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Comparison of Learning Outcomes Between Online-Based and Paper-Based Assessments on Digital Document Elements in Yogyakarta State Vocational High School

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This study aims to compare the exam results of paper-based and online-based assessments among vocational high school students majoring in Office Management and Business Services. The research employed a quasi-experimental method with a post-test only control group design. Using purposive sampling, the study involved 32 tenth-grade students from the Office Management program as the experimental group and tenth-grade students from the Logistics Management program as the control group at Yogyakarta State Vocational High School. The results showed an average score of 65.16 for the experimental group and 68.97 for the control group. This indicates that students who took the paper-based exam achieved higher average scores than those who took the online-based exam. These findings provide empirical evidence that there is a significant difference between paper-based and online-based exam results among vocational students. The study also demonstrates that the choice of exam method has an impact on students' learning outcomes.

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INTRODUCTION

The integration of technology in education has been proven to enhance the quality of learning through the use of various digital tools, thereby facilitating the learning process, promoting self-directed learning, and fostering critical thinking (Qureshi et al., 2021, p. 38). However, in practice, many teachers still rely heavily on printed textbooks during the

instructional process (Isti'ana, 2024; Zahrawati, 2021). Ideally, the use of technology is expected to support active learning processes and contribute to the co-construction of knowledge (Børte et al., 2023). Given that Generation Z are digital natives who are inherently familiar with technology and that the current era demands adaptation to digital advancements, schools should be encouraged to design learning experiences that are closely aligned with the digital world (Mospan & Sysoieva, 2022). Nevertheless, a majority of teachers in Indonesia still rely on paper-based assessments or examinations rather than incorporating technology into assessment practices (Hariono et al., 2021). This practice is inconsistent with the characteristics of Generation Z learners, the demands of contemporary education, and the current digital era (Rosnaeni, 2021).

The learning assessment process is a critical component of education (Andayani & Madani, 2023). Learning assessments serve to monitor students' progress, providing a basis for improving instructional practices (Adnyana, 2023). Effective assessments are those that align with learning objectives, are easy to implement, and are tailored to the characteristics of the learners (Nugraha et al., 2023; Rhosyida et al., 2021; Suwarno & Aeni, 2021). Given that today's learners are immersed in the digital era, assessments should ideally be conducted using digital platforms to enable faster feedback, greater flexibility, and long-term efficiency (Sudirman et al., 2023). However, findings by Epriatna et al. (2023) indicate that assessment is still predominantly paper-based in most classrooms, particularly in summative testing. Consequently, the condition of students taking exams and their habitual screen-based reading behavior make this traditional method less suitable in the current context.

Previous studies have shown that learning assessments predominantly conducted using paper-based methods are not superior to those assisted by technology. Research by Stevkovska (2023) and Azam et al. (2021) revealed that test scores obtained through online assessments were higher compared to paper-based tests. Purwanto et al. (2022) argued that online testing offers several advantages, including reduced time consumption, decreased reliance on human and other resources, and increased testing efficiency. Driessen et al. (2007) further noted that web-based assessments significantly enhance student motivation. Candrlic et al. (2014) and Gehringer (2013) also emphasized that students tend to prefer online examinations, as they favor typing over writing with a pencil, find it easier to demonstrate their knowledge, receive faster feedback, and reduce paper consumption. Washburn et al. (2017) added that online exams allow for quicker and more efficient preparation. These findings suggest that the alignment between student characteristics, digital competencies, and familiarity with digital environments can result in improved academic performance.

A number of prior studies have explored the use of various digital platforms for conducting online assessments, such as Quizizz, Google Forms, Edmodo, Kahoot!, Learning Management Systems (LMS), and Wordwall (Awiria et al., 2022; Aldino et al. 2021; Imanulhaq & Prastowo, 2022). Comparing these platforms to determine which is most effective is a critical step in providing empirical evidence for policymakers. A study by Hartadi (2023) showed that the use of Quizizz led to better learning outcomes compared to Google Forms, while other studies yielded similar results. Quizizz offers several advantages, such as maintaining student focus, shuffling answers per user account, and incorporating images, audio, and memes as part of its feedback system, which are not as readily available in Kahoot! (Sari & Nurani, 2021). These findings are also supported by Utomo et al. (2021), who noted that Quizizz provides access to all features without additional costs and is more accessible compared to Kahoot! and Google Forms. Therefore, Quizizz is considered one of the most appropriate tools for conducting online learning assessments.

