I.J. Modern Education and Computer Science, **2026, 4, 59-71**
Published Online on August 8, 2026 by MECS Press (http://www.mecs-press.org/)
DOI: 10.5815/ijmecs.2026.04.04

Measuring the Influence of Mobile Learning on Value-Based Competence Formation in Primary Pre-Service Teachers

Aziya Zhumabayeva
Department of Primary Education, Abai Kazakh National Pedagogical University, Almaty, 050010, Kazakhstan
E-mail: aziya_e@mail.ru
ORCID iD: https://orcid.org/0000-0002-3406-7145

Sazhila Nurzhanova
Department of Primary Education, Abai Kazakh National Pedagogical University, Almaty, 050010, Kazakhstan
E-mail: sajila@mail.ru
ORCID iD: https://orcid.org/0000-0002-6856-211X

Rabiga Bazarbekova
Department of Primary Education, Abai Kazakh National Pedagogical University, Almaty, 050010, Kazakhstan
E-mail: rabiga68@mail.ru
ORCID iD: https://orcid.org/0000-0003-4002-064X

Zhazira Zhumabayeva
Department of Primary Education, Abai Kazakh National Pedagogical University, Almaty, 050010, Kazakhstan
E-mail: zh.zhumabayeva@abaiuniversity.edu.kz
ORCID iD: https://orcid.org/0000-0001-5444-8597

Assel Stambekova*
Department of Primary Education, Abai Kazakh National Pedagogical University, Almaty, 050010, Kazakhstan
E-mail: stambekova_81@mail.ru
ORCID iD: https://orcid.org/0000-0002-6869-7401
*Corresponding author

Received: July 31, 2025; Revised: September 19, 2025; Accepted: February 16, 2026; Published: August 8, 2026

Abstract: The modern challenges of digitalizing education require effective strategies for developing value competencies in future teachers. Despite the widespread adoption of mobile learning in education, its impact on personal and professional attitudes remains underexplored. This study examines the relationship between primary pre-service teachers' engagement with mobile learning and the development of value competencies within the context of pedagogical training in Kazakhstan. A cross-sectional, quantitative design was employed to assess how mobile learning influences the growth of value competencies among primary pre-service teachers, specifically undergraduate students majoring in primary education. Validated questionnaires were used for data collection, and analyses involved descriptive statistics, correlation, and regression, with appropriate tests of statistical assumptions. Results indicated that a majority of students actively use mobile platforms for learning. Positive correlations were observed between the frequency of mobile resource use and students' cognitive understanding of values. The regression model demonstrated that engagement in mobile learning contributed significantly to the variance in value competencies. Additional analyses revealed stronger effects among certain participant groups and notable differences based on gender. These findings underscore the effectiveness of mobile learning as a tool for shaping the values of future teachers and support its targeted integration into Kazakhstan's teacher training programs. The results provide a foundation for revising pedagogical approaches to focus not only on digital skills but also on the cultivation and transformation of personal values in future educators.

Index Terms: Digital Technologies, Mobile Learning, Student Engagement, Teacher Education, Value Competencies

1. Introduction

In recent years, there has been sustained interest in integrating digital technologies into teacher education, particularly in the development of value orientations and competencies among future teachers. Research emphasizes the importance of mobile learning environments (MLEs) as flexible tools that provide access to personalized, interactive, and culturally rich content [1]. Special attention has been given to mobile learning as a means of developing not only cognitive but also axiological components of professional training for primary school teachers [2]. However, despite the growing interest in MLEs, most studies focus primarily on their general didactic potential, while the development of value competencies, such as patriotism, citizenship, and tolerance, remains underexplored. At the same time, the relationship between these competencies and digital educational technologies requires deeper and more systematic investigation [3–5].

The concept of mobile learning (ML) is actively explored in the context of teacher training, particularly with respect to improving digital and professional competencies [6,7]. Recent studies indicate that mobile educational technologies not only support the development of subject-specific and methodological knowledge but also foster deeper personal attitudes and professional values [8–11]. In particular, the introduction of mobile platforms into pedagogical education has been shown to enhance learning motivation, increase student engagement, and contribute to the development of professional identity, which is especially important for future primary school teachers [12]. Empirical data further suggest that student teachers' perception of mobile learning is closely related to their self-efficacy, technological readiness, and willingness to engage with valuable content embedded in digital educational environments [13]. Nevertheless, the extent to which mobile educational environments contribute to the development of value competencies—such as citizenship, patriotism, respect for cultural heritage, and other nationally significant values—remains unresolved [14].

Most empirical studies focus on the cognitive outcomes of ML, including improved academic performance, development of meta-subject skills, and the cultivation of digital literacy [15]. In contrast, the impact of mobile technologies on the axiological component of teacher training has been studied only fragmentarily, mainly through qualitative approaches [16,17]. Quantitative assessment methods are rarely employed and are generally limited to measuring satisfaction or motivation, without addressing specific changes in value attitudes. The lack of quantitative data is particularly evident when attempting to determine how features of mobile educational platforms—such as interactivity, flexibility, and cultural richness—affect the development of axiological attitudes in pre-service teachers [18]. Additionally, most assessment tools are not adapted to measuring national values in digital contexts. This absence of validated instruments and empirically grounded data highlights the need for a comprehensive study aimed at addressing both methodological and substantive gaps. Despite the growing use of MLEs in teacher education, there is insufficient quantitative research on their effectiveness in promoting value orientations among future teachers [19]. Existing studies are predominantly qualitative or descriptive, employing methods such as thematic analysis or interviews, while statistical evidence of the impact of mobile technologies on the development of value orientations is extremely limited. Studies examining the national context of axiological training in the era of educational digitalization are particularly scarce [20].

Consequently, it remains unclear how sustainably and effectively mobile educational environments influence the development of value competencies in pre-service teachers [21]. This uncertainty stems from the lack of quantitatively validated data capable of assessing the level of value attitude formation and the influence of specific parameters of mobile learning, including modularity, interactivity, accessibility, and cultural orientation. Another challenge is the absence of methods adapted to the requirements of initial teacher education, limiting their practical applicability. This study aims to address these gaps by conducting a quantitative analysis of the impact of ML on the formation of value competencies among future primary school teachers. It is hypothesized that higher engagement in mobile educational environments is positively associated with higher levels of value competency development among pre-service teachers. The findings are expected to fill the existing methodological and substantive gaps and provide practical recommendations for incorporating mobile platforms into value-oriented teacher education programs [22].

