Examination of preservice teachers' electronic assessment anxiety

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ABSTRACT

The increasing use of digital technologies in higher education has reshaped assessment practices, making electronic assessment (e-assessment) a key component of teacher preparation. While e-assessment offers flexibility and rapid feedback, it can also create anxiety among preservice teachers due to limited digital skills and anxieties about technical or assessment -related issues. This study examined preservice teachers' electronic assessment anxiety and explored whether their anxiety levels differed by gender, field of study, and grade level. A quantitative survey design was employed with 513 preservice teachers. Data were collected using the Electronic Assessment Anxiety Scale and analyzed through Independent Samples T-Test, One-Way ANOVA, and Welch ANOVA based on variance homogeneity. Effect sizes were calculated using eta-squared (η^2) and omega-squared (ω^2). The findings indicated that preservice teachers experienced moderate levels of electronic assessment anxiety. Significant but small differences were found between genders and across fields of study, with female and preschool education students reporting higher levels of anxiety. Grade-level differences were observed only in social anxiety. Overall, the results suggest that although demographic and academic variables explain small portions of variance, electronic assessment anxiety remains an important factor to consider in teacher education. Strengthening digital competence and providing structured e-assessment experiences may help reduce anxiety and improve preparedness for technology-supported assessment practices.

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1　INTRODUCTION

With the increasing integration of digital technologies into education, assessment processes have undergone significant transformation. Traditional paper-based examinations are increasingly being replaced or supplemented by digital tools, resulting in more flexible, efficient, and interactive assessment practices. E-assessment enables rapid scoring, automated feedback, improved data management, and opportunities for personalized learning pathways. However, despite these advantages, technology-enhanced assessments may also provoke emotional and technical challenges for learners. Factors such as limited digital competence, fear of technical failure, unfamiliarity with online interfaces, and uncertainty regarding assessment criteria can trigger anxiety in assessment situations. In this context, *electronic assessment anxiety* has emerged as an important construct for understanding preservice teachers' readiness for technology-supported learning and assessment environments. From a theoretical perspective, electronic assessment anxiety can be associated with the broader domain of test anxiety, since both relate to the pressure and evaluative threat experienced during assessment (Spielberger & Vagg, 1995). E-assessment contexts additionally introduce new anxieties—such as potential technical problems or unfamiliar interfaces—which may intensify stress and worry beyond what occurs in traditional assessment settings (Fluck, 2019). For this reason, electronic assessment anxiety may be viewed as a technology-mediated form of evaluative anxiety rather than a completely separate construct.

For preservice teachers, who will soon be expected to design, implement, and interpret e-assessments in their professional practice, managing such anxiety is particularly crucial. High levels of electronic assessment anxiety may negatively affect performance, reduce confidence in using digital tools, and hinder the development of essential pedagogical competencies. Moreover, teacher education programs increasingly require the use of e-assessment platforms, digital portfolios, and online testing systems, which makes understanding the emotional and cognitive aspects of these tools central to effective teacher preparation. Existing research highlights that technological experiences, demographic characteristics, and academic background can shape individuals' reactions to e-assessment environments. Although studies have examined e-assessment practices and students' general perceptions of digital testing systems, research focusing directly on electronic assessment anxiety among preservice teachers remains limited. In particular, few empirical investigations have explored whether anxiety levels differ simultaneously across variables such as gender, field of study, and grade level.

In light of this need, the present study aims to explore preservice teachers' electronic assessment anxiety across various demographic and academic variables. By identifying which groups experience higher levels of anxiety and the magnitude of these differences, the study provides insights that can guide teacher education programs in designing supportive learning environments and targeted interventions. In this context, the research problems are as follows:

1. What are preservice teachers' levels of electronic assessment anxiety?
2. Does electronic assessment anxiety differ by gender?
3. Does electronic assessment anxiety differ by field of study?
4. Does electronic assessment anxiety differ by grade level?

