# Computer-Based Examinations on the Academic Performance of Grade 10 Learners

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## Abstract

This study explores the impact of computer-based examinations on the academic performance of Grade 10 learners at Tikalaan National High School during the 2023-2024 school year, particularly in Technology and Livelihood Education (TLE). By comparing pretest and posttest results of control and experimental groups, the research evaluates the effectiveness of these exams and their implications for TLE teaching. Motivated by declining student competence and inspired by DepEd initiatives, the school adopted computer-based exams. Using a quasi-experimental method, the study assesses cognitive load and technology acceptance, revealing significant improvements in academic performance and positive shifts in attitudes.

Involving 70 learners, the study used a 50-item standardized test and a 10-item survey to measure performance and attitudes. Statistical analyses confirmed that computer-based exams enhance academic performance and student engagement. Initially, the experimental group had negative attitudes due to anxiety and skepticism, but posttest results showed notable improvements attributed to immediate feedback and personalized learning.

The study concludes that computer-based exams significantly boost academic performance and positively influence attitudes among Grade 10 TLE learners. Recommendations include workshops and training for effective integration, collaboration with technology experts, resource allocation for hardware and software, and supporting teachers with innovative methods and updated computer labs.

**Keywords:** *Academic Performance; Computer- based examination; TLE.*

## I. Introduction

Education in the Philippines has traditionally relied on paper-based assessments, which are resource-intensive and time-consuming. Despite the Department of Education (DepEd) allocating significant funds for creating instructional and assessment materials, traditional methods pose challenges such as overwhelming teachers with manual grading and causing delays in feedback, which can confuse students. These methods also fail to accommodate diverse learner needs, particularly disadvantaging students with learning disabilities or those who benefit from interactive content.

Tikalaan National High School, although remotely located, has been equipped with computers and educational technologies through the DepEd Computerization Program. This technological infrastructure offers an opportunity to enhance the teaching and learning process. The school was a pilot for the RX Adobe

program, a computer-based examination initiative. Observations by a TLE teacher and the Curriculum Management Support System report indicate that students perform better with visually supportive and engaging assessments.

Computer-based examinations (CBEs) address traditional assessment challenges by engaging students with interactive elements and providing immediate feedback, thus promoting continuous learning. CBEs can be customized for individual needs and streamline the assessment process, saving time for teachers and reinforcing digital literacy skills. In Talakag District II, 85% of teachers are proficient in ICT, which supports the transition to CBEs and fosters a collaborative learning environment. This proficiency among teachers facilitates the effective implementation of CBEs at Tikalaan National High School, enhancing the overall learning experience.

The global shift towards digital learning, accelerated by the COVID-19 pandemic, highlights the importance of integrating technology into educational assessment. Many countries have successfully adopted CBEs, improving efficiency and educational outcomes. This study on the impact of CBEs on Grade 10 learners at Tikalaan National High School aims to provide insights into their benefits and challenges, with the goal of improving educational standards and enriching the learning experience for students in the Philippines.

## II. Methodology

This study employs a quasi-experimental design to examine the impact of computer-based examinations (CBE) on academic performance in Technical and Livelihood Education (TLE). The research was conducted at Tikalaan National High School in Talakag, Bukidnon, Philippines, involving seventy Grade 10 learners from two sections. The control group, Section A with 35 students, was assessed using traditional methods, while the experimental group, Section B with 35 students, utilized computer-based assessments. Purposive sampling was used to select the respondents, ensuring relevance to the study's objectives.

The research instruments included standardized Quarter examinations provided by the DepEd Bukidnon division and a survey adapted from Tella and Bushron's (2012) study to assess attitudes towards CBE. Data collection spanned twelve weeks, with both groups undergoing pretests and posttests. The experimental group participated in computer-based activities and quizzes, while the control group continued with traditional paper-based methods. This approach allowed for a comprehensive evaluation of academic performance and attitudes towards CBE.

Data analysis involved descriptive statistics to describe academic performance levels and variability, as well as T-tests and F-tests to determine significant differences between pretest and posttest scores. Validated instruments ensured the reliability and consistency of the assessment tools. Ethical considerations included obtaining consent from participants and adhering to institutional protocols.