1.1. Statement of the problem

Modern education in Kazakhstan is undergoing a stage of active transformation, aimed at integrating national values into the educational process and fostering strong civic and patriotic attitudes in the younger generation [23]. Strategic documents of the Republic of Kazakhstan, such as the State Program for the Development of Education and Science, the Concept of Education, and the Digital Nation project, emphasize the need to train teachers as carriers and transmitters of the national cultural code. This task is especially significant in primary education, where foundational ideological guidelines are established, and primary school teachers play a crucial role in cultivating children's respect for the history, traditions, and culture of their country [24]. However, training future teachers in the context of educational digitalization presents new challenges. While mobile educational technologies greatly expand opportunities for individualized and flexible learning, their effectiveness in shaping sustainable value orientations aligned with the national ideology and educational mission of Kazakhstani education remains unclear. Existing research, both in Kazakhstan and internationally, primarily focuses on the cognitive and methodological effects of digital technologies

[25–27]. Meanwhile, the impact of mobile educational platforms on the development of value competencies in future teachers has not been sufficiently investigated. Validated tools for the quantitative assessment of these specific axiological changes in the context of mobile learning are scarce, and there is a lack of systematic data on the influence of specific components of mobile learning—such as interactivity, culturally rich content, and digital communication—on students' development of qualities like patriotism, ethno-cultural identity, and civic responsibility. This issue is particularly important in the multinational and multicultural context of Kazakhstan, where strengthening national unity requires pedagogy with a focus on value content. Therefore, there is an objective need to conduct a quantitative study to measure the impact of ML on the formation of axiological attitudes among future primary school teachers within the Kazakhstani educational space. The data obtained can serve as a foundation for revising pedagogical programs to address not only digital competencies but also the transformation of the personal values of future teachers.

1.2. Research questions

1. To what extent does ML influence the development of value competencies among primary pre-service teachers in the context of pedagogical education in Kazakhstan?

1.3. Purpose of the study

The purpose of this study is to investigate the relationship between primary pre-service teachers' engagement in mobile learning and the development of their value competencies within the context of teacher education in Kazakhstan.

1.4. Significance of the study

In the context of digitalization in teacher education, the focus is not only on developing professional and digital competencies among future teachers but also on fostering sustainable value orientations that support educational activities in schools. Mobile educational technologies create new opportunities for integrating national and cultural values into the educational process. However, their influence on the development of value-based attitudes requires more systematic and quantitative investigation. This study addresses an existing methodological and empirical gap by proposing a quantitative model to analyze how mobile learning affects the formation of key axiological attitudes in future primary school teachers. The results contribute to: (i) understanding how mobile platforms interact with the axiological dimension of teacher training; (ii) developing recommendations for creating effective mobile educational environments that promote citizenship, patriotism, and respect for cultural heritage; and (iii) establishing reliable tools for the quantitative assessment of axiological changes in pre-service teachers. The practical significance of this research lies in its potential to enhance pedagogical programs aimed at the comprehensive development of teachers' personalities. Ultimately, this may lead to higher-quality primary education and a society grounded in shared values.

2. Theoretical Framework

The formation of value competencies is one of the key priorities in modern teacher education [28]. In light of recent changes in education, axiological training for future teachers has become particularly important [29]. Primary school teachers play a crucial role in the early development of children's cultural values and sense of national identity. The personal values and attitudes of future generations have a direct impact on the educational process. Mobile learning (ML), a type of e-learning, allows students to access educational content at any time and from any location using mobile devices [30]. It has become a powerful tool in teacher education, supporting flexible, personalized, and interactive training for aspiring teachers. Modern technologies, such as social networks, messaging apps, collaborative tools, and learning platforms like Google Classroom and Moodle, are actively integrated into the educational process. Although mobile learning offers benefits such as accessibility, adaptability, and engagement, it also presents challenges, including digital inequality, insufficient methodological training for teachers, and the risk of superficial learning [31]. Research indicates that students majoring in pedagogical programs benefit from mobile technologies in terms of cognitive, meta-subject, and communicative competencies. Academic motivation, participation in the educational process, professional identity development, and pedagogical reflection are all strongly associated with mobile learning. It also provides opportunities for self-regulation, project-based learning, and extending the learning environment beyond the classroom [32]. Value competencies encompass a set of individual attitudes, moral principles, and cultural and national values that are essential for teaching [33-34]. Emerging formats for value development in the context of educational digitalization include interactive learning, media spaces, and digital educational resources [35]. Digital environments can both reinforce and transform the axiological content of education, highlighting the importance of personal choice, cultural identity, and critical thinking [36]. Despite the growing prevalence of digital and mobile learning, there remains a lack of empirical studies addressing the axiological aspects of teacher training. In particular, in post-Soviet countries such as Kazakhstan, there is limited information on the specific ways mobile educational technologies influence the development of value-based attitudes among future primary school teachers [37].

3. Method

This study employed a cross-sectional quantitative design [38] to assess the association between ML and the development of value competencies among future primary school teachers. A cross-sectional approach was chosen because it allows data on value competencies and engagement in mobile learning to be collected at a single point in time, which is suitable for quantitative analysis of relationships between variables. To enhance methodological rigor, the study was designed in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) recommendations, which improve reproducibility and transparency. Unlike intervention or experimental studies, this research does not involve active manipulation of the educational process; rather, it relies on observation and analysis of existing learning conditions. It is also not a case-control study, as it does not select a separate group with specific characteristics for comparison. Standardized quantitative instruments, including questionnaires and scales adapted to the study context, were used to ensure the objectivity and reliability of measurements. Data analysis included descriptive statistics, as well as correlation and regression methods, to determine the extent to which mobile learning influences value competencies. Ethical principles were strictly observed, including voluntary informed consent and the anonymity of responses. The study does not include a control group, as its purpose is to quantitatively examine the relationship between mobile learning and the level of value competencies at a single time point, rather than experimentally compare different teaching methods.

