



Analyzing the Effects of Changes in Testing Methods on Evidenced Teaching Competencies

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Abstract: This study addresses the critical need for understanding the effect of changing assessment methods on demonstrated competencies in teacher education. It examines how the transition from online to in-person testing affects the measured teaching competencies of students who completed a Competency-Based Enhancement (CBE) program, aiming to identify factors contributing to performance differences and strategies for adaptation. Using a quasi-experimental pre-test/post-test design, the study involved 669 graduating teacher education students at Pangasinan State University. Participants completed online pre-tests and in-person post-tests, with data analyzed through paired samples t-tests, multiple regression, and ANCOVA. Findings revealed a significant decline in post-test scores despite CBE participation, suggesting a substantial effect of the testing modality change. The change in the testing environment emerged as the most significant predictor of score differences, while student engagement levels were positively associated with minor score decreases. These results underscore the need for adaptive assessment strategies in competency-based education programs. While limited to a single institution, this study recommends implementing a scaffolded approach to assessment transitions and enhancing student support services to mitigate adverse effects on performance across different testing modalities.

Keywords: *assessment method, competency-based enhancement program, paired testing, testing modality*

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Introduction

Educational shifts challenged educators to reimagine how they assess student competencies, particularly in rapidly evolving technological and social contexts. Higher education is significantly transforming to bridge the gap between academic know-how and practical skills. Institutions are striving to equip students with both cognitive knowledge and professional competencies (Vogler et al., 2018; Casner-Lotto & Barrington, 2006) but face challenges due to traditional teaching methods (Alorda et al., 2011) and a misalignment between university education and workplace demands (Holmes, 2012). Competency-based education has emerged as a potential solution, focusing on measurable learning outcomes and mastery of specific skills (Gervais, 2016). However, assessing professional skills within academic frameworks still needs to be improved (Succi & Canova, 2020).

The rapid technological advancement and the changing nature of work have emphasized the need for digital literacy and adaptability (Pentang, 2021; van Laar et al., 2017). The COVID-19 pandemic hastened the demand for educational reform (Hamora et al., 2022), highlighting the importance of flexible, technology-enhanced learning approaches (Toquero, 2020). In response, institutions are exploring innovative models such as project-based learning, which has shown positive outcomes in developing discipline-specific expertise and transferable skills (Kokotsaki et al., 2016). However, implementing these approaches requires significant changes in institutional culture and faculty preparedness (Ertmer & Ottenbreit-Leftwich, 2010).

As higher education evolves, there is a growing need for assessment methods that accurately measure cognitive knowledge and professional skills. Traditional assessment methods often fall short in evaluating complex competencies, prompting the exploration of authentic assessment techniques that mirror real-world scenarios (Kearney, 2013). Developing effective competency-based enhancement programs is crucial for cultivating the professional skills and adaptability required in the modern workforce. This study aims to examine the effect of a Competency-Based Enhancement program on the professional competencies of teacher education students, focusing on the effects of changing assessment modalities.

The Role of Assessment in Learning and Skill Development

Assessment plays a crucial role in learning, with high-stakes assessments significantly affecting academic trajectories (Liang & Creasy, 2019). Online assessments have gained popularity due to their flexibility and accessibility (Bali & Liu, 2018; Kentnor, 2015), providing immediate feedback and enhancing metacognitive skills (Keengwe, 2017). They also offer efficient data organization and analysis, surpassing manual methods (Abedini et al., 2021) and ensuring exam integrity (Chua & Don, 2013). Redecker and Johannessen (2013) argue that technology-enhanced assessment supports personalized and engaging evaluation forms, enabling a deep understanding of student learning processes.

However, online assessments face challenges, including academic integrity concerns and the need for security measures (Holden et al., 2021). The validity and reliability of online assessments compared to traditional exams remain subjects of debate, with Clark et al. (2020) finding that students perform slightly better on online tests, but the effect varies across disciplines. In competency-based education, well-designed assessments can provide clear pathways for skill development (Holt et al., 2015). Innovative formats like simulations and game-based assessments are being explored to evaluate complex skills (Shute & Rahimi, 2017).

