

Development of an Android Application in the Form of a Simulation Lab as Learning Media for Senior High School Students

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The aim of this research is to create learning media for senior high school students through an android application in the form of a simulation lab. The method employed in the study is research and development. A simulation lab which has been made subsequently validated by concept and media experts, further empirical testing by teachers and students. Averages for feasibility of the media on all indicators are 83.13% from media experts, 87.5% from concept experts, 83.13% from empirical test of teachers, and 78.51% from student test. It is concluded that the android application in the form of a simulation lab can be used as a learning media for senior high school students

Keywords: android application, learning media, m-learning, simulation lab

INTRODUCTION

Traditional learning is an activity occurring at the classroom where teachers deliver learning material to students. Because of dependence on teachers, students should attend in every learning process and cannot access learning material anytime and anywhere.

Technological development has created breakthroughs in learning. In the development process, students often contact devices of mobile communication and internet being a new trend that have possibility to organize mobile learning (m-learning). Because of m-learning, students should not always attend in any learning process. Besides that, students can access the learning material anytime and anywhere.

According to Wood (2005), a term of m-learning is based on using of a technological and mobile device, such as PDA, mobile phones, laptop, and tablet in learning. Saedah Siraj and Vijay (2009) state m-learning is using of a mobile device to have possibility which can organize learning anywhere and anytime. According to Mohammed Osman, M. El-Husseini, and Johannes C. Cronje (2010), m-learning is

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one of models in learning environment considering mobile-technology device, student mobility, and learning mobility.

Some research conducted about m-learning predict that it can give much benefit. M. Tamimudin (2009) states that m-learning is prospective and progressive learning to be implemented because it is supported by communication technologies which are sophisticated, cheap, and reliable. Mahizer (2009) on his research concluded that m-learning has been begun an important role in education. The existence of m-learning and wireless devices is a reality. Freedom for students to learn and get information makes m-learning a favorite.

Physics is knowledge learning about nature phenomenon and interaction in the universe. Physics learning demands teachers to demonstrate the real nature phenomenon through direct observation or experiment so students understand whole concepts comprehensively. Physics learning through experiments cannot demonstrate all phenomenon, such as ideal gas phenomenon. Demonstrating ideal gas properties is hard enough. A simulation lab is created to overcome that problem so students can understand ideal gas properties directly.

According to Yudhi Munadhi (2010), a simulation is to demonstrate or imitate condition which cannot be presented directly in a room or at the classroom. General principle of simulation model can be implemented if a course has these characteristics: (a) learn a work process of a tool and creating of certain products, (b) consist of procedures in certain systems, (c) learn how to use a tool, procedure, and certain method, (d) have an aim to prove something through a process, (e) demonstrate and show a simulation sequently, (f) an analysis, a synthesis, and an application, (g) need an accurate observation, (h) stress on physical and attitude achievement, (i) demand evaluation of experiment and observation.

Computer programs are often used as means to learn through simulation because computer can integrate colors, music, and graphic animation. Because of those reasons, computer can present learning concepts in high level of realism. According to Arsyad (2006), a simulation in computers gives chances to learn interactively and personally. That statement is clarified by Bambang Warsita (2009). He states that a simulation is a kind of learning media based on computer. The program tries to imitate dynamic process occurring in the real world. As the time goes by, computer functions can be used in tablet and smartphone.

Tablet and phone which have been used recently use android as operating system. It is an open source giving developers chances to develop their applications so all android users can download the applications in playstore. There are many applications in the playstore. One of categories in playstore is education. Nowadays, applications for physics learning are a few, especially application in the form of simulation lab supporting m-learning.

State of the literature

- Technological development has created breakthroughs in learning. M-learning can give access students to learn anytime and anywhere. M-learning is prospective and progressive learning to be implemented.
- Learning physics demands teachers to demonstrate the real nature phenomenon through direct observation or experiment so students understand whole concepts comprehensively. Unfortunately, teachers cannot demonstrate all phenomenon, such as ideal gas properties. A simulation lab can be made to overcome the problem.
- The aim of this research is to create learning media for senior high school students through an android application in the form of a simulation lab.

Contribution of this paper to the literature

- The method employed in this study is research and development. The method has four main steps- planning, development, evaluation, and product. The aim of this research is to create a product, namely android application in the form of simulation lab. By using this simulation lab, students can observe properties of ideal gas.
- The application has been validated and tested to see how feasible it is
- Averages for feasibility score of the media on all indicators are 83.13% from media experts, 87.5% from concept experts, 83.13% from empirical test of teachers, and 78.51% from student test.