2.1 Literature review / Theoretical framework

Today's society is undergoing an intense period of transformation in economic, social, and cultural spheres, driven largely by the rapid diffusion of digital technologies. This shift has profoundly reshaped education systems, compelling institutions to redesign pedagogical processes and integrate digital tools into instructional and assessment practices. In such an evolving educational landscape, the competencies of future teachers—especially their ability to navigate digital learning and assessment environments—have become increasingly

critical for ensuring high-quality and innovative educational practices.

Advancements in information and communication technologies (ICT) have also transformed the field of measurement and evaluation. Electronic assessment (e-assessment) has emerged as a comprehensive e-assessment framework that includes the processes of measuring, recording, analyzing, and providing feedback on learners' performance through digital environments (JISC, 2007). E-assessment extends far beyond the digitization of traditional paper-based tests; it represents an innovation that makes assessment processes more interactive, adaptive, scalable, and data-driven (Redecker & Johannessen, 2013). Various e-assessment applications—such as online exams, computer-adaptive tests, automated scoring engines, simulation-based assessments, digital portfolios, and formative micro-assessments—have expanded the scope and capabilities of modern assessment systems (Bennett, 2015). Computer-adaptive testing, for instance, dynamically adjusts item difficulty based on a learner's previous responses, thereby increasing precision and reducing test length without compromising reliability (Wainer et al., 2000). Automated scoring systems similarly enhance scoring consistency by minimizing human error and providing rapid assessment of complex constructed responses (Shermis & Hamner, 2013). From a structural perspective, the widespread adoption of e-assessment is also fueled by practical needs: increasing student populations, time-consuming manual grading processes, costs associated with printing and administering large-scale exams, and the growing demand for timely and actionable feedback (Nicol & Macfarlane-Dick, 2006). Additionally, the expansion of distance and blended learning environments has necessitated assessment systems that transcend spatial and temporal constraints, making e-assessment an indispensable component of contemporary education (Gikandi, Morrow & Davis, 2011).

Beyond logistical efficiency, e-assessment also contributes to educational quality assurance and data-informed decision making. E-assessments generate large datasets about learners' performance and engagement patterns, which enable institutions to monitor learning progress, implement early-warning systems for at-risk students, and make evidence-based pedagogical adjustments (Ifenthaler & Yau, 2020). E-assessment promotes sustainability by reducing paper use, while also providing individualized feedback that supports learner autonomy (Evans, 2013). However, the implementation of e-assessment is not without challenges. Inequalities in access to digital devices and stable internet, anxieties about academic integrity and exam security, user distrust in digital scoring algorithms, and limited digital literacy among learners and instructors remain significant issues that must be addressed (Dawson, 2020).

In higher education, the adoption of e-assessment has been widely discussed, yet research indicates that students may experience increased stress and apprehension in technology-mediated testing environments. Studies show that anxieties about system reliability, interface unfamiliarity, and fears of technical failure may lead to heightened anxiety during online exams (Hillier, 2014; Fluck, 2019). In preservice teacher education, these reactions carry greater implications. Preservice teachers must not only succeed in e-assessment environments but also acquire the pedagogical and technological skills to implement e-assessment in their future classrooms. Research suggests that preservice teachers who have limited technological competence or prior exposure to e-assessment tools demonstrate higher levels of emotional strain and reduced confidence when using e-assessment (Ifenthaler & Yau, 2020). Such anxiety may negatively influence their future integration of technology into assessment practices. Furthermore, empirical studies have shown that demographic and academic variables can shape reactions to e-assessment. For example, gender differences have been observed, with female students in some studies reporting higher anxiety levels toward online exams than males (Nomie-Sato et al., 2022). Additionally, students from non-technical fields tend to perceive e-assessment environments as more demanding and less predictable (Alruwais et al., 2018). In Türkiye, Yeşilçınar (2024) examined preservice English teachers' experiences and revealed that online assessment systems may evoke anxieties related to fairness, validity, and technical stability. Although this study highlights valuable insights, it is focused on perceptions rather than anxiety levels. Despite the increasing use of e-assessments in teacher education,

empirical research that systematically examines electronic assessment anxiety among preservice teachers is still limited. Few studies directly investigate how anxiety related to e-assessment varies across gender, field of study, and grade level, leaving a gap in the literature. Understanding these differences is essential for designing targeted interventions that enhance preservice teachers' readiness for technology-enhanced assessment environments. Therefore, the present study aims to address this need by exploring preservice teachers' electronic assessment anxiety across key demographic and academic variables.