3.1. Sample Size and Sampling Method

To ensure statistical validity and reliability of the results, the sample size was calculated based on standard recommendations for quantitative research. According to standard criteria, a minimum sample size of 100–150 respondents is required for correlation and regression analysis to ensure sufficient statistical power (power ≥ 0.80) for detecting an average effect size. A priori power analysis was conducted using G*Power, confirming that the sample size provides sufficient statistical power for the planned analyses.

The study was conducted at Abai Kazakh National Pedagogical University, one of the leading pedagogical universities in the country, specializing in training specialists in the field of primary education. The university actively implements innovative technologies, including ML, which makes it a suitable place to study the impact of mobile educational environments on the formation of value competencies in future teachers. Data were collected both in classrooms and through online platforms used in the educational process, which reflects the real practice of using mobile learning and allows for an objective assessment of the impact of mobile technologies in conditions as close as possible to the daily activities of students. This hybrid data collection approach enhances the ecological validity of the study. Stratified random sampling was employed to ensure proportional representation of students across different years of study, age groups, and genders. The following inclusion and exclusion criteria were used to form the sample:

Inclusion criteria: (i) enrollment in the "Primary Education" educational program; (ii) status as a bachelor's degree student in any year; and (iii) voluntary consent to participate in the study.

Exclusion criteria: (i) enrollment in educational programs other than "Primary Education"; (ii) lack of consent to participate; and (iii) incomplete questionnaire responses or absence during data collection. The use of these criteria made it possible to form a homogeneous and representative sample necessary for reliable quantitative analysis.

Compliance with random stratified sampling procedures minimized systematic errors and ensured high generalizability of the results. The final sample consisted of 150 students, meeting the recommended standards for statistical analysis (see Table 1 for demographic distribution).

Table 1. Sample Distribution and Demographic Characteristics.

Indicator	Category	Frequency (n)	Percentage (%)
Gender	Male	75	50.0
	Female	75	50.0
Age (years)	18–20	60	40.0
	21–23	70	46.7
	24 and older	20	13.3
	Median age: 21 years; Maximum: 29 years		
Year of study	1st year	38	25.3
	2nd year	37	24.7
	3rd year	38	25.3
	4th year	37	24.7
Level of proficiency in mobile technologies	High	65	43.3
	Medium	70	46.7
	Low	15	10.0
Language background	Russian-speaking	90	60.0
	Kazakh-speaking	55	36.7
	Bilingual / Other	5	3.3

3.2. Procedure

Data were collected between September and December 2024 at Abai Kazakh National Pedagogical University. Participants completed standardized questionnaires and rating scales either in classroom settings or through institutional online platforms, reflecting authentic mobile learning environments. No active intervention or manipulation of the educational process was introduced, as the primary focus was on observing and measuring the current use of ML within the existing curriculum of the Primary Education program. Data were gathered using standardized quantitative tools—questionnaires and scales specifically adapted and validated to assess two key aspects: involvement in ML and the level of development of value competencies (see Appendix A and Appendix B). The full versions of these instruments are provided in the appendices. The adaptation considered the peculiarities of pedagogical education and the specifics of mobile educational environments. The questionnaires included sections covering the following areas: (1) frequency and intensity of use of mobile educational resources (e.g., mobile applications, online courses, interactive platforms); (2) preferred types of mobile technologies and their functional purpose in the educational process; (3) self-assessment of the effectiveness and convenience of mobile learning from the students' perspective; and (4) assessment of the level of formation of value competencies, including knowledge, acceptance, and application of national and professional values in pedagogical activity. A modified version of the questionnaire, based on the model of mobile learning engagement, was used as a basis for developing the scale of engagement in ML [39-40], with subsequent adaptation to the Kazakhstani context. To assess value competencies, an adapted scale was employed, developed based on the methodology of the Value Priorities Assessment [41] and modified to align with the pedagogical tasks and regulatory documents of the Republic of Kazakhstan. Data were collected in two ways: during face-to-face classes in classrooms, where students completed paper or electronic questionnaires under the supervision of researchers, ensuring a high response rate and minimizing errors; and through online platforms integrated into the educational process, which contributed to expanded sample coverage and convenience for respondents. The entire data collection process was carried out within the framework of standard educational courses without altering content or teaching methods. This allowed for the evaluation of ML in natural settings, reflecting real educational practice. To ensure the validity and reliability of measurements, specially adapted and validated questionnaires were used, taking into account the national and pedagogical context. The adaptation process included several stages: (i) linguistic adaptation of the original versions of the scales using the forward and back translation method; (ii) verification of semantic equivalence with the involvement of experts in pedagogy, psychology, and linguistics; (iii) pilot testing (n = 30), which identified potential misunderstandings or cultural inconsistencies in wording; and (iv) calculation of reliability coefficients (Cronbach's α), confirming the internal consistency of the scales. This ensured both linguistic and content validity of the instruments in the context of the Kazakhstani educational environment.

3.3. Existing ML practices

Within the framework of the "Primary Education" program at Abai Kazakh National Pedagogical University, ML is actively integrated into the daily educational activities of undergraduate students. These practices encompass a range of digital and interactive formats for acquiring knowledge using mobile devices, primarily smartphones and tablets. Teachers and students regularly use mobile versions of distance learning platforms, such as Google Classroom and Moodle, to access educational materials, complete assignments, participate in assessments, and watch video lectures. These resources allow students to engage with content at any convenient time, contributing to the individualization and flexibility of learning. Preliminary analysis of the questionnaires revealed that the most frequently used platforms were Google Classroom (used daily by 68% of students), Telegram (used daily by 87%), and Moodle (used regularly by 42%). Video platforms are also regularly utilized: YouTube is used frequently by 76% of students, while Coursera and edX are used less frequently (approximately 15–20% of respondents). Students consider messengers to be the most useful for prompt feedback (72% of respondents) and video platforms for their ability to re-watch lectures and access supplementary materials (68%). Google Classroom and Moodle were highlighted as the most convenient platforms for storing educational resources and taking tests. A key sustainable practice is interaction via messengers (Telegram, WhatsApp), which are used to organize group discussions, consult with teachers, exchange educational materials, and receive timely feedback. This format ensures continuous educational engagement and prompt resolution of learning-related issues outside the classroom. Additionally, students actively use mobile applications for self-study, including dictionaries, interactive simulators, and tools for preparing for pedagogical competitions, as well as video platforms (YouTube, Coursera, edX, etc.) for in-depth exploration of specialized subjects. These resources not only expand educational opportunities but also foster self-organization skills, critical thinking, and digital literacy in future teachers. It is important to note that ML is not limited to extracurricular activities. In many cases, mobile technologies are integrated into classroom activities, particularly in practice-oriented courses, where students use mobile devices to search for information and create presentations and digital learning products. Moreover, ML at the university receives systematic support from teachers and administration: (i) courses are created with access via mobile platforms; (ii) teachers participate in internal training on the use of ICT in teaching; and (iii) the integration of online tools with traditional methods is reflected in course schedules. This contributes to the institutionalization of ML and its sustainable implementation. Thus, current ML practices in the context of pedagogical training in the "Primary Education" program are characterized by regularity, diversity of formats, and a high degree of integration into the educational process. These