According to the explanation above, research about “Development Of An Android Application In The Form Of A Simulation Lab As Learning Media For Senior High School Students” has to be conducted. The aim of this research is to create learning media for senior high school students through an android application in the form of a simulation lab.

METHOD

The method employed in this research is research and development. According to Sugiyono (2008), the method of research and development is a kind of research method employed to create and test products. The product of this research is an android application which has been validated by concept experts, media experts, empirical test of teachers, and student test.

Figure 1 shows that research employing research and development method has four main steps: 1) planning, 2) development, 3) evaluation (validation by concept experts, media experts, empirical test of teachers, student test), 4) Android application product in the form of simulation lab.

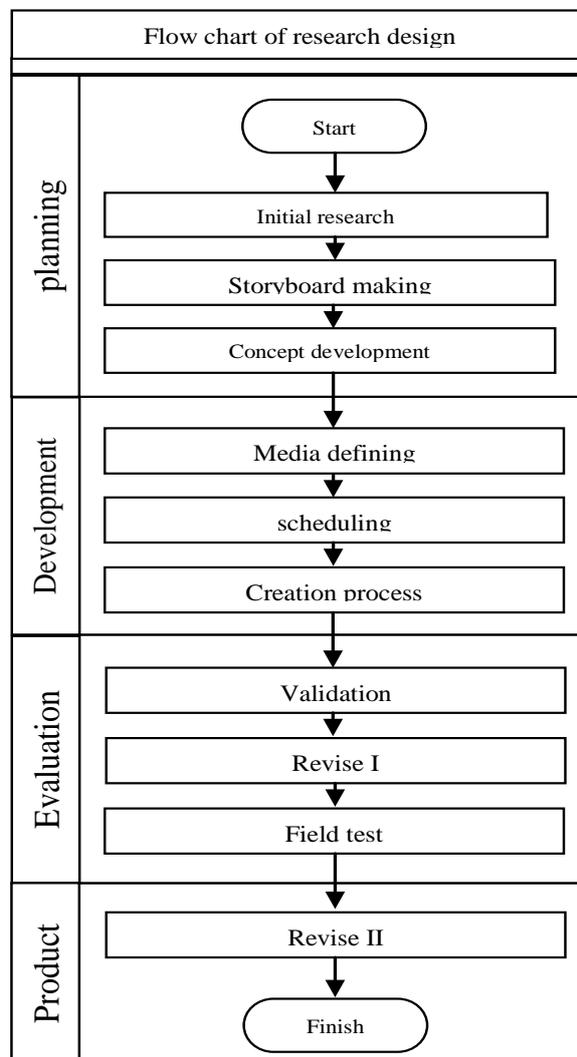
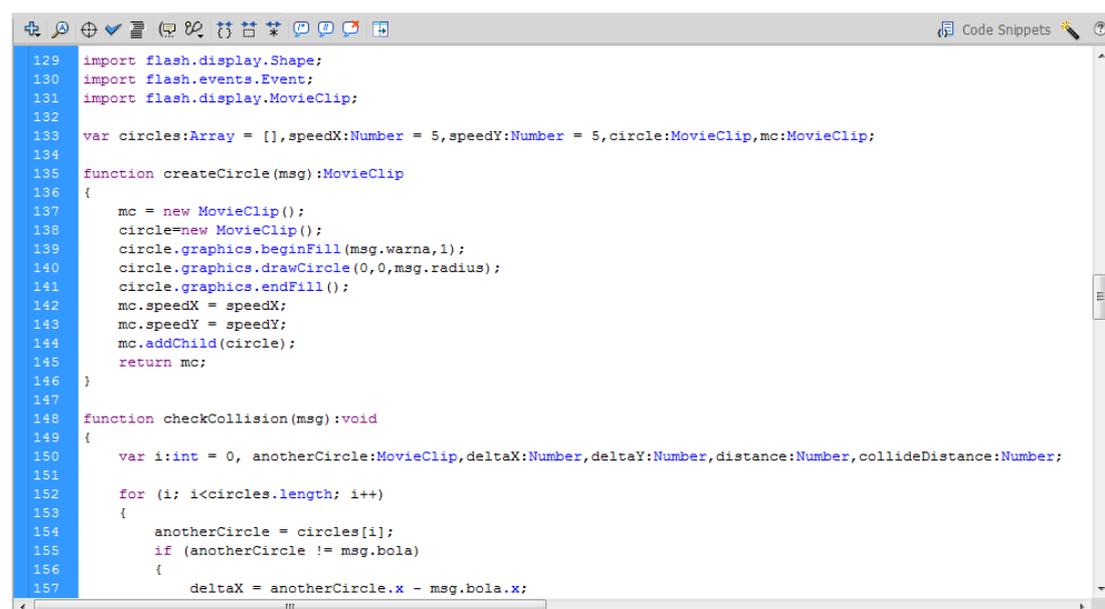