## III. Results and Discussion

**Problem 1: How effective is computer-based examinations in terms of the academic performance in TLE on the pretest and posttest of the control and experimental group and their attitude towards the computer-based examination on the experimental group.**

**Table 1. Distribution of respondents in terms of their performance in the pretest**

| Group | Average | Equivalent Rating | Description |
|---|---|---|---|
| **Control** | 16.8 | 33.6% | Fair |
| **Experimental** | 15.8 | 31.6% | Fair |

Legend: 82-100%: Outstanding, 62-81%: VS, 42-61%: Satisfactory, 22-41%: Fair, 0-21%: Poor

Table 1 showed the Distribution of Respondents in terms of Academic Performance in the pretest of both control and experimental group. The control group, which received traditional instruction, had **29 learners** who scored an equivalent rating of **33.6%**, a **Fair** description that interprets to **developing**. In contrast, the experimental group, which received computer-based examination, had **31 learners** who got a score of **31.6%** still a **Fair** description that interprets to **developing**.

The pretest results for both the control and experimental groups indicate that their baseline understanding of Technology and Livelihood Education (TLE) concepts is at a **developing** stage, characterized by a **fair** description but below the desired proficiency level. These scores highlight that prior to any interventions, including computer-based assessments, both groups had primarily relied on traditional assessment methods.

Research by Smith et al. (2005) has underscored how traditional assessment methods can impede student performance, especially when questions necessitate clear visual representations. This limitation often arises from issues like blurry or poorly rendered images in printed materials, hindering learners' accurate responses. In this study, we observed similar challenges, particularly in the initial performance of the experimental group. Their underperformance could be attributed to their unfamiliarity with using computers and the new assessment platform. The abrupt shift in assessment methods may have overwhelmed some students, impacting their performance initially.

The findings from Pachler et al. (2018) and Molin et al. (2018) further emphasize the hurdles associated with students' unfamiliarity with new assessment platforms, highlighting the critical need for comprehensive implementation strategies and adequate training. Zheng's meta-analysis (2016) also reinforces this point, demonstrating how students' lack of familiarity with computer-based learning environments can negatively affect their academic performance. Moreover, Hussain et al.'s (2018) exploration of educational data mining and analysis revealed the significant impact of introducing new assessment methods alongside technological unfamiliarity on students' academic outcomes. This underscores the potential exacerbation of challenges for students who are not well-versed in technology.

However, despite these challenges, the pretest outcomes in our study signify an initial learning phase for both groups in grasping TLE concepts. This highlights the potential benefits of a deliberate transition to technology-based assessments. Such a transition not only offers promise in enhancing academic outcomes but

also fosters a more inclusive learning environment by addressing technological barriers and providing equal opportunities for all students to excel.

**Table 2. Distribution of respondents in terms of their performance in the posttest**

| Group | Average | Equivalent Rating | Description |
|---|---|---|---|
| **Control** | 40.3 | 80.6 | Very Satisfactory |
| **Experimental** | 47.2 | 94.4 | Outstanding |

Legend: 82-100%: Outstanding, 62-81%: VS, 42-61%: Satisfactory, 22-41%: Fair, 0-21%: Poor

Table 2 shows the Distribution of Respondents concerning Academic Performance in the Posttest for both the control and experimental groups. The posttest analysis reveals notable differences in performance between the control and experimental groups, shedding light on the impact of interventions such as computer-based examinations in Technology and Livelihood Education (TLE).

The control group, without intervention, achieved an average posttest score of **40.3**, corresponding to **80.6%** and classified as **"Very Satisfactory."** This improvement from their pretest average of **16.8** showcases the efficacy of traditional teaching methods in elevating student performance. In contrast, the experimental group, with intervention, achieved an average posttest score of **47.2**, equivalent to **94.4%** and classified as **"Outstanding."** This substantial improvement from their pretest score of **15.8** underscores the potential of computer-based assessment approaches in enhancing understanding and engagement, ultimately leading to higher academic achievement.

The considerable disparity in posttest scores between the control and experimental groups strongly implies the superiority of computer-based assessments over traditional methods in improving student performance in TLE. Furthermore, computer-based examination offers a dynamic learning experience by engaging students actively, as supported by studies such as Clark (2018) and Van der Kleij et al. (2015). These studies emphasize the interactive nature of computer-based learning tools, leading to higher retention and better understanding of the material through immediate feedback.

Educational data mining techniques, as explored by Hussain et al. (2018), can extract valuable insights from student performance data generated by computer-based assessments. Analyzing this data can reveal patterns, trends, and areas of improvement, enabling educators to make informed decisions about instructional strategies and interventions, thereby enhancing the efficacy of teaching and learning processes.

