Development of Educational Adventure Game on Fluid Physics Material

D Muliyati¹, N Wahdaniyah and F Bakri
Department of Physics Education, Universitas Negeri Jakarta
Jl. Rawamangun Muka, Jakarta 13220, Indonesia
Email: dmuliyati@unj.ac.id

Abstract. An educational game is a form of technological progress that can be implemented in the field of education. This article describes the results of research on the development of educational games that can be used as an alternative mentoring for students. The method used in this research is the Research and Development (R&D) method with the ADDIE approach, which includes five stages, namely Analysis, Design, Development, Implementation, and Evaluation. An HTML5-based educational game has been created using Articulate Storyline 3. This educational game contains a person's journey with the background of applying static and dynamic fluids and has several levels containing fluid for the next round. Material experts and media experts have validated the educational games produced. Experts provide a comprehensive opinion on all aspects assessed.

1. Introduction
An educational game is one form of technological progress that can be implemented in the field of education. Initially, games were often considered to give negative stigma to children, but in fact, games as a means of education are not wrong because games are entertaining [1]. Educational games can increase students’ learning, motivation [2]. Educational games can make learning materials enjoyable because they are packaged so that students can feel the sensation of playing while learning [3]. Educational games are effective as a companion for learning in the classroom. The research conducted shows the results if learning using educational games shows better learning outcomes [4].

Characteristics of educational games, namely, fantasy, rules and goals, sensory stimuli, challenges, mystery, and control [5]. Therefore, one of the main advantages of educational games is the visualization of real problems [6]. Using educational games can make the fact that the subject matter is blurred with the characteristics of the game and the interaction between students and the game [7]. From the game, players, consciously or not, are also trained to complete every mission in the game. It requires several skills such as literacy skills, counting, coordinating, setting strategies, and many more [8].

One of the current interactive media innovations is Articulate Storyline software because it is easier to use, but can compete with Adobe Flash media [9]. Global Incorporation is the maker of Articulate Storyline software that can be used to create interactive learning media. The resulting output is a format that can be used for web-based media or HTML5, tablet users, Mac iOS users, Android users, and PC users [10]. Its features make it easier for users to use it. The complete features of Articulate Storyline so that it can compete with Adobe Flash and an easy interface, such as using PowerPoint makes Articulate Storyline an option for creating interactive multimedia [11].

Based on the description above, this article describes the results of research on the development of educational adventure games on static fluid and dynamic fluid physics material.
2. Method

2.1. Research and Design
This research is qualitative research that is descriptive and tends to use analysis. The research method used in this research is the research and development (R&D) method, namely by developing a product and testing the effectiveness [12]. The method used in this research is the ADDIE research and development method. Based on Instructional design: The ADDIE approach, the ADDIE stage consists of five main stages, namely Analyze, Design, Development, Implementation, and Evaluation [13].

2.1.1. Analysis
The stage to analyze the need for product development and analyze the requirements of development. At this stage, a needs analysis and literature study is carried out.

2.1.2. Design
At this stage, a design will be carried out in the development of educational games with HTML5 output that can be accessed via a browser.

2.1.3. Development
At this stage, begins to carry out product realization.

2.1.4. Implementation
At this stage, will be carried out in a limited manner at the designated school at the research site. To produce a decent product, of course, it is necessary to conduct a trial of the product.

2.1.5. Evaluation
This stage is the researcher's final revision stage of educational games to improve product quality. The final result of this research is an educational game on the fluid physics material.

2.2. Instrumentation Research
To test the feasibility of the research results on the development of educational games, an instrument in the form of a questionnaire was used. Questionnaires that have been developed include a questionnaire to test the feasibility of the media and a questionnaire to test the feasibility of the material.

2.2.1. Media Eligibility Instrument
Media feasibility is assessed on five aspects: the aspect of the storyline presented, the element of interactivity, the design aspect of the game, the aspect of the appearance of the game and the part of the ease of operation of the game.

2.2.2. Material Eligibility Instrument
The feasibility of the material is assessed on three aspects, namely the aspect of the presentation of the material, the element of the content of the material and the element of the quality of the questions provided.

3. Results and Discussion

3.1. Product Research
The development research carried out has produced a product in the form of an educational game. This educational game contains a journey related to the fluid physics material. In this game, there are several stages as follows:

3.1.1. Main Menu
The main menu contains a start page, and players must fill in their names first to proceed to the next stage.
3.1.2. **Map Page**
This educational game consists of five levels related to static and dynamic fluid physics material.

![Figure 2. Map page](image)

3.1.3. **Journey**
At each level, there will be a journey. The player must pass this journey to get to the next level.

![Figure 3. Journey](image)

3.1.4. **Question**
At the end of the journey, there will be several questions related to static and dynamic fluid physics material. Players must answer these questions.

![Figure 4. The question](image)
3.1.5. Feedback

In this educational game, there is feedback on player answers. It consists of input on correct answers, feedback on wrong answers, and scores obtained while playing educational games.

![Figure 5](image)

**Figure 5.** (a) feedback when answering correctly, (b) feedback when answering incorrectly, (c) the score received

3.2. Description of Validation

The development of adventure-type educational games on fluid physics, material using articulate storylines has passed the feasibility test stage by media experts and material experts. Interpretation of validation data made qualitative level intervals which are presented in Table 1. The assessment indicators and validation results by experts are shown in Table 2.

| No. | Aspect            | Score Average | Interpretation |
|-----|-------------------|---------------|----------------|
| 1   | Storyline         | 73,33%        | Good           |
| 2   | Interactivity     | 100%          | Very Good      |
| 3   | Design            | 100%          | Very Good      |
| 4   | Display           | 100%          | Very Good      |
| 5   | Convenience       | 73,33%        | Good           |
|     | Average of All Aspects | 89,33%        | Very Good      |

3.3. Discussion

This research succeeded in developing an educational game with a fluid physics material, which was considered very feasible—making this game using Articulate Storyline software, which can be accessed on the browser.
4. Conclusion

This research has produced a physics educational game on the fluid physics material. Based on the formative evaluation results, the resulting educational game was considered very feasible to be used as a learning companion for students in fluid physics material.

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