

d. Test, Evaluation, and Revision

MAGIC Book has been developed on the Construction Stage and lebeled as Draft I. The next step is Test, Evaluation, and Revision. Draft I was validated by mathematics material on elementary

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school expert and media experts to show the feasibility of the MAGIC Book. The validation results is shown on the Table 1 below.

Table 1. Recapitulation of Media Experts Validation

Aspect	Indicator	Preferred Item	Score	Average	Persentage
Display	Systematical Display	5	13	4,55	91%
	Stimulate to Critical Thinking	3,5			
	Contain supporting component	4,5			
Language	Communicative	4	9		
	Easy to understand	5			
Graphic	Cover Design	5	9,5		
	Illustration suitability	4,5			
Content	Concept accuracy	4,5	14		
	Conformity with curriculum	4,5			
	Suitability of the material with the students characteristic	5			

The result of the Table 1 show that the MAGIC Book got the score 91% which can be classified on the "Very Good" criteria.

Then it validated by users on elementary school to find out feasibility of the product about readability test and users' response, and the data obtained as follows.

Table 2. User Validation Results

Aspect	Number of Students	Score
Ease of use	10	8
Interesting display		9
Quality of material		8
Easy to understand		7
Using contextual content		8
Average Score		**8**

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User validation gives a score of 8 which can be categorized as good. It means that the MAGIC Book easy to use, understand and interesting to use. So it can be implemented on the learning process.

e. Implementation

After being validated by experts and users, the book is ready to be used in the learning process in offline and online classes.

4. DISCUSSION

This research aims to develop an e-module called MAGIC Book. This module contains material on GCD and LPM which is oriented to 4C (Creative, Critical Thinking, Collaboration, Communication). It has been validated by experts and users. The expert's validation results are known that the MAGIC Book was categorized as "very good". It means that MAGIC book was arranged systematically, stimulate to critical thinking, and contain supporting component. The Magic book is communicative and easy to understand for users. From the cover design, it got maximal score from the experts and the illustration is suitable for the material. From the content aspect, the MAGIC Book is suitable with the student's characteristic and curriculum. The users' validation results show that the users gave a positive rating for the MAGIC Book. The use of digital modules provides benefits in learning, especially in online learning (Apriansyah & Pujiastuti, 2020; Castro, 2019; Indariani et al., 2019; Rashmi, 2012)

This MAGIC Book can be used by teachers in the class. The existence of MAGIC Book in the mathematics learning process is expected to increase students' learning motivation both in the online and offline learning process. In online learning, teachers can distribute magic books via video conference or share them with students for independent learning at home. teachers and students can open magic books using the gadgets they have, such as cellphones or notebooks/laptops. In offline learning, teacher can share to the students using projector besides the teacher gives more explanations about the material. The MAGIC Book is very easy to use by anyone and its attractive appearance can build students' learning motivation, besides the teachers at school usually use conventional books which lack of illustration and less attractive, this MAGIC Book is more interesting for students. however, MAGIC Book still needs to be developed, such as adding learning videos that can provide a comprehensive illustration of mathematics learning materials.

5. CONCLUSION

This research focuses on the development of the MAGIC (Mathematics Digital Creative) Book using the Plomp development model. From the data obtained, MAGIC Book was valid based on the experts and user validation. It can be used on the learning process. It

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expects to help students develop their Creativity, Critical Thinking, Collaborative, and Communicative.

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