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Differences in Student Enthusiasm and Mathematics Learning Outcomes in Online and Offline Oral Exams

Dzakiyyah Rosyidah Safinatunnajah[*], *Budi Manfaat, Nurma Izzati*

Tadris Matematika, Cirebon, Indonesia

[*]Correspondence: E-mail: nurma@syekhnurjati.ac.id

ABSTRACT

This study aims to investigate the differences in students' enthusiasm and mathematics learning outcomes between online and offline oral examinations. The research employed a quasi-experimental method with a counterbalanced design, involving 64 eighth-grade students. Enthusiasm data were collected using a Guttman scale, while learning outcomes were assessed through validated oral exams on Algebra and Linear Equations in One Variable (LEOV) materials. The Mann-Whitney U test revealed a significant difference in learning enthusiasm between the online and offline groups ($p = 0.005$), with higher enthusiasm observed in the offline group. Independent t-tests also indicated significant differences in mathematics learning outcomes for both Algebra ($p = 0.043$) and LEOV ($p = 0.014$). The large effect sizes ($d = 2.04$ for Algebra and $d = 2.45$ for LEOV) suggest a substantial practical impact of the examination mode. Therefore, offline oral examinations are proven to be more effective in enhancing students' enthusiasm and learning outcomes, particularly in mathematics education.

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1. INTRODUCTION

The advancement of digital technology over the past two decades has revolutionized various aspects of human life, including the field of education (Syelvia Putri & Syafitri, 2023). This transformation encompasses not only teaching and learning processes but also how educators assess and measure students' understanding of subject matter. In the context of mathematics education, assessment plays a crucial role, as mathematics requires deep conceptual understanding and systematic logical thinking (Susanti Telaumbanua *et al.,* 2023). One form of assessment that remains relatively underexplored is oral examination, particularly in digital contexts. Traditionally, oral examinations are known as assessment methods that enable teachers to directly evaluate students' critical thinking, mathematical communication, and conceptual comprehension. Through verbal interaction, teachers can gain deeper insights into how students process concepts and solve mathematical problems. Online oral examinations offer several advantages, such as flexibility in time and location, as well as efficiency in implementation. However, challenges such as unstable internet connections, limited non-verbal communication, and a lack of emotional connection between teachers and students may hinder the effectiveness of this assessment method (M. Riyan *et al*., 2022). In contrast, offline oral examinations are still regarded as an evaluative method that allows for more meaningful and natural two-way interactions. Additionally, students' enthusiasm toward assessment methods is also a critical factor in successful learning (Asria *et al*., 2021). High levels of enthusiasm often indicate intrinsic motivation, which correlates positively with academic achievement (Ariyani & Rahayu, 2019). Therefore, it is important to examine not only the differences in learning outcomes between online and offline oral examinations but also how students' enthusiasm varies across these two assessment methods.

This study stems from the need for a deeper understanding of the effectiveness and psychological impacts of two commonly used oral examination formats. By analyzing differences in students' learning outcomes and enthusiasm toward online and offline oral examinations, this research aims to provide empirical insights for teachers, curriculum developers, and education policymakers in designing evaluation strategies that are more adaptive, effective, and responsive to the dynamics of modern education and the diverse characteristics of learners.

2. METHODS

This study employed a quantitative approach using a quasi-experimental design based on a counterbalanced design. This design was selected to ensure that each group of students experienced both forms of oral examination online and offline in different sequences, thereby controlling for potential order effects that might influence the results. The study involved two classes with relatively homogeneous academic abilities, as well as two instructional units that were comparable in terms of difficulty level, content length, and conceptual complexity. (Izzati *et al*., 2024). The subjects of this study consisted of 64 seventh-grade students from two different classes. The sample was selected through purposive sampling, considering the homogeneity of both groups. Each group received both treatments in alternating order to minimize bias related to sequence effects. The study was conducted in two cycles, each focusing on a different topic. The first cycle centered on Algebra, during which the first group underwent an offline oral examination, while the second group participated in an online oral examination. In the second cycle, the topic was Linear Equations in One Variable (LEOV), with the treatments reversed: the first group took the exam online, while the second group took it offline. This pattern enabled a balanced analysis of the effects of examination mode on students' learning outcomes and enthusiasm. The structure of the research design is presented in **Table 1**.

