Overview of School Readiness to Face the Computer-Based National Examination in Gowa District, South Sulawesi: Analysis of Test Results of Computer-Based Tests (CBT) and Paper-Based Tests (PBT)

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ABSTRACT
At present, the Computer-Based National Examination (CBNE) model to replace the Paper and Pencil-Based National Examination (PBNE). The National Examination Organizer assumes that the items displayed on the monitor screen have the same difficulty index when presented on paper. Based on this assumption, CBNE and PBNE are considered equal. However, judging from the context and the situation, the paper pencil-based test (PBT) and computer-based test (CBT) model has differences, namely the number of items in the range of views, test aid, the types of question that can be displayed, the color of the test items, how to do the test, the need for basic knowledge of operating a computer, and the habit factor. The differences between the two test models can be psychologically influential when working on a computer-based test. This research is to review how schools prepare their students for CBNE. This research uses a combination of development methods and quantitative methods. The development method is used to develop (1) a set of question item packages and (2) Computer-Based Testing (CBT) software. The test was conducted on 452 students in class XII, from 3 (three) schools in Gowa Regency, South Sulawesi, namely SMK N 1 Gowa, SMK N 2 Gowa, and SMK N 4 Gowa. The statistical test results showed the level of school readiness in preparing students for CBNE. If the results of the statistical test do not show any differences in the results of the test scores, then the school students are considered ready to implement CBNE. If the results of the statistical test show that there are differences in the results of the test scores, then the magnitude of the average results will be seen. If the average size of the PBT group test scores is lower than the CBT group test scores, then the school students are considered ready for CBNE. However, if the average amount of PBT group test scores is higher than the CBT group test scores, then the school students are considered not ready for CBNE. The results showed that, in general, students at the schools are considered ready for CBNE.

Keywords: School readiness level indicator, CBNE, CBT, PBT, score results

1. INTRODUCTION
This research has been done because there is an increasing number of implementations of the Computer-Based Testing (CBT) model as a way to analysis the ability of test-takers. CBT began to gradually replace the function of the Paper-Based Test (PBT) [1] [2]. A concrete example of CBT penetration is in the development of the National Examination in Indonesia. The trend of using the CBT testing model in an educational sector is predicted to increase, replacing the PBT model continually.

The implementation of the National Examination in Indonesia currently uses 2 (two) testing models, namely using paper and computer test and it has been changed to the CBT model. The National Examination, which uses paper, is known as PBNE, or in Indonesia, it is termed as UNKP. The computer-delivered national examination is known as CBNE, or in Indonesia, it is termed as UNBK (Ujian Nasional Berbasis Komputer). The National Examination Institutional assumes that the items displayed on the UNBK software monitor screen will have the same level of difficulty when delivered at UNKP, which uses paper. With this assumption, the results-scores of the UNBK and UNKP test models are
considered equivalent. The difference in the context and the situation between the PBT and CBT testing models, as well as the habit factor in exam-taking, can psychologically affect the students during their computer-based examination. On the other hand, the anxiety factors could influence the examination process, which then can negatively affect the focus of the students during the computer-based exam.

Psychometrically, there are almost no advantages between CBT compared to PBT. The testing models use the same number of items for each participant or fix-length test. In scoring, the PBT and CBT models use Classical Test Theory (CTT) with the formula:

\[
\text{Test Scores} = \frac{\text{Question items answered correctly}}{\text{The Total of Question Items}}
\]

Generally, the test scores are converted to a score of 0 to 100. The greater the test scores obtained, the estimated level of students' ability is considered to be higher (in other words, students are considered smarter).

As it utilizes a more modern media tools, CBT has advantages compared to PBT, namely (1) increase standardization, (2) increase test security, (3) enhance test display capabilities, (4) minimize the error of measurement, and (5) accelerate the provision of score and interpretation [3]. Although they have the same paradigm for measuring the ability of test-takers, the PBT and CBT models have striking differences in terms of context and situation. The difference in the context and situational aspects between PBT and CBT is possible to influence the results of the test scores and determine the estimation of students' ability. Psychometrics experts, such as Rudner [4] and Grist [5], argue that the item parameters used on PBT may not match the appearance on the computer monitor screen.

