Real-Time Assessment Software Development to Improve Learning Quality in Petroleum Engineering Department Using Computer Assisted Test Method

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Abstract

In the previous period, to determine the ability of petroleum engineering students in mastering the concept of the field of knowledge, in general, a comprehensive exam was used by writing papers and being tested. This method is considered ineffective because of the large number of plagiarism cases and many students who take more than one semester to complete. Therefore, a breakthrough was made by creating a new method, namely the Computer Assisted Test with Real-Time Assessment software. The purpose of the replacement of this method is that students can master three areas of expertise and can complete comprehensive courses in less than one semester. The first step in the process of replacing this comprehensive course method is done by spreading the old method satisfaction questioner and mastery of the group of experts with the old method. The second stage is to make a question bank made by a lecturer in the petroleum engineering department. The third stage is done by making Real-Time Assessment software. Then the question bank input that has been made into the RTA software is carried out. The final step is to simulate an exam with RTA software. Based on the results of the study, it is known that 75% of students are not satisfied with the old comprehensive system and 95% of students only master two or one of the three fields of expertise in the petroleum engineering department. This shows that the old method is no longer effective, so it is necessary to change the comprehensive method. Comprehensive test results with the method, namely the Computer Assisted Test with Real-Time Assessment software, show good results. Where in the third stage of the exam 95% of participants passed the exam and 96% of the question banks made were feasible to be tested.

Keywords: Real-Time Assessment, Comprehensive, Computer Assisted Test

I. INTRODUCTION

In the process of lecture education, a scholar must be able to master the theoretical concepts of a particular field of knowledge in general and the theoretical concepts of a specific part of that knowledge field in depth. At the Petroleum Engineering Department, UPN Veteran

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Yogyakarta, general theoretical concepts are proven by comprehensive examinations, while specific and in-depth theoretical concepts are tested with the final project. Students who pass the comprehensive exams and final project exams are declared eligible to become a Bachelor of Petroleum Engineering Department. The application of final and comprehensive examinations as the potential of an undergraduate by Presidential Decree No.8 of 2012.

Comprehensive exams held at the Petroleum Engineering Department were carried out in the VII semester to examine students' understanding and integration of the group of areas of expertise (CBC). Where the group of expertise includes reservoir engineering, production engineering, and drilling techniques. To find out the students' understanding of the CBC, a learning method was carried out in the form of writing a paper with a certain title that interpreted the CBC. The paper contains a discussion of two or three CBC obtained from literature studies and student understanding that has been discussed with a comprehensive supervisor. Students who have completed a comprehensive paper and approved by the supervisor then take a comprehensive exam. In this comprehensive exam, students are tested for their understanding of the paper that has been written. If declared to have passed the exam, students can continue to work on their final project for graduation requirements from the Petroleum Engineering Department.

In the comprehensive implementation, there are several field constraints that make this method ineffective. These constraints include titles and topics that are taken often repeatedly so that there are many cases of plagiarism. This causes a comprehensive method to be unable to test student learning outcomes. In addition, there are many cases where students take more than one semester to complete comprehensively. This long completion time is a problem because passing the comprehensive exam is a requirement for doing the final project. So that in practice there are not a few Petroleum Engineering students who have graduated more than 4 years. Because of these problems, a breakthrough was made by creating a Real-Time Assessment method with Computer Assisted Test software by making questions that went through several processes and evaluating the feasibility of the questions. The questions that have been selected are then inputted into the RTA software and tested on students.

Comprehensive test with RTA software has advantages over conventional comprehensive exam methods, namely fast execution time, automatic results recap of the software, passing information can be seen when the exam is finished, and exam material can cover all areas of expertise in the Petroleum Engineering department. This comprehensive method replacement is expected to accelerate the graduation of Petroleum Engineering students without neglecting the competence of a scholar to master theoretical concepts in general knowledge. In addition, this method is expected to be able to uniform and improve the quality of students' understanding of the fields of expertise in Petroleum Engineering.

II. LITERATURE REVIEW

In developing this Real-Time Assessment software, the Computer Assisted Test method was used. Where the Computer Assisted Test (CAT) is a test method with computer aids that are used to obtain a minimum standard of basic competence. The implementation of CAT has several objectives, namely accelerating the process of examining and reporting exam results,

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creating standardization of exam results, setting value standards, increasing transparency, objectivity, accountability, and efficiency. (Dewi Saadah, 2015).