3 METHODOLOGY

3.1 Research Design

This study employed a quantitative, cross-sectional survey design within a non-experimental, descriptive-comparative framework to examine differences in electronic assessment anxiety across demographic and academic variables. This design is widely used in educational and psychological research, as it allows for standardized measurement of latent constructs and enables statistical comparisons among groups in large samples (Creswell & Creswell, 2018).

3.2 Participants

The study group for this study consisted of students enrolled in the faculty of education at a state university during the 2024–2025 academic year. Participants were selected using a convenience sampling strategy. Convenience sampling is a non-probability sampling method in which researchers recruit individuals who are easily accessible and willing to participate (Etikan et al., 2016). This approach is widely preferred in educational and psychological research when the target population is clustered in naturally available groups and when access to participants is based on voluntary participation rather than randomized selection (Bornstein et al., 2013). Participation in the study was entirely voluntary; participants were provided with the necessary information as part of the informed consent process, and a commitment was made that all data obtained would be protected in accordance with confidentiality principles. Information on the percentage and frequency distribution of demographic characteristics of the study group is shown in detail in Table 1.

TABLE 1
Demographic characteristics of the study group

Variables		%
Gender	Female	76.42
	Male	23.60
	Total	100
Field of study	Science Education	4.48
	Mathematics Education	17.35
	Preschool Education	12.68
	Guidance and Psych. Coun.	20.66
	Primary School Education	19.88
	Social Studies Education	10.72
	Turkish Education	14.23
	Total	100
Grade level	1st grade	20.66
	2nd grade	38.40
	3rd grade	30.01
	4th grade	10.92
	Total	100

3.3 Data Collection Instruments

This study used a personal information form prepared by the researchers, which included demographic characteristics and the Electronic Assessment Anxiety Scale.

Personal Information Form: The personal information form, prepared by the researcher, included questions regarding the participants' demographic characteristics, such as gender, grade level, and department.

Electronic Assessment Anxiety Scale: This scale was developed by Tat and Kılıç (2024) to measure university students' electronic assessment anxiety. The scale consists of 19 items and 2 sub-dimensions in 5-point Likert type. The subscales were determined as "technical anxiety" (8 items) and "social anxiety" (11 items). The lowest score that can be obtained from the scale is 19, while the highest score is 95. It can be said that as the scale score increases, individuals' electronic assessment anxiety levels increase. Cronbach's alpha coefficient calculated for the reliability of the scale is 0.89 for the technical anxiety dimension; 0.89 for the social anxiety dimension; It is 0.93 for the Electronic Assessment Anxiety Scale. The critical values used as a basis for interpreting the scores obtained from the scale are presented in Table 2.

TABLE 2
Critical values regarding the interpretation of scale scores

Level	Technical anxiety	Social anxiety	Electronic assessment anxiety
Low	8≤score≤18	11≤ score ≤25	19≤ score ≤44
Medium	19≤ score ≤29	26≤ score ≤40	45≤ score ≤ 70
High	30≤ score ≤40	41≤ score ≤55	71≤ score ≤95

Table 2 shows the critical values determined by the researchers for interpreting the scale scores. To classify electronic assessment anxiety levels as low, medium, and high, the theoretical score range of the scale and each subdimension was divided into three equal intervals. This was achieved by subtracting the minimum possible score from the maximum possible score and dividing the resulting range by three. The interval width obtained through this procedure was then used to define the cutoff points for each category. This equal-interval classification method is frequently applied in educational and psychological research to support descriptive interpretation of Likert-type scale scores (Cohen et al., 2018; DeVellis, 2017).

