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The Effectiveness of Interactive Module Based on Lectora™ to Improve Secondary School Students' Spatial Ability

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Polyhedral geometry is a topic that requires students' spatial ability. The study aims at evaluating the effectiveness of the implementation of the interactive module based on Lectora™ for students. Action research was adopted for this study. This research consisted of two cycles where each followed the steps: plan, implementation, observation, and reflection. The subjects of this study was students Grade 8 of SMP Taman Siswa. In general, learning is said to be effective if at least 85% of students pass the test. The findings show that 75% of the students in cycle I got maximum test score and in cycle II the percentage increases to 87.5%.

Keywords: Lectora™, interactive module, polyhedral geometry, learning media, secondary mathematics

Introduction

In national education system, learning process has three essential components: students, teachers, and curriculum. These three components have links that cannot be separated in order to improve the quality of education. Improving the quality of education could be done through a breakthrough in curriculum development, innovative learning, and/or working facilities. Innovative learning could lead students to learn independently as they study and learn in the classroom. This could be done through innovative creativity built by teachers. To improve learning teachers must consider and plan the process so that students are interested and eager to learn to ensure that teaching is effective.

However, achieving these effective results requires teacher to overcome any obstacles in learning mathematics especially in geometry. Most mathematics learning only focuses on developing skills and neglects the logic and reasoning skills. Learning geometry contains many concepts and applications in life. Learning geometry is learning that provides visual and spatial experience in abstract form. Because learning geometry presents abstract concepts it is hard for students to understand. Many of them cannot visualize two-dimensional or three-dimensional shapes, so they struggle with the broad understanding of the concepts of volume and surface area of a particular shapes. As well, many students have difficulty drawing a three-dimensional object on a flat plane. Empirical evidence in the field shows that there are many students with difficulties in the study of geometry. Sunardi (2001) notes that for junior high school students

they are still not sure in resolving online parallel problems and many still mistake a rhombus as a parallelogram. On the other hand, Sobel (2002, p. 153) stated:

> Geometry is a subject which is rich in material that can be used to motivate and can attract the attention and imagination of the disciples...

For many classrooms, textbook is important in the teaching and learning geometry concepts because the learning system contains material and training, but it cannot provide feedback to students. This makes it hard for students to apply the concepts correctly. These conditions make learning less fun so students more often feel disinterested in learning geometry. With the advance of technology, an interactive learning medium can overcome difficulties in learning geometry where students can visualize and interact with two-dimensional and three-dimensional shapes and increase their visual and spatial ability. One of the interactive learning media able to facilitate students to overcome their difficulties is an interactive module where material is compiled as required by the students. According to Suprawoto (2009), interactive module serves as a whole class unit (self-contained) or can be used for independent study (self-instructional), thus giving students the opportunity to practice. Students can assess their own progress and they are provided with feedback. This software contains text images, sound, or video equipped with interactive buttons and an interactive evaluation.

The interactive module software benefits students as they can learn anytime and anywhere and do not need to carry textbooks. The software that is able to facilitate this interactive module is Lectora™ inspire. Mas'ud (2010) stated that Lectora™ is an e-learning software development by the Trivantis Corporation. Lectora™ was used to make an online course of training, assessment, and presentation. Lectora™ could also be used for conversion of presentation from Microsoft™ Power Point into the content for e-learning. Content developed by the software Lectora™ can be published in various output formats such as html, executable single file (*exe) and cd rom. Lectora™ is furnished with industry standards e-learning as scrom (sharable content object reference model) and aicc (aviation industry computer-based training committee). In addition, Lectora™ is supported by standard based management learning and allows students to use multimedia files to create content that is more interesting.

Based on the issues and student needs in studying geometry, the researchers decided to produce an interactive module based on Lectora™ in geometry of polyhedral for students in junior high school Grade 8. Through the interactive module based students can interact directly with materials in colored pictures, animations, simulations, and videos. The object is shown in the form of a still picture that can be displayed in animated forms, simulated forms, and videos. Animation and simulation can also be used in the discussion of sample problems so the students could witness a problem shown. The interactive module also provides interactive evaluation

for students that can be used to measure their progress with the materials being studied. The form of the interactive evaluation contains multiple choice questions that can be accessed directly by students Grade 8 and results are displayed to encourage improvement in their spatial ability.