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Table 1. Structure of the research.

Group I	X_1O_1	X_2O_2	O_3
Group II	X_2O_1	X_1O_2	O_3

Note: X_1 is the offline oral examination; X_2 is the online oral examination; O_1 is the mathematics learning outcomes on algebra; O_2 is the mathematics learning outcomes on LEOV; O_3 is the students' learning enthusiasm in online and offline examinations.

The research instruments consisted of two main types: an instrument to measure students' learning enthusiasm and an instrument to assess mathematics learning outcomes. Enthusiasm was measured using a scale based on the Guttman scale, which consisted of dichotomous statements (yes/no) following the principle of hierarchical responses. This scale included six indicators of enthusiasm: (1) Response, (2) Attention, (3) Concentration, (4) Willingness, (5) Awareness, and (6) Student Engagement during the examination. The Guttman scale was chosen due to its suitability for measuring the intensity or depth of attitudes through logically and consistently tiered responses. This instrument was validated by experts, and its reliability was tested using internal consistency measures. The second instrument was a mathematics achievement test consisting of open-ended questions answered verbally during the oral examination sessions. The questions were designed based on competency indicators relevant to each topic, Algebra and Linear Equations in One Variable (LEOV). This test underwent content validity evaluation by subject matter experts and reliability testing through a limited trial.

Data collection was carried out in two stages: (1) the administration of oral examinations both online and offline to obtain learning outcome data, and (2) the completion of the enthusiasm scale immediately after the examination. Data were analyzed using quantitative descriptive methods to map students' enthusiasm profiles and learning outcomes under each examination condition, and a paired t-test was used to examine the significance of differences between the two treatments. All research procedures were conducted following research ethics, including obtaining formal permission from the school, securing participant consent, and ensuring confidentiality and the voluntary nature of participation throughout the study.

3. RESULTS AND DISCUSSION

This study aims to investigate whether there are differences in students' enthusiasm and mathematics learning outcomes in the implementation of oral examinations conducted online and offline. In the current era of technological advancement and educational digitalization, assessment methods have undergone significant changes, including the shift in oral examinations, which are now conducted not only face-to-face (offline) but also via online platforms. This shift raises new questions regarding the effectiveness of each method, particularly in the context of mathematics, a subject that demands deep conceptual understanding and the ability to think logically and critically. Oral examinations are a form of assessment that evaluates not only students' cognitive knowledge but also their communication skills, verbal reasoning, and problem-solving abilities (Skills *et al*., 2021). When conducted offline, oral examinations allow for direct interaction, which can strengthen the teacher-student relationship, enable real-time feedback, and provide teachers with access to students' facial expressions and body language, often reflective of their understanding and readiness. However, offline oral exams can also induce anxiety or psychological pressure in some students, especially in formal settings or when facing teachers directly (Kamelia, 2019).

On the other hand, online oral examinations offer flexibility in terms of time, location, and atmosphere, which can increase comfort and confidence for certain students. Nevertheless, this method faces its challenges, such as limited social interaction, technical issues like unstable

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internet connections, and a potential decrease in the intensity of two-way communication. In this context, students' learning enthusiasm serves as a crucial indicator for understanding how each examination method influences their motivation, engagement, and mental preparedness, particularly in mathematics, which many students perceive as a difficult subject.

