



## Development of FLOC (Flipbook Competence) as a Means of Teaching Mathematical Counting for Early Childhood Education Teacher Prospective Students

Andri Kurniawan<sup>1</sup>; Eko Sugandi<sup>2\*</sup>

<sup>1</sup>Early Childhood Education Teacher Education, Universitas PGRI Adi Buana Surabaya, Indonesia

<sup>2</sup>Mathematics Education, Universitas PGRI Adi Buana Surabaya, Indonesia

<sup>2\*</sup>Corresponding Email: [s\\_gandi@uniprasby.ac.id](mailto:s_gandi@uniprasby.ac.id), Phone Number: 0822 xxxx xxxx

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**Abstract:** Technology and education go hand in hand with the needs of Generation Z, who demand ease in learning. Various kinds of information in digital form will be easily accessible with increasingly sophisticated technological developments, especially in learning. The use of digital books in the form of flipbooks, which are used to train creative thinking and can be used as a means of teaching mathematics calculations for prospective Early Childhood Education teacher students, still needs to be found. So, this research aims to develop a digital book product called FLOC (Flipbook Competence) as a teaching aid for prospective Early Childhood Education teacher students to train in collaborative and creative thinking. This research is development research with a method that refers to the development stages of the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). This research produces a product in the form of a flipbook application based on FLIPHTML5, which can be accessed via computer or Android devices. The results of product trials show that FLOC (Flipbook Competence) can attract and motivate prospective PAUD teacher students to teach the concept of Numbers. The implication is that FLOC (Flipbook Competence) is also considered to have ease of use and good visualization and to attract students' interest in learning.

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**Abstrak:** Teknologi dan pendidikan berjalan beriringan dengan kebutuhan Generasi Z, yang menuntut kemudahan dalam belajar. Berbagai macam informasi dalam bentuk digital akan mudah diakses dengan perkembangan teknologi yang semakin canggih, terutama dalam pembelajaran. Penggunaan buku digital dalam bentuk flipbook, yang digunakan untuk melatih berpikir kreatif dan dapat digunakan sebagai sarana mengajar perhitungan matematika bagi mahasiswa calon guru Pendidikan Anak Usia Dini (PAUD), masih perlu ditemukan. Oleh karena itu, penelitian ini bertujuan untuk mengembangkan produk buku digital yang disebut FLOC (Flipbook Competence) sebagai alat bantu mengajar bagi mahasiswa calon guru PAUD untuk melatih berpikir kolaboratif dan kreatif. Penelitian ini merupakan penelitian pengembangan dengan metode yang mengacu pada tahap-tahap pengembangan model ADDIE (Analysis, Design, Development, Implementation, and Evaluation). Penelitian ini menghasilkan produk berupa aplikasi flipbook berbasis FLIPHTML5, yang dapat diakses melalui komputer atau perangkat Android. Hasil uji coba produk menunjukkan bahwa FLOC (Flipbook Competence) dapat menarik dan memotivasi mahasiswa calon guru PAUD untuk mengajar konsep Bilangan. Implikasinya adalah FLOC (Flipbook Competence) juga dianggap memiliki kemudahan penggunaan dan visualisasi yang baik serta dapat menarik minat mahasiswa dalam belajar.

## A. Introduction

The 21<sup>st</sup> century requires someone to develop competence and competitiveness globally (Sugandi & Faizah, 2021). The Industrial Revolution 4.0 has also resulted in significant changes in all aspects of life, including education. The revolution in education led to the educational Revolution 4.0, which transitioned from conventional to digital learning (Gogahu & Prasetyo, 2020). Especially in education in Indonesia, various media tools utilize technology used in learning (Herlinda et al., 2024). Education in the digital era demands digital technology as a tool in learning activities, one of which is using digital books. Agustina et al (2024) say that digital technology is very effectively used for learning activities to develop students' thinking skills. This is because it is essential to use digital books as material content that can help teachers in learning activities, especially learning that utilizes information technology (Suyasa et al., 2021).