Online assessments can support equity and inclusion by accommodating diverse needs, but Hillier et al. (2020) caution about potential inequities due to the digital divide. Integrating artificial intelligence and learning analytics in assessment systems promises more adaptive and personalized evaluation approaches (Wilson et al., 2017). As educational institutions navigate this changing landscape, ongoing research and innovation in assessment are crucial to ensure that evaluation methods support and measure student learning and development in the digital age.

Comparing In-Person and Online Evaluations

Online and in-person assessments each offer unique advantages and challenges in educational evaluation. Online assessments provide flexibility, accessibility, and immediate feedback (Bali & Liu, 2018; Keengwe, 2017; Kentnor, 2015) while enabling efficient data organization and analysis (Abedini et al., 2021; Chua & Don, 2013). However, they face challenges related to academic integrity and security (Holden et al., 2021). In-person evaluations facilitate direct interaction and better assessment of non-verbal communication and interpersonal skills (Bower et al., 2015) but may be less flexible and accessible for some students (Burgstahler, 2015).

The effectiveness of each assessment modality can vary based on individual student characteristics and the skills being evaluated. Stowell and Bennett (2010) found that students with high-trait test anxiety performed better on online exams, while those with low-trait anxiety excelled in classroom settings. In-person evaluations may be more suitable for assessing specific complex skills and promoting collaborative learning (Stödborg, 2012; Kao, 2013). However, advancements in online proctoring technologies have narrowed the integrity gap between online and in-person assessments (Daffin & Jones, 2018). The authenticity of assessment tasks is another consideration, with some arguing that in-person evaluations better mirror real-world contexts (Gulikers et al., 2004), while others suggest that online assessments may be more relevant in increasingly virtual work environments (Crisp, 2014).

As educational practices evolve, a nuanced understanding of the strengths and limitations of both assessment modalities is crucial. Cost, logistics, and accessibility must be carefully considered (Chirikov et al., 2020). Looking forward, hybrid approaches that combine the strengths of both in-person and online evaluations may offer the most comprehensive and flexible assessment strategies (Crisp et al., 2016). These hybrid models could address the diverse needs of learners while accurately measuring competencies across various contexts, aligning with the changing landscape of education and work in the digital age.

The Need for Comparative Analysis of Assessment Methods

Given the distinct characteristics of online and in-person assessments, it is crucial to compare these methods to ensure fair examination practices and accurate interpretation, especially in the face of changing circumstances. While previous research has established that virtual environments might lead to decreased anxiety and increased satisfaction levels (Bali & Liu, 2018), it is essential to note that circumstances between consecutive tests can negatively affect performance. Research conducted on graduate students during the COVID-19 pandemic revealed that 61% of participants believed their grades had deteriorated despite using open books during online examinations. This perception of decreased accomplishment was associated with uneasiness (Toquero, 2021). This implies that the decrease in scores may be partly due to difficulties adapting to a significant change in the testing environment.

Research Questions

The general purpose of this study is to examine the effect of changing testing methods on the demonstrated professional competencies of teacher education students who have participated in a Competency-Based Enhancement (CBE) program at Pangasinan State University in the Philippines. Specifically, this research aims to investigate how the transition from online to in-person testing affects the measurement of teaching skills acquired through the CBE program and to identify potential strategies for mitigating any adverse effects of such transitions.

The specific research questions guiding this study are:

1. Is there a significant difference in measured teaching competencies between online pre-testing and in-person post-testing for students who have completed the CBE program?
2. What key factors significantly predict the variance in performance differences between online pre-test and in-person post-test assessments of teaching competencies?
3. To what extent does participation in the CBE program predict changes in teaching competencies among pre-service teachers, as measured by pre-and post-test assessments, when controlling for the change in testing modality?
4. What strategies do students and faculty identify as potentially effective for facilitating adaptation from online to in-person testing in competency-based teacher education programs?