### Table 1. Comparison of the Context and Situational Aspects of the PBT and CBT Models

| Context and Situation | PBT Model | CBT Model |
|-----------------------|-----------|-----------|
| The number of items in the range of views | Consist of many question items | Generally, it only has 1 (one) question item. I need to scroll the question if it is too long. |
| Test Aid | Paper and Pencil | Monitor screen, CPU, keyboard, mouse, and speaker |
| Types of question that can be displayed | Text and Pictures | Text, picture, audio, and video |
| The way question items can be answered | Marking the selected answer using a pencil | Select the correct answer using a mouse or keyboard |
| Basic knowledge of information technology | Not needed | Needed |
| The color of question items given | Mostly black | Possible for all colors |
| The habit factors in addressing the questions | Students are used to it | Students are still unfamiliar with it |

The objective of this paper is comparing the CBT model and the PBT model in student readiness in Gowa Regency.

### 2. METHOD

This research used a combination of development methods and quantitative methods. The development method was used to develop the test package of questions set and CBT software. The developed questions were chosen from general subjects. They were taught to all high school students without the difference in Core Competencies and Basic Competencies. The question package consisted of 50 (fifty) items with material taken from Indonesian Language Class XII in accordance with the latest 2013 Curriculum. The data was obtained by forming 2 (two) equal groups of respondents, and each group worked on the same questions package with the PBT and CBT testing models.

The CBT model was developed using a web-based client-server system that can be accessed via the LAN network. Similar to the PBT testing model, CBT software was designed to enable the respondents to choose the desired item number. Furthermore, they could review their response if they wanted to replace it. The way to answer the question items on the PBT model is by circling the chosen answers on the answer sheet using a pencil. In contrast, the way to answer the question items on CBT is by selecting the answer that is considered correct with the mouse or keyboard.

In general, the flowchart in this study is presented in Figure 1. Statistical analysis is used after collecting of test scores of the groups of respondents. It aims to find out that there are any significant differences between the two test models. The results of the analytical output from SPSS were then evaluated and used as an indicator to determine whether the students will be ready for a computer-based test or not.
3. RESULTS AND DISCUSSION

Respondents were drawn from students in class XII in schools in Gowa Regency, South Sulawesi, namely in SMK N 1 Gowa, SMK N 2 Gowa, and SMK N 4 Gowa. The respondents are 452 students, consisting of the PBT model with 230 respondents and 222 respondents used CBT test model. After the test was conducted, the results of the PBT group and CBT group are presented in Table 2 and Table 3.

Table 2. The Results of the PBT

| Students | Kolmogorov-Smirnov | Shapiro-Wilk |
|----------|--------------------|--------------|
| Statistic | df | Sig. | Statistic | df | Sig. |
| PBT | .059 | 230 | .049 | .990 | 230 | .093 |
| CBT | .055 | 222 | .096 | .992 | 222 | .264 |

Table 4. Tests of Normality

| Students | Kolmogorov-Smirnov | Shapiro-Wilk |
|----------|--------------------|--------------|
| Statistic | df | Sig. | Statistic | df | Sig. |
| PBT | .059 | 230 | .049 | .990 | 230 | .093 |
| CBT | .055 | 222 | .096 | .992 | 222 | .264 |