Previous studies have extensively examined the comparison and effectiveness of using Quizizz in educational settings. Jati dan Mediatati (2022) explained that Quizizz is effective in improving student learning outcomes. Research by Jati dan Mediatati (2022), which compared learning outcomes between Quizizz and paper-based assessments among elementary school students, revealed that Quizizz resulted in higher scores due to increased student interest and concentration. Moreover, students showed greater enthusiasm, engagement, enjoyment, and motivation when learning was supported by Quizizz (Sitorus & Santoso, 2022). However, most prior studies have focused on general education levels, while experimental research in vocational education remains limited. This gap has encouraged the present study to conduct an experiment comparing student test results at the vocational education level. This focus is justified by the fact that vocational education is characterized by a stronger emphasis on practical competencies rather than theoretical knowledge, aiming to prepare graduates for direct entry into the workforce (Sutirman dkk., 2022; Dahalan dkk., 2024).

Vocational education in the field of Office Management and Business Services requires students to master digital technologies (Kristina & Pahlevi, 2024). The curriculum is designed to include competencies such as digital documentation, office technology, basic business service techniques, information and communication systems, and logistics services, thereby shaping student characteristics that are closely aligned with the digital era (Sulistiowati et al., 2022). Based on these considerations, the present study aims to examine the learning outcomes of vocational students in the Office Management and Business Services field—an area that is highly integrated with technological development—by comparing performance between paperbased tests and those conducted using Quizizz.

METHOD

This study employed a quasi-experimental research design, specifically the Post-Test Only Control Group Design. The population consisted of students from Yogyakarta State Vocational High School. The sample was selected using purposive sampling to ensure that the respondents were members of Generation Z who are familiar with technology, enrolled in the same vocational program, and taught by the same teacher. This technique was applied to ensure that the participants were accustomed to digitalization in the learning process. The study involved 32 tenth-grade students from the Office Management program as the experimental group and 32 tenth-grade students from the Logistics Management program as the control group. The grouping was based on the results of a digital literacy survey, which indicated that the experimental class had a higher level of digital literacy compared to the control class.

Data were collected through a test instrument in the form of 40 multiple-choice questions, each with five answer options. The test items were adapted from the textbook Fundamentals of Office Management and Business Services. Data analysis was conducted using descriptive statistical analysis to assess learning outcomes, followed by classification based on Criterion-Referenced Assessment (CRA), and further statistical analysis using IBM SPSS Statistics 21 and R Studio. The classification used in this study is presented in the table 1:

Table 1. Criterion-Referenced Assessment (CRA) Classification

| Interval | Category |
|---------------|-----------|
| x>90 | Very High |
| 75 < x < = 90 | High |
| 60 < x < = 75 | Moderate |
| 40 < x < = 60 | Low |
| x < =40 | Very Low |

The statistical test used in this study was the Mann-Whitney U test, as the data from the experimental group were not normally distributed. This analysis was conducted to test the following hypotheses:

: There is no significant difference between learning outcomes using Quizizz and H0paper-based assessments.

There is a significant difference between learning outcomes using Quizizz and paper-based assessments.

RESULTS AND DISCUSSIONS

Research Findings

This study aimed to compare students' learning outcomes when assessed using Quizizz and paper-based tests. Data were obtained from a test consisting of 40 multiple-choice questions administered via Quizizz for the experimental group and on paper for the control group. The data were analyzed through descriptive statistics, assumption testing, and hypothesis testing of learning outcome differences.

Descriptive Statistics

The study began by administering a test using Quizizz in the experimental class and a paper-based test in the control class. Based on the test results, the descriptive statistics of student learning outcomes are presented by table 2:

Table 2. Descriptive Statistics of Learning Outcomes

| Description | Experimental Class | Control Class |
|--------------------|---------------------------|---------------|
| N | 32 | 32 |
| Female | 31 | 23 |
| Male | 1 | 9 |
| Mean | 65,16 | 68,97 |
| Maximum Score | 72,5 | 92,5 |
| Minimum Score | 47,5 | 42,5 |
| Standard Deviation | 6,63 | 11,97 |
| (SD) | | |

The descriptive statistics indicate that the control class outperformed the experimental class. Each group consisted of 32 students. The experimental class included 31 female and 1 male student, whereas the control class consisted of 23 female and 9 male students. The average score in the control class was 68.97, which was higher than the experimental class's average of 65.16. This suggests that the paper-based test yielded higher student performance compared to the Quizizz-based test. In terms of maximum scores, the control class achieved a higher top score of 92.5, while the experimental class's top score was 72.5, again indicating better performance with paper-based testing. However, the minimum score in the experimental class (47.5) was higher than that of the control class (42.5), indicating that Quizizz-based testing produced higher minimum scores. Additionally, the standard deviation (SD) was lower in the experimental class (6.63) than in the control class (11.97), suggesting that the learning outcomes in the online-based test group were more consistent, while those in the paper-based

test group were more varied. Overall, the comparison shows that paper-based assessments produced higher average and maximum results than Quizizz-based assessments among vocational high school (Vocational High School MPLB) students.