Methodology

Research Design and Sample

This study employed a one-group pretest-posttest design to address the research questions regarding the effect of changing testing methods on demonstrated teaching competencies. This design was chosen because it allows for examining changes in a single group over time, which is appropriate for evaluating the effectiveness of the Competency-Based Enhancement (CBE) program and the effect of the testing modality change. This study employs a mixed methods quasi-experimental design to investigate the effect of a CBE program on teaching competencies and the effect of changing assessment modalities. The sample comprises 669 graduating teacher education students from Pangasinan State University (Table 1). All participants underwent the CBE program and were assessed before (online pre-test) and after (in-person post-test) the intervention. This substantial sample size allowed for robust statistical analyses and enhanced the generalizability of findings within the context of teacher education programs in the Philippines. The gender composition of the sample reflected a predominance of female participants, with 482 females (72%) and 187 males (28%), which is consistent with typical gender distributions in teacher education programs. The age of the participants spanned from 20 to 25 years old, representing a cohort of young adults at the cusp of entering the teaching profession.

Table 1. Demographic profile of the participants.

Characteristics	Value
Total Participants	669
Gender Distribution	Female: 482 (72%), Male: 187 (28%)
Age Range	20-25 years
Bachelor of Elementary Education	312 (46.6%)
Bachelor of Secondary Education	357 (53.4%)

Data Collection and Instruments

The assessment instrument utilized in this study was designed to evaluate participants' competencies across a comprehensive spectrum of General Education (GE) subjects, reflecting the breadth and depth of knowledge expected of graduating teacher education students. The content of both the pre-test and post-test encompassed nine core GE subjects: GE 1 Understanding the Self, GE 2 Readings in Philippine History, GE 3 Arts Appreciation, GE 4 Purposive Communication, GE 5 The Contemporary World, GE 6 Science and Technology and Society, GE 7 Math in the Modern World, GE 8 Ethics, and GE 9 Life and Works of Rizal. The test comprised 150 multiple-choice items strategically distributed across these nine subjects to ensure comprehensive coverage while maintaining a balance reflecting each subject's relative importance in the curriculum. This distribution allowed for a thorough assessment of participants' knowledge and competencies across the diverse range of GE subjects.

The assessment tool's exclusive use of multiple-choice questions was carefully considered for several reasons. Firstly, it allowed for broad content coverage within the testing time constraints, enabling a comprehensive evaluation of participants' knowledge across all nine GE subjects. Secondly, multiple-choice questions provide objective and consistent scoring, reducing potential biases in the evaluation process. Thirdly, this format facilitates efficient data collection and analysis, which is particularly valuable given the large sample size of 669 participants. Each multiple-choice question was crafted to assess not only recall of facts but also higher-order thinking skills such as application, analysis, and evaluation within the context of each GE subject. Questions were designed to challenge participants to apply their knowledge to educational scenarios, analyze complex concepts, and make informed choices based on their grasp of the subject matter.

Subject matter experts reviewed the instrument to ensure it accurately measures the intended teaching skills and competencies. The experts provided feedback and suggestions for improvement, which were incorporated into the final version of the assessment tool. The assessment instrument underwent a comprehensive pilot-testing process to establish its face validity and ensure its appropriateness for the target population. A sample of 50 senior education students, distinct from the primary study cohort, participated in this crucial validation phase. These students completed the assessment under conditions mirroring those planned for the actual study, providing valuable feedback on the clarity of instructions, comprehensibility of questions, and overall test-taking experience. The researcher and the General Education instructors thoroughly analyzed the feedback and results following the pilot test. This analysis informed several revisions to the instrument, including clarification of question-wording, adjustments to item difficulty levels, and refining instructions to enhance overall clarity. The pilot test results showed an internal consistency reliability (Cronbach's alpha) of 0.87, indicating good reliability. Item analysis revealed that 92% of the questions had an appropriate difficulty index (between 0.3 and 0.7) and a discrimination index above 0.3.