In today's digital era, proficiency in technology is a valuable skillset, as noted by Zheng (2016). Integrating computer-based assessments prepares students for real-world scenarios where digital literacy and technological competence are essential, aligning with contemporary technological trends and equipping students with practical skills for future success.

Additionally, computer-based examination improves accessibility and inclusivity in education, as supported by research from Pachler et al. (2018) and Molin et al. (2017). These studies highlight features such as screen readers, adjustable font sizes, and language translation tools that cater to diverse learning needs, fostering equity and ensuring all students can participate actively and achieve their full potential.

Considering these insights and research support, it becomes evident that technology-based examination offers numerous advantages, including enhanced engagement, personalized learning experiences, data-driven insights, preparation for the digital age, and improved accessibility and inclusivity. These benefits contribute significantly to the effectiveness of such approaches in improving student performance and fostering a more dynamic and inclusive educational environment.

**Table 3. Distribution of respondents in terms of their attitude towards the use of computer-based examinations of the experimental group in the pretest**

| Indicators | Weighted Mean | SD | Description |
|---|---|---|---|
| In my opinion, computer-based examinations effectively assess my knowledge and skills | 2.2 | 0.47 | Disagree |
| I consider computer-based examinations to be a viable alternative to traditional paper-and-pencil tests. | 2.2 | 0.60 | Disagree |
| I feel at ease and confident when taking exams on a computer. | 2.3 | 0.68 | Disagree |
| Navigating and using computer-based examinations is challenging, in my view. | 2.1 | 0.38 | Disagree |
| Immediate feedback on my performance is a key reason I prefer computer-based examinations. | 2.1 | 0.57 | Disagree |
| I hold the belief that computer-based examinations foster a fair and unbiased assessment of students' abilities. | 2.3 | 0.76 | Disagree |
| I experience anxiety and stress when faced with computer-based examinations. | 2.4 | 0.65 | Disagree |
| Maintaining concentration during computer-based examinations is a challenging aspect for me. | 2.3 | 0.63 | Disagree |
| The convenience of accessibility and ease of submission are aspects of computer-based examinations that I appreciate. | 2.4 | 0.70 | Disagree |
| I envision computer-based examinations as integral to the future of assessments in education. | 2.3 | 0.57 | Disagree |
| **Overall** | **2.3** | **0.06** | **Disagree** |

Legend: 3.25-4.0: Strongly agree, 2.25-3.24: Agree, 1.75-2.44: Disagree, 1.00-1.74: Strongly Disagree

Table 3 presents the distribution of respondents in terms of their attitude towards computer-based examinations of the experimental group during the pretest phase, The overall **weighted mean of 2.3 (SD=0.06)**, falling into the **"Disagree"** category, indicates a general disagreement with positive statements regarding computer-based examinations. It is evident that students initially held negative perceptions about these assessments. This initial skepticism or discomfort among students is crucial to acknowledge, as it sets the groundwork for understanding the impact of computer-based exams not only on academic performance but also on student attitudes and perceptions.

**Indicator 7 & 9** received the highest mean score, **"I experience anxiety and stress when faced with computer-based examinations"** and **"The convenience of accessibility and ease of submission are aspects of computer-based examinations that I appreciate"** with a **mean of 2.4 (SD= 0.65 & 0.70)**,

describe as **Disagree.** This suggests several important insights. Firstly, most students do not find computer-based exams particularly stressful, indicating a positive attitude and comfort towards this format. This reflects a general acceptance or neutrality towards these assessments, suggesting that students are comfortable and confident in taking them.

Secondly, the disagreement with the statement about appreciating the convenience and ease of submission suggests that students either do not find these aspects significantly beneficial or take them for granted. This neutrality hints at potential areas for improvement, as enhancing the system to make these features more noticeable and appreciated could further improve the student experience. On the other hand, the disagreement with the convenience and ease of submission aspect indicates that students may not perceive computer-based assessments as user-friendly or accessible. This could be due to issues such as difficulty navigating the assessment platform, challenges in submitting answers or files, or a lack of clarity in instructions related to the submission process.

In Contrast, **indicator 4 & 5**, "**Navigating and using computer-based examinations is challenging, in my view" & "Immediate feedback on my performance is a key reason I prefer computer-based examinations"** received the lowest **mean score of 2.1 (SD=0.38 & 0.57)** describe as **Disagree** indicating that most learners strongly disagree with this statement. This strong disagreement suggests that most learners do not find computer-based examinations challenging in terms of navigation and usage, implying a sense of comfort and confidence in using assessment platforms and tools. Similarly, the disagreement indicates that immediate feedback on performance is not a primary factor influencing learners' preference for computer-based examinations, although it is still appreciated. This nuanced view reflects a positive acceptance of computer-based examination, highlighting learners' adaptability and comfort with digital assessment methods.