3.4 Data Analysis

The scales used in this research on proservice teachers' electronic assessment anxiety were applied to a total of 535 people. The data obtained in the research were analyzed by transferring them to the SPSS 23 (Statistical Package for the Social Sciences 23) package program. First of all, the data was analyzed by extreme value; 22 outlier data detected according to z score; histogram and box plots were cleaned by row deletion. The analysis continued with 513 people, and with missing data analysis, data was assigned to 16 empty cells that did not contain a pattern, using the mean imputation method. Mean imputation is a commonly used technique in educational and psychological research when the proportion of missing data is small and the missingness is random (Tabachnick & Fidell, 2019). This method allows researchers to preserve sample size and maintain statistical power without substantially distorting parameter estimates, particularly in large samples with low levels of missing data (Little & Rubin, 2019). Given that the missing data in the present study constituted a very small proportion of the dataset and showed no identifiable pattern, mean imputation was considered an appropriate and practical solution. Afterwards, the Kolmogorov-Simirnov test results were interpreted together with descriptive and graphical methods and it was determined that the data showed a normal distribution

(Abbott, 2011). To test the validity of the structure of the scale used in the study, confirmatory factor analysis (CFA) was performed using the LISREL 8.70 (Linear Structural Relations 8.70) software package. The findings obtained from the CFA are presented in detail in Table 3.

TABLE 3
Results of confirmatory factor analysis for the scale

Indeks	Perfect	Acceptable	Research findings	Decision
χ^2/df	0-3	3-5	4.76	Acceptable
RMSEA	.00-.05	.05-.08	.07	Acceptable
SRMR	.00-.05	.05-.10	.06	Acceptable
CFI	.95-1.00	.90-.95	.97	Perfect

The overall model fit was evaluated according to commonly accepted SEM criteria (Hu & Bentler, 1999; Kline, 2005), and the results indicate that the measurement model demonstrates an acceptable to excellent level of fit. The chi-square ratio (χ^2/df = 4.76) falls within the 3–5 range, suggesting an acceptable fit. The RMSEA value of .07 is within the .05–.08 interval, indicating a reasonable approximation error, while the SRMR value of .06 meets the acceptable threshold. Moreover, the CFI value of .97 exceeds the .95 cutoff, reflecting excellent incremental fit. Together, these indices show that the model provides an overall satisfactory representation of the observed data, with some indicators reaching the level of perfect fit.

Descriptive statistics were used to determine the electronic assessment anxiety levels of preservice teachers. On the other hand, whether electronic assessment anxiety differed statistically according to gender was analyzed with an Independent Samples T-Test as a result of meeting the normality assumptions. For independent variables consisting of three or more groups, either a One-Way ANOVA or a Welch ANOVA was applied depending on whether the assumption of homogeneity of variances was met. Specifically, when Levene's test indicated that the homogeneity assumption was satisfied ($p > .05$), a standard One-Way ANOVA was conducted, and the effect size was calculated using eta-squared (η^2). However, when the homogeneity assumption was violated ($p < .05$), the Welch ANOVA was employed as a more robust alternative. In such cases, omega-squared (ω^2) was used as the effect size measure, as it provides a less biased estimation under unequal variances. According to commonly accepted benchmarks, eta-squared values of .01, .06, and .14 and omega-squared values of the same magnitudes were interpreted as small, medium, and large effects, respectively (Cohen, 1988; Field, 2013).

4   FINDINGS

4.1 Findings on preservice teachers' electronic assessment anxiety

In this section, preservice teachers' electronic assessment anxiety was examined separately for the overall scale and its sub-dimensions; the findings are presented in Table 4.

TABLE 4
Descriptive statistics of preservice teachers' electronic assessment anxiety

	n	$\overline{X}$	SD	Level
Technical anxiety	513	26.26	6.56	Medium
Social anxiety	513	33.53	9.30	Medium
Electronic assessment anxiety	513	59.79	14.76	Medium

When Table 4 is examined, it is seen that preservice teachers' electronic assessment anxiety is at a moderate level

($\bar{X} = 26.26$). When the descriptive statistics regarding the sub-dimensions are examined, it is determined that there is a moderate level of anxiety in the technical anxiety dimension ($\bar{X} = 33.53$) and the social anxiety dimension ($\bar{X} = 59.79$).

4.2 Findings regarding the differences in preservice teachers' electronic assessment anxiety by gender

In this section, the difference between preservice teachers' electronic assessment anxiety according to gender was analyzed for each sub-dimension using an Independent Samples T-Test, and the findings are presented in Table 5.