After revisions, a panel of seven experts, including experienced faculty members and education researchers, validated the assessment tool. Using a content validity index (CVI), the experts rated each item's relevance on a 4-point scale. The scale-level CVI was calculated at 0.91, exceeding the 0.90 threshold for excellent content validity. Inter-rater agreement among the experts, measured by Fleiss' kappa, was 0.83, indicating substantial agreement. Test-retest reliability was assessed with a subset of 30 students over a two-week interval, yielding a correlation coefficient of 0.85. These quantitative measures, combined with the qualitative feedback from experts and pilot participants, established strong evidence for the instrument's validity and reliability for measuring the desired teaching skills and competencies in the target population of graduating teacher education students.

The data collection process was conducted in two stages: The study employed a pre-test/post-test design to evaluate the effect of the Competency-Based Enhancement (CBE) program on teaching skills and competencies. All 669 graduating students from the College of Teacher Education at Pangasinan State University - Bayambang Campus participated in both assessments. The pre-test, administered online before the CBE program commenced, measured initial competencies. Following completing the CBE program, which spanned one semester, participants undertook an in-person post-test in a controlled environment. The post-test was designed to be comparable in content and difficulty to the pre-test, allowing for meaningful comparison of results. The primary instrument was a researcher-developed assessment tool tailored to align with the CBE program objectives and desired teaching competencies. To ensure validity, the instrument underwent expert review for content validity and pilot testing with 50 senior education students for face validity. This process led to refinements in question-wording, difficulty levels, and instructions. The interval between the pre-test and post-test was four months, during which participants engaged in the program.

Data Analysis

The data analysis for this study employed a comprehensive approach utilizing descriptive statistics and effect size calculations. Descriptive statistics (mean and standard deviation) were considered to provide an overview of the participant's performance on pre-test and post-test assessments. Paired samples t-test and effect sizes were calculated (Cohen's d) to quantify the magnitude of changes between pre-test and post-test scores. Comparisons using Analysis of Covariance (ANCOVA) were made across demographic variables and specific aspects of the CBE program to explore factors contributing to observed differences in performance. Effect sizes for these differences were also computed to measure the practical significance of the changes. Multiple regression analysis was performed to determine if the included demographic variables (age, gender, academic program) and specific aspects of the CBE program (duration of participation, engagement levels) predict the score differences.

Ethical Consideration

This study adhered to stringent ethical standards to protect participants' rights, privacy, and well-being. Before commencing the research, the Institutional Review Board of Pangasinan State University - Bayambang Campus (IRB approval code: PSU-BC-2023-0142) attained ethical clearance. Informed consent was secured from all participants, detailing the study's purpose, potential risks and benefits, and participants' rights, including voluntary participation and the right to withdraw at any time.

Results and Discussion

Effect of Testing Modality Change on Measured Teaching Competencies

The analysis revealed that after the CBE training program, the post-test averages declined (Table 2). The pre-test mean score was 92 (SD = 8.5), while the post-test mean score was 83.34 (SD = 10.04). The paired samples t-test

yielded a significant negative correlation with a t-value of -9.22 and a p-value less than .001. The effect size, measured by Cohen's d, was moderate, with a value of .93. This unexpected result suggests that changing the testing modality from online to in-person may have significantly affected students' performance. The decline in scores could be attributed to several factors, including increased test anxiety in the face-to-face setting, unfamiliarity with the in-person testing environment, or potential differences in the perceived stakes of the assessments.

Table 2. Pre-test and post-test score comparison.