The test results were also presented using classification based on Criterion-Referenced Assessment (CRA) to provide deeper statistical insights. The classification is presented in the table 3:

Table 3 Classification Based on Criterion-Referenced Assessment (CRA)

| Intomval | Category | Number of Students | | |
|---------------|-----------|--------------------|---------|--|
| Interval | | Experimental | Control | |
| x>90 | Veri High | 0 | 1 | |
| 75 < x < = 90 | High | 0 | 17 | |
| 60 < x < = 75 | Moderate | 25 | 9 | |
| 40 < x < = 60 | Low | 7 | 5 | |
| x<=40 | Very Low | 0 | 0 | |

The classification table shows a comparison of score categories between the control and experimental classes. In the control class, 1 student achieved a "Very High" score category, while none in the experimental class did. Seventeen students in the control class fell into the "High" category, whereas none in the experimental class achieved this level. For the "Moderate" category, 25 students from the experimental class were classified in this range, compared to only 9 students from the control class. This indicates that the control class had fewer students in the "Moderate" range than the experimental class. Similarly, in the "Low" category, 5 students came from the control class and 7 from the experimental class. These results suggest that paper-based testing yielded higher performance classifications compared to the use of Quizizz. Therefore, assessments conducted using paper tests resulted in a better classification distribution than those using Quizizz.

Normality Test

The test data were analyzed using the Shapiro-Wilk test. The results of the normality test are presented in the table 4:

Table 4 Normality Test

| Table 4 Normanity Test | | | | |
|---------------------------------------|--------------|--------------|----|------|
| Tests of Normality | | | | |
| Class | | Shapiro-Wilk | | |
| | | Statistic | df | Sig. |
| Learning | Experimental | .889 | 32 | .003 |
| Outcome | Control | .935 | 32 | .054 |
| a. Lilliefors Significance Correction | | | | |

The normality test results indicate that the data were not normally distributed. The pvalue for the experimental class was 0.003 < 0.05, meaning the data were not normally distributed. In contrast, the p-value for the control class was 0.054 > 0.05, indicating a normal distribution. These findings show that at least one of the datasets was not normally distributed. Fitri et al. (2023, p. 70) stated that data not normally distributed meet the requirements for nonparametric analysis. Accordingly, the non-parametric test used in this study was the Mann-Whitney U test.

Hypothesis Test

The test score data were analyzed using the Mann-Whitney U test with the assistance of R Studio software. The results of the analysis are presented by table 5:

Table 5. Mann-Whitney U Test Results

| Ţ. | |
|------------------------|--|
| Component | Value |
| Method Tested | Experimental VS Control Group |
| U Statistic (W) | 265 |
| P-Value | 0,00088 |
| Alternative Hypothesis | Differece in central tendency $\neq 0$ |
| Continuity Correction | Applied |
| Warning Message | Exact p-value could not be computed due to tied ranks (identical values) |

The Mann-Whitney U test results indicate a difference in student learning outcomes between the Quizizz and paper-based test groups. The significance score (p-value) was 0.00088, which is less than the threshold of 0.05. This result leads to the acceptance of the alternative hypothesis (H₁) and the rejection of the null hypothesis (H₀). In other words, there is a statistically significant difference in learning outcomes between students assessed using Quizizz and those assessed using paper-based tests.