TABLE 5
T-test results of preservice teachers' electronic assessment anxiety according to gender

	Gender	n	$\bar{X}$	SD	t	p	η^2
Technical anxiety	Female	392	26.68	6.33	2.597	.010**	.013
	Male	121	24.92	7.11			
Social anxiety	Female	392	33.88	8.95	1.525	.128	.005
	Male	121	32.40	10.32			
Electronic assessment anxiety	Female	392	60.55	14.17	2.089	.037*	.009
	Male	121	57.34	16.33			

*: p<.05   **: p<.01

When Table 5 is examined, a significant difference was found in the general electronic assessment anxiety and "technical anxiety" levels of preservice teachers by gender (p<.05). According to the calculated Eta-square effect size coefficients, this differences have small effects on the variance $\left(\eta^2_{tech.} = .013; \eta^2_{elec.ass.} = .009\right)$. In this case, it is seen that the general electronic assessment anxiety ($\bar{X}_{female} = 60.55; \bar{X}_{male} = 57.34; t = 2.089$) and technical anxiety levels ($\bar{X}_{female} = 26.68; \bar{X}_{male} = 24.92; t = 2.597$) of the females were higher than those of the males. No significant difference was found in the "social anxiety" levels of preservice teachers by gender (p>.05).

4.3 Findings regarding the differences in preservice teachers' electronic assessment anxiety by field of study

In this section, the differences in preservice teachers' electronic assessment anxiety according to their field of study were examined for the overall scale and its sub-dimensions. Since the assumption of homogeneity of variances was violated according to Levene's test (p < .05), the analyses were conducted using the Welch ANOVA. The findings obtained from the Welch tests are presented in Table 6.

TABLE 6
Welch ANOVA Test results of preservice teachers' electronic assessment anxiety according to the field of study

	df_1	df_2	Welch's F	p	ω^2	Difference*
Technical anxiety	24.96	166.96	1.844	.09	.008	No diff.
Social anxiety	29.77	159.80	3.616	.002**	.021	1-3; 2-3
Electronic assessment anxiety	54.41	161.19	3.436	.003**	.018	1-3; 2-3

*1. Science Education, 2. Mathematics Education, 3. Preschool Education, 4. Guidance and Psych. Coun., 5. Primary School Education, 6. Social Studies Education, 7. Turkish Education; ***: p<.01

Table 6 shows the results of the Welch ANOVA test to determine whether pre-service teachers' electronic assessment anxiety and its sub-dimensions differ significantly according to their fields of study. No significant difference was found between the groups in the technical anxiety sub-dimension ($Welch's\ F(24.96, 166.96) = 1.844, p > .05$). On the other hand, significant differences were found between the fields in the social anxiety sub-dimension ($Welch's\ F(29.77, 159.80) = 3.616, p < .01, \omega^2 = .021$). When the effect size was examined, it was known that the ω^2 value was in the range of .01–.06, and this range is classified as a small-level effect (Field, 2013). 14. The Games–Howell multiple comparison test determined that this difference emerged particularly

between science education and pre-school and mathematics education and pre-school. Similarly, a significant difference was found between the domains in total electronic assessment anxiety scores ($Welch's\ F(54.41, 161.19) = 3.436, p = .003, \omega^2 = .018$). This ω^2 value also indicates a small effect (Field, 2013). Post-hoc analyses indicated that the significant difference in total anxiety scores occurred between science education and preschool and between mathematics education and preschool.

4.4 Findings Regarding Differences in Preservice Teachers' Electronic Assessment Anxiety by Grade Level

In this section, the differences in preservice teachers 'electronic assessment anxiety by grade level were examined using a One-Way ANOVA for the overall scale and its sub-dimensions. The findings are presented in Table 7.