Figure 1. Research design



```

129 import flash.display.Shape;
130 import flash.events.Event;
131 import flash.display.MovieClip;
132
133 var circles:Array = [],speedX:Number = 5,speedY:Number = 5,circle:MovieClip,mc:MovieClip;
134
135 function createCircle(msg):MovieClip
136 {
137     mc = new MovieClip();
138     circle=new MovieClip();
139     circle.graphics.beginFill(msg.warna,1);
140     circle.graphics.drawCircle(0,0,msg.radius);
141     circle.graphics.endFill();
142     mc.speedX = speedX;
143     mc.speedY = speedY;
144     mc.addChild(circle);
145     return mc;
146 }
147
148 function checkCollision(msg):void
149 {
150     var i:int = 0, anotherCircle:MovieClip,deltaX:Number,deltaY:Number,distance:Number, collideDistance:Number;
151
152     for (i; i<circles.length; i++)
153     {
154         anotherCircle = circles[i];
155         if (anotherCircle != msg.bola)
156         {
157             deltaX = anotherCircle.x - msg.bola.x;

```

Figure 2. Script

In the evaluation step, media is evaluated through questionnaires. Then, data is judged by rating scale (in the scale of four).

RESULTS AND DISCUSSION

In this part, results obtained from data of media development sequence, validation data, and product test is presented.

In the beginning, this research started with planning. In that step, initial research is conducted. It collected data from various source to know physics applications in playstore and software of physics simulation used in learning. Then, storyboard which would be used in application is made. Storyboard contains interface design, layout, and concepts. Next, the concepts are developed. Standard of competence for the concepts is “to apply thermodynamic concept in heat machine”. Meanwhile, basic competence discussed in the application is “to describe properties of monoatomic gas”. Concepts which can be learnt by the application are Boyle’s law, Charles’s law, Gay Lussac law, boyle-lusaac law.

Creation process of application in the form of simulation lab uses Adobe Flash Professional CS.5.5 and ActionScript 3.0 for scripting.

Figure 2, script is used to control navigation buttons and gas particles motion. Simulation lab created to understand properties of ideal gas can be used by following instruction on simulation page.

By following instructions, students are demanded to understand properties of ideal gas or fundamental law of an ideal gas through observing gas motion and change of volume, pressure, and temperature. Data can be saved in table when students practice simulation. After saving data, students can draw a graph based on the data like figure 3.

Besides practicing simulation, students can understand more and more by short explanation like figure 4. Figure 5 shows exercises containing multiple choice questions to test students understanding about the concept discussed in simulation lab.

After simulation lab application has been created, it is evaluated. Validation of simulation lab application is done by media experts and concept experts. The application is validated by two media experts.