It's essential to monitor how these attitudes evolve over the course of the study and with increased exposure to computer-based assessments. Research by Smith et.al (2019), emphasizes the importance of addressing student anxiety and providing adequate support when introducing new educational technologies. By addressing these initial challenges and emphasizing the benefits, educators can help students appreciate the value of computer-based examinations and ultimately improve academic outcomes in Technology and Livelihood Education (TLE)

The experimental group exhibits a generally negative or disagreeing attitude towards various aspects of computer-based examinations during the pretest phase. This reaction is expected as learners are accustomed to traditional assessments, initially finding computer-based assessments unfamiliar. These findings emphasize the need to address these concerns and enhance the user experience to improve acceptance and effectiveness of computer-based examination systems.

**Table 4. Distribution of respondents in terms of their attitude towards the use of computer-based examinations of the experimental group in the posttest.**

| Indicators | Weighted Mean | SD | Description |
|---|---|---|---|
| In my opinion, computer-based examinations effectively assess my knowledge and skills | 3.6 | 0.61 | Strongly Agree |
| I consider computer-based examinations to be a viable alternative to traditional paper-and-pencil tests. | 3.8 | 0.41 | Strongly Agree |
| I feel at ease and confident when taking exams on a computer | 3.8 | 0.41 | Strongly Agree |
| Navigating and using computer-based examinations is challenging, in my view. | 3.6 | 0.55 | Strongly Agree |
| Immediate feedback on my performance is a key reason I prefer computer-based examinations. | 3.3 | 0.52 | Strongly Agree |
| I hold the belief that computer-based examinations foster a fair and unbiased assessment of students' abilities. | 3.7 | 0.47 | Strongly Agree |
| I experience anxiety and stress when faced with computer-based examinations. | 3.8 | 0.38 | Strongly Agree |
| Maintaining concentration during computer-based examinations is a challenging aspect for me. | 3.6 | 0.55 | Strongly Agree |
| The convenience of accessibility and ease of submission are aspects of computer-based examinations that I appreciate. | 3.8 | 0.47 | Strongly Agree |
| I envision computer-based examinations as integral to the future of assessments in education. | 3.5 | 0.51 | Strongly Agree |
| **Overall** | **3.6** | **0.49** | **Strongly Agree** |

Legend: 3.25-4.0: Strongly agree, 2.25-3.24: Agree, 1.75-2.44: Disagree, 1.00-1.74: Strongly Disagree

Table 4 provides a full assessment of the shift in views regarding computer-based examinations within the experimental group during the posttest phase. The overall weighted **mean of 3.6 (SD=0.49)** describes as **Strongly agree** indicates a considerable agreement with favorable remarks concerning computer-based assessments, representing a significant improvement from the pretest phase. This shows that students' initial skepticism and uneasiness were effectively resolved through the course of the study. This shift can be ascribed to various causes, including increased familiarity with the computer-based format, focused support and training provided during the intervention, and positive reinforcement from observing their improved performance.

The indicators with the highest mean were **2,3, 7 & 9**, **"I consider computer-based examinations to be a viable alternative to traditional paper-and-pencil tests", I feel at ease and confident when taking exams on a computer", "I experience anxiety and stress when faced with computer-based examinations", & "The convenience of accessibility and ease of submission are aspects of computer-based examinations that I appreciate"** with the **mean=3.8 (SD=0.41, 0.41, 0.38, 0.47)** describe as **strongly agree.** This data indicates a highly positive perception among students towards computer-based examinations. The strong agreement with **Indicator 2** suggests that students widely accept computer-based exams as a

feasible alternative to traditional methods. This shift suggests that students recognize the benefits of digital assessments, such as increased interactivity, multimedia integration, and adaptability, which traditional paper-and-pencil tests may lack. This recognition aligns with contemporary educational trends emphasizing the integration of technology to enhance learning experiences.

The strong consensus reflected in **Indicator 3**, highlighting students' comfort and confidence in completing exams via computer, underscores the pivotal role of user experience in assessment design. Elements such as user-friendly interfaces, explicit instructions, and accessible tools play a crucial role in elevating students' comfort levels and overall performance during computer-based assessments. This underscores the imperative for assessment platforms to prioritize usability and accessibility, ensuring that students can seamlessly demonstrate their knowledge without encountering technological obstacles.

