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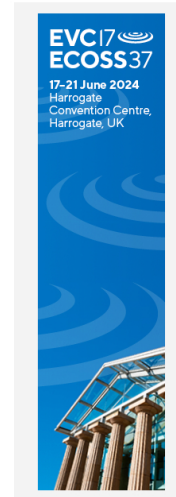
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## Batik AR ver.1.0: Augmented Reality application as gamification of batik design using waterfall method

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# Batik AR ver.1.0: Augmented Reality application as gamification of batik design using waterfall method

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**Abstract.** During the Covid-19 pandemic, it's time to implement asynchronous learning. The problem is, elementary school students have difficulty learning cultural arts, especially batik design. This study aims to create an application base on augmented reality (AR) with batik design content that can be used to introduce batik design as cultural art to elementary school students. The method used in developing this application is a waterfall which consists of (1) feasibility study, (2) requirements, (3) System design, (4) Encoding, (5) Testing system, (6) Acceptance Test. The results of this study were the validators rated more than 85% of media validation consisting of the quality of visual and auditory perceptions, ease of interaction, ease of interaction, and ease of use, while user responses consisted of 80% efficiency, 85% usability, 78% cognitive absorption, and enjoyment. 87%. This implies that the AR application can provide benefits for students who learn cultural sessions, especially batik design.

## 1. Introduction

Batik is made by applying melted wax to the cloth with a canting tool or a lid, coloring it. Education has a significant role in the development of bad human life for the better. However, canting has been part of the batik process by hand for centuries, canting response to the 'modern' effect. Invention of the *cap*—a copper block that applies an entire design onto the cloth with a single imprint—revolutionized the batik industry [1]. The *cap* was invented in the early 19<sup>th</sup> century, but only become popular with the commercialization of the industry from the 1850s, use of *cap* means cloth can be waxed many times faster than with a *canting*, and the tool dramatically increased the production batik, rendering the industry and important factor in the economy of Java [2].

Making motive batik designs on a product must also conform to design principles [3], including unity, a center of interest, balance, proportion, and rhythm. The use of motifs in fashion is very urgent. Many ways are used to create the motive itself. On its development, people began to be interested in creating motives more inherently. This is because it started the level of public awareness in maintaining the environment, one of which is getting a motive to be applied to cloth or clothing.



Learning that is suitable in a pandemic like this is a fun application such as learning to know batik motifs with augmented reality. Applications developed should be game-based so that students don't feel bored. In terms of learning technology, there are new things that provide ideas on how to take advantage of augmented reality technology in spreading cultural arts, especially batik designs.

Gamification is the integration of game elements and game thinking in non-game activities. The game has several distinctive features that play an essential role in gamification [4]: a) users are all participants - employees or clients (for companies), students (for educational institutions); b) challenges/tasks carried out by the user and progress towards the specified goals; c) points accumulated as a result of carrying out the mission; d) the level the user passes depends on the points; e) badges that serve as prizes for completing actions f) user ratings according to their achievements.

Educational content must be interactive, engaging, and rich in multimedia elements [4]: a) various performances - learning activities need to be designed so students can repeat them; b) business case that fails. It is imperative to create conditions and opportunities to achieve the final goal. As a result of repetition, students will improve their skills; c) eligibility - learning activities must be attainable. They must be adjusted and adjusted to the level of students' potential and abilities; d) increase the level of difficulty - each subsequent assignment is expected to be more involved, requires more effort from students, and matches the knowledge and skills they have just acquired; e) various paths - to develop multiple skills in learners, they must be able to reach their goals with various pathways. This allows students to build their strategies, which is one of the keys to active learning characteristics. The research designing application of Android-based learning (Mobile Learning) for multidiscipline Students [5].

The research reported in this paper concerns the development and deployment of an Augmented Repair Training Application (ARTA); a template-based interface to support end user (shop floor) AR content creation [6]. The research found that both technologies can be used to promote exploratory behavior and perceived usefulness and develop a positive attitude. Other findings related to these aspects were identified and described. The outcomes from this study can provide insights for administrators and policy makers to set priorities for using VR and AR in school practice to carry out various reflective and exploration tasks [7]. The research is a foundational study that formalizes and categorizes the existing usage of AR and VR in the construction industry and provides a roadmap to guide future research efforts [8]. The potential solutions to address these challenges in both AR and VR displays are presented case by case, including the most recent optical research and development, which are already or have the potential to be industrialized for extended reality displays [9]. Typical visualization elements have been presented, using an AR-based assembly instruction system [10].