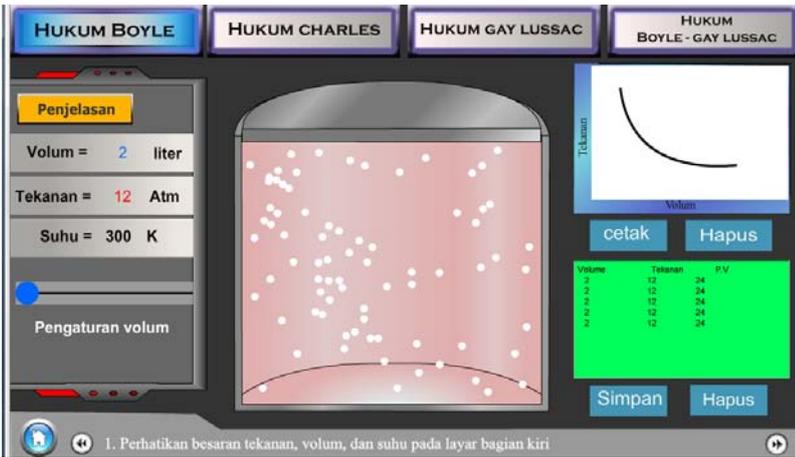


Figure 3. Simulation page

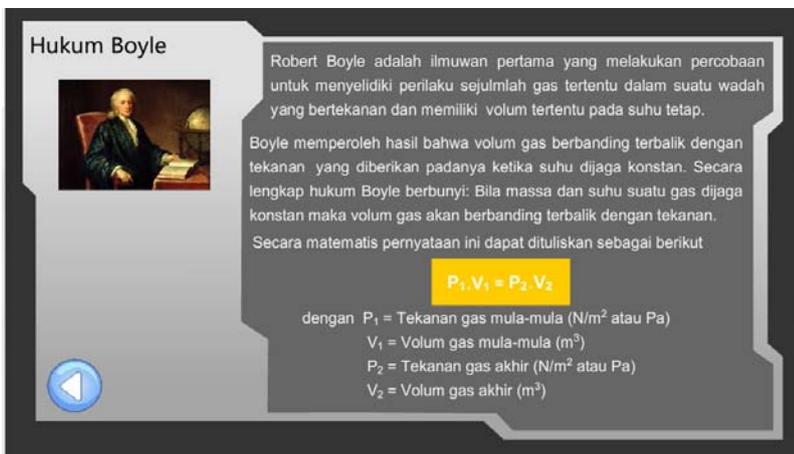


Figure 4. Short explanation

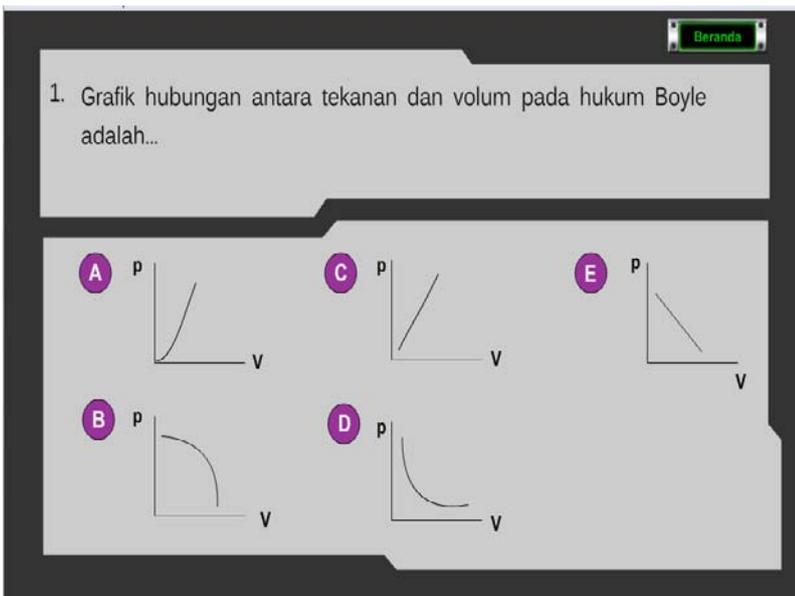


Figure 5. Exercise

Questionnaire for media experts consists of 17 questions. Those are interface design indicator, font indicator, interaction indicator, illustration indicator, and appropriate language indicator. Scale consists of 1-4 score and is judged by rating scale from 0%, means rather good, to 100%, means very good. Data are shown on figure 6.

Shown on figure 6, average scores for the application are 84, 48 at interface design indicator, 83, 33 at font indicator, 87, 5% at interaction indicator, 81,13 at illustration indicator, and 79,17% at appropriate language indicator. Total average for the application shows that it is very good. In other words, the application can be used as learning media.

Then, the application is validated by concept experts to test whether concept in the application is valid and easy to understand. Validation Instrument of concept expert consists of 13 questions. Those are interface design indicator, concept and evaluation relevance to curriculum indicator, technological definition indicator, illustration indicator, clarity and difficulties to understand indicator. Data obtained from concept experts are shown on figure 7.

According to figure 7, average score for all indicators is 87, 5%. It represents that the application is very good and can be used as learning media.

