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Digital etiquette and belief-oriented technology use among Kazakhstani pre-service teachers: a cross-sectional survey

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Introduction: Digital etiquette (netiquette) is a key component of digital citizenship, yet its behavioral profile and association with belief-oriented technology use remain underexamined in bilingual teacher-education contexts. This study examined Kazakhstani pre-service teachers' self-reported digital etiquette and belief-oriented technology use, evaluated the factorial structure and language equivalence of the adapted measures, and explored whether digital etiquette was associated with instructional-technology course completion and selected background variables.

Methods: A quantitative cross-sectional survey was conducted in Winter 2024–2025 with 300 students from two Kazakhstani universities. Data were collected using Kazakh and Russian versions of the questionnaire. Confirmatory factor analysis was used to evaluate the measurement structure, multi-group CFA was conducted to test language invariance, and correlational and regression-based analyses examined associations among digital etiquette, belief-oriented technology use, instructional-technology course completion, GPA, year of study, and gender.

Results: Confirmatory factor analysis supported a two-factor structure with acceptable fit (CFI = .95, RMSEA = .06), and multi-group CFA indicated scalar invariance across language versions. Participants reported high digital etiquette (M = 4.47, SD = 0.41) and belief-oriented technology use (M = 4.30, SD = 0.48). Digital etiquette was positively associated with belief-oriented technology use (Spearman's $r_s = .53$, 95% CI [.45, .60], $p < .001$). After adjustment for GPA and year of study, instructional-technology course completion was not associated with higher digital etiquette ($\Delta R^2 = .003$; ANCOVA $p = .142$), and gender differences were negligible.

Discussion: The findings provide bilingual measurement evidence from Kazakhstan and suggest that belief-oriented technology use is associated with, but not equivalent to, self-reported digital etiquette. Because the study was cross-sectional, relied on single-source self-report data, and showed an upper-range concentration in digital etiquette scores, the results should be interpreted as exploratory and correlational rather than causal.

KEYWORDS

belief-oriented technology use, digital citizenship, digital etiquette, Kazakhstan, pre-service teachers, teacher education

1 Introduction

The diffusion of digital technologies within educational environments has increased scholarly and practitioner concerns about the way in which education practitioners and learners interact with digital environments - concerns that go beyond concerns about pedagogical efficacy - into the domain of ethical responsibility. As digital tools become so entrenched in an instructional context, they simultaneously increase access to, improve interaction and enable the construction of knowledge as well as foreground the ethically salient risks, specifically those related to privacy violations, detrimental online interactions, and the misattribution or misuse of information. Within this changing space, digital citizenship is usually defined as a constellation of knowledge, skills, and dispositions that form the basis for safe, ethical, and responsible participation in digital milieus (Boonlab and Pasitpakakul, 2023; Zheng et al., 2024). It generally includes respect for others, recognition of online hazards and following moral standards in mediated communication (Prasetyo et al., 2023). Embedded within this larger paradigm, digital etiquette or netiquette describes sets of collectively agreed to expectations determining the appropriate behavior in virtual interaction (Ribble et al., 2004).

In formal education, digital etiquette can be understood as a behavioral repertoire that regulates communication, attention, privacy, and academic integrity in technology-mediated learning environments (Al-Khatib, 2023; Mellado-Moreno and Burgos, 2025). A related but less consistently operationalized construct is belief-oriented technology use, which concerns the extent to which students' ethical, pedagogical, and personal beliefs inform their choices about digital tools and practices (Abulibdeh, 2019). Technology use is therefore not value-neutral: beliefs may shape what students consider appropriate, useful, respectful, or professionally acceptable online (Bice and Tang, 2022; Hardianto et al., 2023).

Although the importance of responsible digital participation is widely recognized, its integration into pre-service teacher education remains uneven. International standards increasingly position teachers as models of safe, legal, ethical, and professionally responsible technology use. For example, the **International Society for Technology in Education** (ISTE) standards emphasize educators' role in promoting responsible digital behavior and ethical use of digital tools (Mangkhang and Kaewpanya, 2021; Mucundanyi and Tamang, 2022). UNESCO similarly stresses the shared responsibility of educators, families, and policymakers in fostering safe and responsible digital cultures among young people while noting persistent gaps in preparation and capacity (UNESCO Bangkok, 2015). Empirical studies also suggest that teachers and pre-service teachers often report limited formal preparation for teaching digital citizenship and for addressing ethically complex digital dilemmas in practice (Gümüş et al., 2023; Vajen et al., 2023; Yoorubsuk and Maneewan, 2022).

Preparedness for digital citizenship is not limited to technical skill. Emerging evidence indicates that responsible digital participation is partly grounded in dispositions, relational judgment, empathy, assertiveness, and ethical sensitivity (Shi et al., 2023). This distinction is important because digital competence can enable participation without guaranteeing responsible conduct. Conceptual frameworks therefore treat

ethical participation as a separable dimension of digital citizenship rather than a simple extension of technical proficiency (Choi et al., 2017; Simsek and Simsek, 2013). Teacher education programs that focus mainly on tool use may therefore leave a gap between what future teachers can do with technology and how they choose to use it in socially and professionally responsible ways (Novella-Garcia and Cloquell-Lozano, 2021).

