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# Designing Three Dimensional Maze Games on Atomic Core Material Using Blender Applications for High Schools

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**Abstract** - Aimed of this research is to design and create three-dimensional games for physics learning media in core atom material using blender application for Senior High School . It was R&D research and designed by ADDIE instructional design. Result of this research is Blender application with 38,5 MB size that can be open by computer at least with processor dual core and RAM 2GB. It was found that is good to innovate and create a new way to teach physics so that this learning multimedia can help students to understand about core atom subject.

Keywords: Learning Multimedia, 3D Animation, Aplikasi Blender

## 1. Introduction

Education is an attempt to change a human behavior for the better. Ki Hajar Dewantara stated that education is a guide in the growth of children's lives. Education is to guide all natural forces that exist in these children, so that they as humans and as members of society can achieve the highest safety and happiness (Suwarno, 1998).

According to the syllabus of Indonesia high school in 2013 Curriculum. High school level students in third grade required to be able to understand physics learning materials about the nucleus which include the core structure, core reactions, radioactivity and nuclear science and technology. This indicates that high school students are required to be able to observe, question, explore, associate, and communicate about the learning of atomic nuclei. (Nurmaliza, 2019) Unemployment is main problems that occur almost in all countries including Indonesia. The phenomenon of low interest in entrepreneurship becomes an important issue to be studied. A few people think for creating jobs. They hope to become employees, laborers or just sell their energy just to expect service rewards. One effort to reduce unemployment rate in Indonesia is to create graduates who not only have orientation as job seeker but job maker or commonly referred as entrepreneur.

Redish's (Onur, 2005) states that the problem in learning physics is that students have difficulty in knowing the meaning of symbols that emerge from an equation. Difficulties faced by these students make physics considered a difficult subject to understand and a frightening specter. Onur Kabil concluded that the big challenge now faced in learning physics is about what and how to teach physics. (Suryani, 2019) In order to be effective in implementing peer tutoring, the teacher must make preparations from various aspects including choosing and training tutors who are responsible and formulating materials and tasks to be given. (Yenita, 2019) By using computer-based learning media students directly interact with the computer individually, so that what particular students experience will be different from what is experienced by other students. This ability will accommodate students with the heterogeneous ability to learn in a different climate of effective learning which is individualized by computer-based learning media.

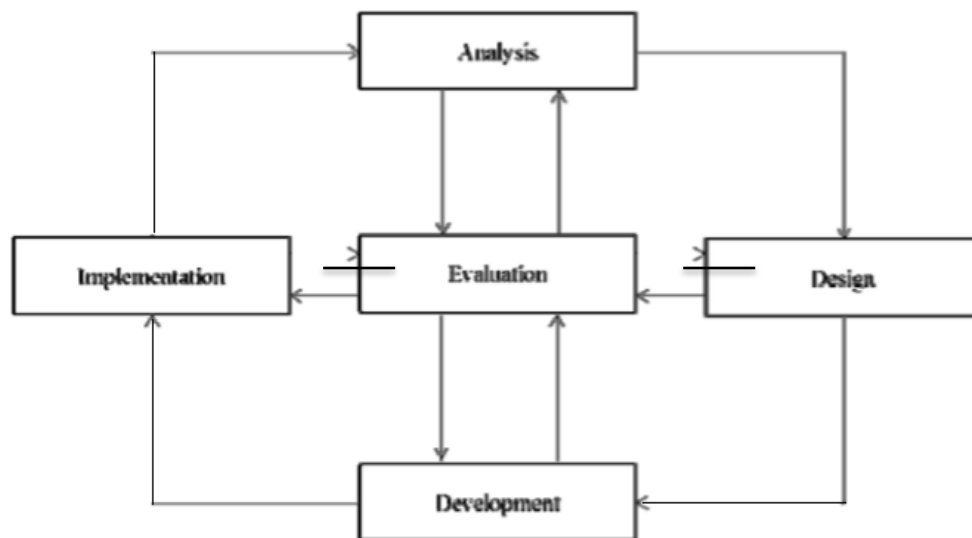
The use of three-dimensional in learning has been done before by Maria Virvou (2002). Maria Virvou et al have conducted research on the effectiveness of three-dimensional games in helping the learning

process. They stated that the virtual reality educational game they made (VR-ENGAGE) can be very motivating while increasing the educative effect on students. Similar development was also carried out by Niyati Gosalia et al (Niyati, 2015). Niyati Gosalia et al carried out the development of three-dimensional based on E-learning games on a mathematics lesson called MathMazing. The results of his research state that by using MathMazing learning becomes more effective, practical and makes it easy for students to remember the lesson. (Hadriana, 2019) The teacher can provide services to students without having face to face meeting. In addition, teachers and students can obtain information or learning materials from various sources of cyberspace with the help of computers or the internet. Furthermore, teachers and students can search, explore, analyze, and exchange information effectively and efficiently.