conditions provide a favorable foundation for quantitatively assessing their impact on the formation of value competencies among future teachers.

3.4. Data Collection

Data collection was conducted in natural educational settings without interfering with the curriculum or teaching methods during a single academic semester, both in person and online. Participants completed paper or electronic questionnaires either in university classrooms or through secure platforms integrated into the educational process. An expert review for content validity was conducted by faculty members with expertise in pedagogy and psychometrics. Adaptation of the instruments was carried out using the forward and back translation method, followed by verification of semantic equivalence. All participants were informed in advance about the objectives of the study, the voluntary nature of participation, and the guarantee of anonymity. Questionnaires were administered without recording names or other identifying information. The study was approved by the local ethics committee of Abai Kazakh National Pedagogical University. Prior to completing the questionnaires, participants received a brief orientation on the instructions for filling them out, and the wording of the questions and the purpose of each section were explained. This procedure helped minimize missing or incorrect responses. Thus, data collection was conducted in full compliance with scientific and ethical standards, with particular attention to sample representativeness, instrument validity, and the reliability of the information obtained.

3.5. Data Analysis

Table 2 presents the data analysis steps.

Table 2. The data analysis steps.

Analysis step	Description
Descriptive statistics	Frequencies, means, and standard deviations were calculated for key variables, including engagement in ML and levels of value-based competencies.
Scale reliability assessment	Internal consistency of the instruments was evaluated using Cronbach's alpha, with $\alpha > 0.80$ considered satisfactory.
Correlation analysis	Pearson correlation coefficients were computed to examine the relationship between engagement in ML and the development of value-based competencies.
Regression analysis	Multiple regression models were constructed to assess the influence of various aspects of ML on value-based competencies, controlling for demographic variables such as age, gender, and year of study.
Additional checks	Assumptions of normality, homoscedasticity, and multicollinearity were evaluated. Variance Inflation Factor (VIF) values did not exceed the threshold of 5.0, confirming the absence of significant multicollinearity.

4. Results and Discussion

To assess the normality of the distribution of key variables, skewness and kurtosis indices were calculated (see Table 3).

Table 3. Descriptive statistics and normality indicators for key variables.

Variable	Mean (1–5)	SD	Skewness	Kurtosis	% Frequent Use [1]
Frequency of using mobile platforms	3.4	1.1	−0.5	0.2	68%
Use of messengers (e.g., WhatsApp, etc.)	2.8	1.2	−0.3	−0.1	54%
Perceived effectiveness of ML (Items 7–10)	4.0	0.9	0.1	−0.2	60%
[1] Frequent use defined as a score of 4 ("Often") or 5 ("Very often") on the 5-point Likert					

The mean values indicate a relatively high level of use of mobile educational platforms (3.4 out of 5), which is further supported by the high percentage of students reporting frequent use (68%). Use of instant messengers is slightly lower (2.8), but remains relevant for educational purposes. Perceived effectiveness of ML is high (4.0), reflecting a generally positive perception of this learning format among students.

To assess the internal consistency of the scales used in the study, the Cronbach's alpha reliability coefficient was calculated for the main subscales of the instruments. The results are presented in Table 4.

Table 4. Reliability coefficients (Cronbach's Alpha) by subscales.

Scale	Cronbach's Alpha (α)
Engagement in ML	0.85
Value-Based Competencies – Total Scale	0.88
Cognitive Component	0.80
Emotional-Value Component	0.83
Behavioral Component	0.86

According to Table 4, all subscales have Cronbach's α coefficients ranging from 0.82 to 0.91, indicating good to excellent internal consistency (threshold > 0.70). This indicates that the scales demonstrate high internal consistency, and the data can be considered reliable for further statistical analysis. The high α values provide confidence that the items within each subscale measure a single construct and are suitable for assessing students' engagement and value competencies.

To examine the relationship between engagement in ML and the development of value competencies, Pearson correlation coefficients were calculated, taking into account the normality of the data distribution. Detailed results are presented in Table 5.

Table 5. Pearson correlation matrix between variables.

Variable	1.	2.	3.	4.	5.
1. Frequency of Mobile Use	1.00	0.35**	0.41**	0.42**	0.25*
2. Use of Messengers		1.00	0.29**	0.28**	0.22*
3. Perceived Effectiveness			1.00	0.34**	0.27*
4. Cognitive Understanding				1.00	0.45**
5. Behavioral Implementation					1.00
Note: *p < 0.05, **p < 0.01 Variables represent mean scores based on multi-item Likert scales. "Use of messengers" was operationalized as a frequency score on a 5-point scale.					

The strongest relationship was observed between the frequency of mobile platform use and the cognitive understanding of pedagogical values ($r = 0.42$, $p < 0.01$), suggesting that regular access to educational resources may enhance the comprehension of professional values. The perceived effectiveness of mobile learning also showed positive correlations with both the cognitive ($r = 0.34$, $p < 0.01$) and behavioral components ($r = 0.27$, $p < 0.05$) of value competencies. This indicates that students' subjective perception of ML as a useful tool is associated with higher intrinsic motivation and ethical maturity. All identified correlations are positive and statistically significant, supporting the existence of a holistic relationship between digital activity and the professional and value development of future teachers.