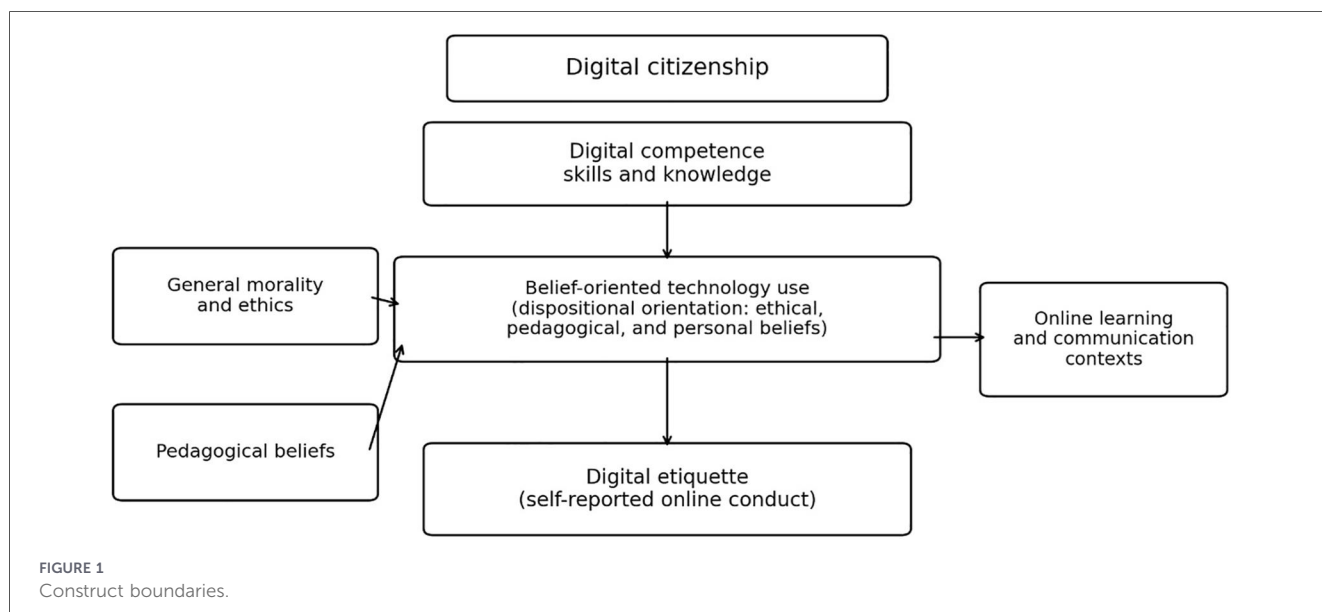
Kazakhstan provides a significant context for this line of inquiry. Digitization in education has accelerated, but scholarship has tended to foreground technology adoption, classroom integration, access, and institutional support rather than the ethical and interactional dimensions of digital citizenship (Maulet et al., 2024; Nogaibayeva and Yersultanova, 2025; OECD, 2023). Local studies have begun to address digital etiquette and teacher-student interaction in online environments (Abdigapbarova et al., 2024; Zhunusbekova et al., 2024), yet systematic evidence concerning pre-service teachers' digital etiquette and belief-oriented technology use remains limited.

A further methodological issue concerns language. Teacher education in Kazakhstan operates in a bilingual and increasingly trilingual ecology in which professional meanings and institutional expectations are negotiated across Kazakh, Russian, and other languages (Karabassova, 2022; Kryukova et al., 2022). Because digital etiquette and belief-oriented technology use are normatively and culturally embedded constructs, locally adapted instruments must be tested for measurement equivalence across language versions before substantive interpretation is warranted (Rubach and Lazarides, 2021; Zhunusbekova et al., 2024). Psychometric work in educational technology shows that such validation is especially important for constructs located at the intersection of competence, ethics, and civic participation (Masalimova et al., 2022).

In this study, digital etiquette and belief-oriented technology use are treated as related but analytically distinct constructs. Digital etiquette refers to enacted norms of respectful, responsible, and academically appropriate online conduct, including source attribution, privacy protection, respectful communication, avoidance of harmful online behavior, and responsible information sharing (Al-Khatib, 2023; Ribble et al., 2004). By contrast, belief-oriented technology use refers to a dispositional orientation through which students' ethical, pedagogical, and personal beliefs shape decisions about when, why, and how digital tools should be used (Abulibdeh, 2019; Bice and Tang, 2022). The conceptual link between the two constructs is therefore not one of equivalence. Belief-oriented technology use may inform platform choice, self-regulation, privacy awareness, academic integrity, and judgments about appropriate digital participation, whereas digital etiquette represents the behavioral expression of norms in concrete online learning and communication contexts. Although overlap between the constructs is possible, particularly because both are normatively framed, the present study examines whether they can be empirically distinguished and how they are associated among pre-service teachers.

The aim of this study was to examine digital etiquette and belief-oriented technology use among Kazakhstani pre-service teachers in a bilingual Kazakh-Russian higher education context. Because the study was exploratory and cross-sectional, it was guided by research questions rather than causal hypotheses. The following three research questions were addressed:

RQ1. Do the digital etiquette and belief-oriented technology use scales demonstrate acceptable factorial validity and



measurement equivalence across the Kazakh- and Russian-language survey versions?

RQ2. What levels of digital etiquette and belief-oriented technology use are reported by Kazakhstani pre-service teachers, and how are the two constructs associated?

RQ3. To what extent are digital etiquette scores associated with instructional-technology course completion and selected background variables, including GPA, year of study, and gender?

A positive association between belief-oriented technology use and digital etiquette was expected on theoretical grounds; however, all relationships were interpreted as associations rather than causal effects because of the cross-sectional design.