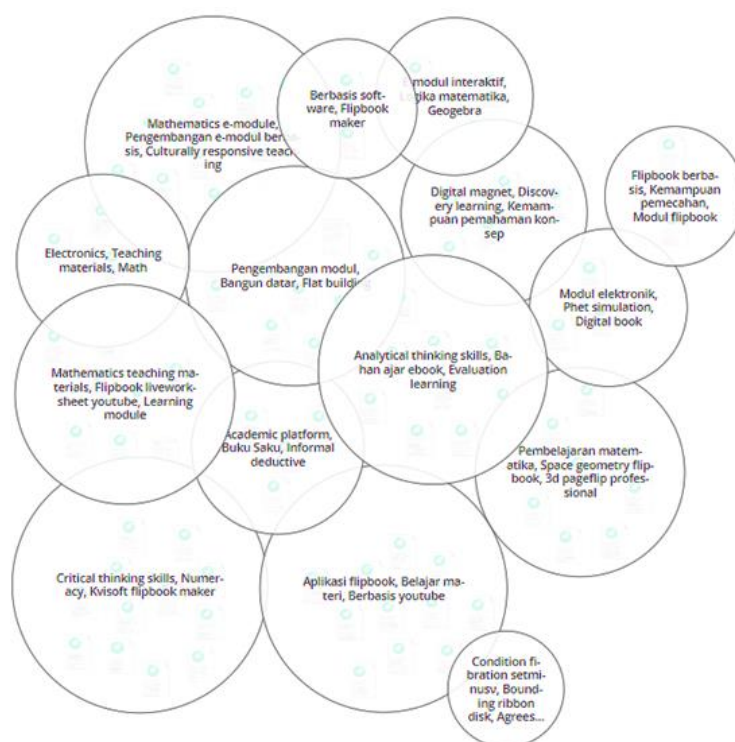
The future is determined by education from an early age. Early Childhood is the golden period throughout the age range of human development (Sutrisno, 2021). The continued success of early childhood education depends on the quality of educators from the time they become Early Childhood Education Teacher Candidates. Based on research results, Formen (2022) found that creative and innovative aspects are characteristics of early childhood teachers in the 21<sup>st</sup> century, and prospective Early Childhood Education Program teachers feel they have the readiness to become early childhood educators in the 21<sup>st</sup> century. Education and learning in the 21<sup>st</sup> century are critical in providing provisions for students to form and produce the next golden generation, which has critical thinking, collaborative, creative thinking, and communication skills. Early Childhood Education is promoted in Indonesia as a swing and ladder for today's young people to become the golden generation of 2045 (Kemdikbud, 2017). Formen (2022), in his research, found that there is an alienation in the preparation of Early Childhood Education Program teachers from efforts to prepare them to face current and future challenges. Early Childhood Education Program is one of the parties responsible for social transformation towards a democratic society.

Early Childhood Education Program teachers must be creative and innovative, especially from college, when they become prospective Early Childhood Education Program teachers. Students must be able to develop and utilize all relevant learning media to improve the quality of learning in line with digital-based developments. Shalehuddin (2022) states that there are three principles of digital educational media that can be used to develop early childhood media: 1) quality digital media must be child-friendly and not damage or impact physical, mental health and personal development; 2) digital media must have good quality in terms of content, context and function; 3) the digital media developed must be by the needs of students or teachers in learning activities. However, based on the results of the problem analysis, it was found that many students needed to improve in the use and development of digital media for Early Childhood. Many students think utilizing existing media rather than developing from scratch is easy. Limited knowledge is an obstacle faced by prospective Early Childhood Education Program teachers. Faizah et al (2022) explained that digital media must continue to be developed, despite many obstacles in the

development process, by providing more attractive packaging to attract interest and increase student motivation.

Mathematics is an essential material to be introduced to young children, so teachers and parents play a role in the teaching process. The introduction of mathematics in early Childhood must be adjusted to the child's level of mental development, starting from simple mathematical concepts (Lisa, 2018). Lubis & Umar (2022) explain that there are several concepts taught in early childhood mathematics, including 1) the development of number concepts, 2) the development of concept and relationship patterns, 3) the development of geometric concepts, 4) the development of measurement concepts; 5) development of concepts for collecting, organizing and displaying data. Based on this, it is hoped that the introduction of mathematical concepts to young children uses fun methods that make them happy to do so to learn while playing. The process of instilling understanding in students must be carried out using concrete objects connected by symbols or symbols so that they can better understand the concept (Roliana, 2018). In research, Imrayanti (2012) explains that children's numeracy skills in recognizing numbers using objects are still deficient and need to improve. Through the use of learning media, children can be stimulated to recognize numbers (Ningrum & Nur, 2023). Therefore, as a prospective Early Childhood Education Program teacher, you must be able to develop and utilize all learning media by combining various learning methods that can attract students' interest, especially young children.