Similarly, the agreement observed in **Indicator 7**, despite its mention of anxiety and stress, implies that students may acknowledge these emotions while still embracing the format positively. This nuanced perspective suggests that students value the benefits of computer-based assessments enough to navigate any accompanying challenges, further highlighting the adaptability and resilience fostered by digital learning environments.

Furthermore, the robust agreement noted in **Indicator 9** regarding the convenience and simplicity of submission accentuates the tangible advantages of computer-based assessments. The streamlined process of submitting, accessing, and reviewing assessments not only enhances operational efficiency but also alleviates administrative burdens for both students and educators. This streamlined workflow promotes timely feedback, facilitating a continuous learning cycle that fosters heightened student engagement and facilitates ongoing progress.

Conversely, **indicator 5** recorded the **lowest mean at 3.3 (SD=0.52),** described as **"Strongly Agree"** with the statement, **"Immediate feedback on my performance is a key reason I prefer computer-based examinations."** While this score still falls within the "Strongly Agree" category, it is slightly lower compared to the other indicators, indicating that although students highly value prompt feedback, there may be areas for improvement in how feedback is delivered or utilized. This highlights the necessity for further enhancement in the feedback systems of computer-based assessments to ensure they effectively meet students' expectations and needs. Offering more comprehensive, constructive, and actionable feedback could significantly improve the efficacy of computer-based exams and further enhance students' learning outcomes.

The positive shift in attitudes is further corroborated by Johnson et.al (2022), who found that students' confidence in using technology for assessments increased with familiarity and positive reinforcement. This consistency with prior studies underlines the necessity of providing proper training and assistance to students when they move to new evaluation methodologies. Additionally, the increase in views towards computer-based examinations implies that students appreciate the benefits of instant feedback and the convenience of digital assessments, which can lead to a more efficient and effective learning process.

**Problem 2: Is there a significant difference in the learners' academic performance in TLE on the pretest of the control and experimental group?**

**Table 5. Test statistics on the comparison of grade 10 learners' academic performance in the TLE (Technology and Livelihood Education) during the pretest of the control and experimental group.**

| Group | N | Pretest | SD | Df | p-Value | Interpretation |
|---|---|---|---|---|---|---|
| **Control** | 35 | 16.8 | 5.44 | 34 | 0.495 | No Significant Difference |
| **Experimental** | 35 | 15.8 | 3.55 | 34 | 0.365 | No Significant Difference |

Legend: NS= not significant at α = 0.05, if p-value > 0.05;** S = significant if p-value<0.05

Table 5 presented the test statistics on the comparison of grade 10 learners' academic performance in TLE during the pretest of the control and experimental group. The control group, consisting of 35 students, had a mean pretest score of **mean= 16.8 (SD=5.44),** with a p-Value of 0.495. while the experimental group, also with 35 students, demonstrated a lower mean pretest score of **mean=15.8 (SD=3.55), with a p-value of 0.365.** Both the p-values suggested that this disparity was not statistically significant.

The lack of statistical significance in the pretest comparison does not discount the potential impact of the intervention; rather, it indicates the need for a nuanced analysis. One insight is that while both groups started at similar proficiency levels, there may be qualitative differences in their understanding and approach to TLE concepts. These nuances could become more apparent in posttest analyses, offering a more comprehensive view of the intervention's effects.

The observation of modest mean scores underscores the broader challenge of ensuring adequate subject-matter competency among students. This suggests a potential gap in foundational knowledge or teaching methodologies that could be addressed through targeted interventions and instructional adjustments. Garcia et al.'s (2019) emphasis on early diagnostic assessments aligns with this perspective, highlighting the importance of identifying and remedying knowledge gaps early in the learning process.

Furthermore, considering contextual factors such as students' socio-economic backgrounds, learning styles, and access to educational resources can enrich the understanding of academic performance variations. This holistic approach to analysis not only uncovers nuanced insights but also informs targeted interventions and instructional strategies tailored to meet the diverse needs of learners.

The pretest comparison serves as a baseline for understanding initial proficiency levels and sets the stage for deeper investigations into the intervention's impact. By examining qualitative differences, addressing knowledge gaps early, refining intervention strategies, and considering contextual nuances, educators can enhance the effectiveness of interventions and foster improved academic outcomes in TLE and beyond.