1.1 Literature review

1.1.1 Digital etiquette in teacher education

Within the broader field of digital citizenship, digital etiquette can be understood as a set of norms that governs participation in digitally mediated social and learning spaces (Ribble et al., 2004). Although the construct may appear self-evident, norms of respectful communication, privacy, attention management, and academic integrity change with platforms, institutional expectations, and the organization of learning. As education becomes more networked and interactive, digital etiquette is not merely a matter of interpersonal politeness; it is connected to pedagogical order, inclusion, safety, and the professional modeling expected of future teachers.

Recent work suggests that digital etiquette is underemphasized relative to other dimensions of digital citizenship despite its practical importance for sustaining constructive online participation (Al-Khatib, 2023). If digital etiquette is understood as a behavioral repertoire, its measurement should move beyond broad claims about “being respectful online” and specify the practices through which norms are enacted. These practices include citing online sources, verifying information before sharing it, protecting others’ privacy, avoiding offensive or harmful

communication, respecting academic integrity, and managing attention during digital learning. For pre-service teachers, this operational specificity is consequential because they are expected not only to follow such norms themselves but also to model and teach them in technology-rich educational settings (Abdigapbarova et al., 2025; Mellado-Moreno and Burgos, 2025).

1.1.2 Belief-oriented technology use

A parallel line of inquiry emphasizes that skill-based accounts alone cannot fully explain responsible digital behavior. Belief-oriented technology use foregrounds the idea that students’ choices about tools, platforms, boundaries, and digital practices are shaped by ethical, pedagogical, and personal commitments (Abulibdeh, 2019). This orientation may guide whether a student prefers licensed or open-access educational resources, avoids tools perceived to undermine well-being or productivity, considers privacy and fairness before adopting a platform, or encourages peers to use technology respectfully.

A central theoretical task is to distinguish belief-oriented technology use from neighboring constructs. Pedagogical beliefs concern assumptions about teaching and learning and about how technology should support instruction (Chew, 2022). General morality and ethics provide broad principles of right and wrong but do not necessarily specify how those principles are enacted in platform-specific environments characterized by anonymity, visibility, and rapid diffusion. Digital competence and literacy refer to knowledge and skills that facilitate technology use, but competence does not by itself imply responsible conduct (Choi et al., 2017; Getenet et al., 2026; Puniatmaja et al., 2023; Simsek and Simsek, 2013). In this study, belief-oriented technology use is therefore treated as a value-laden dispositional orientation that may inform digital etiquette without being reducible to it.

Figure 1 illustrates these construct boundaries by presenting belief-oriented technology use as a dispositional orientation that may inform digital etiquette while remaining conceptually distinct from

pedagogical beliefs, general morality, and digital competence. The figure is intended to support, not replace, the conceptual distinction made in the text: digital etiquette concerns enacted or self-reported conduct, whereas belief-oriented technology use concerns the belief-based rationale guiding technology-related decisions.

1.1.2.1 Individual differences and the context-sensitive requirement for evidence

Although ethical and value-laden dimensions of digital participation are increasingly recognized, empirical evidence remains limited on how these dimensions vary across individuals and settings. Gender differences are frequently examined in studies of technology attitudes and self-assessments, but their direction and magnitude are inconsistent across samples and cultural contexts. Gender is therefore best treated cautiously as an exploratory background variable rather than as a theoretically central explanation. Academic performance indicators such as GPA may also be relevant, partly because they may reflect self-regulation and academic engagement, but the literature does not provide a stable account of how GPA relates to responsible digital behavior. These uncertainties support the empirical examination of GPA, year of study, and gender as background variables in particular teacher-education contexts rather than the importation of assumptions from other populations (Deng et al., 2022).

1.1.3 Kazakhstan, bilingual measurement, & an empirical gap

The Kazakhstani context adds two layers of importance. First, the rapid expansion of educational digitization has not been matched by equally extensive empirical work on the ethical and interactional dimensions of digital citizenship. Second, bilingual educational settings require careful measurement work before scores can be interpreted across Kazakh and Russian survey versions. If language versions do not measure constructs equivalently, observed differences may reflect translation artifacts or differential interpretation rather than substantive differences in digital etiquette or belief-oriented technology use (Rubach and Lazarides, 2021; Zhunusbekova et al., 2024). The present study addresses this gap by examining digital etiquette and belief-oriented technology use among Kazakhstani pre-service teachers while also testing whether the adapted measures provide an interpretable basis for bilingual research and curriculum evaluation.

2 Methods

2.1 Study design and setting

The study used a quantitative cross-sectional survey design during the winter term of 2024–2025. This design was appropriate for describing self-reported digital etiquette and belief-oriented technology use, testing the measurement structure of the adapted scales, and exploring associations among the focal constructs and selected background variables at one point in time. The design does not permit causal inference or estimation of change over time. Data were collected from two Kazakhstani institutions: L.N. Gumilyov Eurasian National University in Astana and K. Zhubanov Aktobe Regional University in Aktobe.

TABLE 1 Participant demographics.

Characteristic	Value
Age (years), mean $\pm$ SD (range)	20.7 $\pm$ 1.2 (18–25)
Gender: Female	225 (75.0%)
Gender: Male	75 (25.0%)
Year of study: 1st year	80 (26.7%)
Year of study: 2nd year	70 (23.3%)
Year of study: 3rd year	60 (20.0%)
Year of study: 4th year	90 (30.0%)
Instructional-technology course completed (Yes)	150 (50.0%)
Instructional-technology course not yet taken (No)	150 (50.0%)
Cumulative GPA (4.0 scale), mean $\pm$ SD	3.30 $\pm$ 0.25
Survey language: Kazakh	186 (62.0%)
Survey language: Russian	114 (38.0%)

Percentages are based on $N = 300$.