Table 4 shows the results of the Liliefors and Shapiro Wilk tests. The score of P-value (Sig) Liliefors was 0.049 in the PBT group and 0.096 in the CBT group. The P-value of the Shapiro Wilk test in the PBT group was 0.93, and in the CBT group was 0.264. Table 3 shows that the scores of the PBT group for the Liliefors test obtained p-value (Sig) of 0.049, all the results of the test scores > 0.05. The scores of the PBT group for the Liliefors test obtained p-value (Sig) of 0.049 is generally assumed that both the PBT and CBT groups are normally distributed. Assumptions that the two groups are normally distributed can be seen in the visual appearance of the Q-Q Plot and P-P Plot as follows. The display Q-Q Plot and P-P plot, it is found that the data or point spreads around the diagonal line and follows the direction of the diagonal line.
Homogeneity independent t-test results for the entire respondent’s data are shown in Table 5. Levene values are shown in the line of values based on mean, which is 1.313 with a p-value (sig) of 0.252, which is > 0.05, which means there is a similarity of variances between groups or which means homogeneous.

Stem-leaf diagrams (Figure 3) and box-plot diagrams (Figure 4) were used to detect outliers. In the stem-leaf diagram, the presence of an outlier is marked based on whether there are extreme values above and below the stem-leaf. Based on the results, there are no extreme values, which means there are no outliers in the two groups. Outlier detection can also be assessed using the following box-plot.

The box-plot does not indicate that there are plots above and / or below the box-plot, which means there are no outliers in the data of the two groups. Because all assumptions are fulfilled, it can proceed to the next test, namely the Independent T-Test.

Comparing the average test results, the difference between PBT group and the CBT group is conducted by

Table 5 Homogeneity Test

| Value                          | Levene Statistic | df1 | df2     | Sig. |
|-------------------------------|------------------|-----|---------|------|
| Based on Mean                 | 1.313            | 1   | 450     | 252  |
| Based on Median               | 1.268            | 1   | 450     | 261  |
| Based on Median and with adjusted df | 1.268       | 1   | 439.984 | 261  |
| Based on trimmed mean         | 1.305            | 1   | 450     | 254  |
using the t-test number. The analysis assumes both variances are similar (equal variances are assumed). This figure was used because the results of the analysis using the F test showed no difference in variance between the two groups.

Figure 3 Detection of Outliers with Box-plot

Table 6 SPSS Outputs Assessment Results of PBT and CBT Testing Models

| Group Statistics | Students | N  | Mean     | Std. Deviation | Std. Error Mean |
|------------------|----------|----|----------|----------------|-----------------|
|                  | Scores   |    |          |                |                 |
|                  | PBT      | 230| 49.7217  | 13.82710       | .91173          |
|                  | CBT      | 222| 47.4144  | 12.41658       | .83335          |

| Independent Samples Test | Levene's Test for Equality of Variances | t-test for Equality of Means | 95% Confidence Interval of the Difference |
|--------------------------|----------------------------------------|----------------------------|-----------------------------------------|
|                          | F          | Sig. | t       | Df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| scores                   | Equal variances assumed                  | 1.313 | .252 | 1.864 | 450 | .063 | 2.30732 | 1.23755 | -.12477 | 4.73942 |
|                          | Equal variances not assumed               | 1.868 | 447.686 | .062 | 2.30732 | 1.23520 | | -.12019 | 4.73484 |

The steps are taken to test the average P&P Test model, and the CBT model is:

1. Formulating research hypotheses
   There are differences in the average assessment results between groups of PBT and CBT testing models
2. Formulating operational hypotheses (null and alternative hypotheses)
   Ho: The average assessment results using the PBT and CBT methods are the same
   Ha: The average results of the assessment using the PBT and CBT methods are not the same
3. Determining the level of trust used
   The confidence level used is 95% or using alpha 5%.
4. Determining the decision-making rules
   The rule in making decisions is to accept H0 if the t count is smaller than the t table and reject H0 if the t count is greater than t table. Based on the t table with alpha, 5% 2-way test or 2.5%, and the degree of freedom df = 450, the value of the t table is 1.96525. So the decision taken is to accept H0 if t arithmetic smaller than 1.96525 and reject H0 if t arithmetic greater than 1.96525
5. Calculating t count or t statistics
The SPSS 16.0 assistive program is used to calculate t count is 1.864
6. Decision making and interpretation of results

After calculating t statistics, the final step is to make a decision on the results of the analysis and interpretation of these results. The average difference in the assessment results between the PBT and CBT methods is 2.30732, with a standard deviation of 1.23755. The results of the t statistical calculation resulted in a value of 1.864 and a significance of 0.063.