TABLE 7
One-Way ANOVA Test results of preservice teachers' electronic assessment anxiety according to grade level

	Grade Level	n	$\overline{X}$	SD	F	p	Difference	η^2
Technicalanxiety	1st grade	106	25.60	6.39	1.626	.182	No diff.	.009
	2nd grade	197	26.07	5.99				
	3rd grade	154	27.19	7.18				
	4th grade	56	25.64	6.87				
Social anxiety	1st grade	106	32.67	9.49	2.994	.030*	2-4; 3-4	.017
	2nd grade	197	34.14	8.62				
	3rd grade	154	34.40	10.2				
	4th grade	56	30.48	8.62				
Electronic Assessment anxiety	1st grade	106	58.29	14.77	2.347	.072	No diff.	.014
	2nd grade	197	60.21	13.71				
	3rd grade	154	61.59	16.14				
	4th grade	56	56.06	13.70				

*: p<.05

Table 7 shows that a one-way ANOVA was conducted to determine whether preservice teachers' electronic assessment anxiety and its sub-dimensions differed according to grade level. For the technical anxiety sub-dimension, the results indicated no significant differences among grade levels ($F(3, 509) = 1.626, p > .05$). In contrast, a significant difference was found between grade levels in the social anxiety sub-dimension, ($F(3, 509) = 2.994, p < .05$). The effect size was ($\eta^2 = .017$) indicating a small effect (Cohen, 1988). Post-hoc analyses showed that the significant differences occurred between 2nd- and 3rd-grade preservice teachers, and between 1st- and 3rd-grade preservice teachers. For the overall electronic assessment anxiety scores, no significant differences were observed across grade levels ($F(3, 509) = 2.347, p > .05$). This suggests that preservice teachers' general electronic assessment anxiety levels are relatively similar regardless of grade level.

5   CONCLUSION

This study investigated preservice teachers' electronic assessment anxiety across gender, field of study, and grade level, using both One way ANOVA and Welch ANOVA depending on variance homogeneity. The results showed that preservice teachers experienced a moderate level of electronic assessment anxiety overall, as well as in both technical and social anxiety sub-dimensions. Significant differences emerged in electronic assessment anxiety based on gender, field of study, and grade level, although the effect sizes were consistently small. Female preservice teachers demonstrated higher levels of both overall anxiety and technical anxiety compared to males. Furthermore, students in preschool education showed higher anxiety levels than those in science and mathematics education programs, while third-year students reported higher social anxiety than students in other grade levels. Overall, the study highlights that demographic and academic variables contribute to small but meaningful variations in electronic assessment anxiety. These findings underscore the importance of

supporting preservice teachers' digital competence and emotional readiness for technology-enhanced assessment environments

6   DISCUSSION

The findings of this study provide important insights into preservice teachers' levels of electronic assessment anxiety and the factors influencing this construct. First, the observation that preservice teachers exhibited a moderate level of electronic assessment anxiety aligns with previous studies documenting that technology-mediated assessment environments may evoke uncertainty, perceived difficulty, or emotional strain among preservice teachers (Ifenthaler & Yau, 2020; Tat & Kılıç, 2024). As e-assessment tools increasingly become integrated into teacher education programs, emotional reactions to such tools gain critical importance for effective teacher preparation.

Gender-based differences observed in this study indicate that female preservice teachers reported higher levels of overall and technical anxiety than males. This finding is consistent with earlier research suggesting that females often report higher test-related or technology-mediated anxiety due to socialization patterns, differential expectations, or perceived self-efficacy in technology use (Cassady & Johnson, 2002; Ong & Lai, 2006). Although the effect sizes in the current study were small, technology confidence remains an important factor affecting preservice teachers' engagement in e-assessment practices. Although several of the observed differences reached statistical significance, the corresponding effect sizes were generally small. It is important to distinguish between statistical significance and practical significance when interpreting these findings. Statistical significance indicates that an observed difference is unlikely to have occurred by chance, particularly in large samples, whereas practical significance refers to the extent to which this difference has meaningful implications in real educational contexts (Cohen, 1988; Kirk, 1996).

In teacher education settings, even small effect sizes may carry educational relevance. Modest increases in electronic assessment anxiety, for example, can influence preservice teachers' confidence, willingness to engage with digital assessment tools, and future adoption of technology-supported evaluation practices. Therefore, the small effect sizes observed in this study should not be interpreted as trivial, but rather as indicators of subtle yet meaningful variations that may accumulate over time and across learning experiences. From this perspective, the findings provide valuable insights for designing targeted support strategies aimed at reducing electronic assessment anxiety among preservice teachers.