In addition to enthusiasm, this study also focuses on students' mathematics learning outcomes as a key variable reflecting the effectiveness of the assessment method used. By comparing the learning outcomes obtained through online and offline oral examinations, the study seeks to reveal whether there are significant differences in academic achievement based on the mode of evaluation. This research is important for providing deeper insights into how assessment methods impact learning quality and student performance, and it offers valuable guidance for teachers and educational institutions in selecting the most appropriate, efficient, and supportive evaluation strategies to optimize students' competency development.

3.1. Students' Learning Enthusiasm

Table 2 summarizes the descriptive statistics of students' learning enthusiasm data for those who participated in oral examinations conducted both offline and online. The table presents key information that reflects the general trends in learning enthusiasm within each student group.

Table 1. Descriptive statistics of student learning enthusiasm data.

Data	Statistic	
Online	Mean Rank	26.03
	Sum of Ranks	833.00
	N	32
Offline	Mean Rank	38.97
	Sum of Ranks	1247.00
	N	32

Based on the descriptive analysis results presented in **Table 2**, the group of students who participated in offline oral examinations had a higher mean rank of 38.97, while the group that took the oral exams online had a mean rank of 26.03. Each group consisted of 32 students, making the total number of respondents in this study 64. The total sum of ranks for the offline group was 1247.00, compared to 833.00 for the online group. These data descriptively indicate that students who took the oral exams offline demonstrated a higher level of learning enthusiasm compared to those who took the exams online. Subsequently, the data were analyzed using the non-parametric Mann-Whitney U test. This test was selected due to the non-normal distribution of the data and the ordinal nature of the measurement.

Table 2. Result of the Mann-Whitney U.

Test statistics	score
Mann-Whitney U	305,000
Wilcoxon W	833,000
Z	-2,839
Asymp. Sig. (2-tailed)	0,005

Based on the results of the Mann-Whitney U test displayed in the Test Statistics in **Table 3**, a U value of 305.000 was obtained, with a Z value of -2.839 and an asymptotic significance (Asymp. Sig. 2-tailed) value of 0.005. This significance value is smaller than the predetermined significance

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level of 0.05, indicating that there is a statistically significant difference in the learning enthusiasm between students who took the oral exam online and those who took it offline. The negative Z value suggests that the direction of the difference favors the offline group, which exhibited higher learning enthusiasm compared to the online group. Therefore, this analysis indicates that the mode of oral examination, whether online or offline, has a significant impact on students' learning enthusiasm.

3.2. Mathematics Learning Outcomes

Table 4 presents a summary of the descriptive statistics regarding students' mathematics learning outcomes obtained through the implementation of oral examinations conducted both online and offline. The assessment was based on two main topics: Algebra and Linear Equations in One Variable (LEOV).

Table 3. Statistical description of mathematics learning outcomes.

Data	Statistics	Group I	Group II
Algebra Scores	Mean	65.31	53.44
	Median	65.00	50.00
	Std. Deviation	21.89	24.09
	Minimum	30	10
	Maximum	100	100
LEOV Scores	Mean	51.56	64.55
	Median	50.00	60.00
	Std. Deviation	23.55	19.10
	Minimum	10	30
	Maximum	100	100

From these results, it can generally be concluded that the class that was first given the offline oral examination treatment tends to achieve higher scores, both in Algebra and Linear Equations in One Variable (LEOV). However, further inferential statistical analysis is needed to confirm whether this difference is statistically significant.

Table 4. Independent T-Test results.

Data	Independent Samples Test	
	T	Sig. (2-tailed)
Learning Outcomes of Algebra	2.066	0.043

The displayed significance value is 0.043 (which is less than 0.05), meaning that there is a difference in the mean exam scores for the Algebra topic between the offline and online examinations.

Table 5. Mean score of algebra.