Measure	Pre-test (online)	Post-test (in-person)	t-value	p-value	Effect size (Cohen's d)
Mean Score	92.00	83.34	-9.22	<.001	0.93
Standard Deviation	8.50	10.04			

Factors Contributing to Performance Differences

The study included demographic variables (age, gender, academic program) and specific aspects of the CBE program (duration of participation, engagement levels) as predictors. The results indicated that the change in testing modality was the most significant predictor of score differences ($\beta = -.45, p < .001$), accounting for 20% of the variance in score changes. Additionally, student engagement levels in the CBE program were positively associated with smaller decreases in scores ($\beta = .18, p < .01$), suggesting that highly engaged students were better able to adapt to the change in testing modality. Further, the academic program emerged as a significant factor, with students in the Bachelor of Elementary Education program showing smaller decreases in scores compared to those in the Bachelor of Secondary Education program ($\beta = -.15, p < .05$). This finding may indicate differences in how the two programs prepare students for diverse assessment contexts. Subsequently, in math studies exploring performance, Bachelor of Secondary Education students have performed significantly higher than Bachelor of Elementary Education students (Bacangallo et al., 2022).

Table 3. Multiple regression analysis of factors affecting score differences.

Factor	Standardized Coefficient (β)	p-value	Variance Explained	Interpretation
Change in testing modality	-0.45	<.001	20%	The most significant predictor, accounting for 20% of the variance in score changes.
Student engagement levels	0.18	<.01	Not Specified	Positively associated with smaller decreases in scores.
Academic program (Elementary vs Secondary)	-0.15	<.05	Not Specified	Students in Elementary Education showed smaller decreases in scores.

Effectiveness of the CBE Program

The Competency-Based Enhancement (CBE) program analysis revealed an effect on teaching competencies (Table 4). After controlling for the change in testing modality, the program demonstrated a statistically significant effect on teaching competencies, $F_{(1, 666)} = 4.32, p < .05$. However, the effect size was small ($partial \eta^2 = .006$), indicating that while the CBE program contributed to some improvement in teaching competencies, the magnitude of this improvement was modest. This finding is particularly noteworthy given the substantial adverse effect of the change in testing modality on overall scores. Despite this challenging context, the CBE program still produced a small positive effect on teaching competencies. These results highlight the program's potential to enhance teaching skills, even in the face of significant assessment challenges, while also underscoring the need for further refinement to achieve more substantial improvements in teaching competencies. The findings advise that innovations in test designs, student interactions, and variations in academic programs are critical factors that should be considered when evaluating student performances in CBE contexts.

Table 4. ANCOVA results for CBE program effect (controlling for testing modality change).

Measure	Value	Interpretation
F-statistic	4.32	Indicates the ratio of variance between groups to variance within groups
Degrees of freedom	1,666	1 degree of freedom for the CBE program effect, 666 for error
p-value	<.05	Statistically significant at the 0.05 level
Partial η^2 (eta-squared)	0.0006	Small but significant positive effect size

Strategies for Adapting to Testing Modality Changes

This analysis revealed several recurring themes illuminating potential approaches to maintaining assessment rigor while supporting student performance across different testing modalities (Table 5, 6). A prominent theme that emerged was the expressed need for familiarization with the in-person testing environment before high-stakes assessments. Participants consistently advocated for implementing practice sessions, suggesting that such experiences could mitigate the anxiety and performance decrements associated with an unfamiliar testing context. This finding aligns with Stowell and Bennett (2010), who demonstrated that exposure to testing environments can significantly reduce test-related anxiety. Another salient theme centered on the demand for enhanced clarity in assessment instructions and expectations specific to the in-person format. This suggests that students perceive a distinct difference in the presentation and interpretation of assessment requirements between online and face-to-face contexts. Clear assessment criteria are well-documented in educational literature (Brookhart, 2013), and this finding underscores the need for tailored communication strategies when transitioning between assessment modalities.

Participants also frequently suggested integrating stress-management techniques into the Competency-Based Enhancement program. This recommendation reflects an awareness of the psychological effect of assessment modality changes and indicates a desire for proactive measures to address these challenges. Incorporating stress-management strategies in educational programs has positively affected student performance and well-being (Regehr et al., 2013). Lastly, a recurrent theme was the recommendation for a gradual transition from online to in-person assessments throughout the program. This suggestion implies that students perceive value in a scaffolded approach to modality changes, allowing for incremental adaptation rather than an abrupt shift. This concept aligns with principles of instructional scaffolding (Wood et al., 1976) and suggests a potential avenue for enhancing student adaptability to diverse assessment contexts.

