Interactive educational games assisted Construc 2: A systematic perspective of design reviews

D D Chrisyarani, A D Yasa, A R Hakim* and F M Putra
Elementary School Teacher Education Study Program, Universitas Kanjuruhan Malang, Jl. S. Supriadi No. 48 Malang, 65148, Indonesia

*ariefrahman@unikama.ac.id

Abstract. Educational games are increasingly being used, it is very important for designers to recognize the quality and reliability of the software. The purpose of this article is to describe the results of game evaluations at the level of ease of use of the software. The research method used is descriptive qualitative with Heuristic evaluation. Testing by involving experts in the process. The assessment instrument consists of ten statements. The assessment results show the game only has cosmetic problems (score 0 and 1 point from the total HE instruments). However, in error prevention, an average of 2.33 is obtained which means it has a small usability problem. So, the game application is declared eligible to be distributed to end users.

1. Introduction
Technology and information development in Indonesia becomes one of challenges in education section. The application of technology and information is important for learning support [1]. For example, the application of game in education which is known as Education Game (EG). On this research, we will discuss about EG. EG is one of the innovative method that extract a lot of attention, especially for student [2,3]. EG was designed for specific subject to reach the learning goal and its outcome which is wanted by student [4]. The research of EG shows some of advantages such as can motivate student, stimulate the ways of thinking, including the increasing of concentration and solve the problem so it can upgrade the student activity [3-6]. A better EG needs to take attention for criteria and evaluation of product [6]. The evaluation and development of EG observe a lot of complexity criteria so it make the designer has to understand the relevant learning goal, the design, behaviour alteration, motivation and able to identify the compatible game building on evaluation method [5]. In addition, it is important to observe the base element of EG that is mechanics, story, aesthetics, and technology [5,7]. Thus, utility evaluation is necessary to do ensuring the effectiveness and efficiency of EG [8]. There are so many method which is can evaluate the utility of product. Heuristic evaluation method is method of utility evaluation that often to use [6,9,10].

This method involve single expert user (3-5 person) or a double specialist utility (2-3 evaluator) to examine the design toward the utility principle that has been decided for problem identification [11,12]. For this reason, heuristic methods have been carried out in previous research to evaluate the utility of game [6]. Therefore, this article purpose to analyse the results of Heuristic Evaluation (from multiple specialists) on “EG GASITOSI (adventure Games)”.

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2. Research methodology

The research methodology used is descriptive research. Perspective Take (PT) is identified as significant component for argumentation, problem solving, and creativity [13]. PT is observed from heuristic evaluation result (from expert) toward EG expansion that is GASITOSI (adventure Games). For the utility trial, will been execute the steps which is drawn in Figure 1.

![Figure 1. The steps of utility trial [14].](image)

The first step of heuristic evaluation trial that seen in Figure 1 is choose one of evaluators. The chosen evaluators have a characteristic appropriate with its specification. It is consist three specific expert. The second step is identify and define the goal of the games. In this steps, the process is define the matter, learning goals, identify the student characteristic to expand the product that is national proclamation figure EG with the help of construk2. The third step is define a set of tasks that commit on the games. The last steps is provide the result of utility trial using heuristic evaluation instrument. The method of HE has ten declarations as valuation instrument for user toward the trial product [15]. The HE instrument’s shown in Table 1.

| Nielsen Declarations of Heuristic Evaluation | Scale |
|---------------------------------------------|-------|
| Visibility of system status                 | 0, 1, 2, 3, 4 |
| Match between system and the real world    | 0, 1, 2, 3, 4 |
| User control and freedom                   | 0, 1, 2, 3, 4 |
| Consistency and standards                  | 0, 1, 2, 3, 4 |
| Error prevention                            | 0, 1, 2, 3, 4 |
| Recognition rather than recall             | 0, 1, 2, 3, 4 |
| Flexibility and efficiency of use          | 0, 1, 2, 3, 4 |
| Aesthetic and minimalist design            | 0, 1, 2, 3, 4 |
| Help users recognize, diagnose, and recover from errors | 0, 1, 2, 3, 4 |
| Help and documentation                     | 0, 1, 2, 3, 4 |

Information about scale:
0: there aren’t usability problem
1: cosmetic problem
2: minor usability problem; need improvement
3: major usability problem; need improvement because it relate to process
4: usability catastrophe; need redesign

3. Result and discussion

3.1. Research object

The object that been examined in heuristic evaluation is a GASITOSI (adventure Game) with the help of construk2. This application is evaluated by the expert and will be provide for elementary student in
Indonesia. In Figure 2-4 can be seen the display of GASITOSI (adventure Game) with the help of construk2 after login.