The simulation lab application which has been revised is tested and rated by teachers to know whether the application can be used in learning process. Empirical test of teachers is done by two physics teachers of SMAN 30. Indicator for

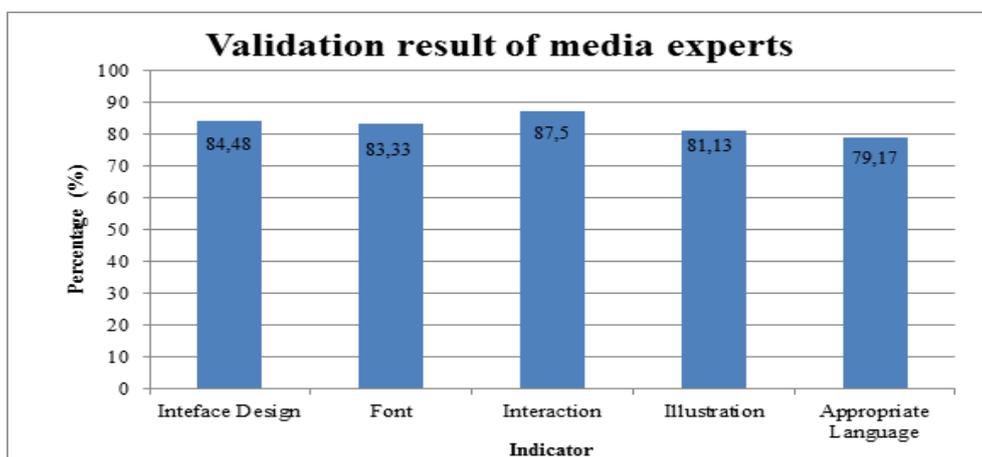


Figure 6. Validation result of media experts

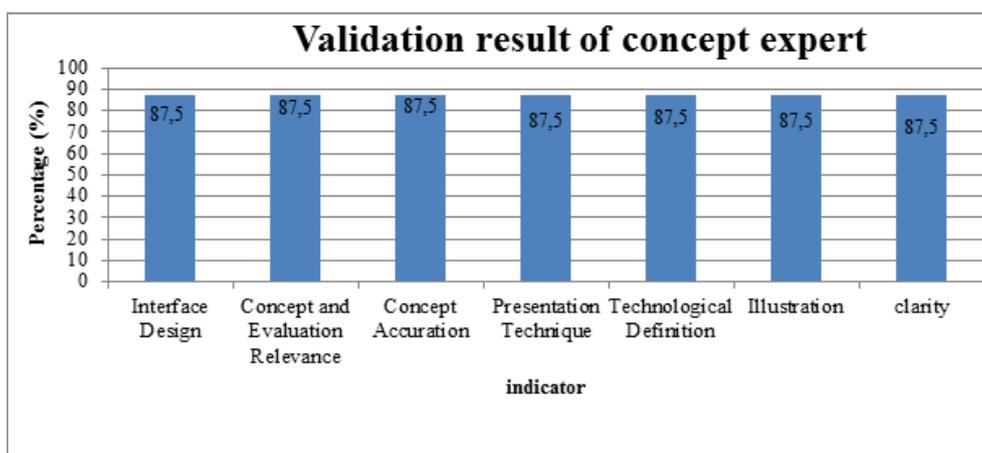


Figure 7. Validation result of concept expert

assessments are interface design, font, interaction, illustration, appropriate language. Data obtained from teachers is shown on figure 8. According to figure 8, average score are 81, 25% at interface design indicator, 87,5% at font indicator, 83,33% at interaction indicator, 84,38% at illustration indicator, 79,17% at appropriate language indicator. Average score for all indicators shows that the application is very good and can be used as learning media.

Then, the android application in the form of simulation lab is tested by students of SMAN 30 Jakarta. They assessed the application through questionnaire containing some indicators, such as concept understanding, interface design, font, interaction, attraction of illustration (figure, animation, and video), and language. Data obtained from student test is shown on figure 9. Average score are 77, 5% at concept understanding indicator, 76, 25% at interface design indicator, 74, 17% at font indicator, 77, 5% at interaction indicator, 83,13% at attraction of illustration indicator. Total average represents that the application is very good to be a learning media.