**Problem 3: Is there a significant difference in the learners' academic performance in TLE on the posttest of the control and experimental group?**

**Table 6. Test Statistics on the Comparison of Grade 10 Learners Academic Performance in the Posttest of the Control and Experimental Group**

| Group | N | Post - test | SD | Df | p-Value | Interpretation |
|---|---|---|---|---|---|---|
| Control | 35 | 40.4 | 6.97 | 34 | 0.004 | With Significant Difference |
| Experimental | 35 | 47.2 | 4.07 | 34 | 0.001 | With Significant Difference |

Legend: NS= not significant at α = 0.05, if p-value > 0.05;** S = significant if p-value<0.05

Table 6 presents a meticulous comparison of academic performance during the posttest phase between the control and experimental groups. The Control group, comprising 35 students, achieved a mean score of **40.4 (SD=6.97)**, with a p-value of **0.004**. In contrast, the Experimental group demonstrated a notably higher mean score of **47.2 (SD=4.07)**, with a p-value of **0.001**. Both p-values signify a **significant difference** between the two groups, indicating distinct outcomes derived from their respective assessment methodologies. The control group's p-value serves as a benchmark, reflecting the expected results from traditional assessment methods.

The discernible disparity in academic performance between the two groups underscores the typical outcomes associated with conventional teaching and assessment practices. This disparity is instrumental in contextualizing the improvements observed in the Experimental group, illustrating the intervention's efficacy in surpassing traditional methods. The significant enhancement in both groups strongly implies the effectiveness of computer-based examinations compared to traditional assessment methods, with the Experimental group showcasing a clear advantage.

The outcome suggests that integrating technology into assessment methodologies can yield substantive improvements in learning outcomes among Grade 10 learners. This finding aligns with contemporary research, including the (2021) study by Smith et al., which empirically demonstrates the positive impact of technology-enhanced assessments on student learning outcomes. The substantial increase in scores not only reflects academic proficiency but also indicates active improvement facilitated by computer-based tests.

Moreover, Johnson et al. (2021) conducted research focusing on the impact of technology-enhanced assessments on academic performance, mirroring the significant improvements observed in the experimental group. The substantial progress in the experimental group underscores the intervention's significant impact on bolstering academic outcomes in Grade 10 students in TLE. These findings underscore the effectiveness of the experimental intervention and highlight its potential to positively contribute to educational practices aimed at enhancing student performance and learning outcomes.

**Problem 4: Is there a significant effect of computer-based examinations on learners' academic performance?**

**Table 7. Test Statistics on the Learners Academic Performance on the use of computer-based examination.**

| Group | N | Academic Performance | | T-test | f-test | Interpretation |
|---|---|---|---|---|---|---|
| | | Pretest | Posttest | | | |
| Control | 35 | 16.8 | 40.4 | 9.23 | 0.50 | No Significant Difference |
| Experimental | 35 | 15.8 | 47.2 | 17.4 | 2.00 | With Significant Difference |

Table 7 shows the test statistics on the comparison of Grade 10 learners' academic performance on the use of computer-based examination of the control and experimental group in TLE (Technology and Livelihood Education). The control group exhibited an increase in academic performance from a **pretest mean of 16.8** to a **posttest mean of 40.4** with a **T-test value of 9.23** and an **F-test value of 0.50**, indicating **no significant difference**.

In contrast, the experimental group showed a substantial improvement, with their academic performance rising from a pretest mean of 15.8 to a posttest mean of 47.2. This group exhibited a T-test value of 17.4 and an F-test value of 2.00, suggesting a **significant difference**. The introduction of computer-based examinations triggered a remarkable surge in academic achievement, surpassing the control group's progress and highlighting the transformative impact of interactive learning environments facilitated by technology.

The Control Group's significant change in academic performance, as indicated by a high t-test value of 9.23, reflects the impact of their instructional methods on student learning outcomes. However, despite this improvement, the variability of scores within the control Group remained relatively stable.

On the other hand, the Experimental Group's dramatic increase in academic performance, evidenced by a t-test value of 17.4, underscores the positive impact of computer-based examinations on student learning outcomes. The interactive nature of these exams, coupled with immediate feedback mechanisms, nurtured continuous improvement and reduced test anxiety, fostering a conducive learning environment.

The human dimension of education is integral to this narrative. Students in the Experimental Group engaged in a personalized learning journey that resonated with their digital fluency and preferences. The interactive, personalized nature of computer-based assessments empowered students, contributing to their academic success.

The difference in outcomes between the two groups can be attributed to the interactive and engaging nature of computer-based examinations. Immediate feedback, personalized learning experiences, and reduced anxiety contributed to improved educational outcomes, as supported by recent studies. The implementation of computer-based examinations significantly enhances learners' academic performance, providing a platform for efficient learning, engagement, and improved.

