Production Management in the Design Process of Learning Applications for Elementary School Students

Louis Cahyo Kumolo Buntaran[(✉)], Agnes Indah Suciani Kristanti, and Bayu Widiantoro

Universitas Katolik Soegijapranata, Semarang, Indonesia
louis@unika.ac.id

Abstract. Good design must have an objective nature and can be accounted for in all forms produced. Given the design is problem-solving. In making a design that is intended for learning, the designer needs to pay attention to the pattern of order in making the design using design thinking methods. Without rules in making a design, the design will not be right on target. Meanwhile, in Indonesia, the education system is still underdeveloped. The education curriculum has not changed much, even though the development of technology and information has been very rapid. Students' interest in learning tends to decrease because the learning process is not varied and even boring. But then there is an app that helps students to study, especially science subjects. Turns out this app is really helpful for elementary school students, and it was made by one person. This research will discuss the use of production management in learning applications through an effective design process for elementary school students. The purpose of this research is to find out the use of design thinking in the production management of learning applications for elementary school students.

Keywords: Education · Interactive Media · Production Management · Application Design

1 Introduction

Several methods can be used in the design process. The method commonly used is design thinking, this method does not only focus on the visual execution part but sees the whole design as a series of processes starting from data collection, and analysis, to visual execution. By going through the stages of data collection and analysis, the resulting design will be more targeted [1]. The design process can be carried out individually or in groups, with the division of job descriptions according to their respective competencies, so that the design process can run more effectively and maximally. When done in groups, the work will be completed faster, but it takes coordination and production management between teams to get maximum results. Meanwhile, if the design is done individually, of course, it will take longer, but coordination with other members is not required, although management still needs to carry out the design process effectively. Research stages still

need to be carried out both in groups and individually. This applies to any design topic including designs that are used as learning media.

It should be noted that in Indonesia the education system is still underdeveloped. Much of the subject matter is delivered in the same way year after year. The education curriculum has not changed much, even though the development of technology and information has been very rapid. Students' interest in learning tends to decrease because the learning process is not varied and even boring. The quality of education for students is not satisfactory, there are not many changes and even tends to decline if adaptation is not carried out [2]. Some of the existing subjects and materials should be delivered creatively. Science subjects have the potential to be done in a more fun way, one of which is to provide creative simulations. The presence of learning media in the form of textbooks with a design display that can be considered outdated still does not support the learning process. The appearance of the book in the form of still images accompanied by many writings cannot explain phenomena or practices in science subject matter in an interesting way. Children's interest in learning needs to be increased from an early age so that later they are accustomed to and motivated to learn. Basic education is an important future provision for children [3]. Educating children from an early age is important and has a positive influence on children's development in the future [4]. If education in primary schools does not change, children's interest in learning will decrease. Interactive and innovative learning media are needed to support children's education. By looking at these problems, the design method is considered to be the right solution to be applied in the process of preparing effective and appropriate learning methods for elementary school students. This research will focus on production management that is being made individually with a design thinking approach as the right solution for the application of design methods in making interactive learning media for elementary school students.

This research will discuss the use of production management in learning applications through an effective design process for elementary school students. Data was collected using qualitative methods through interviews with resource persons. Resource persons have specific criteria related to experience in designing learning applications for elementary school children. In addition, resource persons who have achievements or track records related to learning applications are prioritized. In addition to collecting data through interviews, data was also obtained through literature studies and digital observations. The data is then processed and analyzed using design thinking for the entire application production stage. Then specifically for the design stage of the application design, the analysis is carried out using a kanban board.

2   Literature Review

2.1   Design Thinking

Design thinking is a non-linear process to design a creative solution [5]. In design thinking there are 5 stages, namely empathize, define, ideate, prototype, and test. Empathize stage is the initial stage in design thinking which is used to understand the problem. At this stage, the designer needs to find data and then process it so that the data can be understood and become the foundation for planning. The define stage is carried out after data collection and analysis are complete. Designers need to determine what needs

and problems are faced by the target. Then the designer determines the right solution to the problem of the target. The next stage is to ideate where the designer already knows the solution to be addressed. The development of ideas is based on data that has been obtained previously. The idea is processed again so that alternative ideas can emerge to overcome the problem. The design concept began to appear for its visual development. After finding the basic concept of developing the solution, the next stage that needs to be passed is the prototype. At the prototype stage, experiments and alternative forms of other solutions are needed. This stage is close to the final result but still needs to be tested. The trial was carried out in the fifth stage, namely the test. At this last stage, the prototype is tested on samples that have criteria similar to the targets. Continue to be done so that feedback from the target can be known for the development of design prototypes. After improvements have been made, the product can be disseminated to the target audience. In this study, the design thinking approach was used to analyze the steps involved in designing learning applications for elementary school children.