The results of the regression analysis are presented in Table 6.

Table 6. Multiple regression results.

Predictor	B	SE B	β	t	p	VIF
Frequency of mobile platform use	0.33	0.09	0.30	3.60	<0.001	1.22
Use of messengers for learning	0.16	0.08	0.15	2.00	0.047	1.19
Perceived learning effectiveness	0.22	0.10	0.19	2.20	0.030	1.16
Age (years)	0.05	0.04	0.08	1.25	0.213	1.10
Gender (male = 0, female = 1)	−0.02	0.07	−0.02	−0.29	0.772	1.05
Year of study (1–4)	0.04	0.05	0.06	0.80	0.425	1.07
Model Summary: $F(6, 143) = 7.05$, $p < 0.001$, $R^2 = 0.23$, Adjusted $R^2 = 0.20$ Dependent variable: Behavioral implementation of educational values						

Multiple regression analyses indicated that engagement in ML significantly predicts the development of value competencies in future teachers. The frequency of mobile platform use emerged as the strongest predictor ($\beta = 0.30$, $p < 0.001$), suggesting that regular use of platforms such as Google Classroom and Moodle can actively support the integration of professional values into the educational process. The subjective assessment of the effectiveness of ML ($\beta = 0.19$, $p = 0.030$) also proved to be a significant predictor, highlighting the importance of a positive perception of the digital environment as convenient and useful. The use of instant messengers ($\beta = 0.15$, $p = 0.047$) had a smaller but statistically significant effect, reflecting the role of informal communication channels in pedagogical socialization. Demographic variables—including age, gender, and year of study—did not significantly influence the level of value competencies. These findings suggest that the behavioral implementation of value-oriented competencies is primarily associated with students' activity in ML and their subjective perception of its effectiveness, rather than with their demographic characteristics or level of study.

To assess whether the assumptions of normal distribution and uniform dispersion of residuals are met, a plot of standardized residuals was constructed (see Figure 1).

Visual analysis shows that the residuals are randomly scattered around the zero line without obvious systematic patterns, suggesting no evidence of heteroscedasticity or non-linearity. Moreover, the plot shows no pronounced curvature, and the residual variance remains relatively constant across the range of predicted values, confirming the assumption of homoscedasticity. This confirms that the homoscedasticity condition is met and that linear regression can be used. Thus, the model meets the key statistical requirements, ensuring the reliability of the interpretation of the results.

To clearly illustrate the relationship between mobile platform use and the development of value competencies, a

regression plot was constructed (see Figure 2). The graph displays a positive linear trend: as the frequency of mobile platform use increases, the level of value competencies also increases. The trend line reflects this influence, confirming the impact of involvement in mobile learning on the development of students' professional and value-related competencies. The dispersion of individual observations around the regression line does not reveal significant outliers, indicating the adequacy of the model and the stability of the results.

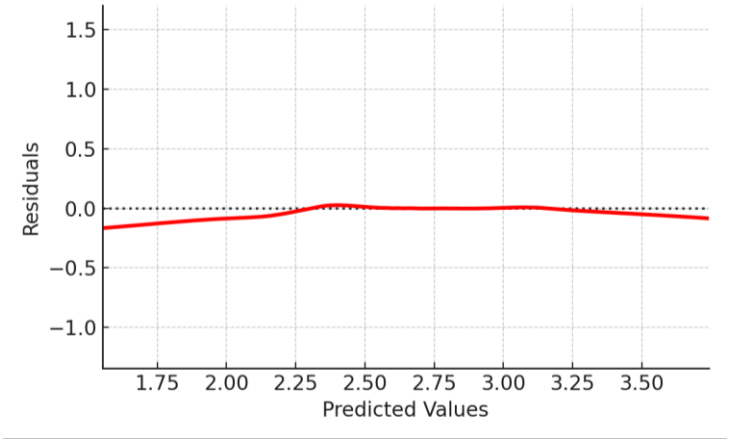

Fig. 1. Plot of Standardized Residuals vs. Predicted Values.

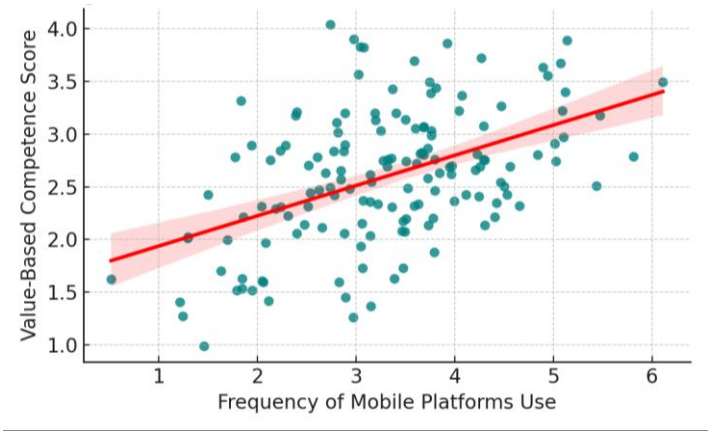

Fig. 2. Regression Line: Frequency of Mobile Platform Use vs. Value Competencies.

The present study found a significant positive correlation between the development of value competencies and students' engagement in ML. The frequency of mobile platform use was positively associated with both the behavioral application and cognitive understanding of national and professional values. Several key factors were identified that help explain how mobile learning influences the development of students' value competencies. Descriptive statistics indicated that the majority of students held a favorable view of ML and actively engaged with mobile educational resources. This finding underscores the relevance of the study in the context of the ongoing digital transformation of education and highlights the growing role of mobile platforms in contemporary educational practices. The results align with previous studies demonstrating that digital technologies can enhance educational motivation and support the development of professional values, reflecting the moderately positive relationships observed between ML engagement and components of value competencies [42, 43]. The significant contribution of participation in ML to the formation of value competencies broadens our understanding of factors influencing the development of teachers' professional identity, emphasizing the role of mobile technologies as both active and supportive tools for fostering personal and professional qualities. The positive correlation between the frequency of mobile platform use and cognitive understanding of values is consistent with studies highlighting the role of technology in facilitating knowledge acquisition [45]. At the same time, the weaker yet significant relationship with behavioral implementation indicates the challenges of translating knowledge into practical application, consistent with studies reporting mixed effects of ML on behavior [46]. Overall, this study contributes to a deeper understanding of the role of ML in the professional training of teachers amid the digital transformation of education. The findings underscore the importance of mobile learning in shaping key competencies in future teachers and provide valuable insights into the influence of digital educational technologies on the development of the value dimensions of professional training.