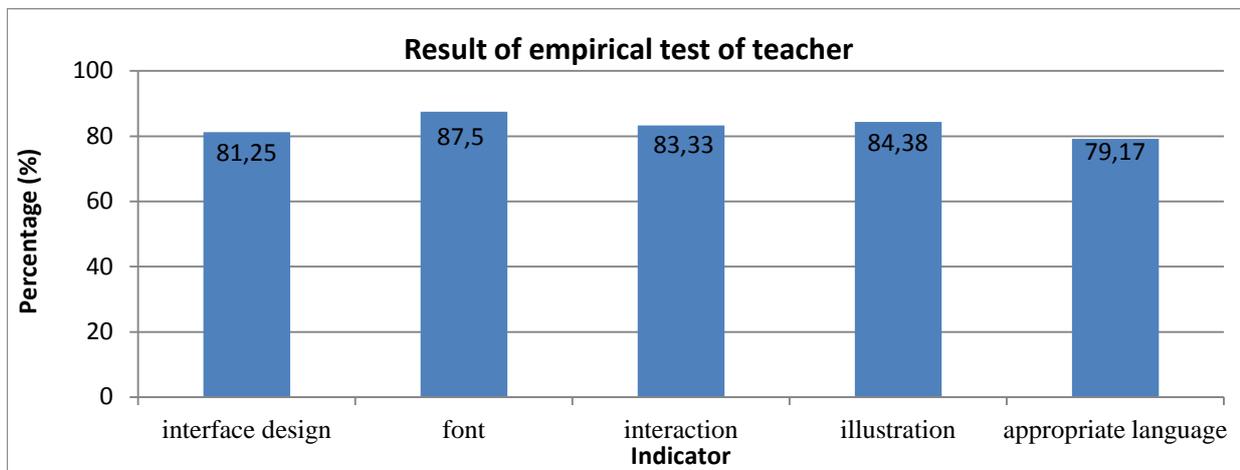


Figure 8. Result of empirical test of teacher

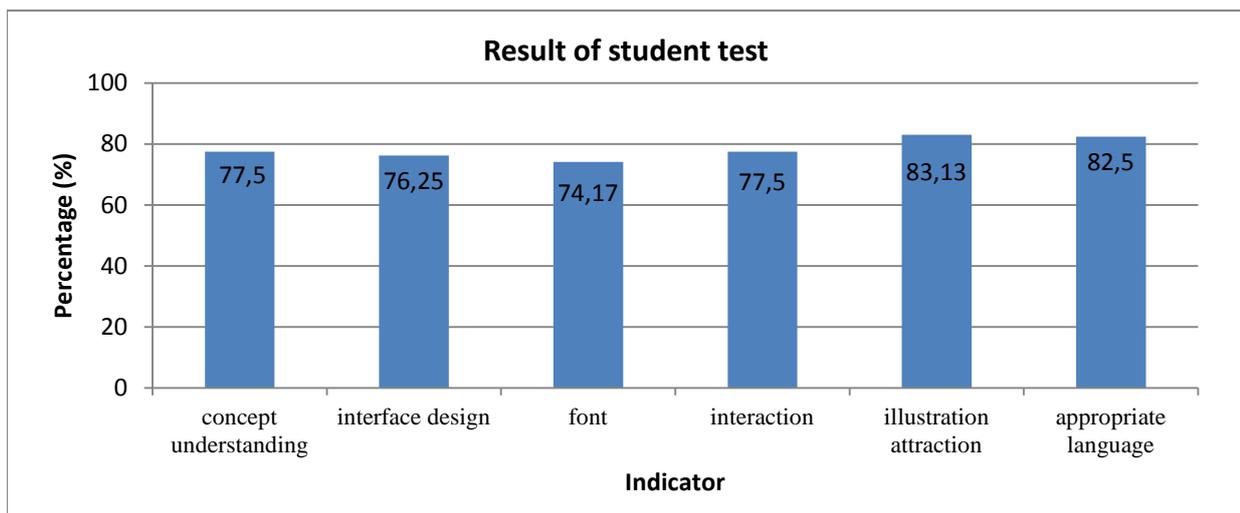


Figure 9. Result of student test

CONCLUSIONS

According to the result of study, conclusion for this research is that the simulation lab application can be used as learning media for senior high school students because the average score of feasibility shows that the application is feasible.

Students can learn ideal gas properties, such as Boyle's law, Charles's law, and Gay Lussac's law by using this application on their smartphone. Besides that students can also evaluate their knowledge by following evaluation section. The application has been launched in playstore so everyone can download it by keyword "simulasi gas" and play it as learning media.

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