Learning media comes in many forms. Learning media is one of the tools used in teaching and learning activities to generate interest in the material presented (Wulandari et al., 2023). Children will be inquisitive through digital learning media, supporting their learning development (Hasbi et al., 2020). Digital books in the form of flipbooks are new teaching materials that are a solution for learning activities (Riyanto et al., 2020).utama et al (2021) have developed e-modules for Early Childhood, focusing on open-ended play. Sandy et al (2022) developed a flipbook containing numeracy literacy, which was used to improve mathematical communication skills. Erminawati & Arief (2023) researched the development of multimedia flipbooks to improve literacy in early Childhood. Mapping results using the website <https://openknowledgemaps.org/map> obtained the following data.



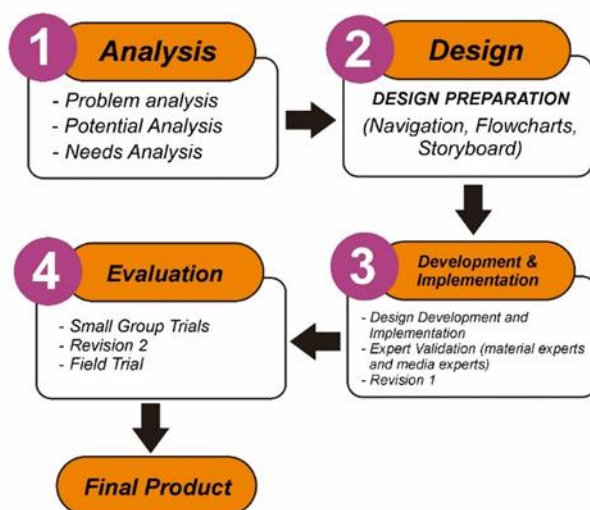
**Figure 1.** Flipbook Research Mapping Based on Open Knowledge Maps

Based on the map above, research on the creation and use of flipbooks has been carried out in various fields of science. However, research has yet to develop digital books in the form of flipbooks that can be used to train collaborative skills and creative thinking about mathematical calculation material in Early Childhood. So, research is needed to accommodate the development of digital books to train collaborative and critical thinking skills.

Flipbooks are generally made with several objectives: 1) cost savings, 2) interactive and exciting, and 3) printing cost efficiency. Flipbook will provide an interactive and engaging experience with text, images, music, and animation. Specifically, the aim of developing digital flipbooks in this research is to create learning materials in the form of flipbooks specifically used for mathematics material to train collaborative and creative skills.

## B. Method

This research aims to develop FLOC (Flipbook Competence) based on 2C (Collaborative and Creative Thinking) to assist prospective early childhood education teacher students in learning mathematical calculations. This research adopts the ADDIE development theory (Analysis, Design, Development, Implementation, Evaluation). The ADDIE development flow chart is as follows.



**Figure 2.** FLOC Development Flow using the ADDIE Model

In the Analysis Phase, several initial analyses are carried out: problem, potential, and needs analysis. Problem analysis was carried out to understand the problems prospective Early Childhood Education Program teacher students face in teaching mathematical concepts, especially Numbers. Potential analysis is carried out to determine how feasible the product being developed is for users to use. Requirements analysis is carried out to understand the problems as a whole (comprehensively) in the software to be developed and define what must be done by the device being developed to meet user needs. In the needs analysis, several questionnaires were given to identify the learning tools used by prospective Early Childhood Education Program teacher students and information on all the needs desired by prospective Early Childhood Education Program teachers in digital-based learning activities.

Next, a FLOC design plan is prepared based on the preliminary analysis that has been carried out. In preparing the design, a flowchart is made to provide a simple, neat, clear, and concise picture of the flow of the FLOC process and serve as a reference in the technical implementation of the work process. Storyboards are created to simplify the process of creating and designing the FLOC layout that will be made.