2.2 Kanban Board

A Kanban board is a tool that can be used to manage a project. This tool can be used for personal as well as at the organizational level [6]. The purpose of the kanban board is to help work management so that the work or production process can be properly monitored. In a kanban board, there are three main columns, namely waiting, in progress, and completed. The waiting column is used to display a list of jobs to be completed. The second column is in progress where the tasks that are being done are entered in that column. Then the last column, which is completed, contains the tasks that have been completed. Each task that has been completed will be shifted so that it can be seen how far the work process is. These columns have sub-columns whose number varies depending on the work being performed. This study utilizes the kanban board to find out how the design workflow is passed by the designer in making learning applications for elementary school children. And the kanban board focuses on designing at the prototype stage.

2.3 Iteration Design on the Application Stage

In the design process, after going through the discovery, planning, and creative stages, then the next stage is application. In the application stage, a prototype is needed to test a design before it is finally published or given to consumers widely [1]. With prototype testing, the resulting design can be improved. One of the methods in the application stage is iteration design. This method allows testing the design before it is mass-produced or distributed. Iteration design includes testing, analysis, refine. The test step is to test the design made for the team or respondents. The analysis step is to analyze the results of the design test by the team or respondents. Then the last step is to refine where the design is improved according to the results of the design test analysis. This method allows the design to work well and on target. The use of this method is intended to see the production process of application design carried out by designers.

3   Figures and Tables

Analyze result of design step on the application using design thinking as Table 1.

The use of kanban boards to decide the workflow of application creation (prototype). Workflows are organized by urgency and build order. The work process must be sequential because each stage is continued in the next stage of work. Every work process cannot jump to the next stage. If there is a work process that has not been fulfilled, it cannot be continued to the next stage. This flow is used by Mrs. Tuti to manage the production of learning applications. There is no overlapping work process because the work is carried out by only one person. From this flow comes a model that fits the production application (Fig. 1).

From the kanban board flow and analysis of the design thinking stages, a model that fits the application production appears. This model is also in line with the design method using iteration design at the application stage. Where in iteration design, the prototype improvement process is carried out based on feedback from users (Fig. 2).

Following are the results of this research. The keynote person is an elementary school teacher named Tuti Susanti, S.Pd. This teacher who teaches in grade 5 of SD Negeri

Table 1. Design thinking on the production process of the learning application.

Empathize	Define	Ideate	Prototype	Test
Observations of 5th grade elementary school students related to: 1. Barriers to learning process. 2. Habit of using technology 3. Science subject material	From the observations, a learning application design for science subject matter for elementary school students was compiled that could be used on Android phones	1. Deciding suitable visuals to include in the application 2. Determine which music and sound effects can be included 3. Determine the script that can be entered into the application 4. Develop workflow in learning applications	1. Create vector-based image assets 2. Selecting music and sound effects then recording the script in sound form 3. Animate images synchronized with sound 4. Incorporating animated image and sound assets into the application 5. Export files into APK form to be installed on Android phones	1. Distribute application files to students 2. Conducting interviews with students who have used the application 3. Fix the application if there are problems in it
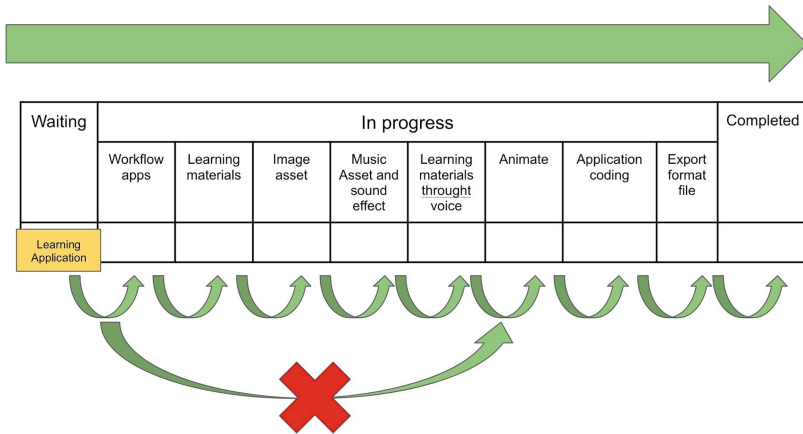
Fig. 1. Kanban board on the production of learning application.
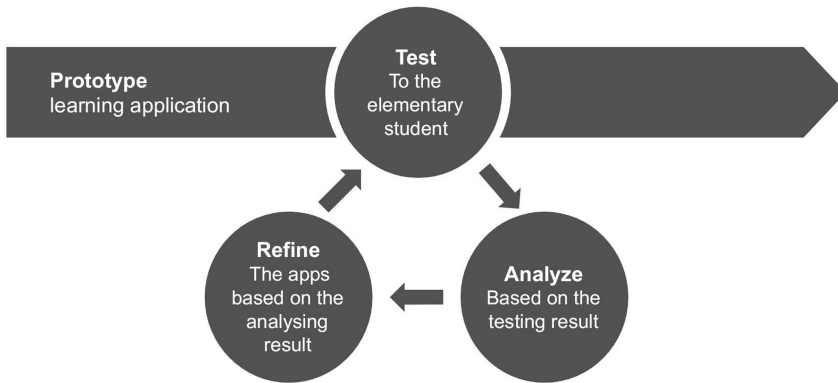
Fig. 2. Iteration design in application stage.