Discussion of Research Findings

The descriptive statistics in this study indicated that the average score of students taking paper-based exams was higher than those taking online-based exams. This finding is consistent with the study by Van Vo dan Csapó (2023), which showed that the overall average scores were more favorable in pencil-and-paper supervised tests compared to online tests. Saleh et al. (2022) explained that student test results from both web-based and paper-based formats showed similar averages and no specific trend, meaning that one format was not consistently superior to the other. Previous studies have suggested that paper-based methods can improve student scores (Pratiwi et al., 2024). J. Yu et al. (2022) and Ocal et al. (2022) also noted that the use of paper allows students to concentrate better, avoid distractions, retain information more

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effectively, and experience improved reading comprehension, which helps them choose correct answers more accurately. Furthermore, paper-based testing encourages students to read and understand questions with full concentration, without distractions from digital notifications (Petrucco, 2024; Díaz et al., 2024). Other findings have emphasized that handwriting plays a crucial role in deeper cognitive understanding for learners (van der Velden, 2023). Paper-based tests are also considered reliable instruments for evaluating student performance and should be used when computer-based assessments are not adequately facilitated, in order to prevent test anxiety caused by waiting in queues or other logistical issues (Ibaan et al., 2024). Therefore, in the context of vocational students, paper-based exams tend to result in higher scores than online-based exams.

These results contrast with the findings of Anggraini dan Erviana (2023), who stated that the use of Quizizz can enhance students' motivation and improve their learning outcomes. Quizizz has been shown to significantly increase interest, enjoyment, engagement, attention, and academic performance (Mesterjon et al., 2024). Similarly, Jalo et al. (2021) found that computer-based testing leads to better student performance compared to paper-based exams. In English language learning, computer-based tests have also yielded better results (M. A. Khan & Fareed, 2021). Quizizz is designed with colorful interfaces, memes, and leaderboards that can motivate students. Herawati dan Erawati (2023) further explained that Quizizz facilitates interactive and student-centered learning. Prior studies have consistently reported that Quizizz encourages students to be more active during the learning process, which tends to lead to improved learning outcomes. Additionally, digital assessments are more cost-effective, reduce administrative burdens, and eliminate the need for travel (Bandtel et al., 2022). Quizizz also enhances learning experiences, improves English language skills, and increases teaching efficiency (Niek & Abdul Aziz, 2022).

Nevertheless, the use of Quizizz imposes time limits that require students to think quickly while answering questions (Zulfa & Ratri, 2022). These studies also highlight that Quizizz is susceptible to technical issues, such as poor internet connectivity. Online testing can trigger fears related to technical failures, time constraints, and environmental distractions (Abumalik & Alqahtani, 2024). Computer-based testing may increase anxiety, be affected by noisy environments, and present difficulties in reading comprehension for students who are less comfortable with CBT (W. Yu & Iwashita, 2021). Meanwhile, paper-based tests remain the preferred choice among students for reading comprehension assessments, as computer use is often associated with eye strain, the need to type and click, and overall discomfort (M. A. Khan & Fareed, 2021). Students may also experience screen fatigue caused by excessive screen brightness while reading (Dasher & Pilgrim, 2022). Furthermore, features in e-books that are not designed to support reading comprehension may distract students and hinder understanding (J. Lim et al., 2021). Online examinations also raise concerns about the potential for academic dishonesty (Stevkovska, 2023; Taşkın & Kokoç, 2025). These factors may contribute to the relatively lower average scores observed in online-based assessments.

This study also revealed that there is a statistically significant difference between learning outcomes from online-based and paper-based examinations. This indicates that the assessment method—whether online-based or paper-based—significantly affects students' academic performance. These findings suggest that the results are valid and that the mode of assessment has a measurable impact on student scores. However, this finding contrasts with the study by Valentine et al. (2022), which reported no clearly observable or consistent mode effects in the literature comparing computer-based and paper-based exams in technical and computing education. Similarly, W. Yu dan Iwashita (2021) found no significant differences in test scores between computer-based and paper-based assessments. Paper-based tests allow students to work at their own pace, unlike Quizizz, which features real-time feedback and imposes time pressure that demands rapid reading skills (Fatimah, 2025). Emerson and MacKay (2011) also reported that students learning with paper performed 24% better than those learning online. Other findings have shown that students performed slightly better on paper-based assessments in terms of knowledge retention due to improved memory recall (Abumalik & Alqahtani, 2024). Prior research has consistently indicated that differences in testing methods affect student learning outcomes. Therefore, a significant difference exists between paper-based and online-based exam results.

CONCLUSION

This study found that the average scores of students taking paper-based exams were higher than those taking online-based exams. Although additional features in online-based assessments can enhance student engagement, motivation, and interactivity, time constraints, anxiety, screen fatigue, and digital notifications can reduce students' focus during the test. In contrast, paper-based assessments allow students to concentrate better, improve memory retention, and minimize distractions—resulting in higher learning outcomes. This study recommends further research to examine the consistency of these differences across other subjects and skill areas in vocational high schools (VHS).

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