**Problem 5: What are the implications to the findings of the study in teaching TLE (Technology and Livelihood Education) to Grade 10 learners?**

**Implication to TLE (Technology and Livelihood Education)**

Integrating technology-driven approaches like computer-based examinations into Technology and Livelihood Education (TLE) brings about transformative implications that redefine the educational landscape and prepare students for success in the digital age. Firstly, this integration aligns TLE education with the rapidly evolving technological landscape, ensuring that students not only acquire technical skills but also develop a deep understanding of how technology intersects with contemporary workplaces. This alignment is crucial for bridging the gap between classroom learning and real-world application, equipping students with the relevant competencies needed for modern career pathways.

Moreover, the integration of technology fosters a culture of innovation and adaptability among students. Exposure to technology-driven learning environments encourages creative problem-solving, critical thinking, and an entrepreneurial mindset. Students learn to navigate the dynamic nature of technology across various livelihood sectors, preparing them for the challenges and opportunities presented by rapid technological advancements.

Furthermore, leveraging technology in TLE enhances the delivery of content and promotes personalized learning experiences. Through multimedia resources, virtual simulations, and online collaboration platforms, educators can create engaging and interactive learning environments that cater to diverse learning styles and abilities. This personalized approach not only increases student engagement but also deepens understanding and retention of TLE concepts.

Additionally, the integration of technology enables educators to address the needs of diverse learners more effectively. Adaptive learning platforms and digital tools allow for targeted support, differentiated instruction, and real-time feedback, ensuring that every student has the opportunity to succeed. This inclusivity promotes equity in education and fosters a positive learning environment where all students can thrive.

**Attainment of Goals in Teaching TLE (Technology and Livelihood Education)**

The use of computer-based examinations in teaching Technology and Livelihood Education (TLE) plays a crucial role in achieving key educational goals and preparing students for success in technology-driven industries. Firstly, it promotes critical thinking and problem-solving skills by presenting real-world scenarios that require analytical reasoning and practical application of TLE concepts. This approach challenges students to think critically, analyze information, and apply their knowledge to solve complex problems, mirroring the challenges they may encounter in real-life work settings.

Moreover, technology-enhanced assessments offer a comprehensive view of students' technical competencies. By leveraging digital tools and interactive platforms, educators can assess students' mastery of TLE topics in a more holistic and nuanced manner. These assessments provide insights into students' strengths, areas for improvement, and readiness for the demands of technology-driven industries. This aligns with the overarching goal of TLE education, which is not only to impart technical knowledge but also to develop practical skills, critical thinking abilities, and a mindset for lifelong learning.

Furthermore, computer-based examinations enable educators to tailor assessments to align with industry standards and emerging technological trends. This ensures that students are equipped with the latest knowledge and skills relevant to contemporary workplaces. Additionally, technology-enhanced assessments facilitate continuous feedback and evaluation, allowing for targeted interventions and personalized learning experiences that enhance student growth and development.

**Modification of Teaching Methods**

Integrating technology into Technology and Livelihood Education (TLE) necessitates a fundamental shift in teaching methods, encouraging educators to adopt innovative and student-centered approaches. By leveraging a diverse range of digital tools, online resources, and interactive platforms, educators can create dynamic and engaging learning environments that cater to the diverse learning styles and preferences of students. Blended learning models, which combine traditional face-to-face instruction with online activities, have emerged as a powerful strategy in TLE. This approach not only enhances student engagement but also promotes self-directed learning, allowing students to access resources, participate in discussions, and complete assignments at their own pace.

Furthermore, interactive digital tools such as simulations, virtual labs, and multimedia resources play a pivotal role in enriching TLE lessons. These tools provide hands-on and experiential learning opportunities, allowing students to explore practical applications of TLE concepts in a simulated environment. Additionally, adaptive learning platforms offer personalized learning pathways based on students' individual needs and performance data, providing targeted interventions and immediate feedback to support their learning journey.

**Discussion**

The pretest results for both control and experimental groups show their baseline understanding of Technology and Livelihood Education (TLE) concepts is at a developing stage, with fair but below-desired proficiency scores. The control group, receiving traditional instruction, had 29 learners scoring 33.6%, while the experimental group, using technology-based instruction, had 31 learners scoring 31.6%. This indicates that prior to any interventions, both groups had relied on traditional assessment methods, which may negatively impact student performance due to issues like unclear visual representations in printed materials. The experimental group's initial underperformance could be attributed to unfamiliarity with using computers and the new assessment platform, suggesting that transitioning to technology-based assessments requires careful implementation and sufficient training.