The FLOC development process was carried out using the software Corel Draw 2019, Microsoft Office PowerPoint 2023, and Nitro Pro 9, which were used to design digital module interfaces and convert them into digital files. After completing the FLOC interface design digital file, a flipbook using FLIPHTML5 can be created and accessed online via the URL <https://fliphtml5.com>. FLIPHTML5 is a platform specifically used to develop flipbooks quickly. It is equipped with complete, practical, and adequate features. After product development, experts, including material and media experts, validate. Material expert validation is carried out to evaluate the material and questions presented at FLOC, especially mathematics material for Early Childhood. The material validator appointed to validate the material is one mathematics education lecturer and one Early Childhood



Education Program lecturer in their scientific field. Media validation is carried out to obtain input and evaluate the product being developed based on the aspects to be measured. The media validator appointed was a lecturer from the Masters in Educational Technology department. After experts validate, improvements are made based on input from the validators to achieve perfection in FLOC product development.

After the product is suitable for use in learning activities based on the results of expert validation, trials consist of limited and field trials. Limited trials were carried out on 5 Early Childhood Education students who were randomly selected. Based on the results of the limited trials, an evaluation of the FLOC product will be carried out, and improvements will be made. After that, field trials were carried out to determine the weaknesses and broad impacts. Modifications are made to the input and notes during the field trial. The product can be used in learning activities once its suitability has been declared following field trials.

## C. Result and Discussion

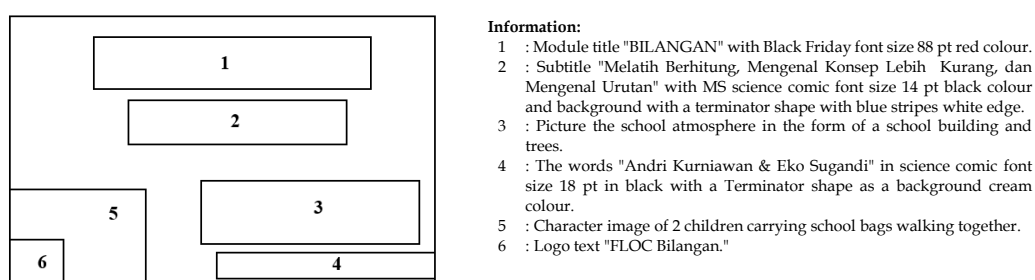
### Result

This research produces a product, a flipbook, that can be used as a learning aid and teaching practice for prospective Early Childhood Education Program teacher students, especially in mathematics and number material. The number material consists of several sub-materials used to practice counting, learning more or less concepts, and learning sequences.

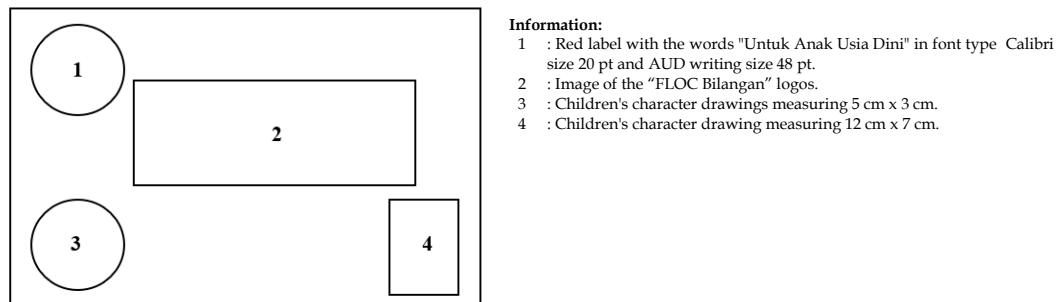
The Analysis Stage is the initial stage of digital module development, which identifies problems, potentials, and needs in FLOC development. Problem analysis activities are carried out through observations and interviews. Based on the results of observations and interviews, it is known that several problems were found, namely that prospective Early Childhood Education Program teacher students experienced difficulties in finding teaching materials in the form of mathematics learning modules related to number material, especially in developing collaboration and creative thinking skills in Early Childhood. Students also want new innovative electronic modules to teach mathematics calculations to early childhood education students who can train and instil collaboration and skills. Based on the results of the potential analysis, using exciting and interactive digital media can increase student motivation in learning and make it easier for educators, especially prospective Early Childhood Education Program teachers, to teach students by displaying realistic and exciting images. The results of the needs analysis questionnaire also show that 70.62% of prospective Early Childhood Education Program teacher students still depend on textbooks, 20.15% of prospective Early Childhood Education Program teacher students still use PowerPoint media, and 9.23% of prospective Early Childhood Education Program teacher students still use photographs. Apart from that, as many as 91.07% of prospective teacher students hope to develop other accessible media to create and implement for students and access online, and 86.35% of prospective Early Childhood Education Program teacher students want multimedia that can improve 4C skills. The devices used by prospective teacher students are adequate because it can be seen that as many as 100% of