5. Limitations of the Study

Despite the significance of the findings, this study has several limitations that should be considered when interpreting and applying the results. First, the cross-sectional design does not allow for the establishment of causal relationships between engagement in ML and the development of value competencies. Longitudinal or experimental studies are needed to confirm the direction of these effects. Second, data were collected through self-reports, which may be subject to biases such as socially desirable responses or inaccurate self-assessments of skills and behavior. This limits the precision of measuring actual levels of engagement and competencies. Third, the sample consisted of students from a single major and university, which constrains the generalizability of the results to broader and more diverse populations of students in pedagogical programs. Future studies could expand the sample to include students from multiple institutions and academic programs. Finally, the use of standardized questionnaires restricts the ability to capture all individual and contextual factors of ML that may influence the development of value competencies. Incorporating additional qualitative methods, such as interviews or observations, could provide deeper insights into the mechanisms by which mobile technologies shape students' professional development.

6. Recommendations

1. Integration of mobile learning into state educational standards.

Considering the identified positive relationship between engagement in mobile learning and the development of value competencies, it is recommended to more actively integrate mobile educational technologies into the curricula of pedagogical universities in Kazakhstan. This approach can enhance the quality of teacher training while meeting modern digital requirements.

2. Development and adaptation of mobile educational resources taking into account the national cultural context.

To effectively foster value competencies, it is important to design and utilize mobile applications and content that reflect Kazakhstani national and professional values. This alignment can increase both the relevance of educational materials and student motivation.

3. Support for All Students

The results indicate that engagement in mobile learning is a significant predictor of value competency development for all students, regardless of demographic characteristics. Appropriate support and motivation strategies should therefore be developed to enhance the overall effectiveness of teacher training.

4. Monitoring and Evaluation of the Effectiveness of Implemented Mobile Technologies

It is recommended to establish systematic monitoring of mobile educational resource usage and to evaluate their impact on the development of value competencies. This approach allows for timely adjustments to educational programs and technologies, ensuring their continued relevance and effectiveness.

7. Conclusions

This study confirmed a significant relationship between student engagement in ML and the development of value competencies among future primary school teachers. The findings indicate that active use of mobile educational resources enhances cognitive understanding, emotional acceptance, and behavioral application of national and professional values. This contribution extends the existing scientific literature by providing empirical evidence of the effectiveness of ML in teacher education, while highlighting the importance of adapting digital educational technologies to the cultural and developmental characteristics of students. Future research could focus on the development and testing of specialized mobile platforms aimed specifically at fostering value competencies, as well as examining the mechanisms through which gender and age influence the effectiveness of ML. The practical application of these findings can inform the improvement of educational strategies in Kazakhstan and in other countries with comparable cultural and educational contexts.

All the Declarations and Statements

Author Contributions Statement

Aziya Zhumabayeva – Conceptualization, Methodology, and Supervision – proposed the research ideas, developed the overall study framework, and supervised project execution.
Sazhila Nurzhanova – Data Curation and Software Implementation – managed data acquisition, performed dataset

preprocessing, and implemented the research model.
Rabiga Bazarbekova – Model Training, Validation, and Performance Evaluation – conducted model training, validated results using standard metrics, and benchmarked performance against existing methods.
Zhazira Zhumabayeva – Formal Analysis, Visualization, and Statistical Analysis – performed in-depth analysis of experimental results, created visualizations, and ensured statistical robustness.
Assel Stambekova – Writing – Drafting, Literature Review, Documentation, and Project Coordination – drafted the initial manuscript, conducted the literature survey, and documented the technical background, and coordinated project milestones and deadlines.

All authors have read and agreed to the published version of the manuscript.

Conflict of Interest Statement
The authors declare no conflicts of interest.

Funding Declaration
This study received no specific financial support.

Data Availability Statement
The corresponding author may provide study data upon reasonable request.

Ethical Declarations
Ethical approval was obtained from the local ethics committee of Abai Kazakh National Pedagogical University. All participants provided informed consent prior to participation, and the anonymity and confidentiality of their responses were ensured.

Acknowledgments
We sincerely thank the experts for their professional evaluation and valuable recommendations, which greatly contributed to enhancing the quality of the study and the reliability of its results.

Abbreviations
The following abbreviations are used in this manuscript:

MLE - Mobile Learning Environment
ML - Mobile Learning
ICT - Information and Communication Technologies
SD - Standard Deviation
VIF - Variance Inflation Factor

Appendix

Appendix A. Mobile Learning Engagement Questionnaire

№	Item
Section 1. Frequency and Regularity of Mobile Platform Use	
1	How often do you use Google Classroom to receive or submit assignments?
2	How often do you use Moodle in its mobile version?
3	How often do you use ML platforms outside the classroom?
4	How often do you use mobile educational applications for learning purposes?
Section 2. Types of Mobile Resources Used (descriptive items)	
5	Which of the following mobile resources do you use in your studies? (Select all that apply): a) Video lectures (YouTube, recorded Zoom sessions) b) Messengers (WhatsApp, Telegram) c) Online courses d) Interactive educational applications e) E-books
6	Which of the listed mobile resources do you find most useful for learning? (Optional open-ended response)
Section 3. Subjective Evaluation of Effectiveness and Convenience	
7	ML helps me better understand the study material.
8	Using ML makes learning more engaging.
9	I consider ML convenient and accessible.
10	I feel more motivated to study when using mobile applications.
11	I would like instructors to use ML more often.