Base on the thoughts that refer to several articles, in this study, the intention is to create an application base on augmented reality (AR) with batik design content that can be used to introduce batik design as cultural art to elementary school students.

## 2. Methods

This research uses the Waterfall method [11] and using 10 validator media. This method has 6 stages: (1) feasibility study, (2) requirements, (3) System design, (4) Encoding, (5) Testing system, (6) Acceptance Test. Figure 1 below is a brief description of each stage.

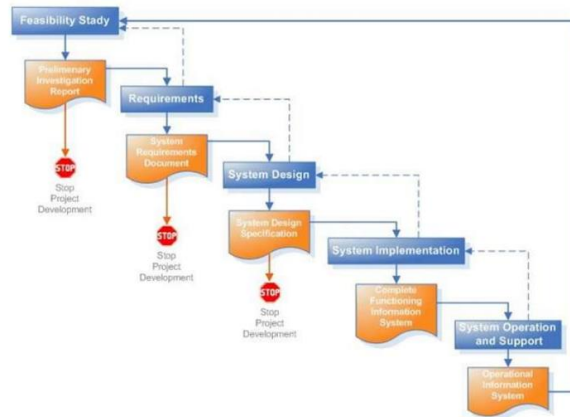


Figure 1. Flow method of Waterfall [11].

- **Stage I:** A feasibility study. The things involved in the first stage such as understanding what needs to be designed and what functions, the goal is to design an Augmented Reality-based application with batik design content. At this stage, the requirements that must be met by the software are listed and detailed.
- **Stage II:** The requirements, software, and hardware required for proper project completion are analyzed in this phase. The material that will be included in this application must be able to support the display because of using the application using a smartphone, how to update the material and questions, what features are needed.
- **Stage III:** Algorithm System Design or program flow diagrams or software code that will be written at a later stage, made now. This is a very important stage, which relies on the previous two stages for proper implementation. Proper design at this stage ensures execution at a later stage. If at the design stage there are several requirements for designing code, the analysis stage is reviewed and the design stage is carried out according to the new resource set as Figure 2.

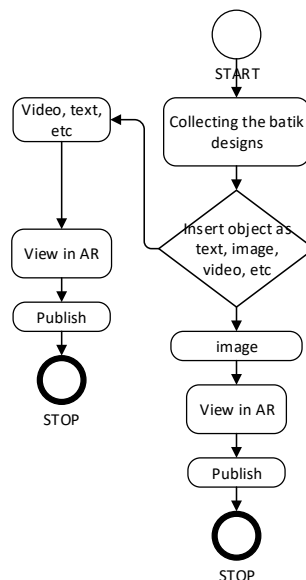
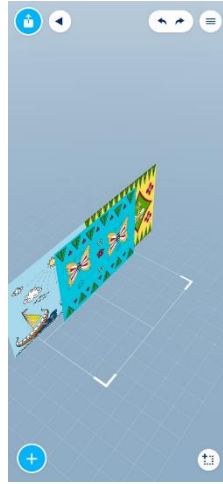


Figure 2. Algorithm system design.

- **Stage IV:** Coding based on algorithms or flowcharts of software coding is carried out. At this stage, the ideas and flowcharts of the application are physically manifested. The proper

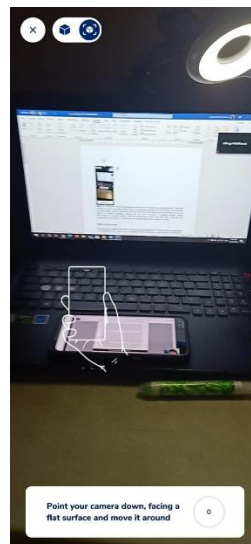


execution of the previous stages ensures that the execution of these stages is smooth and easy. The figure 3, shown the result after coding, and ready to be published as Figure 3.