![Figure 4 Two Tail Hypothesis Test Results Assessment](Image)

With a significance result of 0.063, the decision to accept H0 can be taken because the significance level is greater than alpha (0.025). The results of the calculation of the t value (1.864) turned out to fall in the rejection area, then H0 is accepted. Therefore, H0 is accepted, and Ha is rejected. This means, from the results of the analysis, it can be stated that statistically, the values of the two methods (PBT and CBT models) are stated to be no significant difference.

In a deeper analysis, there is an average difference (mean difference) of 2.30732, which indicates the difference in the average scores of PBT and CBT, which is 49.7217 for PBT and 47.4144 for CBT. This indicates that there is no significant difference between two groups. However the average scores CBT model are smaller than the PBT model. So that, it can be concluded that the same package of questions, when done with the CBT method, is still felt more difficult by test-takers compared to if it is done with the PBT method.

The analysis shows that in classical theory, there are differences in the average results of the exam scores if the same package of questions is displayed with the PBT model and the CBT model. The package of questions displayed on the CBT monitor screen using a mouse and keyboard is felt to have a different level of difficulty when presented on a paper and using a pencil.

In addition to the different aspects of context and situation, the factor of the unfamiliarity of students working on problems with a computer-based test model can contribute to the differences of average scores between the PBT and CBT models. In general, not many schools have applied computer-based testing models to classroom learning practices. The number of computer laboratories is not proportional to the overall number of students. With the UNBK policy implemented by the government, it was responded by conducting socialization on the use of computer-based exams for final-level students several months before the National Examination. However, such a short time does not necessarily result in students becoming accustomed to taking computer-based exams.

In the use of CBT, it is important to consider the aspects of computer self-efficacy or the students’ confidence as being successful in working on a computer-based test. Computer self-efficacy helps to reduce student anxiety levels in taking computer-based exams [6] [7] [8]. With the reduced level of anxiety, students can focus more on working on problems and can show their best abilities. On the other hand, one way to reduce test anxiety using a computer is to improve students' computer experience and confidence in taking computer-based exams [9] [10]. It is important to provide the opportunities for students to become familiar with the CBT model [11]. Making students familiar with reproducing CBT model trials before test day can reduce anxiety factors. It will be beneficial for students who are economically disadvantaged and do not have computers. Furthermore, the habituation of this exam model is expected to increase students' confidence in being able to succeed at this UNBK so that they do not feel significant obstacles compared to other students who take the UNKP.

Although there are indicators that students are declared ready to face UNBK in the use of computer-based testing media. It does not mean that they will be successful and get high test scores if a computer-based testing model is conducted. This strategy is only an indicator of readiness to use a computer that is related to the level of student habits towards computer-based testing. To get high scores on UNBK/CBNE, of course, it remains focused on the mastery of the material contained in the learning process.

4. CONCLUSION

It can be concluded that there were no significant differences in the score results if the same question items were displayed with the Paper Based Test (PBT) model and the Computer-Based Testing (CBT) model. This indicates that, in general, students are considered ready to do computer-based exams such as CBNE (UNBK). However, there is a difference in the average (mean difference) of 2.30732. It indicates a difference in the average scores of PBT and CBT, which is 49.7217 for PBT and 47.4144 for CBT. Although statistically stated there is no significant difference between groups working on the PBT and CBT testing models, but when viewed from the average scores, it can also be stated that the same question package, when worked with the CBT method,
will be felt as more difficult for test-takers compared to if it is done by the PBT method. In this case, students need more opportunities to get used to using a computer-based testing model so that the level of readiness to face CBNE (UNBK) may increase.

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