For this research to run well, the lecturers in the Petroleum Engineering Department made exam questions. The questions that are made must be good, where the questions can be said well when the questions can provide data or a description of the mastery of learning material by the participants so that the teacher can improve the quality of the teaching and learning process (Endra Susila, 2012).

In making the question bank, the qualitative analysis uses the moderator technique and the panel technique. The Moderator technique is a technique of discussing with several people in it and one person as a mediator. The use of the moderator technique is considered very good because every question made can be seen together with several experts such as teachers who teach the material, material experts, curriculum compilers/developers, test experts, and linguists. While the panel technique is a question validation technique that is studied based on the rules of writing the questions. The study of the questions includes material, construction, language/culture, the truth of the answer key, and the scoring guide. (Mujimin, 2010).

After the test is carried out, the next step is to compile the test results. The preparation of test results should be able to measure learning objectives, be a representative sample of learning material, a format that suits your needs, and a reliable assessment result (A.Muri Yusuf, 2005).

III. RESEARCH METHODOLOGY

In implementing a comprehensive change to the Computer Assisted Test method with Real-Time Assessment software, several stages are carried out. From the several stages, it can be concluded that the replacement of this method is appropriate for the petroleum engineering department. The stages of changing the method include:

1. The first step in this research begins with the distribution of satisfaction questioners via Google Form to students who are taking and have taken a comprehensive course. The questionnaire contains about student satisfaction with the current comprehensive method. In addition, the questioner also contains students' confidence in mastering material fields of expertise.
2. The question bank is made according to three groups of expertise, namely drilling, reservoir, and production. The questions made were divided into categories for easy, medium, and difficult levels for each group of expertise. These questions are made by all petroleum engineering lecturers according to their group of fields of expertise. In the development of the question bank, the analysis was carried out by the head of each area of expertise and the head of the department using forms using moderator techniques and panel techniques.
3. Development of Real-Time Assessment (RTA) software whose features are tailored to the needs of a comprehensive exam. Where the RTA software uses the Computer Assisted Test method with multiple-choice questions.
4. Input the question bank that has been made into the Real-Time Assessment software. Where in this software, you can set the portion of the questions for each category, the minimum passing grade (a passing grade), the time taken for the exam, and the scoring.

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5. Examination simulations were carried out by taking several samples of students who had not completed a comprehensive course

IV. FINDING AND DISCUSSION

The results of the questionnaire distributed to students showed that 75% of students were dissatisfied with the current method and 25% of students were satisfied with the comprehensive method. Meanwhile, for the results of the questioner regarding the mastery of groups of expertise, as many as 45% of students only mastered 1 field, 50% of students mastered 2 fields, and only 5% mastered 3 fields. For more details, it can be seen in Figure 1.
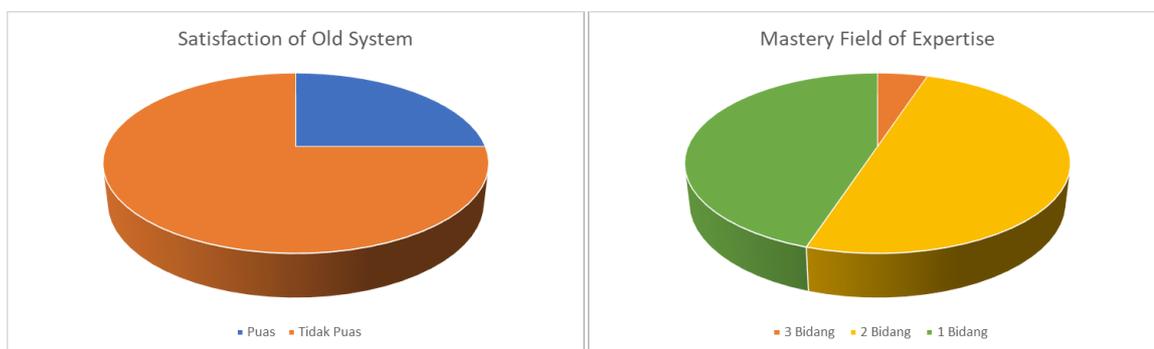

Figure 1.
Results of the Old Comprehensive Method of Satisfaction Questionnaire and Mastery of Expertise

Based on Figure 1, it can be seen that students have not mastered the theoretical concepts of certain fields of knowledge in general with the old method. This is proven by where 95% of students do not master 3 groups of expertise. Therefore, it is necessary to standardize the assessment of this competency understanding by replacing it with a new method. So it is hoped that students who have completed a comprehensive course will have a good mastery of the basic material in the field of Petroleum Engineering expertise.