prospective teacher students have laptops and cell phones, which are used to support learning.

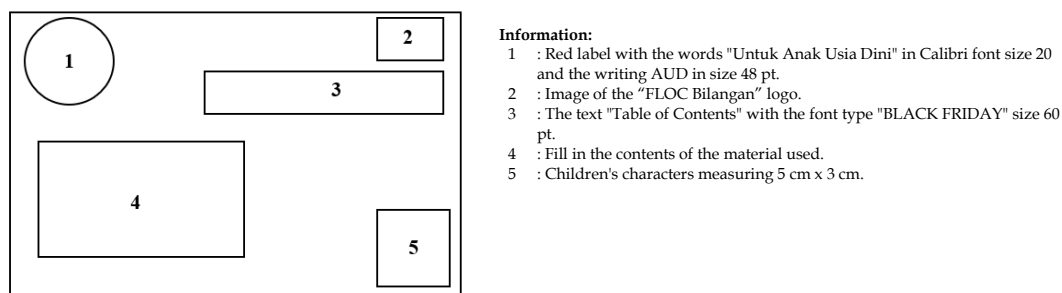
The design stage involves creating flowchart and storyboard designs for FLOC development. The main parts designed in the design stage generally consist of the cover page layout, table of contents page layout, material page layout, and various FLOC content components. Flowcharts are created to illustrate the sequence and structure of FLOC. The flowchart in FLOC development is linear, considering that the digital modules created are technically operated online with linear interactivity features. Meanwhile, Storyboards were created to simplify and speed up researchers in creating visual projects in rough sketches. The cover page storyboard design can be seen in Figure 3 below.



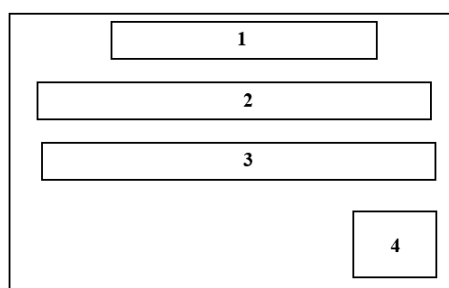
**Figure 3.** FLOC Cover Page Storyboard Image



**Figure 4.** FLOC Title Page Storyboard Image

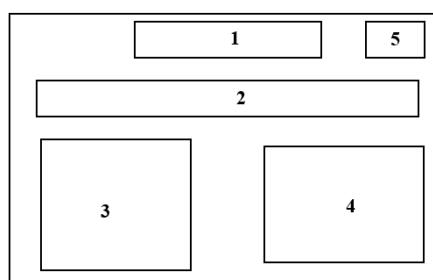


**Figure 5.** Storyboard image of the FLOC Table of Contents page

**Information:**

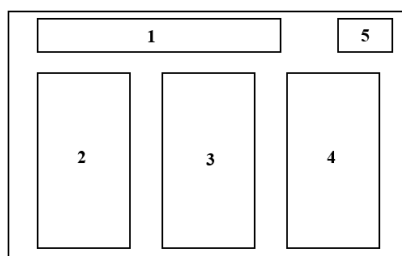
- 1 : Command sentence "Coba Urutkan Angka-angka di bawah ini" with font type "BLACK FRIDAY" size 24 pt.
- 2 : The box contains the numbers 1 to 5.
- 3 : The box where the numbers 6 to 0.
- 4 : FLOC logo.