2 Binangun, Banyumas Regency, has succeeded in designing learning applications for several subjects. The results of the applications that have been made have also received awards in one of the competitions held by private campuses in Semarang. Interviews were conducted with Tuti using a podcast approach, where the resource persons told stories and answered questions from the moderator. The content of the podcast can be watched on the LPPM Unika YouTube channel with the title, "LPPM SCU podcast eps 15: Learning to be More Active in Creative Media".

Based on the results of the interview, a learning application called "Digital Experiment" for science subjects can be done in just 1 month. This application is done independently by Mrs. Tuti. The work process can be done within 1 month because it uses the same coding as the previous application with some additional adjustments to the material. In the previous application design, Mrs. Tuti worked on it for a longer time (3 months), because she was still exploring the program used. Before working on the application, first prepare the assets in the application such as images, music, or sound, as

well as the material. Images are created using a program called CorelDraw, a program commonly used to create vector-based visuals. For music and sound effects use what is available and free to use. Meanwhile, for the voice explanation in the application, Mrs. Tuti recorded it first by reading the text of the script that had been prepared. The recording is done using an application on the cellphone. Then for the material, Mrs. Tuti first surveyed her students and also through the textbooks used. From there it is determined the material that can be lifted to be simulated in the application. Considering Mrs. Tuti's profession as a teacher who teaches many subjects, one of which is science. So it is not too difficult for Mrs. Tuti to get the material.

The selection of applications as learning media is based on Mrs. Tuti's observations of her students. Many of Bu Tuti's students are accustomed to using technology for their daily activities. In addition, it also sees the needs of students. At the time this application was designed, the atmosphere of the pandemic was still engulfing the Banyumas area. The area where Mrs. Tuti teaches is also a mountainous area with signal difficulties. So online learning is not best. In addition, Mrs. Tuti also sees the need for her students to get used to positively using technology. Technology does seem like two blades, it can be used for positive things, but it can also have a negative impact. From Mrs. Tuti's observations, most of the students still use smartphones with their parents. This can be used to educate parents and students that technology can be used positively by their children. Applications can be accessed without using the internet at home at any time. This is what made Mrs. Tuti decide to design an application that it can be used on a smartphone.

The designed application is then distributed to students by supplying a.apk file, a file format commonly used to install applications on mobile phones based on the Android operating system (Fig. 3). The file size is not too large making it easy to spread the application to students. From Mrs. Tuti's observations, students can easily operate the applications on their cell phones. This is because students are used to using technology so they are not too constrained when operating. Students also feel happy to explore the application. Even according to Mrs. Tuti, some students admitted to using the application repeatedly for the same material. This shows that students are interested in the material presented using the application. If there are problems in the application, students can convey to Mrs. Tuti to make improvements to the application.

Fig. 3. Documentation of testing learning application.

4   Conclusion

In general, the design process continues through 5 stages of design thinking. From the results of the research, although it is done individually, design thinking is still needed so that the design is effectively delivered to the target. The stages of work can also clearly find what is done at each step. The design thinking process allows for improvements and innovations in applications that are always based on the user. From the results of the research, the stages that have a lot of work are the prototype stage. This is due to the complexity of making learning applications in which there are moving images, sound, and of course content. The next stage which also has a lot of work is the ideate stage. This stage must be arranged in as much detail as possible so that no work planning at the prototype stage is missed.

In working on the prototype, an analysis of the production management flow with a kanban board approach is carried out to determine the workflow in making applications. Broadly speaking, this flow is the same as making applications in general. The Kanban board of this learning application can also be applied to create applications for other topics. Individual work continues to follow the workflow because the results of work in each step will be used in the next step. For example, for making animation, the image and sound must first be ready. Another example of making the drawing itself is to look at the needs of the material. If the material is not yet available, the designer does not know what drawing to make. The work process cannot be done simultaneously because the application is done individually.

As previously mentioned, whether it is done in groups or individually, the design process must still be fulfilled in it. The difference is in the division of tasks when done in groups. Then by making a clear workflow, it is possible for learning applications for elementary students to be completed within 1 month even though they are done individually. The responses from elementary school students who showed satisfaction proved that production with a design thinking approach and also the production management of learning applications that sequentially adjusted the number of workers, which was only one person, was correct.

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