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The Effectiveness Analysis of Android Based E-Diagnostic Test Development Program to Identify Level of Student's Misconception.

Abstract

The purpose of this study is to create an e-diagnostic test application that will help identify students' misconceptions and assess the usefulness of the e-diagnostic test being employed. Based on the use of the e-diagnostic test, this study also attempts to define the profile of students' misconceptions. This type of research is Research and Development (R&D). Tests, questionnaires, interviews, and documentation are the techniques employed. Students are the research participants. An online-based Android test system is the created e-diagnostic application. Work standards, a teacher and student login system, question checking, and question modifying features are all included in the system. With a score of 91.67% and an overall response rate of 80.57%, the validator's validation results demonstrate the high viability of the e-diagnostic test application. 51.32% of students have misconceptions, according to the diagnostic results. The concepts of frequency and centripetal acceleration are both widely misunderstood, with frequency misconceptions ranking highest and lowest respectively.

Keywords: E-diagnostic Test, Application, Misconception, Student.

Abstrak

Tujuan dari penelitian ini adalah untuk membuat aplikasi tes e-diagnostik yang akan membantu mengidentifikasi miskonsepsi siswa dan menilai kegunaan tes e-diagnostik yang digunakan. Berdasarkan penggunaan tes e-diagnostik, penelitian ini juga berupaya untuk mengetahui profil miskonsepsi siswa. Jenis penelitian ini adalah Research and Development (R&D). Tes, angket, wawancara, dan dokumentasi adalah teknik yang digunakan. Mahasiswa adalah peserta penelitian. Sistem pengujian Android berbasis online adalah aplikasi e-diagnostik yang dibuat. Standar kerja, sistem login guru dan siswa, pengecekan pertanyaan, dan fitur modifikasi pertanyaan semuanya termasuk dalam sistem. Dengan skor 91,67% dan overall response rate 80,57%, hasil validasi validator menunjukkan viabilitas yang tinggi dari aplikasi uji e-diagnostik. 51,32% siswa mengalami miskonsepsi, sesuai dengan hasil diagnosa. Konsep frekuensi dan percepatan sentripetal keduanya banyak disalahpahami, dengan miskonsepsi frekuensi masing-masing menempati peringkat tertinggi dan terendah.

Kata Kunci: E-diagnostic Test, Aplikasi, Miskonsepsi, Siswa.

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INTRODUCTION

Before moving on to more difficult learning materials, teachers in schools take a number of steps to increase the quality of instruction, one of which is by paying attention to students' fundamental ideas. Students start learning with the knowledge they have gained before, not from nothing. This knowledge is not only obtained from school but also from everyday life. Students' initial knowledge can be in the form of knowledge that is in accordance with the knowledge to be studied; it can also be completely different or have misconceptions. Readiness to make changes with a clear concept starting from the process of planning, organizing, implementing, monitoring, and evaluating will certainly get closer to achieving organizational goals, including quality improvement, which will certainly continue to require improvement from time to time. Research to reveal the existence of misconceptions has been carried out on various student teaching materials, one of which is a misconception about circular motion. Research conducted by previous researcher in 186 high school students showed that there were misconceptions about learning physics. One study found that as many as 37.63% of pupils have incorrect ideas about periods, 18.82% about frequency, 41.40% about angular velocity, 44.09% about linear speed, 53.22% about centripetal acceleration, and 40.14% about how the wheels are connected. Research conducted previous researcher on 62 students showed 41.6% of students had misconceptions about the material of regular circular motion. The highest misconception is in the linear velocity concept at 50%, and the lowest misconception is in the angular velocity concept at 34.5%.

Efforts to overcome misconceptions in students in physics subjects have been carried out, including by using cognitive conflict strategies, conceptual change learning models with four stages, applying learning models with concept maps and experiments, and the use of the Children Learning in Science (CLIS) Learning Model. Even though efforts to overcome misconceptions continue to be made, it is still found that some students still experience misconceptions after learning is implemented. Therefore, a diagnostic test system is needed to find out the misconceptions experienced by students. A diagnostic exam, according to the Ministry of National Education (2007), is a test used to identify student shortcomings so that the results can serve as the foundation for giving students the proper action or treatment in accordance with their weaknesses. A three-tier multiple-choice test is one type of diagnostic test. The three-tier multiple-choice diagnostic test has the benefit of avoiding the need for student interviews to establish the test's validity.

The idea of applying learning has changed in line with the advancement of the times and the era of globalization, which is marked by the quick adoption of information technology and products. Modern learning can use Android-based smartphones that are familiar to students and teachers, so they can be used easily. Systems that work online are considered to be more effective, so it is necessary to develop an application to diagnose misconceptions experienced by students. Based on interviews conducted with physics subject teachers. He revealed that, so far, no diagnostic test had been carried out to reveal

the misconceptions experienced by students. The teaching and learning process so far have only used books, practicum tools, and computers. According to the physics teacher at the school, the use of smartphones for learning will facilitate the learning process because each student already has a personal smartphone. The use of diagnostic test applications is very necessary because they are easy to use.

