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The Innovation Breakthrough
in Digital and Disruptive Era
Optimizing the Implementation of Computer-Based Exams to Paperless in the Department of Chemistry of Musamus University

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ABSTRACT
This research is a descriptive study that aims to optimize the implementation of computer-based exams in minimizing the use of paper in the Department of Chemistry of Musamus University. The subject of this research is the fifth semester students of the Chemistry Education Department in the Classroom Action Research Course. The research data was obtained through a student response questionnaire with the implementation of a computer-based exam filled in via the Google form. From the results of descriptive data analysis it was obtained that the response of students to the implementation of computer-based exams was positive with an average value of student responses of 83.08%. The conclusion that can be obtained from this research is that the computer-based test with the wondershare quiz creator software can minimize the use of paper. In addition, computer-based exams can make students independent in working on problems, as well as accelerated acceptance of student exam results.

Keywords: Optimization, Computer Based Exam, Paperless

1. INTRODUCTION

Government policies regarding programmed forest resource management often fail in protecting forests. The fact of forest destruction and environmental degradation is a major problem that must be addressed by the Indonesian government. For about 50 years, natural forests in Indonesia have drastically depreciated. The acceleration of the loss of some forest areas in Indonesia occurred in the last 20 years. Based on data from the Ministry of Forestry in 2004, the total amount of forest fell sharply from 124,476,000 ha in 1980 to 109,791,000 ha in 1995. At the end of 1999, the total amount of forest area in Indonesia was reduced to around 98 million ha. This shows the condition of the loss of 26.4 million ha of forest area over 19 years [1]

Paper is a means to convey information as well as a communication tool used by the community. In terms of use, paper is difficult to separate from human life. However, paper is also one of the causes of the removal of the amount of forests in Indonesia. The use of large amounts of paper will cause forest loss because the main ingredient of paper making is wood. The need for paper in Indonesia is increasing every year, as well as world paper demand has also increased, of course with the increasing demand for paper in the country and abroad making raw materials for paper making increased. The high demand for paper is likely to increase forest exploitation. The Industrial Research and Development Agency (BPPI) released data in 2013. Indonesia had 82 pulp and paper industries consisting of 4 pulp industries, 73 paper industries, and 5 integrated paper pulp industries with an installed capacity of the pulp and paper industry of 18.96 million tons. The realization of pulp and paper production were 4.55 million tons and 7.98 million tons respectively [2]. Such high paper consumption can lead to large forest loss. An innovation or renewal is needed regarding reducing the use of paper to preserve forests and ecosystems [3]

Reducing the use of paper is an excellent method that must be carried out by all parties because it can support forest conservation. All activities carried out by humans very much use paper both in daily life and activities carried out in government, private and even in the world of education. The use of paper is generally used for example as magazines, reading books, novels,
food containers, newspapers, and others. For example in the world of education very much uses paper from textbooks, administrative letters to the implementation of the exam also uses paper [4]. In supporting the government program, what must be done is the paperless movement or also called the reduction of paper usage. In doing this movement, it is necessary to do an innovation to minimize the use of paper so that the environment is preserved, because forests are also one of the biggest contributors of oxygen to humans, so that the minimization of paper through the paperless movement can help government programs.

Efforts to minimize the use of paper is the use of technology. This time. Information and Communication Technology (ICT) is experiencing rapid development. This affects the development of instructional media in each educational institution. One type of development is the use of information and communication technology in the conduct of examinations. An example is the use of computers and networks as media in the Computer-Based School Examination (USBK) which is also called the Computer Based Test (CBT). So far, the paper-based test system is still used that uses paper as a test media. Examination using paper is considered no longer effective at this time, so it is necessary to use computer-based exams [5]. This can be seen from what was originally oriented on paper being paperless [6]. The idea of a paperless class has developed side by side with the development of computer technology that is available today but also as we know before the existence of technology humans still use letters in sending information, but with the presence of ICT letters can be sent via email and their use is very effective [7].

In modern education, many methods have been found to improve student learning outcomes. Teachers must be able to design appropriate learning strategies that can motivate students to learn [8]. Some ways to do this are by utilizing technology as a medium for transferring knowledge to their students. The use of technology in learning is used to improve the quality of learning [9]. To create the best management system in education, we need technology to manage all that processes. Included in the implementation of the exam, it should have used technology.