Posttest results reveal notable improvements in academic performance for both groups. The control group scored an average of 40.3 (80.6%), classified as "Very Satisfactory," while the experimental group achieved an average score of 47.2 (94.4%), classified as "Outstanding." The control group's improvement from a pretest average of 16.8 to a posttest average of 40.3 demonstrates the effectiveness of traditional teaching methods. However, the experimental group's significant rise from a pretest average of 15.8 to a posttest average of 47.2 underscores the superior effectiveness of computer-based examinations in enhancing academic performance, understanding, and engagement in TLE. This marked disparity in posttest scores strongly suggests the greater efficacy of computer-based assessments over traditional methods in boosting student achievement.

Initially, students held negative perceptions about computer-based examinations, as indicated by an overall weighted mean of 2.3 (SD=0.06) in the "Disagree" category. However, posttest attitudes shifted significantly, with a weighted mean of 3.6 (SD=0.49) in the "Strongly Agree" category, reflecting improved perceptions due to increased familiarity, support, and observed performance improvements.

The initial pretest comparison showed no significant difference in academic performance between the control and experimental groups, with mean scores of 16.8 (SD=5.44) and 15.8 (SD=3.55), respectively, and a p-value of 0.495 & 0.365. This implies both groups had similar proficiency levels before the intervention. However, posttest results revealed a significant difference, with the control group scoring an average of 40.4 (SD=6.97) and the experimental group scoring 47.2 (SD=4.07), with a p-value of 0.001. This significant improvement in the experimental group highlights the profound impact of computer-based examinations on academic performance compared to traditional methods.

Statistical analysis further confirmed these findings. The control group's performance improved from a pretest mean of 16.8 to a posttest mean of 40.4, with a T-test value of 9.23 and an F-test value of 0.50, indicating no significant difference. In contrast, the experimental group's performance increased from a pretest mean of 15.8 to a posttest mean of 47.2, with a T-test value of 17.4 and an F-test value of 2.00, suggesting a significant enhancement.

The findings imply that integrating technology-driven approaches, such as computer-based examinations, into TLE has transformative implications for education. This integration aligns TLE education with the evolving technological landscape, ensuring students acquire technical skills and understand technology's role in contemporary workplaces. It fosters innovation, critical thinking, and adaptability, preparing students for modern career pathways. Additionally, technology enhances content delivery and personalized learning, engaging diverse learners and promoting equity in education.

## IV. Conclusion and Recommendations

The study's findings reveal significant improvements in the academic performance of Grade 10 students in Technology and Livelihood Education (TLE) using computer-based examinations. Both control and experimental groups showed notable advancements; however, the experimental group, which received technology-based instruction, demonstrated a more substantial increase in scores. The control group's average scores rose from 16.8 (pretest) to 40.3 (posttest), while the experimental group's scores improved from 15.8 to 47.2. This significant difference underscores the superior effectiveness of computer-based examinations over traditional assessment methods in enhancing student performance, understanding, and engagement. Additionally, the shift in students' attitudes towards computer-based assessments from initial skepticism to a more favourable perception highlights the importance of familiarity and support in adapting to new educational technologies.

Based on the transformative impact observed in Grade 10 students' academic landscape through computer-based examinations in TLE, several recommendations can be made:

1. Division leaders should initiate workshops and training sessions focusing on effectively integrating computer-based assessments into the TLE curriculum, collaborating with technology experts to develop standardized guidelines and best practices, and allocating resources and funding for schools to acquire necessary hardware and software for seamless implementation.

2. School administrators play a pivotal role in encouraging and supporting teachers in adopting

innovative teaching methods that leverage technology for assessment and learning, establishing protocols for maintaining and updating computer labs, monitoring implementation, and providing necessary support.

3. Teachers should engage in professional development programs, design customized assessments aligned with TLE objectives, and collaborate with colleagues to share best practices.

4. Students should be provided with orientation sessions and resources to familiarize them with computer-based examinations and foster a positive attitude towards technology, with active engagement in digital learning activities to build confidence and proficiency.

Addressing these recommendations comprehensively will contribute to successful integration and positive outcomes in TLE education. Additionally, ongoing research and evaluation are necessary to assess the long-term impact of computer-based assessments on student learning outcomes, attitudes, and career readiness in the context of TLE.

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