2.2 Participants and sampling

Participants were undergraduate students enrolled in pedagogy-psychology programs, preparing for future roles as teachers and educational psychologists. A cluster-based recruitment approach was used: intact class cohorts from each university were invited to participate during scheduled class sessions. Eligibility criteria were: (a) enrollment in the first through fourth year of a bachelor's degree program in pedagogy and psychology, and (b) age 18 years or older. Participation was voluntary, and no compensation was provided other than a brief educational debriefing on digital citizenship after completion of the survey. A total of 318 responses were received. After data screening, 18 cases were removed because of substantial missingness or patterned responding, resulting in a final analytic sample of $N = 300$. Table 1 presents the sample characteristics.

2.3 Instructional technology course exposure

Instructional-technology course exposure was operationalized as a binary indicator of whether students had completed a regular one-semester course in ICT or Instructional Technology in Education by the time of data collection. In the participating programs, this course is typically taken in the second or third year. The variable was coded as 0 = not yet completed and 1 = completed. This indicator was used as an exploratory measure of course exposure and should not be interpreted as a detailed measure of course content, instructional quality, ethical emphasis, or learning activities.

2.4 Measures

2.4.1 Digital etiquette scale

Digital etiquette or netiquette was assessed using a 10-item scale adapted from Abulibdeh (2019) for the Kazakhstani

teacher-education context. Respondents rated items on a 5-point frequency scale ranging from 1 = Never to 5 = Always. The scale measured the self-reported frequency of responsible and respectful online conduct in academic and communication contexts. Items addressed source attribution, information accuracy, privacy protection, respectful interaction, avoidance of harmful online behavior, academic integrity, and basic security practices. Example items include: “I credit the original source when I use online materials or ideas in my assignments or presentations” and “Before sharing information online, I check that it is accurate and not misleading.” Negatively worded items referring to insulting language, plagiarism, distraction, and sharing others’ messages without consent were reverse-coded so that higher scores indicated stronger digital etiquette. Internal consistency in the present sample was high (Cronbach’s $\alpha = .88$).

2.4.2 Belief-oriented technology use scale

Belief-oriented technology use was measured using an 8-item scale adapted from Abulibdeh (2019). Respondents rated items on a 5-point agreement scale ranging from 1 = Strongly disagree to 5 = Strongly agree. The scale measured students’ agreement with statements describing the role of ethical, pedagogical, and personal beliefs in technology-related decisions. It captured whether students considered beliefs, privacy, academic integrity, productivity, well-being, and respectful collaboration when choosing or using digital tools. Example items include: “I choose digital tools or platforms because they align with my values or educational philosophy” and “Before adopting a new app or platform, I consider whether its use is ethically acceptable.” Higher scores indicated stronger belief-oriented technology use. Internal consistency in the present sample was acceptable (Cronbach’s $\alpha = .82$).

2.4.3 Translation, cultural adaptation and content validity

The questionnaire was administered in Kazakh and Russian. Translation followed a forward-translation and back-translation procedure conducted by bilingual experts to support semantic equivalence. To strengthen content validity, three expert reviewers with expertise in educational technology or educational psychology evaluated each item for clarity, cultural relevance, and construct relevance. Item wording was revised in response to expert feedback. The average item-level Content Validity Index across all items was .90.

2.4.4 Construct validation, measurement invariance

Confirmatory factor analysis (CFA) was conducted in AMOS 24 to test a two-factor measurement model with 10 Digital Etiquette indicators and 8 Belief-Oriented Technology Use indicators. Model fit was evaluated using χ^2 , CFI, TLI, RMSEA, and SRMR. Composite reliability (CR) and average variance extracted (AVE) were calculated to assess reliability and convergent validity. Because the survey was administered in two languages, measurement invariance across the Kazakh and

Russian versions was tested sequentially at the configural, metric, and scalar levels using Δ CFI and Δ RMSEA criteria.

2.5 Procedure and ethical considerations

Surveys were completed face-to-face in class in a paper-and-pencil format. Before distribution, a trained member of the research team provided a general explanation of the study aims without disclosing specific expectations about the results. Participation was anonymous, and no identifying information was collected. Instructors were not involved in survey administration in order to reduce perceived evaluation pressure. Completion took approximately 15–20 min. After completing the questionnaire, participants received a brief debriefing on digital citizenship.

The study was approved by the Institutional Research Ethics Committee of L.N. Gumilyov Eurasian National University (approval #2024-015-D). Written informed consent was obtained from all participants, who were informed of their right to withdraw at any time.

2.6 Statistical analysis

The statistical analysis proceeded in stages aligned with the three research questions. First, descriptive statistics and item-level distributions were examined to describe the sample and response patterns for both scales. Second, CFA was used to evaluate the factorial structure of the digital etiquette and belief-oriented technology use scales, and measurement invariance across the Kazakh- and Russian-language versions was examined to assess whether the constructs were comparable across language groups. Third, the association between digital etiquette and belief-oriented technology use was examined using Spearman’s rank-order correlation because the scale distributions showed non-normality and the digital etiquette score showed an upper-range concentration. Fourth, regression, ANCOVA, and group-comparison analyses were used exploratorily to examine whether digital etiquette was associated with instructional-technology course completion and selected background variables.

Before interpreting parametric models, relevant assumptions were considered. For regression, linearity, independence of observations, multicollinearity, homoscedasticity, residual normality, and influential observations were assessed. For ANCOVA, homogeneity of regression slopes, homogeneity of variance, independence of observations, and residual distributions were considered. For the independent-samples *t*-test, independence, approximate within-group normality, and equality of variances were assessed. Because digital etiquette scores were highly concentrated near the upper end of the scale, parametric findings were interpreted cautiously and were treated as exploratory rather than causal or definitive.