The exam is carried out to measure the level of students’ ability to understand the subject matter that has been studied [10]. In carrying out the exam, an appropriate assessment instrument is needed to be able to measure students' abilities [11]. But in reality, the implementation of the test is still colored by several obstacles and obstacles, so the results of the test are feared to produce invalid data. Continuously the meaning of measurement will also erode, and the evaluation will also become invalid [12]. The right assessment method is very important for students to get their learning outcomes. It is not enough to change learning methods without good judgment [13]. Implementation of computer-based exams can save budgets, reduce cheating rates, speed up the correction process, and encourage students to study well [14]. Implementation of computer-based exams can minimize all the weaknesses experienced in the implementation of the exam so far. Computer-based exams can be done using the wondershare quiz software.

Computer-based tests are carried out using computer software where the software can present test questions, accommodate participant responses to the test and then be stored and analyzed electronically [15]. The implementation of computer-based exams can use the wondershare quiz software to support the process of minimizing the use of paper. Wondershare Quiz Creator is a software for making questions, quizzes, or tests offline or online. In use, this software is very familiar and easy to operate so it does not require programming language skills that are difficult to operate. The results of the compiled questions can be stored in the form of a standalone flash or can stand alone on the website. With Wondershare Quiz Creator can arrange various forms of questions and have different levels, ranging from multiple choice questions, true / false, matching, fill in the blank and others [16].

The use of Wondershare quiz can determine the deadline for working on the questions and design the package of questions randomly so that one student with another different questions on the same workmanship number. Students find it difficult to cheat the results of their friends' work. One of the character of students needed in the exam is the independent character. Independent character is an attitude and behavior that is not easy to depend on others in completing tasks [17]. Questions that have been collated with Wondershare can make students not dependent on other people's work. After completing work, students can immediately get the results of the exam, so as to accelerate the process of correction and transparency of the results of the exam to students. In addition, it has other advantages including having statistical features, results analysis, flexible data results, complete display settings so that it can support various types of tests and is easy to use and manufacture.

Computer-based exams that use the Wondershare quiz can be carried out offline, so they can be done anywhere without waiting for the internet network. This is very suitable to be implemented in Papua, which is not yet all covered by the internet.

Based on the description above, the purpose of this study is to optimize the implementation of computer-based exams to minimize the use of paper in the Department of Chemistry of Musamus University.
2. RESEARCH DESIGN

This research is a descriptive study to optimize the implementation of computer-based exams to minimize the use of paper in the Department of Chemistry at Musamus University. The fifth semester students of the Chemistry Education Department in the Classroom Action Research subject are the subjects of this study.

The research data was obtained through a student response questionnaire with the implementation of a computer-based exam filled in via the Google form. The student response questionnaire consisted of 15 questions. The form of questions from this questionnaire is a Likert scale with 5 student responses, namely: strongly agree, agree, neutral, disagree, and strongly disagree. This is to determine the response of students to the implementation of computer-based exams. The questionnaire gratuity of the students’ responses to the implementation of computer-based examinations is determined by the following table 1:

Table 1. Student response questionnaire grilles

<table>
<thead>
<tr>
<th>Number</th>
<th>Indicator</th>
<th>Positive statement</th>
<th>Negative statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acceptability</td>
<td>1, 13</td>
<td>3, 6, 8, 9</td>
</tr>
<tr>
<td>2</td>
<td>Easily</td>
<td>12</td>
<td>2, 15</td>
</tr>
<tr>
<td>3</td>
<td>Interestly</td>
<td>4, 5, 7, 10, 11</td>
<td>14</td>
</tr>
</tbody>
</table>

The data analysis technique used is descriptive data analysis of the student response questionnaire using the following formula [18]:

\[ K = \frac{F}{N \times I \times R} \times 100\% \]

Information:
- \( K \) = Percent of each student response indicator
- \( F \) = Total student answers
- \( N \) = Highest score for each question
- \( I \) = Number of question
- \( R \) = Many students gave responses

Student responses are said to be positive if the percentage obtained is more than 80% of the average percentage of each indicator [19].

3. RESEARCH RESULT AND DISCUSSION

Industry era 4.0, there are some literacy changes needed in the field of education. The government has a program to strengthen the old literacy program (reading, writing, and mathematics) with new literacy (data literacy, technology literacy and human literacy) [20]. Utilization of technology to support the implementation of education is very necessary. In the trend of the industrial revolution 4.0 in the use of Technology it is very important to help students find more information about the topic and explore a lot of information that can open their mindset knowledge [21]. Utilization of technology can also be done in conducting tests both online and offline.