Methodology

This was an action research study and consisted of two cycles. Each cycle followed the steps of classroom action research namely plan, implementation, observation, and reflection.

The subjects of this study were 24 students Grade 8 of SMP Taman Siswa. Depdikbud (1994, p. 39) stated learning is said to be effective if at least 85% of students pass the test and this study will use this criteria.

Results

The process began with a discussion of materials such as the cube, nets, surface area and volume followed by the common forms of geometry such as beam, prism, and pyramid. The researchers constructed menus containing the list of material to be studied by students including the guidance. At the beginning there was an introduction followed by the presentation of materials and exercises. An evaluation at the end of the whole interactive module for students involved the compilation of exercises of all subsections. Based on the structure an interactive module prototype was produced. The first prototype and menus produced by the team is presented in Figure 1.

Figure 1. Interactive module based on Lectora™ to learn geometry

The navigator button *MULAI* (START) leads students to the *MENU UTAMA* (MAIN MENU). The main menu is presented in Figure 2.

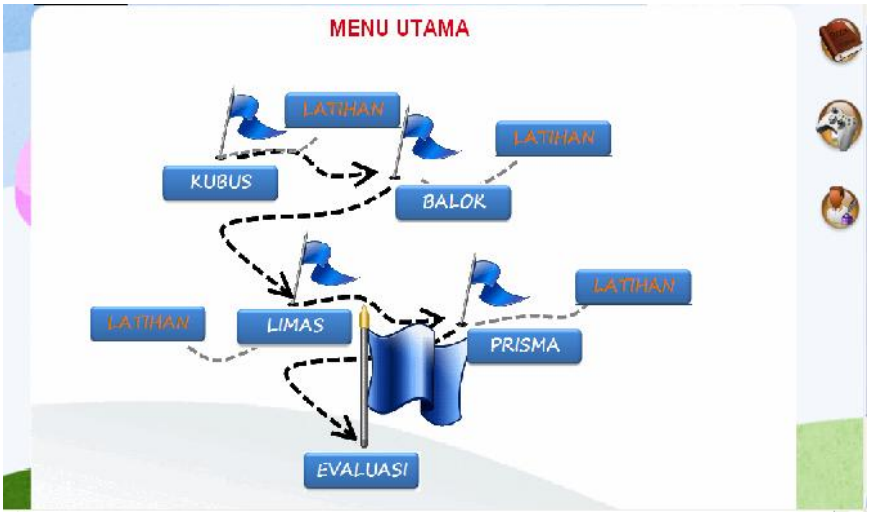

Figure 2. The *MENU UTAMA* (MAIN MENU)

The *MENU UTAMA* (MAIN MENU) has tabs that contains materials of *KUBUS* (CUBOID), *BALOK* (CUBE), *LIMAS* (PYRAMID), *PRISMA* (PRISM), *LATIHAN* (EXERCISES); and *EVALUASI* (EVALUATION) related to the title of each chapter. Each tab is not intertwined and so students can go back to the *MENU UTAMA* (MAIN MENU) where there are guidelines to use the interactive module. Tabs 1, 2, 3, and 4 contain polyhedral. The materials in the interactive module are displayed with animation to visualize the polyhedral based on their properties. The tab on the *KUBUS* (CUBOID) is presented in Figure 3.