The hierarchical regression model was specified to examine whether instructional-technology course completion explained additional variance in digital etiquette beyond general academic and cohort-related background variables. GPA and year of study were entered at Step 1 because they represent academic attainment and stage of teacher preparation; year of study was

TABLE 2 CFA fit and construct reliability/validity indices ($N = 300$).

Construct	Items (k)	Cronbach's α	Composite reliability (CR)	AVE	Standardized loadings (range)
Digital Etiquette	10	.88	.89	.50	.55–.83
Belief-Oriented Technology Use	8	.82	.84	.45	.60–.79

Model fit after theory-justified correlated residuals: CFI = .95, TLI = .93, RMSEA = .06, SRMR = .045. Latent factor correlation (Digital Etiquette - Belief-Oriented Technology Use) = .62.

TABLE 3 Descriptive statistics for study variables ($N = 300$).

Variable	Scale range	M	SD
Digital etiquette	1–5	4.47	0.41
Belief-oriented technology use	1–5	4.30	0.48
Cumulative GPA	0–4	3.30	0.25
Age (years)	–	20.7	1.2

Higher scale scores indicate greater digital etiquette adherence and stronger belief-oriented technology use.

represented using dummy variables. Instructional-technology course completion was entered at Step 2 as the focal educational exposure variable. This ordering was used to test incremental association rather than to imply a causal sequence.

Data analysis was performed using SPSS 28.0. Item-level response distributions were analyzed to identify digital etiquette behaviors with comparatively lower or higher adherence. Associations between digital etiquette and belief-oriented technology use were examined using Spearman's r s with bootstrapped 95% confidence intervals based on 10,000 resamples. Course completion was examined using hierarchical regression and ANCOVA with GPA as a covariate; effect sizes were reported where appropriate. Given the gender imbalance in the sample, gender comparisons were treated as exploratory and were examined using Mann–Whitney U tests. Common-method bias associated with single-source self-reporting was assessed using Harman's single-factor test and a CFA sensitivity model including a latent common-method factor.

3 Results

3.1 RQ1: measurement model, reliability, and language invariance

A two-factor CFA model comprising Digital Etiquette (10 indicators) and Belief-Oriented Technology Use (8 indicators) was estimated. Following two theory-justified correlated residuals suggested by modification indices, model fit was within conventional acceptability criteria (CFI = .95, TLI = .93, RMSEA = .06, SRMR = .045). Standardized factor loadings ranged from .55 to .83 for Digital Etiquette and from .60 to .79 for Belief-Oriented Technology Use (all $p < .001$). The latent correlation between the two factors was .62. Reliability and convergent validity indices are reported in Table 2. The AVE for Belief-Oriented Technology Use was .45, below the conventional .50 threshold; this issue is addressed in the Discussion and Limitations sections.

Measurement invariance across the Kazakh ($n = 186$) and Russian ($n = 114$) survey versions was tested sequentially at the

TABLE 4 Selected item-level response highlights.

Construct	Behavioral indicator (item content abridged)	Response category	Proportion
Digital etiquette	Use insulting language or harass others online	Never	95%
Digital etiquette	Cheat or plagiarize online content for assignments	Never	88% (remainder: rarely)
Digital etiquette	Neglect to cite online sources properly	At least sometimes	$\approx 20\%$
Digital etiquette	Get distracted by social media during class/study	At least sometimes	$\approx 15\%$
Belief-oriented technology use	Prefer licensed/open-access educational resources over pirated materials	Agree/strongly agree	$\approx 85\%$
Belief-oriented technology use	Choose communication platforms aligned with values such as privacy or respectful interaction	Agree/strongly agree	$> 80\%$
Belief-oriented technology use	Avoid tools believed to negatively affect productivity or well-being	Agree/strongly agree	78%

Abridged item wording is provided for readability. Full item wording and complete response distributions are reported in [Supplementary Tables S1 and S2](#).

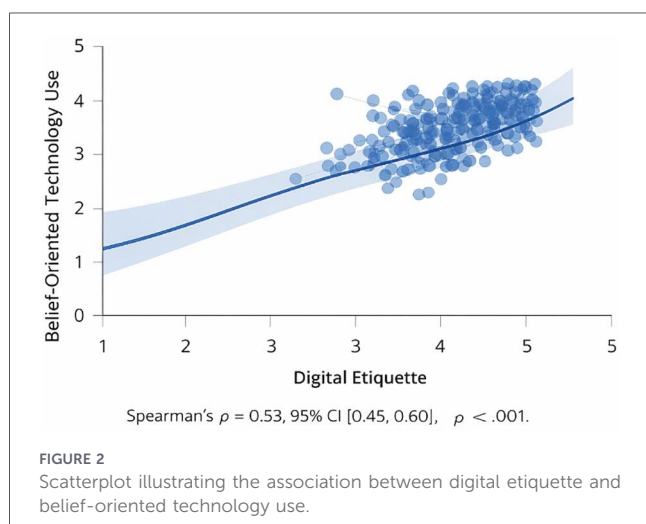
configural, metric, and scalar levels. Fit comparisons satisfied commonly used criteria for invariance at each step (all $\Delta\text{CFI} \leq .010$; all $\Delta\text{RMSEA} \leq .015$), supporting scalar invariance across language versions.

3.2 RQ2: descriptive statistics and item-level response patterns

Descriptive statistics for the main study variables are shown in Table 3. The mean Digital Etiquette score was 4.47 (SD = 0.41) on a 1–5 scale, and the mean Belief-Oriented Technology Use score was 4.30 (SD = 0.48) on a 1–5 scale. Table 4 provides selected item-level response indicators showing behaviors with comparatively higher and lower endorsement or adherence.