The results of research on optimizing the implementation of computer-based exams to minimize the use of paper in the Department of Chemistry at Musamus University were carried out through the preparation of the test using the wondershare quiz creator software and published in the form of flash data, then tested offline to students. The process of implementing a computer-based exam can reduce the use of paper that has only been wasted when the exam is corrected. The test is carried out offline so that it can be carried out, even in areas without internet network, so it is very suitable to be carried out in the Papua area. The questions made have been arranged for the duration of the exam, randomizing the questions and options, so that all students can focus on the questions they are doing without expecting answers from friends.

At the end of the exam, students fill in the response questionnaire via the Google form. The following table is the response of students to the implementation of computer-based exams:
Table 2. Description of student responses to the implementation of exam-base

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptability</td>
<td>The implementation of computer-based exams is very suitable to be applied in the chemistry education department</td>
<td>46%</td>
<td>54%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In my opinion, a computer-based exam is the same as a manual exam</td>
<td></td>
<td>8%</td>
<td>69%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I feel more satisfied with the results obtained with the manual exam compared to the results of the computer-based exam</td>
<td></td>
<td>8%</td>
<td>31%</td>
<td>38%</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>I feel uncomfortable with computer-based exam</td>
<td></td>
<td>8%</td>
<td>77%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The implementation of computer-based exams had no effect and gave good results in my exam</td>
<td></td>
<td>8%</td>
<td>8%</td>
<td>69%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Implementation of computer-based exams can help protect the environment because they no longer use paper test</td>
<td></td>
<td>69%</td>
<td>31%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easily</td>
<td>I find it difficult to use computer-based exams</td>
<td>31%</td>
<td>54%</td>
<td>7%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I can’t focus on computer-based exams</td>
<td>8%</td>
<td>8%</td>
<td>61%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td>Interstly</td>
<td>I am very happy with the implementation of computer-based exams</td>
<td>31%</td>
<td>61%</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Display computer-based exams interesting so that it can help in conducting the exam</td>
<td>39%</td>
<td>46%</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I prefer computer-based exams because they are accompanied by images, audio and video</td>
<td>23%</td>
<td>69%</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I am very happy with the computer-based exam because I get the exam results right away</td>
<td>46%</td>
<td>54%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I am very happy with the computer-based exams because questions and options are automatically randomized so it is difficult to share answers</td>
<td>46%</td>
<td>46%</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I am not happy with the computer-based exam</td>
<td>15%</td>
<td>69%</td>
<td>16%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Analysis of Student Response Data on the Implementation of Computer-Based Exams

<table>
<thead>
<tr>
<th>Number</th>
<th>Indicator</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acceptability</td>
<td>83,59 %</td>
</tr>
<tr>
<td>2</td>
<td>Easily</td>
<td>80,51 %</td>
</tr>
<tr>
<td>3</td>
<td>Interstly</td>
<td>85,13 %</td>
</tr>
<tr>
<td></td>
<td>Total Average</td>
<td>83,08 %</td>
</tr>
</tbody>
</table>
From table 2 it can be seen students' responses to the implementation of computer-based exams. Of the 15 questions consisting of 3 student response indicators given through a questionnaire on the Google form. In table 3 it can be seen that for the category of acceptance of computer-based exams of 6 item questions the average response of students is 83.59%, the ease of category of 3 item questions the average response of students is 80.51%, and the interest category of 6 items the average student response was 85.13%. After averaging it was obtained the value of total student responses to the implementation of computer-based examinations at 83.08%. Therefore, based on the results of descriptive data analysis, students' responses to the implementation of computer-based exams both for each indicator and the turbidity are in the positive category (more than 80%).

Based on the questionnaire students' responses to the implementation of computer-based exams are very good to be applied in the Department of Chemistry at Musamus University. In addition, through this research has succeeded in making a paperless movement for the implementation of paperless exams, students can also independently work on questions (without expecting answers from friends), and accelerate the delivery of exam results (direct scores are obtained).

4. CONCLUSION

Based on the results of research that has been done that to optimize the implementation of the test in minimizing the use of paper, a computer-based test can be carried out using the wondershare quiz creator software. Through student questionnaire responses obtained positive responses to the implementation of computer-based exams with an average value of student responses (K) of 83.08%. The implementation of computer-based exams can minimize the use of paper, students can work independently, and accelerate the acceptance of exam results.

AUTHORS’ CONTRIBUTIONS

Jesi Jecsen Pongkendek is in charge of compiling abstracts, introductions, and the flow of drafting the manuscript. Marantika Lia Kristyasari was in charge of compiling the research design and data analysis. Henie Poerwandar Asmaningrum was in charge of compiling the results and discussion. All authors read and agree on the final manuscript.

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