![Figure 2](image1.png) ![Figure 3](image2.png) ![Figure 4](image3.png)

**Figure 2.** The main display of product and the selection of game arena.

**Figure 3.** The display of question.

**Figure 4.** The display of game arena and animation character.

### 3.2. Nielsen's heuristic evaluation results

#### 3.2.1. Visibility of system status.
Visibility of system status is valuation instrument to know if the product always can provide information for user related to the ongoing process, such as: Completed with main menu for participant, consist distinct user guideline [10]. Relies on instrument evaluation result, visibility of system status obtain the value from evaluator that is 2 evaluator give 0 point and 1 evaluator give 1 point. The average of the evaluator result is 0.33 which is mean in this instrument, GASITOSI doesn’t have usability problem.

#### 3.2.2. Match between system and the real world.
Match between system and the real world is valuation instrument to know if the product uses communicative and interactive language, according to student development, accuracy of sentence structure [17]. In this instrument, 2 evaluator give 0 point and 1 evaluator give 1 point. The average from 3 evaluator is 0.33. It mean the product doesn’t have usability problem in this instrument.

#### 3.2.3. User control and freedom.
User control and freedom is valuation instrument to valuate that product can be run comfortably and easily understood [10]. Building on valuation from 3 evaluator, is known that the average is 0 (3 evaluator give 0 point). So, we can say that in the user control and freedom, the product doesn’t have usability problem.

#### 3.2.4. Consistency and standards.
Consistency and standards is valuation instrument of HE to know if the product doesn’t have ambiguous purpose, not the using of word, images nor the icon [11]. In this instrument, 2 evaluator give 0 point and 1 evaluator give 1 point because it consist not relevant
language. The average of this instrument is 0.33. So, it doesn’t have usability problem in consistency and standards.

3.2.5. Error prevention. Error prevention is valuation instrument of HE to know if product can handle if there are an error or mistake occurred by the user by giving notification [18]. In this instrument, the average of value that given by the three evaluator is 2.33 (each evaluator give 1 point). In conclusion, the error prevention in GASITOSI has minor usability problem, so it needs improvement.

3.2.6. Recognition rather than recall. Recognition rather than recall is valuation instrument of HE to know if the product clarify the user in recognizing features, images, icons on the menu according to their function [11]. Building on valuation of three evaluator, it is given average 0 (the three evaluator give 0 point). So, as the conclusion, Recognition rather than recall doesn’t have usability problem.

3.2.7. Flexibility and efficiency of use. Flexibility and efficiency of use is valuation instrument of HE to evaluate the product if can work faster by seeing a clear display of features [11]. In this instrument, 2 evaluator give 0 point and 1 evaluator give 1 point, because there is a future in this matter which is unclear. The average from three evaluator is 0.33. So, it doesn’t have usability problem in flexibility and efficiency of use. Although, it have no problem as the conclusion, the unclear future still need improvement.

3.2.8. Aesthetic and minimalist design. Aesthetic and minimalist design is the instrument of HE to see product have good, simple designs, relevant to the user's wishes [15]. In aesthetic and minimalist design get score from evaluator that is 2 evaluator give 0 point and 1 evaluator give 1 point. One evaluator give 1 point because the background less uninteresting and the figure less nationalists. The average of this instrument is 0.33, which is means that the product doesn’t have usability problem in this instrument, but it still need improvement in background and animation figure.

3.2.9. Help users recognize, diagnose and recover from errors. Help users recognize, diagnose, and recover from errors is instrument HE to know if the expansion product can display a message if there is an error occurred and have information about how to solve it [11,14,15]. In this instrument, 2 evaluator give 0 point and 1 evaluator give 1 point. So, the average score is 0.33. From that reason, GASITOSI (adventure Game) has cosmetic problem and need improvement in adding a message display if there is an error.

3.2.10. Help and documentation. This indicator in HE to assess if the product has been completed with instructions, help, and use guideline [11,15]. In this instrument, 2 evaluator give 0 point and 1 evaluator give 1 point because it needs manual book. So, the average score is 0.33. From this reason, help and documentation in GASITOSI has cosmetic problem and it needs improvement.

4. Conclusion
Building on the valuation from evaluator toward GASITOSI (adventure Game), it can be conclude that the game doesn’t have usability problem in general. The game just have cosmetic problem or score 0 and 1 point from total instruments of HE. But, in error prevention, it get average 2.33 which is mean it have minor usability problem. So, improvements are needed to add notifications when an error occurs during a game or when passing a feature. Thus, the expansion application of GASITOSI have a good category.

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