The distribution of digital etiquette scores indicated a pronounced upper-range concentration. Several items showed very high endorsement of socially desirable conduct, particularly items related to avoiding insulting language, plagiarism, and non-consensual sharing of others' messages or photos. This pattern suggests a potential ceiling effect and restricted score range. Consequently, weak or non-significant associations involving digital etiquette, including group differences by course completion or gender, should be interpreted cautiously because limited variance may have reduced analytic sensitivity.

Spearman's rank-order correlation indicated a positive association between Digital Etiquette and Belief-Oriented Technology Use, $r_s = .53$, $p < .001$, with a bootstrapped 95% confidence interval [.45, .60]. Figure 2 visualizes the bivariate association. Students who reported stronger belief-oriented technology use also tended to report higher levels of digital etiquette. However, the association is correlational and does not establish the direction of the relationship between the two constructs.



3.3 RQ3: instructional-technology course completion and background variables

In hierarchical regression, Step 1 (GPA and year of study) accounted for 4.6% of the variance in Digital Etiquette, $R^2 = .046$, $F(4, 295) = 7.12$, $p < .01$. Adding instructional-technology course completion in Step 2 did not improve model fit, $\Delta R^2 = .003$, $p = .180$; the standardized coefficient for course completion was $\beta = .06$. This result indicates that the binary course-completion indicator did not add meaningful explanatory value beyond GPA and year of study in the present sample.

Consistent with the regression results, ANCOVA comparing course completers ($n = 150$) and non-completers ($n = 150$), with GPA as a covariate, did not detect a statistically significant group difference in Digital Etiquette, $F(1, 297) = 2.17$, $p = .142$, partial $\eta^2 = .007$. The adjusted mean Digital Etiquette score was 4.50 (SE = 0.03) for course completers and 4.43 (SE = 0.03) for non-completers. GPA was a statistically significant covariate, $F(1, 297) = 5.80$, $p = .017$, partial $\eta^2 = .02$. A robustness check using an independent-samples t-test yielded a similar result, $t(298) = 1.48$, $p = .140$. The mean difference was 0.07, 95% CI [-0.02, 0.16], and Cohen's d was approximately .17.

Figure 3 depicts the adjusted mean digital etiquette scores by instructional-technology course completion status.

The non-significant course-completion result should not be interpreted as evidence that instructional-technology coursework is ineffective. It indicates only that the binary course-exposure variable used in this study did not differentiate self-reported digital etiquette scores in this sample.

Gender differences were examined using Mann-Whitney U tests because Digital Etiquette scores were non-normally distributed and group sizes were unequal (female: $n = 225$; male: $n = 75$). Digital Etiquette did not differ significantly by gender, $U = 7,970$, $p = .330$. Belief-Oriented Technology Use also did not differ significantly by gender, $U = 8,122$, $p = .470$. These comparisons were treated as exploratory because of the gender imbalance in the sample.

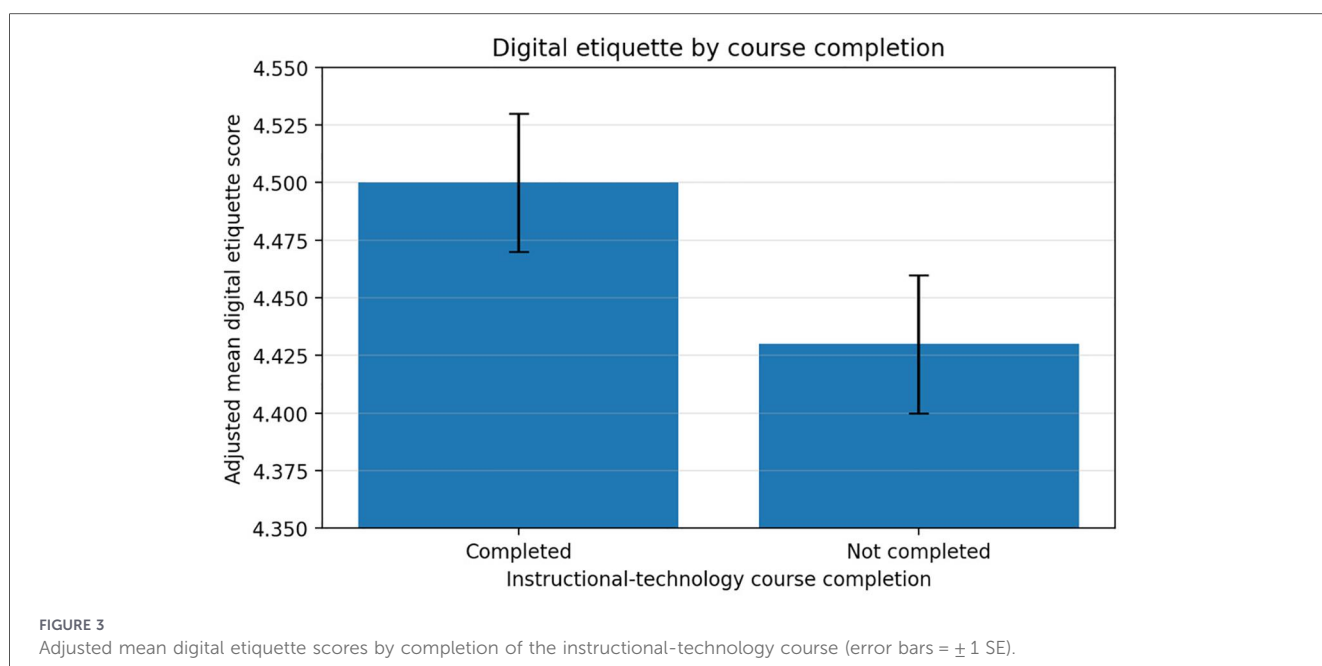


TABLE 5 Summary of main tests and sensitivity analyses.