From the results of the questioner which showed that the old method was no longer effective in the petroleum engineering department, a question bank was collected for the new method. From the results of the collection of questions from the lecturer, 100 multiple choice questions were obtained for each group of areas of expertise. The writing of this question was carried out using the moderator technique where each item of the question was discussed by several composing lecturers and there was one mediator. This technique is considered to be the most appropriate to use because the question bank made consists of various subjects so that each lecturer can combine their competencies with these areas of expertise. After the question bank is collected and approved by all the lecturers, the analysis is carried out in a blank form according to the form template as shown in Figure 2.

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Figure 2.
Blank Problem Analysis using the Panel Method

In the analysis of questions using blank Figure 2, panel analysis techniques are used. Where the analysis is carried out by the head of their respective fields of expertise and the head of the department. After analyzing the questions that have been made, then an analysis of the level of difficulty of each item is carried out. Where the level of difficulty is based on the level of the semester questions from certain subjects are taken. The results of classifying the difficulty level of the questions based on the semester in which the subject is taught can be seen in Table 1.

Table 1.
Classification of Problem Difficulty Level by Semester

Level of difficulty	Semester
Easy	I and II
Moderate	III and IV
Difficult	V, VI, and VII

Based on Table 1, it is known that the questions made from the initial semester subject will be categorized as an easy level and vice versa. This is because the courses in the first semester are basic subjects that have a low level of difficulty. The higher the semester, the courses being taught are a development of the existing courses so they are considered more difficult. From the classification results, the difficulty level of the questions can also be grouped based on groups of areas of expertise. Where the results can be seen in Table 2.

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Table 2.
Distribution of Problem Difficulty Levels by Field of Expertise

Question Category	Level of difficulty			Total Question
	Easy	Moderate	Difficult	
	33%	60%	7%	
Drilling	5	9	1	15
Reservoir	5	9	1	15
Production	5	9	1	15
Integration		4	1	5

From the results of question classification, then 50 questions were selected with the distribution of questions as shown in Table 2. Where the questions were dominated by moderate level questions with 60% of the total questions. The questions made consisted of 15 questions for each skill field plus 5 integration questions from the three groups of expertise fields. The results of the selection of questions are then inputted into the web-based RTA software from the administrator account. The display of the RTA software login page can be seen in Figure 3.
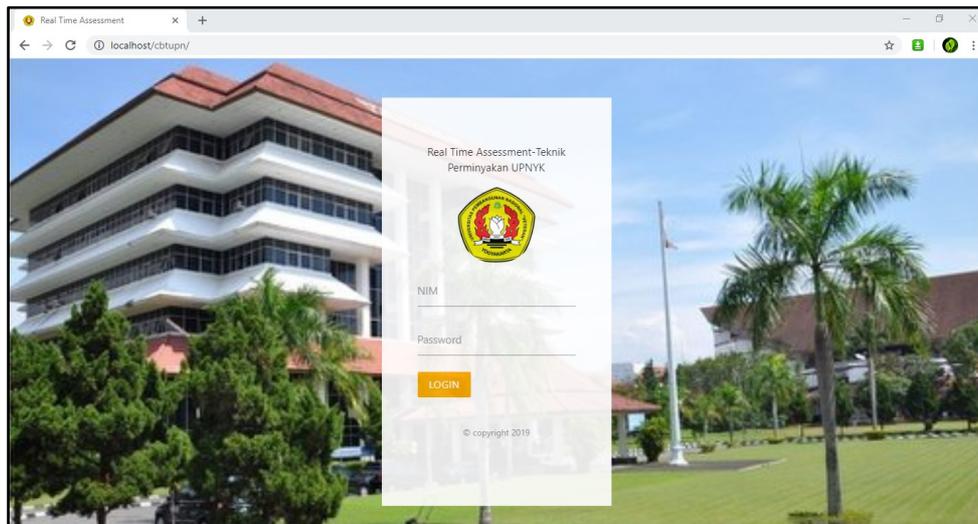

Figure 3.
Display of RTA Software Login Page

The login page in Figure 3. can be used by admins and test-takers before the exam is carried out. In order for students to become test participants, they are required to register and submit their NIM (Student Identification Number). After registering, students will get a password that can be used to log in. The password given by the admin can only be used once during the exam so that when the exam fails, students cannot log in with the same password. For the admin page, you can determine the number of questions, type of questions (pictures or writing), a passing grade, exam travel time, and scoring system. After logging in, the exam participant will enter the exam questions page where its appearance can be seen in Figure 4.