**Figure 6.** Storyboard image of the FLOC Content Page for the Topic Proficient in Recognizing Sequences

**Information:**

- 1 : Kalimat tanya "Angka berapa itu?" dengan jenis fonts "BLACK FRIDAY" ukuran 44 pt.
- 2 : kalimat tanya "Kotak mana yang jumlahnya sama dengan angka tersebut?" dengan jenis fonts *Comic Sans MS* ukuran 18 pt.
- 3 : Gambar angka dengan ukuran 10 cm x 7 cm.
- 4 : kotak-kotak tempat peletakan benda-benda dengan jumlah yang berbeda.
- 5 : Logo FLOC.

**Figure 7.** FLOC Content Page Storyboard Image for the Topic Proficient in Numeracy

**Information:**

- 1 : Command sentence "Perhatikan Contoh Berikut" in Comic Sans MS font size 40.
- 2 : The box where the image objects.
- 3 : The box where the more significant and more minor signs are.
- 4 : The box where the image objects.
- 5 : FLOC logo.

**Figure 8.** Storyboard Image of the FLOC Content Page Concept More or Less

The development stage is the activity of making and testing products. Making product interfaces refers to storyboards and flowcharts that have been created previously. To create the FLOC interface, use the Corel Draw 2019 application and the website <https://www.freepik.com> to search for the needed vector files. Apart from using the application above, which is used to design, another application is used to create the FLOC interface layout, namely the Microsoft Office PowerPoint 2023 application. The layout results for the front cover page, table of contents, body content, and back cover page using the Microsoft Office application PowerPoint 2023 and Corel Draw 2019.