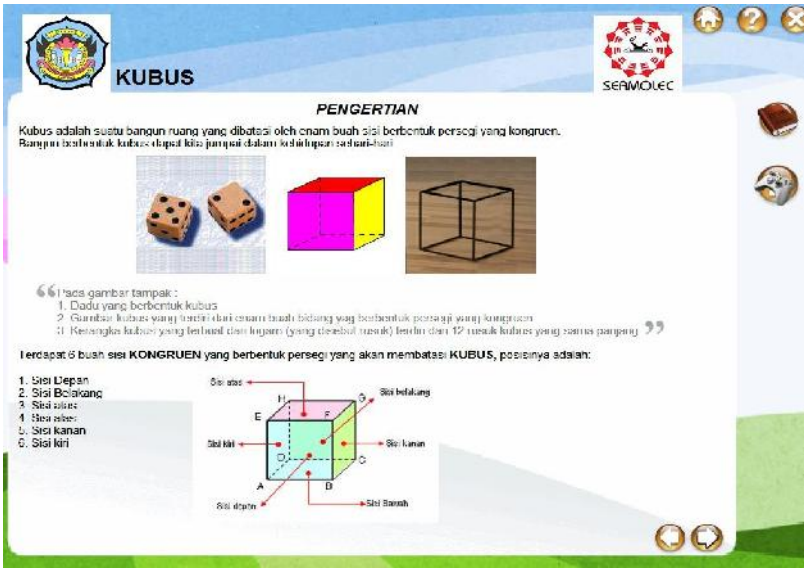

Figure 3. The menu of *KUBUS* (CUBOID)

The menu of *SOAL 1* (EXERCISE 1) which contains multiple choices problems is presented in Figure 4. Answers receive instant feedback so students can see directly without waiting for an explanation from teachers and gain from the feedback of the actual exercises.

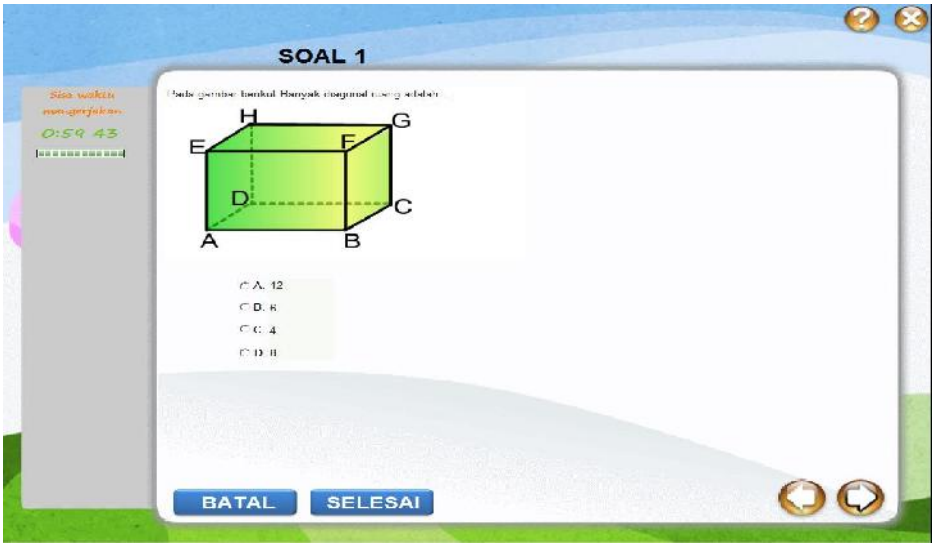

Figure 4. The menu of *SOAL 1* (EXERCISE 1)

During the implementation of the learning process, the teacher monitored the students to determine their understanding of the material provided through a process of discussion with each student as shown in Figure 5**.**

Figure 5. Monitoring students through discussion

Firstly, the students had difficulty in answering the questions because they did not understand the spatial material involving the cube. As a result, they received unsatisfactory score, *KAMU BELUM LULUS* (YOU HAVE NOT PASSED THE TEST), as shown in Figure 6.