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Figure 4.
Display of Exam Participants With RTA Software

In Figure 4. it can be seen that there is a question page 1 page with 2 main columns, namely questions and an indicator for the number of questions that have been answered. The work can be done not necessarily according to the question number. So that questions that they feel do not understand can be passed first by the test takers. The exam will end when the preset time expires or the student presses the button ends the exam. The advantage of this software is the speed of the correction system, which at the end of the exam will immediately display a pass or not statement. This software is also arranged so that after the exam is finished the page is set so that it cannot be returned again so that students who fail the exam cannot repeat it directly. Students who graduate will receive a certificate of completion that can be used to obtain comprehensive course scores.
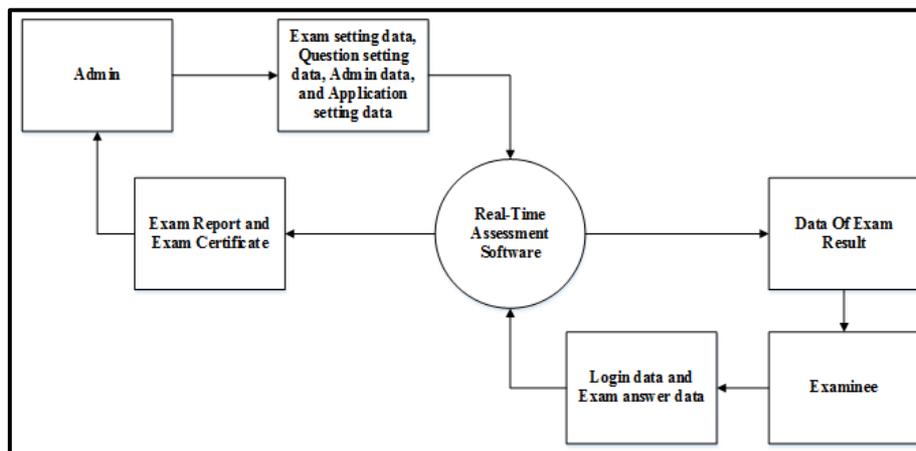

Figure 5.
CTA Method Data Flow Diagram using RTA Software

The data flow diagram is shown in Figure 5. It shows that the exam setting data, question setting, admin data, and Real-Time Assessment application setting data can only be managed by the admin. In addition, the data on the number of participants who took and passed the exam will also enter the exam report to the admin. This shows that the RTA application is safe to use because only from one direction the admin can control this application. To ensure that it gives an idea of the feasibility of the questions and the frequency of student

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examinations until they graduate, a sampling technique is carried out on 20 students whose results are shown in Figure 6.
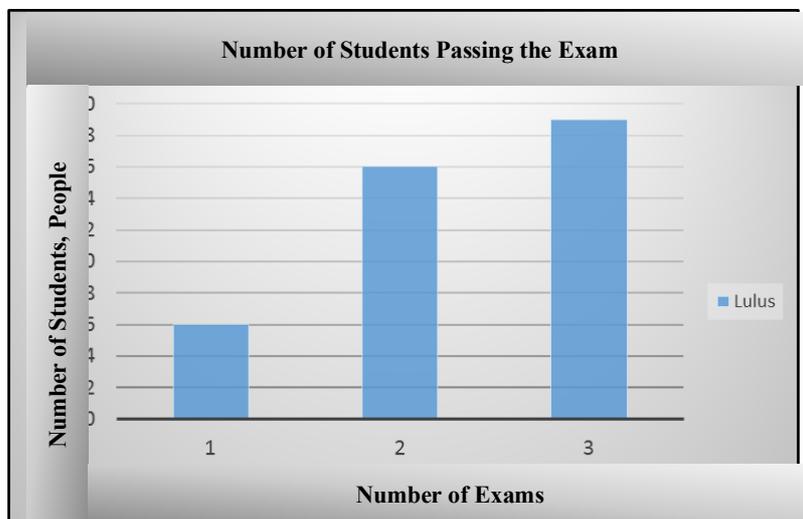