Analysis	Test statistic	p	Effect size/CI
Digital Etiquette ↔ Belief-Oriented Technology Use	Spearman $r_s = .53$	<.001	95% CI [.45,.60]
Course completion (ANCOVA; DV = etiquette; covariate = GPA)	$F(1, 297) = 2.17$	.142	partial $\eta^2 = .007$
GPA covariate in ANCOVA	$F(1, 297) = 5.80$	.017	partial $\eta^2 = .02$
Course completion (t-test; etiquette)	$t(298) = 1.48$	.140	Mean difference = 0.07; 95% CI [-0.02, 0.16]; $d = .17$
Gender difference (etiquette)	Mann–Whitney $U = 7,970$	.330	–
Gender difference (belief-oriented use)	Mann–Whitney $U = 8,122$	.470	–

All tests are two-tailed.

In Harman's single-factor test including all Digital Etiquette and Belief-Oriented Technology Use items, a single unrotated factor accounted for 34% of the total variance. In a CFA sensitivity model including an uncorrelated latent common-method factor, model fit improved only marginally ($\Delta CFI = .006$), and the method factor accounted for 8% of total variance. These diagnostics do not eliminate the possibility of common-method variance, but they suggest that a single dominant method factor was not the sole explanation for the observed association between the two constructs (Table 5).

4 Discussion

This study examined digital etiquette and belief-oriented technology use among Kazakhstani pre-service teachers in a bilingual Kazakh-Russian survey context. The findings address three linked issues: whether the adapted measures functioned adequately across language versions, how students reported digital etiquette and belief-oriented technology use, and whether digital etiquette was associated with instructional-technology course completion and selected background variables. Taken together, the findings present a mixed picture. On the one hand, the two-factor measurement model and language-invariance results provide an interpretable basis for studying the constructs in this bilingual context, and students reported high levels of both digital etiquette and belief-oriented technology use. On the other hand, the upper-range concentration of digital etiquette scores, reliance on self-report, AVE below .50 for the belief-oriented scale, and limited differentiation by course completion or gender require cautious interpretation.

4.1 RQ1. Measurement structure and language equivalence

The CFA results supported a two-factor structure distinguishing Digital Etiquette from Belief-Oriented Technology Use, and measurement invariance testing supported scalar invariance across the Kazakh and Russian survey versions. This is important because the constructs are normatively and culturally embedded; without evidence of language equivalence, comparisons or pooled analyses across language groups would be less defensible. The invariance result therefore strengthens the interpretability of the bilingual measurement framework and supports its use in future Kazakhstani teacher-education research.

At the same time, statistical separability should not be interpreted as complete conceptual separability. A two-factor CFA solution indicates that the observed items can be modeled as two related factors, but it does not by itself prove that the constructs are fully distinct at the theoretical level. This is why the manuscript distinguishes the constructs in substantive terms: belief-oriented technology use is treated as a dispositional orientation toward technology-related decisions, whereas digital etiquette is treated as self-reported conduct in online academic and communication contexts. This distinction is reinforced by the item content and by the moderate-to-strong, but not redundant, association between the two scales.

One measurement-related concern is the AVE for Belief-Oriented Technology Use, which was .45 and therefore below the conventional .50 threshold (Fornell and Larcker, 1981). This result indicates that the convergent validity of this construct should be interpreted with caution. The scale was retained because its reliability, factor loadings, and theoretical coverage were acceptable, and because removing items solely to improve a statistical index could narrow the conceptual coverage of the construct. Nevertheless, findings involving Belief-Oriented Technology Use should be regarded as provisional and should be tested further through item refinement and validation in future bilingual and culturally specific teacher-education samples.

4.2 RQ2. Levels of digital etiquette and belief-oriented technology use

Participants reported high levels of digital etiquette and belief-oriented technology use. This pattern is encouraging because pre-service teachers are expected to model safe, respectful, and academically honest online participation in digitally mediated learning environments (Al-Khatib, 2023; Ribble et al., 2004). However, the item-level profile clarifies that "high etiquette" is not uniform across all behaviors. Near-universal endorsement was observed for avoiding insulting language and plagiarism, whereas more routine practices such as consistent source attribution, attention management, and basic security practices showed comparatively more variation.

The high etiquette scores should be interpreted in light of the normative nature of the items. Behaviors such as avoiding plagiarism, respecting privacy, and refraining from harmful online communication are socially desirable and professionally expected. Students may therefore have been motivated to present themselves favorably, even though anonymity and

standardized administration procedures were used to reduce this risk. The findings should not be read as direct evidence of enacted digital behavior in authentic online settings. Rather, they provide a self-reported baseline that should be triangulated with behavioral tasks, scenario-based assessments, learning-platform data, peer evaluations, or qualitative evidence.

The positive association between digital etiquette and belief-oriented technology use is theoretically meaningful. It suggests that students who describe their technology use as guided by ethical, pedagogical, and personal beliefs also tend to report more responsible online conduct. This finding is consistent with digital citizenship frameworks that treat responsible participation as more than technical competence and emphasize normative judgment about what is acceptable, respectful, and professionally appropriate online (Choi et al., 2017; Simsek and Simsek, 2013).