**Figure 3.** prototype of application of BATIK-AR.

- **Stage V:** Testing with application coding complete, the written test code now goes into the scene. The test checks for any deficiencies in the designed software and if the software has been designed according to listed specifications. Implementation of this stage correctly ensures that students who are interested in the software that is made will be satisfied with the product. If there are deficiencies, the software development process must move back to the design stage. At the design stage, changes are implemented and then the encoding and re-testing stages are carried out. All bases can be used as markers where AR objects appear as Figure 4.



**Figure 4.** Scanning as bases of AR object.

- **Stage VI:** Acceptance. This is the final stage of software development in the waterfall model. The proper execution of all the preceding stages ensures the application matches the requirements provided and, most importantly, ensures students are satisfied. However, at this stage, it may be necessary to provide support to students regarding software that has been developed. If students demand further improvements to existing software, then the development

process must start again, right from the requirements. In this study, it is still limited to material experts who validate the media.

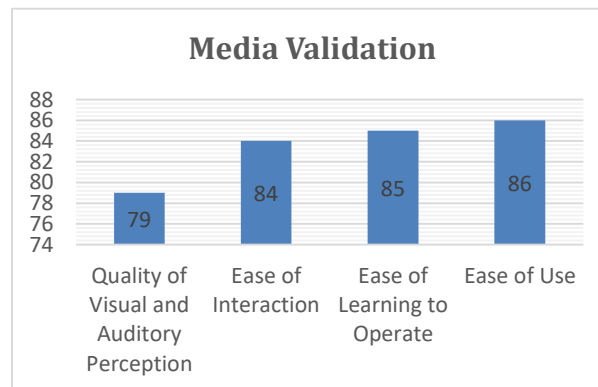
### 3. Results and discussion

The introduction of the art and culture of batik design to elementary school students becomes interesting if it is presented with a game model. Augmented Reality applications created using the ASSEMBLR Studio application, and made into APKs. The APK file has not been widely published yet, because it is still a copyright registration process. This application requires a smartphone camera as an input device that is assigned to a track marker (special marker) by recognizing the position and orientation of the marker and then being compared with the data in the database. If the information received is the same as the information in the database, the virtual object will be displayed in the 3D coordinates (x, y, and z) indicated by the marker. The final result in developing this media consists of two forms, namely in the form of physical print media or a book consisting of pages containing bookmarks and a mobile-based augmented reality application as Figure 5.



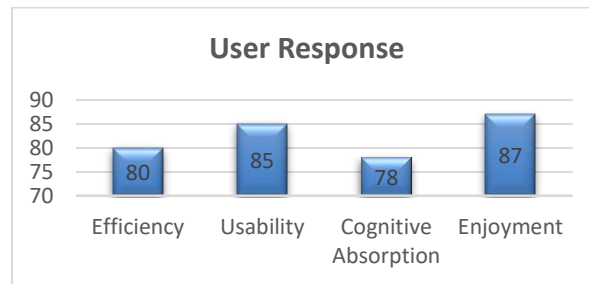
**Figure 5.** Augmented reality application BATIK-AR.

The validators rate more than 85% media validation consist of quality of visual and auditory perception, ease of interaction, ease of learning to interaction, and ease of use as Figure 6.



**Figure 6.** Media validation.

Meanwhile, user response consisting of efficiency 80%, usability 85%, cognitive absorption 78%, and enjoyment 87% as Figure 7. This implies that the application can provide benefits for learners who will be learning and knowing about batik design.



**Figure 7.** User response.

#### 4. Conclusion

It can be concluded that based on research on augmented reality (AR) based applications with batik design content, it can be used to introduce batik design as cultural art to elementary school students. In AR research with photographic content, it also gets positive assessments to be developed in understanding light techniques [12]. The results of this study were validator assessments of more than 85% media validation consisting of the quality of visual and auditory perceptions, interaction, use and use, while user responses consisted of 80%, 85% use, 78% cognitive absorption, and 87% enjoyment. This means that the AR application can provide benefits for elementary students studying cultural sessions, especially batik design.

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