Figure 6.
Increased CTA Method Examination Pass Using RTA

The increase in passing exam participants can be seen in Figure 6. where the exam is carried out by the same 20 students with an interval of 2 weeks per the exam schedule. The test time applied is 60 minutes with a passing grade of 60%. In the first stage of the exam, only 6 students can pass the exam. This is due to the unpreparedness of students for each category of questions. In the second and third stages of examinations, there was a significant increase. Where in the second stage 80% (16 people) of the test participants passed and in the third stage 95% (19 people) of the participants passed the exam. From this result, a decision was made to hold 3 exams per semester. This means that each semester students have the opportunity to repeat the exam 3 times with the difference in time for each exam for preparation. In addition to the distribution of participants who passed, the frequency of results of the field of expertise examination was also recapitulated. The results can be seen in Figure 7.

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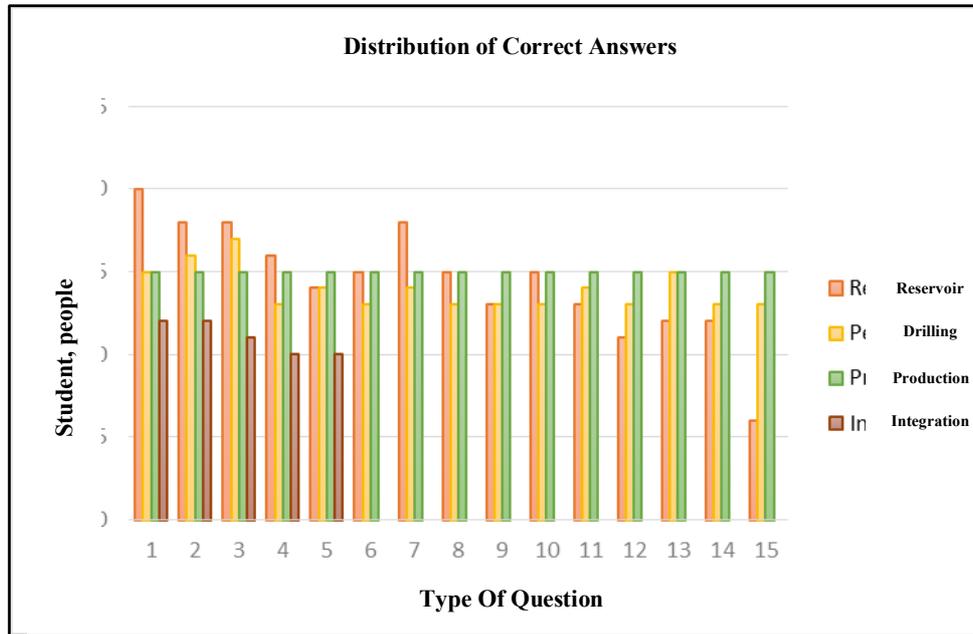Herianto, Ratna Widyaningsih, Ristiyan Ragil Putradianto

Figure 7.
Distribution of Correct Answers in Every Field of Expertise

Based on Figure 7, it is known that question type 1 for reservoir expertise is too easy and not appropriate to use as a comprehensive test. This is because all participants (20 people) can answer the question. Meanwhile, for the 15th field of reservoir expertise, it is too difficult and not feasible because only a few students (6 people) can answer it. However, for the other 48 questions, which is 96%, it can be concluded that it is feasible and can be used as a comprehensive exam.

From the research results, the authors suggest replacing the old comprehensive method. The comprehensive method that the author recommends is a computer-based comprehensive exam using the RTA software we have developed. The replacement of this method is expected to accelerate student graduation without neglecting the competence of an undergraduate.

V. CONCLUSION AND FURTHER RESEARCH

From the research results, the following conclusions can be drawn:

1. The old comprehensive method is no longer effective and needs to be replaced because only 5% of students can master all three areas of expertise and the other 95% only master two or even one area of expertise.
2. The new comprehensive method with RTA software is feasible to apply wherein the third stage of the exam there are 18 out of 20 exam participants or 95% of participants passed the exam.
3. Of the 50 types of questions that have been made, there are 2 questions (4%) of the reservoir area questions that are not feasible and 48 questions (96%) are appropriate to be applied as a new comprehensive examination method.

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4. The development of this comprehensive method can be done by adding new types of questions and applying the automatic question randomization method to the RTA software after the exam has been completed so that students cannot memorize the exam questions.

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