Furthermore, significant differences across fields of study, particularly the higher levels of anxiety among preschool education students compared to those in science and mathematics education, may reflect variations in program curricula and exposure to digital tools. Programs with stronger emphasis on ICT integration tend to prepare students more effectively for technology-enhanced assessment practices (Tondeur et al., 2017). Preschool teacher education programs may focus more on developmental and pedagogical practices, offering fewer opportunities to practice structured e-assessments. This may explain the elevated anxiety levels in these groups.

Grade-level differences in social anxiety also support the notion that as students progress through their programs, their familiarity with assessment practices and technological tools changes. Third-year students' higher social anxiety levels may derive from increased workload, rising performance expectations, and their closer proximity to teaching practicum experiences—periods during which assessment anxieties tend to heighten (Brookhart, 2013). Nevertheless, the absence of significant differences in overall anxiety across grade levels suggests that general electronic assessment anxiety may remain relatively stable throughout teacher education.

Finally, effect size analyses consistently demonstrated small magnitudes, indicating that although differences

exist, demographic and academic factors explain only a small portion of variance in electronic assessment anxiety. This finding aligns with studies emphasizing that technology-related anxieties are shaped not only by observable demographic variables, but also by deeper psychological constructs such as digital self-efficacy, prior experiences, and attitudes toward technology (Teo, 2014; Redecker & Johannessen, 2013).

7   PRACTICAL IMPLICATIONS

The results of this study provide several practical implications for teacher education programs. First, the moderate levels of electronic assessment anxiety highlight the need for targeted training designed to enhance preservice teachers' confidence and competence in technology-mediated assessment. Integrating structured practice opportunities with digital testing platforms, online rubrics, automated scoring tools, and simulation-based assessments could reduce anxiety and strengthen practical skills.

Second, since female students and certain departmental groups (e.g., preschool education) reported higher anxiety levels, tailored support programs such as digital literacy workshops, mentoring, or hands-on laboratory sessions may help reduce disparities. Embedding these activities systematically across teacher education curricula may ensure that all students, regardless of background, have sufficient exposure to e-assessment environments.

Third, given that anxiety related to social aspects of e-assessment varies across grade levels, educators may consider providing consistent opportunities for feedback, peer collaboration, and scaffolded e-assessment tasks throughout the program, rather than concentrating such activities in upper years. Strengthening affective support—including promoting growth mindsets and self- assessment strategies—can further reduce social anxiety associated with technology-enhanced assessment.

Finally, the small effect sizes indicate that although demographic variables have some influence, they do not fully explain variations in electronic assessment anxiety. This suggests that additional factors—such as prior digital experience, technological readiness, instructional support, and the quality of exposure to e-assessment environments—may also play an important role. Accordingly, teacher education programs may benefit from strengthening opportunities for hands-on practice with e-assessment tools and enhancing institutional support for technology-rich learning environments.

8   LIMITATIONS AND FUTURE DIRECTIONS

This study has several limitations that should be considered when interpreting the findings. First, the sample was drawn from a single faculty of education, which limits the generalizability of the results. Future research should include participants from multiple institutions and diverse geographic regions. While the study examined demographic variables such as gender, grade level, and field of study, other factors—including digital literacy levels, prior experience with e-assessment tools, and attitudes toward technology—were not directly measured but may significantly influence electronic assessment anxiety.

Future research could adopt mixed-methods designs to explore the cognitive and emotional processes underlying electronic assessment anxiety in more depth. Additionally, longitudinal studies could examine how anxiety levels evolve throughout teacher education and during transition into professional teaching roles. Experimental interventions that aim to reduce electronic assessment anxiety and improve digital self-efficacy would also be valuable for informing teacher education practices.

DECLARATIONS

Author Contributions

YK: [Conceptualization, Methodology, Writing – Original Draft, Data Curation, Software, Formal Analysis, Supervision]

NSU: [Data Collection, Spell Checking, Bibliography]

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