Nevertheless, the cross-sectional design does not allow conclusions about directionality. It is possible that students with stronger belief-oriented technology use are more likely to report responsible online conduct. It is also possible that repeated engagement in digitally appropriate behavior strengthens students' belief-based orientations toward technology. A third possibility is that both constructs are shaped by broader factors such as self-regulation, professional identity, institutional culture, prior digital literacy experience, or normative conformity. For this reason, the findings are best interpreted as evidence of association rather than evidence of directional influence.

4.3 RQ3. Instructional technology course completion and digital etiquette

The binary indicator of instructional-technology course completion did not differentiate digital etiquette scores after accounting for GPA and year of study. This result should be interpreted cautiously. It does not demonstrate that instructional-technology coursework is ineffective; rather, it shows that the course-exposure variable used in this survey did not capture a statistically significant association with self-reported digital etiquette in the present sample. The variable did not include information about course content, intensity, pedagogical approach, assessment format, timing, or the degree to which ethical and digital citizenship issues were explicitly addressed.

Two explanations are especially plausible. A curriculum-alignment explanation is that the course may have focused on functional technology use, software, platforms, or instructional design without sustained attention to digital etiquette, privacy, academic integrity, and online communication norms. A measurement explanation is that the binary variable was too coarse to detect meaningful variation in learning experience. In addition, the upper-range concentration of digital etiquette scores may have reduced sensitivity to small differences between groups. These explanations are not mutually exclusive and should be examined using longitudinal or pre-post designs with more detailed measures of curriculum exposure.

The exploratory analyses of gender and GPA should also be interpreted with restraint. GPA was a significant covariate in ANCOVA, but the effect size was small. Gender comparisons were non-significant and were limited by

unequal group sizes. These background variables are therefore best viewed as contextual descriptors and exploratory covariates rather than as central explanatory mechanisms in the present study.

4.4 Implications of this for teacher education and curriculum design

Several practice-oriented implications follow from the findings. First, digital etiquette should be taught as a learnable behavioral repertoire rather than as a vague expectation of "being respectful online." Teacher-education programs can make this repertoire explicit by addressing source attribution, information verification, privacy protection, respectful communication, academic integrity, attention management, and basic security practices. Such instruction is likely to be more actionable than broad moral appeals because it connects professional norms to recurring classroom and online-learning situations.

Second, digital etiquette does not necessarily require a separate standalone course. Short, recurrent modules can be embedded across instructional technology, methodology, academic writing, and practicum seminars. Case vignettes can focus on realistic scenarios, such as responsible sharing of student data in messaging groups, respectful communication with peers, teachers, and parents, appropriate citation of online and AI-assisted resources, and boundary setting during digital learning. This approach aligns with the view that digital citizenship develops through guided practice and institutional norms, not only through abstract knowledge (Lauricella et al., 2020; Vajen et al., 2023).

Third, the bilingual measurement evidence has practical relevance for Kazakhstan. If teacher-education programs need to monitor digital citizenship competencies across Kazakh and Russian cohorts, evidence of measurement equivalence is a prerequisite for fair interpretation. The present findings support the use of the adapted measures as a starting point for such monitoring, while also indicating that the belief-oriented technology use scale requires further refinement.

4.5 Limitations and directions for future research

Several limitations should be noted. First, the cross-sectional design prevents causal inference and does not allow change in digital etiquette or belief-oriented technology use to be estimated over time. Second, all data were collected through a single self-report survey, which raises the possibility of common method variance and socially desirable responding, especially because the topic concerns normatively valued behaviors. Third, digital etiquette scores showed a restricted upper-range distribution, which may have attenuated effect sizes and reduced the ability to detect meaningful group differences. Fourth, instructional-technology course exposure was measured only as a binary completion variable and did not capture differences in course content, instructional quality, ethical emphasis, or learning activities. Fifth, the AVE for the belief-oriented

technology use scale was below the conventional threshold, which requires caution when interpreting results involving this construct. Sixth, the non-probability sample was drawn from two universities and was predominantly female, limiting the generalizability and precision of subgroup comparisons. These limitations indicate that the findings should be interpreted as exploratory and should be tested further using longitudinal, behavioral, scenario-based, and mixed-method designs.

5 Conclusion

This study contributes to research on digital etiquette and belief-oriented technology use by providing exploratory evidence from a bilingual Kazakhstani pre-service teacher sample. The findings suggest that digital etiquette and belief-oriented technology use are positively associated, while the binary instructional-technology course-completion indicator did not clearly differentiate digital etiquette scores in this sample. These results should be interpreted cautiously because the study was cross-sectional, relied on self-report data, showed a restricted upper range in digital etiquette scores, and identified a convergent-validity concern for the belief-oriented technology use scale. Future research should use longitudinal or pre-post designs, more sensitive measures of curriculum exposure, and behavioral or scenario-based assessments to clarify how teacher-education programs can support responsible, ethically grounded digital participation.

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary Material](#), further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Research Ethics valuation Commission, L.N. Gumilyov Eurasian National University, Astana, Kazakhstan, #2024-015-D. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. No identifiable human images or identifiable personal data are included in this article.

Author contributions

NI: Data curation, Funding acquisition, Methodology, Writing – original draft, Writing – review & editing, Formal analysis, Investigation. DR: Formal analysis, Writing – review & editing, Methodology, Validation, Writing – original draft. ZU: Supervision, Writing – review & editing, Project administration,

Validation, Writing – original draft. ZK: Software, Writing – original draft, Data curation, Investigation, Resources, Writing – review & editing. PS: Conceptualization, Project administration, Supervision, Writing – review & editing, Methodology, Writing – original draft.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2026.1827729/full#supplementary-material>

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