METHOD

Research and development (R&D) research is the name given to this kind of study. Conducting research and developing methodologies involves four basic steps: defining, designing, developing, and disseminating. Purposive sampling was used to identify the sources of data for this investigation. The sample used was students of classes Science 2 and Science 3, for a total of 100 students. Carrying out research and data collection requires data collection tools. The tools used are instruments in the form of questionnaires, questions, interviews, and documentation. Data analysis in this study includes product feasibility tests by media experts and misconception profiles. This research uses the 4D development method, but this research is limited to the third stage. Because the focus of this research is on product development. The analysis of student misconceptions in this study only used data obtained from product implementation. So that the causes of students experiencing misconceptions cannot be known.

RESULT AND DISCUSSION

Overall, the application that has been developed from the aspects of software and visual communication gets a feasibility value of 91.67%, which includes very good criteria. But there are still some suggestions and comments for product improvement. Application product improvements are carried out according to directions from experts. After repairing the Android-based e-diagnostic test application, the product is ready to be tested on respondents. Experts' produced products that have been deemed feasible are subsequently put through a small-scale test with ten responses. Before implementing the student response questionnaire, a small-scale experiment will be conducted to ascertain the responses received from the respondents. The results of the small-scale tests revealed that the e-diagnostics that were created were fairly good. Some students claim that the background is too black and the font size is too small, making it difficult to utilize for extended periods of time. Students are unaware that the view can be increased by touching and dragging the screen with two fingers, just like when enlarging an image. Adaptations were made in response to student feedback.

Products that have been developed and declared feasible by experts are then tested on a large scale with 100 respondents. The deadline for work by students is until 10 PM because, when distributing applications, there are several students who experience problems, so the final deadline for work is closed at 10 PM. The implementation that has been done produces student responses. Based on the interviews conducted, students prefer to do tests with applications rather than in writing. However, students hope

that there is material that can be studied before working on the questions. There are 2 questions that fall into the category of low misconceptions, namely questions 2, 3. There are 31 questions that fall into the category of moderate misconceptions, namely on questions 1, 4, 5, 6, 7, 8, 10, 11, 12, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 26, 27, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40. There are 7 questions that fall into the category of high misconceptions, namely question numbers: 1, 9, 13, 19, 25, 28, and 35. Based on the outcomes of the use of the e-diagnostic exam, misconceptions were found.

It is known that students have a moderate amount of misconceptions based on the implementation that has been done in two classrooms. The highest misconception experienced by students is about the indicator determining the magnitude of the frequency in uniform circular motion. This is almost the same as the findings of previous research on misconceptions, amounting to 41.6% of students experiencing misconceptions about uniform circular motion material. Similar findings were made: 39% of pupils were found to have incorrect understandings of uniform circular motion. The results of the data that have been interpreted are known; the highest misconception is found in question number 28, namely in the indicator determining the centripetal force in uniform circular motion. Students presume that the square of linear velocity is inversely proportional to centripetal force. This is nearly the same as earlier studies, which show that students believe the centripetal force is inversely related to the mass and radius of the circle and directly proportional to the square of the linear speed.

Students experience misconceptions about understanding an object when it experiences uniform circular motion with the same path length and time interval. Students assume that an object that moves in a uniform circle can have a different path length and time interval. Students assume that the period is the number of cycles per unit time, so that the value of the period is inversely proportional to the time. This is in accordance with previous research, namely that there were 32.26% of students who thought that the period was directly proportional to the number of revolutions that the object took. Students' assumptions about frequency are based on the time it takes an object to go around a full circular path. There are also students who think that frequency is inversely proportional to angular speed. Students erroneously believe that circle radius and linear speed are inversely related to each other and that angular velocity is directly proportional to both. Another common misconception among students is that linear speed is directly proportional to radius and inversely proportional to period. The angular velocity is thought to be directly related to the square of the linear velocity and inversely proportional to the circle's radius by students. Students also assume that the greater the angular velocity, the faster the linear speed approaches zero. There are also students who think that the greater the angular speed, the smaller the linear speed. According to the student's premise, the circle's radius and linear speed are directly proportional to centripetal acceleration. There are some pupils who believe centripetal acceleration is directly proportional to the circle's radius rather than being inversely proportional to quadratic linear speed. The assumption made by students is that the centripetal force is exactly proportional to the mass and radius of the circle but inversely proportional to the square of the linear speed. Others contend that

the centripetal force is exactly proportional to the square of the linear speed and inversely proportional to the mass and radius of the circle. Assume that the wheels that are connected by a rope and that touch each other have the same angular velocity, while objects that are concentric have different angular speeds.

CONCLUSION

The android-based e-diagnostic test for students was declared suitable for use as an evaluation tool for students' misconceptions. This is because the Android-based e-diagnostic test application has fulfilled the feasibility aspect as described by media experts and received a very good response from students. The average percentage of validation results by experts reached 91.66%, and responses by students reached 85.33%. Students had a misperception rate of 51.32%, a concept understanding rate of 26.70%, and a concept comprehension rate of 21.98%. The misconceptions around the concepts of frequency and centripetal acceleration are, respectively, highest and lowest. Android-based e-diagnostic tests should be prepared as well as possible by ensuring students know how to use the application, ensuring the application runs properly, and backing up research data. It is better if the application is given an additional menu, such as material, so that students can study before taking the test. To anticipate cheating when students are working on questions, random questions and cooldown features should be given when working on questions.

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