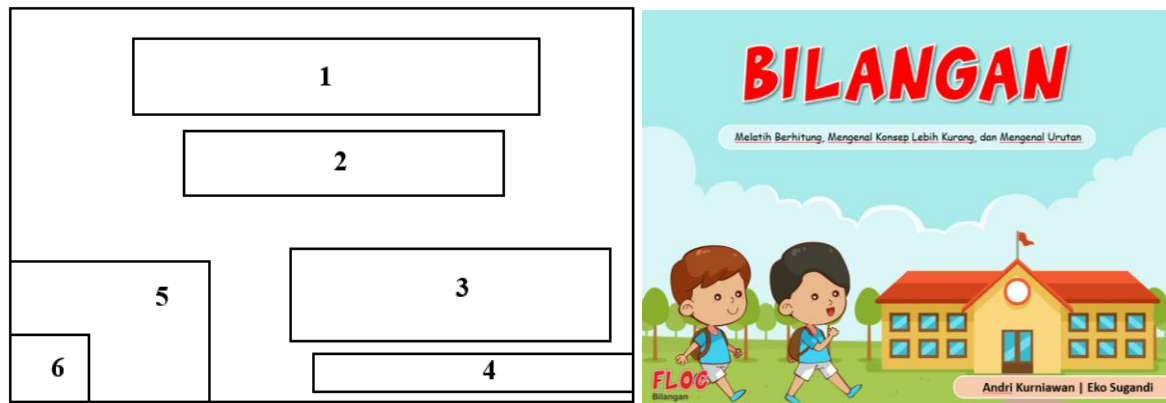


Figure 9. Storyboard Display and Cover Page Interface Design Results

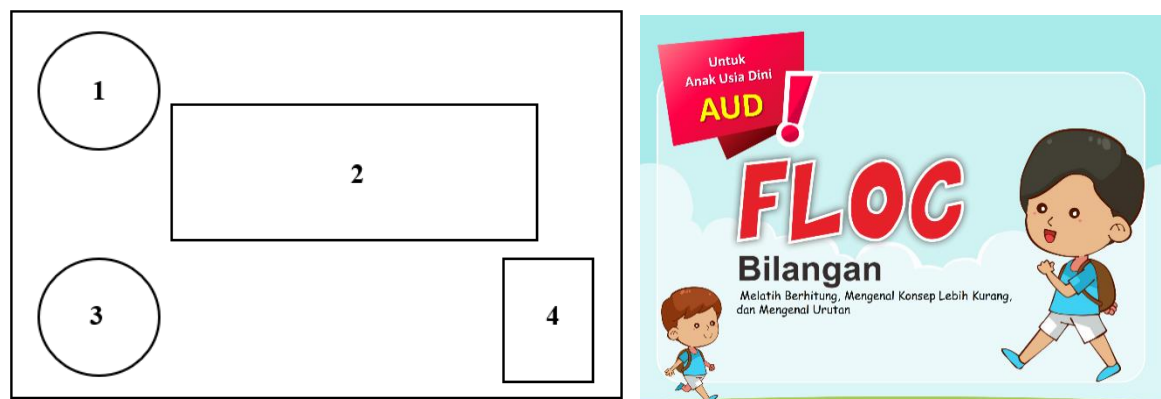


Figure 10. Storyboard Display and Title Page Interface Design Results

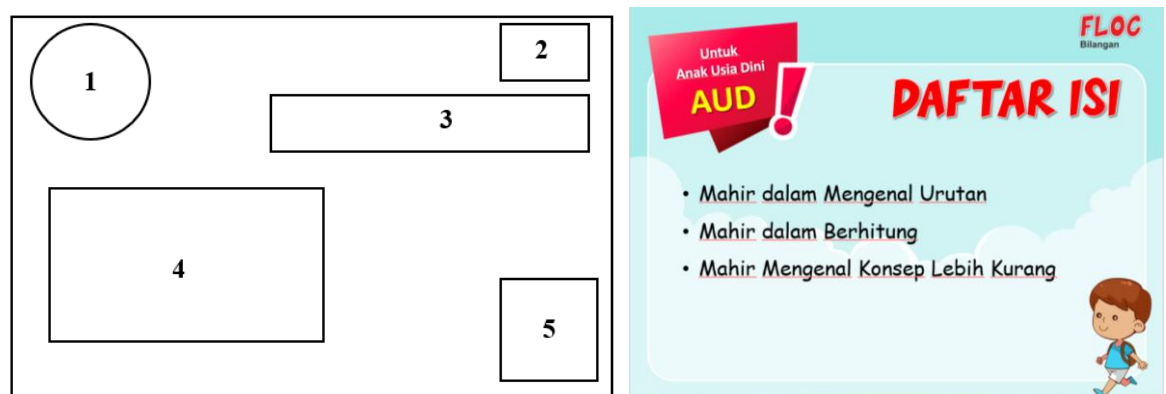
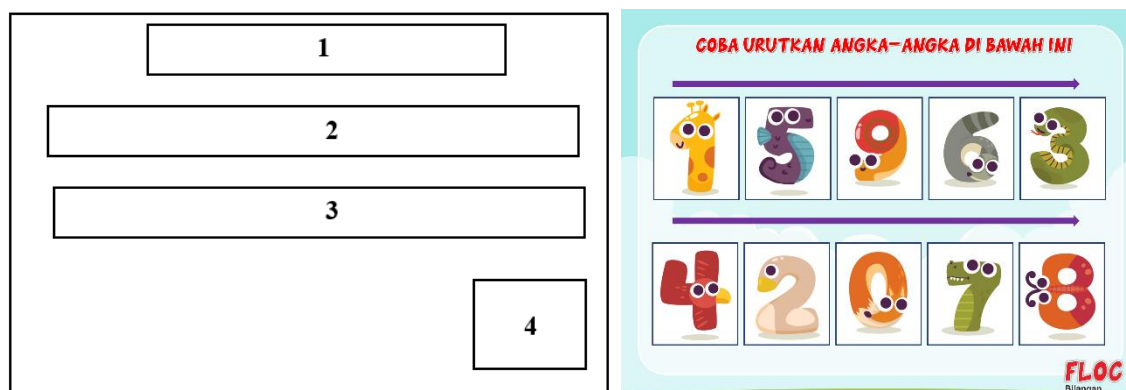


Figure 11. Storyboard View and Table of Contents Interface Design Results



**Figure 12.** Storyboard Display and Interface Design Results  
Contents of Introduction to Sequence Material



**Figure 13.** Storyboard Display and Interface Design Results for Numeracy Material Content



**Figure 14.** Storyboard Display and Interface Design Results  
Material Content is More Than

The image above shows the result of the interface design on each page. After the interface design has been carried out, the file is converted into a PDF using NITRO Pro 9 software and then uploaded to the <https://fliphtml5.com> page so that it automatically turns into a flipbook by registering an account on that page. After the PDF document is uploaded using the link, the results of the created flipbook will appear, as shown below.