Inspired by the success of several preview studies. So making a three-dimensional Blender game application as a learning medium capable of animating atomic nuclei is expected to be good contribution in develop of physics learning media. And by create it, it also able to be the solution to the problem “how to design a three-dimensional maze game on atomic materials for high school?”. So the authors conducted research under the title "Designing Three Dimensional Maze Games on Atomic Core Material Using Blender Applications for High Schools

## 2. Methodology

The research method used is R&D (Research and Development) and uses the ADDIE instructional media design model. The choice of this approach is based on the research objectives, to design, create, and validity of the dimensions of the triangle animation with the application of Blender on the material of the atomic nucleus used as a medium of physics learning in high school. Following are the steps in conducting research using R&D research methods:



**Picture 1.** Instructional design type ADDIE (Razali, 2015)

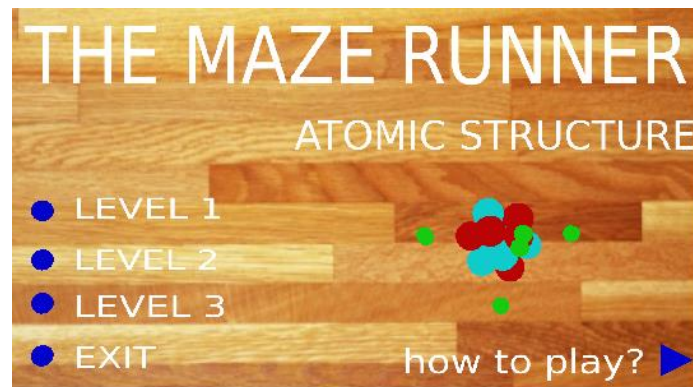
The steps of the R&D method carried out in this study is in expert validation. The following are the steps that will be carried out in this research:

1. **Analysis**  
Conducted on the subject of learning physical matter about atomic. Analysis started from students and teachers. It continued by analysis about the material from book (Sunardi, 2015).
2. **Design**  
Design Based on the results of the analysis, design and manufacture of physics learning animations based on three-dimensional atomic core material with the Blender application. The research design was made in the Blender application because this game application is a three-dimensional and blender application is Open Source, which means free to use without any illegal use status. This design is evaluated to be in accordance with the problem analysis.
3. **Development**  
Program development is based on the design in the previous stage. The development of the program is described on History board. This development is evaluated by expert and also feedback from teacher and student.
4. **Implementation**  
Implementation is a concrete step to implement the system that has been made. At this stage everything that has been developed is tested and then evaluated by expert. If it is not suitable, repair it again to achieve the desired results.
5. **Evaluating**  
An evaluation can only be carried out if the implementation phase is complete. From this step the results will be obtained whether the media produced is suitable for use or not.

### **3. Result and Discussion**

The design of this media is done in order to provide alternative solutions in solving problems about how to teach physics learning for abstract atomic core material. So using this three-dimensional Blender application as a learning media will visualize all the atomic nuclei material. Design of three-dimensional animated physics learning media uses the Blender application because the Blender application is an application that has a three-dimensional design standard and is an open source application. This makes Blender application suitable for describing abstract things more concretely. The next step is to be able to start designing this learning media so a computer capable of running Blender applications is needed. The minimum specifications required to run the Blender application are dual core or equivalent processor and 2GB RAM and the recommended specifications are i5 core processor or equivalent and 8GB RAM

Game application has been done named “The Maze Runner : Atomic Structure”, with format exe with 38,5 Mb. This application can be use in any computer with specification at least dual core processor and 2GB RAM.

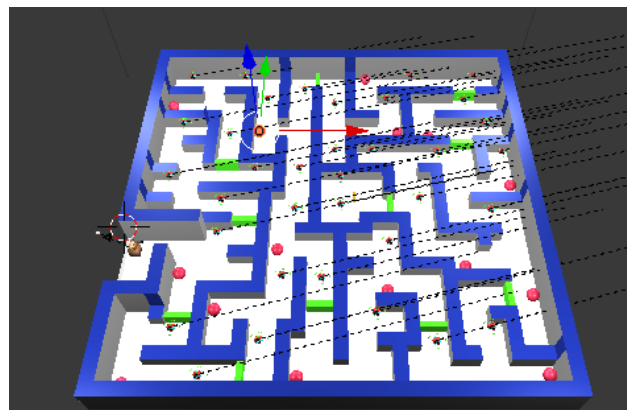


**Picture 2.** Main menu of the maze runner game



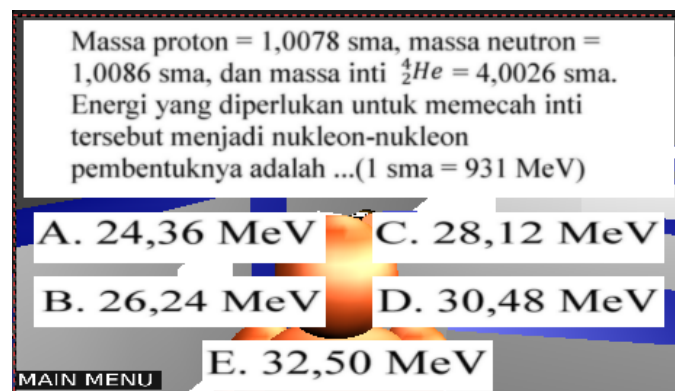
**Picture 3.** Explanation how to play the game

In this game application the player will move the bear character in the maze to get honey. In the effort to get honey bears will get disruption in the form of a moving bee and if the bear is hit by a bee collision, the bear will return to its initial position.



**Picture 4.** Maze map from The Maze Runner: Atomic Structure Game

In the maze the player will meet the barrier doors that will open when successfully answering questions on the door. If the answer is wrong then the player will lose, and if correct, the player will get one point and continue his adventure in the maze until it is fined to get honey. There are three levels to this game. Level one for meeting material one to level three for meeting material three. There are 10 questions on each level. The maze has been designed so that players find at least 5 doors, which means there are 5 questions to reach the finish line.



Picture 5. Question appear when the bear knock the door

#### 4. Conclusion

The design of three-dimensional game as physics learning media using the Blender application on atomic core material for high school has been successfully designed. This design has been successfully done with the ADDIE instructional design. The design results have been successfully made with the Blender application. This program is 38,5 MB in size and can be opened on a minimum computer capacity with a dual core processor or equivalent and 2 GB RAM.. This media can be used as an alternative choice of learning media and can be a reference to the teachers in the field of science to be able to innovate more or other parties who need it.

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