These complementary findings underscore the critical importance of preparing students for changes in assessment modalities and providing comprehensive support to mitigate potential adverse effects on performance. The themes identified offer valuable direction for developing targeted interventions and program modifications to enhance student adaptability and maintain assessment integrity across diverse testing environments. These have implications for designing and implementing competency-based education programs and assessment practices in teacher education. The unexpected decline in scores from pre-test to post-test underscores the need to carefully consider assessment modalities and their potential effect on student performance. While the CBE program showed some positive effects on teaching competencies, these benefits were overshadowed by the negative effect of the testing modality change. This suggests that future implementations of similar programs should include specific strategies to prepare students for different assessment environments.

Table 5. Recurring theme in assessment modality transition.

Theme	Description
Familiarization with In-Person environment	Need for practice sessions in the physical testing space.
Enhanced Clarity in Assessment Instructions	Demand for more precise guidelines specific to the in-person format
Integration of Stress-Management Techniques	The desire for proactive measures to address psychological effects
Gradual Transition Between Modalities	Preference for scaffolded approach to modality changes

Table 6. Potential interventions based on the identified themes.

Theme	Proposed Intervention	Expected Outcome
Familiarization with In-Person Environment	Implement pre-assessment practice sessions in the physical testing space.	Reduced test anxiety and improved performance.
Enhanced Clarity in Assessment Instructions	Develop detailed, format-specific assessment guides.	Improved student understanding and preparedness.
Integration of Stress-Management Techniques	Incorporate stress-management workshops into the program curriculum.	Enhanced student well-being and performance under pressure.
Gradual Transition Between Modalities	Design a progressive assessment schedule, gradually increasing in-person components.	Smoother adaptation to diverse assessment contexts.

Conclusion and Recommendations

The findings of this study reveal the complex interplay between competency-based education, assessment modalities, and student performance in teacher education programs. The unexpected decline in scores following the transition from online to in-person testing highlights the significant effect that assessment environments can have on demonstrated competencies. This phenomenon underscores the need for a more nuanced understanding of assessment validity across different modalities, particularly in competency-based education. The results suggest that the construct of teaching competency, measured by standardized assessments, is more context-dependent than previously assumed. This has profound implications for the design and implementation of teacher education programs, challenging educators to develop more adaptive and holistic assessment strategies that accurately capture student competencies across varied environments. Furthermore, the identified factors contributing to performance differences, such as student engagement and program-specific preparation, point to the importance of personalized learning approaches in competency-based education. These findings contribute to the broader theoretical discourse on the nature of competence in professional education and assessment's role in measuring and developing these competencies.

To address the challenges identified in this study, it is recommended to implement a SMARTER approach to assessment in competency-based teacher education programs. Specifically, programs should (S) Scaffold the transition between online and in-person assessments through gradual exposure and practice sessions; (M) Modify assessment criteria to ensure they are equally applicable and precise across different modalities; (A) Adapt the CBE curriculum to include explicit instruction on test-taking strategies for various environments; (R) Regularly evaluate and adjust the program based on ongoing feedback and performance data; (T) Train faculty in designing and administering equitable assessments across modalities; (E) Enhance student support services to include stress management and adaptive skills training; and (R) Research and implement innovative assessment methods that can more accurately capture teaching competencies regardless of the testing environment. Future research should explore the long-term effect of mixed-modality assessment experiences on teacher performance in natural classroom settings. Additionally, studies investigating the potential of technology-enhanced simulations to tie the gap between online and in-person assessments could provide valuable insights. Future research should consider multi-institutional studies to enhance generalizability and explore potential cultural or institutional factors influencing the observed phenomena.

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