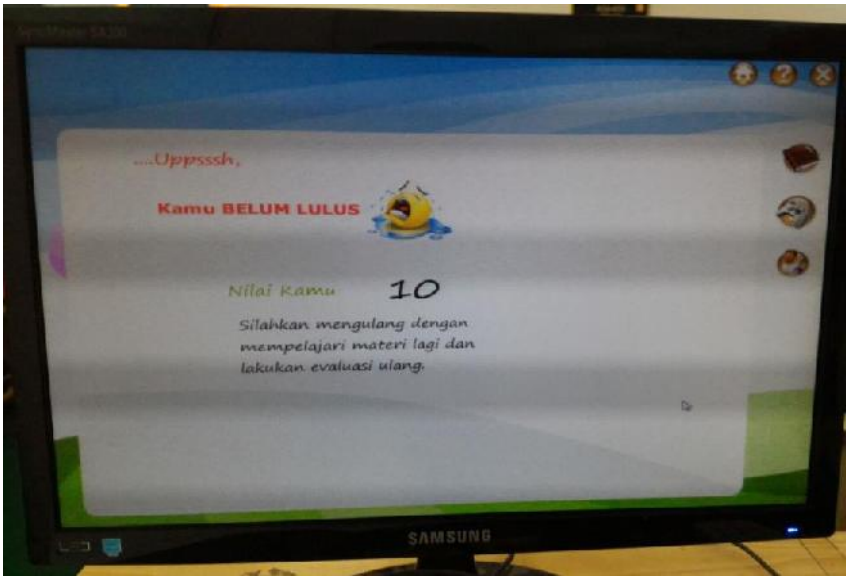

Figure 6. Student first score

However, the results encouraged the students to again solve the problems and get a satisfactory score as shown in Figure 7, *SELAMAT! NILAI KAMU 90* (CONGRATULATION! YOUR SCORE IS 90).

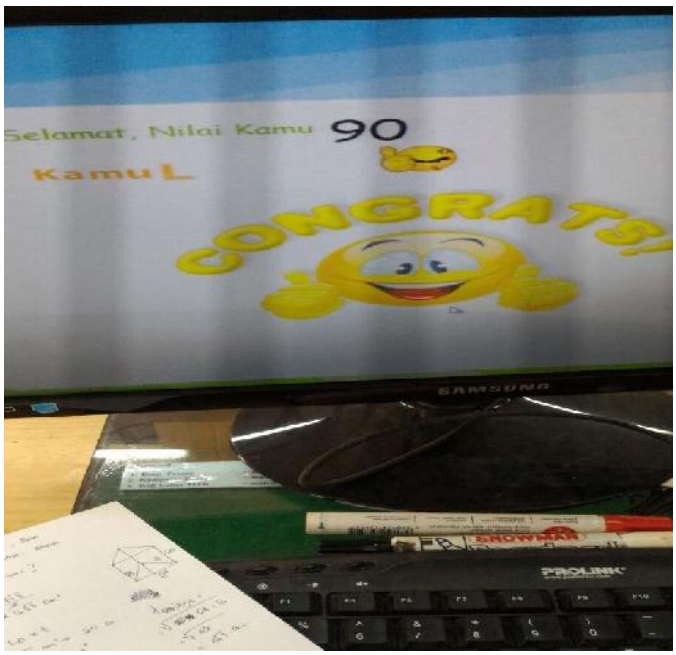

Figure 7. Student final result

To determine the effectiveness of learning using interactive modules from Lectora™, the researcher held a written test that consisted of questions containing the three aspects. The written test was conducted at the end of the learning process involving the straight line equation. Below is shown a summary of the scores obtained by the students in cycle I and II.

Table 1.
Student Achievement in Cycle I and Cycle II

Components	Score (Cycle I)	Score (Cycle II)
Maximum test score	100	75
Minimum test score	60	40
Average	79.30%	82.70%
Number of students with maximum test score	18	21
Percentage of students with maximum test score	75%	87.5%

In accordance with the criteria described previously, the effectiveness of learning must meet the criteria that at least 85% of the students pass the test. Table 1 shows that the percentage of students with maximum test score in cycle I was 75%, after the implementation of learning the percentage of students with maximum test score was 87.5%. Thus, it can be concluded that the learning using interactive module based on Lectora™ was effective.

Conclusion

This study took a lot of work and time but now it will be used by other teachers and the process of improvement still continue. Further research needs to be done in an effort to improve students' ability in understanding and applying interactive modules based on Lectora™.

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