**Figure 15.** Display of the FLOC Page When it is In Flipbook Form

After the product is complete, product validation is carried out by material expert validators and media experts. The validation results from the Mathematics Education Lecturer as a material expert stated that the FLOC product was suitable for learning with slight improvements to the sequence of material presented. It was also suggested that visualizations of objects known to students should be used daily. The validation results of the Early Childhood Education Teacher Education Lecturer as a material expert stated that the FLOC packaging was suitable for use and sufficient to train children to understand numbers. However, the composition of the material still needs to be simplified so it can be developed to be more complicated in the future. The results of the validation of the Educational Technology Lecturer as a media expert stated that there was a need to improve the interface and use of fonts and colours to the characteristics of Early Childhood Education Programs children. Based on input from validators, researchers make improvements based on their improvement notes.

Evaluation activities are carried out after the FLOC product has been validated and is suitable for use. Evaluation is carried out by conducting trials in small groups/limited trials on prospective Early Childhood Education Programs teacher students to determine the response from prospective Early Childhood Education Programs teacher student users. Based on the results of limited trials, most prospective Early Childhood Education program teacher students are enthusiastic and motivated to use the digital module. Students said FLOC was easy to use and attractive because of its full-color and interactive interface design.

## Discussion

Digital flipbooks will eliminate the need for physical books and switch to digital ones, reducing printing and distribution costs. In addition, flipbooks will save physical space in classrooms and libraries because data can be stored digitally. Based on the research results, it is known that most prospective early childhood education teachers still rely on

textbooks, and most students hope that other media can be developed and accessed online. This is in line with the results of research by Winarti et al (2022), which explains that the digital competence of early childhood education teachers still needs to improve. So, it still depends on textbooks.

Multimedia is a medium that is an indispensable requirement for Early Childhood educators as an alternative for training 4C skills. Through multimedia, learning will be more meaningful, fun, and engaging. This is in line with research by Shalehuddin (2022), which explains that multimedia is necessary for young children to develop teacher competence, a sense of comfort, and a pleasant atmosphere in the classroom. Besides that, Maulidah (2021) also explained that 4C skills are urgent for future life and development, especially for young children. Thus, multimedia learning activities are necessary to train 21<sup>st</sup>-century skills, specifically creative and collaborative thinking.

Based on the results of limited trials, most prospective Early Childhood Education program teacher students are enthusiastic and motivated to use the digital module. Students said FLOC was accessible and attractive because of its full-colour and interactive interface design. FLOC is easy to use in learning activities and can be accessed using a computer or mobile phone. The use of FLOC can attract students to learn. 90% of prospective early childhood education teacher students are beneficial, and the flipbook that has been developed is easy to use. Research by Arianty et al (2022) explained that flipbooks are very effective for learning activities and can increase student participation, especially among young children. Apart from that, Erminawati et al (2022) also explained that using flipbooks supports early childhood learning and can improve literacy from an early age. So, using FLOC in learning activities is helpful for early childhood education students and those studying mathematical numeracy material.

## D. Conclusion

The FLOC digital module can accommodate the needs of Early Childhood Education Program student teachers in carrying out mathematics learning by counting material numbers. Through FLOC, with exciting and interactive visualizations, it can increase attraction and motivation for prospective Early Childhood Education Program teacher students. FLOC development can also motivate students to develop teaching modules independently using good-quality digital devices. With the limitations of the FLOC digital module, it is hoped that it can be further developed, directly implemented with school students, and produced on other material topics by prioritizing quality.

This research will directly impact prospective Early Childhood Education teacher students in teaching counting concepts of mathematical numbers and become a reference to be developed into further teaching materials using the flipbook model. Through FLOC, students and teachers will be motivated to use it in teaching and learning because FLOC is very easy to use and has an attractive user interface.

In further research, researchers hope that FLOC can be developed in terms of material content and made more interactive. This will not only raise two 21<sup>st</sup>-century skills,

collaborative and creative thinking, but it can also promote critical thinking and communication. In addition, it is hoped that future research can measure the significance of the influence of using FLOC in learning activities on a broader scale.

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