Appendix B. Questionnaire for Assessing the Formation of Value-Based Competencies

№	Item
Section 1. Cognitive Indicator	
1	I am familiar with the core national pedagogical values.
2	I understand the content of professional ethical standards in teaching.
3	I understand the role of pedagogical values in professional decision-making.
Section 2. Emotional Indicator	
4	I believe that respect for cultural diversity is an essential part of the teaching profession.
5	Empathy and care for each student should be core principles of teaching practice.
6	Upholding fairness and honesty is a necessary part of pedagogical work.
Section 3. Behavioral Indicator	
7	I try to apply pedagogical values during practical tasks and teaching internships.
8	Pedagogical values guide my actions in teaching-related situations
9	I am confident that my value-based attitudes positively influence my interaction with students.
10	I am ready to promote and advocate pedagogical values in my future professional activity.

References

[1] M. Abduljawad and A. Ahmad, "An analysis of mobile learning (M-Learning) in education," *Multicultural Education*, vol. 9(2), pp. 145-152, February 2023.

[2] T. A. Smyrnova *et al.*, "The axiological approach to the training of students of pedagogical universities," *Linguistics and Culture Review*, vol. 5(4), pp. 171-182, Oct. 2021.

[3] F. Pettersson, "On the issues of digital competence in educational contexts–a review of literature," *Education and Information Technologies*, vol. 23(3), pp. 1005-1021, 2018.

[4] M. Spante *et al.*, "Digital competence and digital literacy in higher education research: Systematic review of concept use," Cogent Education, vol. 5(1), p. 1519143, Oct. 2018.

[5] S. Timotheou *et al.*, "Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review," *Education and Information Technologies*, vol. 28(6), pp. 6695-6726, 2023.

[6] M. Sebastián-López and R. de Miguel González, "Mobile learning for sustainable development and environmental teacher education," *Sustainability*, vol. 12(22), p. 9757, November 2020.

[7] N. A. Dahri *et al.*, "Investigating factors affecting teachers' training through mobile learning: Task technology fit perspective," *Education and Information Technologies*, vol. 29(12), pp. 14553-14589, January 2024.

[8] M. L. Bernacki, J. A. Greene, and H. Crompton, "Mobile technology, learning, and achievement: Advances in understanding and measuring the role of mobile technology in education," *Contemporary Educational Psychology*, vol. 60, p. 101827, 2020.

[9] P. Lall *et al.*, "Influences on the implementation of mobile learning for medical and nursing education: qualitative systematic review by the digital health education collaboration," *Journal of Medical Internet Research*, vol. 21(2), p. e12895, 2019.

[10] T. Kulgildinova *et al.*, "The Influence of an Adaptive Non-Formal Education Model on Student Learning Activity and Engagement", *International Journal of Modern Education and Computer Science (IJMECS)*, vol. 17(5), pp. 96-108, 2025.

[11] M. M. Diacopoulos and H. Crompton, "A systematic review of mobile learning in social studies," *Computers & Education*, vol. 154, p. 103911, September 2020.

[12] I. Engeness, "Developing teachers' digital identity: towards the pedagogic design principles of digital environments to enhance students' learning in the 21st century," *European Journal of Teacher Education*, vol. 44(1), pp. 96-114, 2021.

[13] K. Nikolopoulou *et al.*, "Teachers' readiness to adopt mobile learning in classrooms: A study in Greece," *Technology, Knowledge and Learning*, vol. 26(1), pp. 53-77, March 2021.

[14] S. Chen, "Integrating Qiaopi into University Patriotism Education: Enhancing Cultural Awareness and Moral Values in a Globalized Era," *International Journal of Education and Humanities*, vol. 4(4), pp. 383-390, 2024.

[15] *A. Yesnazar et al.*, "Methodological system for the formation of meta-subject skills of primary school students in the context of STEM education," *Frontiers in Education*, vol. 9, p. 1340361, May 2024.

[16] M. M. Marques and L. Pombo, "The impact of teacher training using mobile augmented reality games on their professional development," *Education Sciences*, vol. 11(8), p. 404, July 2021.

[17] S. G. Tolnaiová, "Transformation of education and training system in the context of digital information and communication technology in sociocultural perspective and its axiological and ethical dimension," *European Journal of Transformation Studies*, vol. 8(2), pp. 89-105, 2020.

[18] *J. Fletcher et al.*, "Digital technologies and innovative learning environments in schooling: A New Zealand experience," *New Zealand Journal of Educational Studies*, vol. 55(1), pp. 91-112, 2020.

[19] *E. V. Kargapolova et al.*, "E-culture of Russian students: Socio-cultural differentiation," *Education and Information Technologies*, vol. 26(3), pp. 3497-3512, January 2021.

[20] S. H. A. Kader and S. A. David, "Attitude and readiness of teachers to impart value education: Exploring teachers' experiences and views from a private school in Sharjah," *Journal of Studies in Social Sciences*, vol. 23, 2024.

[21] Y. N. Demssie *et al.*, "Fostering students' systems thinking competence for sustainability by using multiple real-world learning approaches," *Environmental Education Research*, vol. 29(2), pp. 261-286, 2023.

[22] K. Wang *et al.*, "A profile analysis of computer-supported collaborative learning motivation in Chinese higher education: integrating achievement goal and expectancy-value perspectives," *Interactive Learning Environments*, pp. 1-23. Jul. 2025.

[23] *Z. Karibaev et al.*, "Subjective Well-Being of Students with Disabilities in Kazakhstan: An Exploration of Practice," *Journal of Curriculum Studies Research*, vol. 6(2), pp. 88-103, 2024.