Data	Group	Mean
Learning outcomes of algebra	Group I (*Offline*)	65.31
	Group II (*Online)*	53.44

The average exam score for the Algebra topic in the Offline group is higher (better) than that of the students in the Online group. This is shown in the Group Statistics table, where the mean score for the Offline exam is 65.31, while the mean score for the Online exam is 53.44. This indicates that the offline oral examination method has a positive impact on the Algebra topic. The effect size will be calculated using the formula for two independent groups. This calculation

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is conducted to determine the magnitude of the effect that the oral examination method has on mathematics learning outcomes. We can get $d = \frac{65.31-53.44}{\sqrt{\frac{24.044^2+21.699^2}{32-1}}} = 2.04$.

Since the value of *d* is greater than 1, the positive effect is in the very large category. This means that the implementation of offline oral examinations has a very large positive impact on improving mathematics learning outcomes. For the Algebra topic, offline oral examinations significantly improve mathematics learning outcomes compared to online oral examinations.

The results of the independent t-test analysis will be presented for the students' learning outcomes on the topic of Linear Equations in One Variable (LEOV), in order to determine whether there is a significant difference between the groups that took the oral exam online and those who took it offline (**Table 7**).

Table 6. Independent t-test results.

Data	**Independent Samples Test**	
	T	**Sig. (2-tailed)**
Learning Outcomes of LEOV	2.517	0.014

As shown in **Table 7**, the displayed significance value is 0.014 (which is less than 0.05), meaning that there is a difference in the mean exam scores for the Linear Equations in One Variable (LEOV) topic between the offline and online examinations. The next analysis is LEOV, shown in **Table 8**.

Table 7. Mean score of LEOV.

Data	**Group**	**Mean**
Learning Outcomes of LEOV	Group II (*Offline*)	64,55
	Group I (*Online*)	51,56

As shown in **Table 8**, the average exam score for the Linear Equations in One Variable (LEOV) topic in the Offline group is higher (better) than that of the students in the Online group. This is shown in the Group Statistics table, where the mean score for the Offline exam is 64.55, while the mean score for the Online exam is 51.56. This indicates that the offline oral examination method has a positive impact on the LEOV topic.

Next, the effect size will be calculated using the formula for two independent groups. This calculation is performed to determine the magnitude of the effect that the oral examination method has on mathematics learning outcomes. We can get $d = \frac{64.55-51.56}{\sqrt{\frac{19.380^2+22.159^2}{32-1}}} = 2.45$.

The positive effect is in the very large category. This means that offline oral examinations have a very large positive impact on students' learning outcomes. Finally, this study adds new information regarding mathematics education, as reported elsewhere (Hashim *et al*., 2021; Anggraini *et al*., 2024; AJenikoko & Ogunwuyi, 2022; Abidin *et al*., 2024).

4. CONCLUSION

Based on the results of the study, the researcher concludes that there is a significant difference between online and offline oral examinations in terms of students' enthusiasm for learning and their mathematics learning outcomes. The results of the Mann-Whitney U test indicate that students exhibit a higher level of enthusiasm when taking oral exams offline compared to online. This finding suggests that direct interaction during offline oral exams enhances students' motivation and engagement in mathematics learning.

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Furthermore, further analysis shows a significant difference in students' learning outcomes, both in the Algebra and Linear Equations in One Variable (LEOV) topics. This difference is reinforced by a high effect size value of 2.04 for Algebra and 2.45 for LEOV. These values fall within the large effect category, indicating that the method of conducting the oral exam not only has a statistical impact but also a practical one on students' learning achievements.

Overall, the mode of conducting oral exams plays a crucial role in determining students' enthusiasm for learning and their learning outcomes. Offline oral exams have proven to have a more significant positive impact than online exams, both in terms of student engagement in the learning process and the outcomes achieved. Therefore, the findings of this study provide important implications for educators and policymakers to consider the effectiveness of direct interaction in the evaluation process, especially in subjects that require conceptual understanding and logical reasoning, such as mathematics. This discovery is expected to serve as a basis for designing more effective evaluation strategies that focus on improving the quality of the learning process and student outcomes.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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