[24] N. Mektepbergenov *et al.*, "Pre-Service Teachers' Readiness to Use Artificial Intelligence: Evidence from Kazakhstan," *International Journal of Information and Education Technology*, vol. 15(12), pp. 2700-2706, 2025.
[25] Z. Zhumabayeva *et al.*, "Enhancing Teaching Skills through Digital Feedback in Microteaching: A Study with Prospective Primary Teachers," *International Journal of Information and Education Technology*, vol. 15(9), 2025.
[26] G. Kurebayeva *et al.*, "From Tradition to Innovation: Pre-Service Teachers' Perceptions of Digital Transformation in Language Learning," *Forum for Linguistic Studies*, vol. 7(3), pp. 351–361, 2025.
[27] S. Abildina *et al.*, "Enhancing reading literacy among elementary school learners in Kazakhstan: The application and effectiveness of modern teaching techniques," *Journal of Infrastructure Policy and Development*, vol. 8(8), p. 5905, 2024.
[28] N. V. Savina *et al.*, "Key competencies in pedagogical activities," *Current Problems and Ways of Industry Development: Equipment and Technologies*, Cham: Springer International Publishing, pp. 967-976, 2021.
[29] O. Kryvylova, N. Sosnickaya, and K. Oleksenko, "Axiological approach to the psychological and pedagogical training of future teachers of the new generation," *Educational Dimension*, vol. 3, pp. 141-155, 2020.
[30] R. Kaliisa, E. Palmer, and J. Miller, "Mobile learning in higher education: A comparative analysis of developed and developing country contexts," *British Journal of Educational Technology*, vol. 50(2), pp. 546-561, 2019.
[31] S. Sophonhiranrak, "Features, barriers, and influencing factors of mobile learning in higher education: A systematic review," *Heliyon*, vol. 7(4), p. e06696, April 2021.
[32] R. Salhab and W. Daher, "The impact of mobile learning on students' attitudes towards learning in an educational technology course," *Multimodal Technologies and Interaction*, vol. 7(7), p. 74, 2023.
[33] N. H. Le *et al.*, "Developing pedagogical students' competency for educating life values in general education," *Multidisciplinary Reviews*, vol. 7(9), pp. 2024192-2024192, 2024.
[34] K. Al-Said, "Influence of teacher on student motivation: Opportunities to increase motivational factors during mobile learning," *Education and Information Technologies*, vol. 28(10), pp. 13439-13457, March 2023.
[35] A. Haleem *et al.*, "Understanding the role of digital technologies in education: A review," *Sustainable Operations and Computers*, vol. 3, pp. 275-285, 2022.
[36] O. V. Gordienko, A. A. Sokolova, and A. A. Simonova, "Axiological characteristics of digitalized education," *ARPHA Proceedings*, vol. 1, pp. 1253-1261, 2019.
[37] Z. Serikkhan *et al.*, "Professional Training of Future Primary School Teachers Based on Kazakh National Identity," *Novitas-ROYAL (Research on Youth and Language)*, vol. 18(1), pp. 155-168, 2024.
[38] J. Brown *et al.*, "Nursing students' academic success factors: A quantitative cross-sectional study," *Nurse Educator*, vol. 46(2), pp. E23-E27, 2021.
[39] R. Salhab and W. Daher, "University students' engagement in mobile learning," *European Journal of Investigation in Health, Psychology and Education*, vol. 13(1), pp. 202-216, 2023.
[40] H. H. Lin *et al.*, "Measuring mobile learning readiness: scale development and validation," *Internet Research*, vol. 26(1), pp. 265-287, 2016.
[41] F. Fahrenbach, "A design science approach to developing and evaluating items for the assessment of transversal professional competences," *Education+ Training*, vol. 64(1), pp. 21-40, 2022.
[42] I. Hidayat-Ur-Rehman, "Digital competence and students' engagement: a comprehensive analysis of smartphone utilization, perceived autonomy and formal digital learning as mediators," *Interactive Technology and Smart Education*, vol. 21(3), pp. 461-488, 2024.
[43] S. Zhang and Q. Liu, "Investigating the relationships among teachers' motivational beliefs, motivational regulation, and their learning engagement in online professional learning communities," *Computers & Education*, vol. 134, pp. 145-155, 2019.
[44] M. T. Kaarakainen, and L. Saikkonen, "Multilevel analysis of the educational use of technology: Quantity and versatility of digital technology usage in Finnish basic education schools," *Journal of Computer Assisted Learning*, vol. 37(4), pp. 953-965, 2021.
[45] M. Shanmugasundaram and A. Tamilarasu,"The impact of digital technology, social media, and artificial intelligence on cognitive functions: a review," *Frontiers in Cognition*, vol. 2, p. 1203077, 2023.
[46] T. Talan, "The effect of mobile learning on learning performance: A meta-analysis study," *Educational Sciences: Theory and Practice*, vol. 20(1), pp. 79-103, 2020.

Authors' Profiles

Aziya Zhumabayeva is a Doctor of Pedagogical Sciences, Professor, and Head of the Department of Primary Education at the Faculty of Pedagogy and Psychology, Abai Kazakh National Pedagogical University. She is the author of textbooks for schools in the Republic of Kazakhstan and conducts research in the field of education.

Sazhila Nurzhanova, Candidate of Pedagogical Sciences, Associate Professor, Department of Primary Education, Faculty of Pedagogy and Psychology, Abai Kazakh National Pedagogical University, Almaty, Kazakhstan. Her research focuses on the training of future primary school teachers, educational psychology, and innovations in teaching. She is the author of textbooks and instructional materials in these areas.

Rabiga Bazarbekova, Acting Associate Professor, Department of Primary Education, Abai Kazakh National Pedagogical University, Candidate of Pedagogical Sciences. She is a lead researcher on Ministry of Science and Higher Education–funded projects (2022–2025). Her research focuses on neurodidactics, mobile learning, teacher professional collaboration, and cognitive development in primary education.

Zhazira Zhumabayeva, Senior Lecturer and Postdoctoral Researcher, Department of Primary Education, Institute of Pedagogy and Psychology, Abai Kazakh National Pedagogical University, Kazakhstan. She leads and participates in Ministry of Science and Higher Education–funded projects (2022–2024, 2023–2025). Her research focuses on the training of future primary teachers, meta-disciplinary education, national values, and subject-specific teaching methodologies in English.

Assel Stambekova, Associate Professor, Department of Primary Education, Abai Kazakh National Pedagogical University, Candidate of Pedagogical Sciences. Her research focuses on training future primary school teachers, multilingual and inclusive education, neurodidactics, national values, and the implementation of innovative teaching methods and updated teacher education programs.

How to cite this paper

Aziya Zhumabayeva, Sazhila Nurzhanova, Rabiga Bazarbekova, Zhazira Zhumabayeva, Assel Stambekova, "Measuring the Influence of Mobile Learning on Value-Based Competence Formation in Primary Pre-Service Teachers", International Journal of Modern Education and Computer Science(IJMECS), Vol.18, No.4, pp. 59-71, 2026. DOI:10.5815/ijmecs.2026.04.04