FORMATION OF INFORMATION COMPETENCE OF PEDAGOGICAL EDUCATION SPECIALISTS IN THE PROCESS OF STUDYING PROFESSIONAL TRAINING DISCIPLINES

FORMAÇÃO DA COMPETÊNCIA INFORMACIONAL DE ESPECIALISTAS EM EDUCAÇÃO PEDAGÓGICA NO ÂMBITO DO ESTUDO DE DISCIPLINAS DE FORMAÇÃO PROFISSIONAL

DESARROLLO DE LA COMPETENCIA INFORMATIVA DE LOS ESPECIALISTAS EN FORMACIÓN PEDAGÓGICA DURANTE EL ESTUDIO DE LAS DISCIPLINAS DE FORMACIÓN PROFESIONAL

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ABSTRACT: This study investigates factors associated with information competence using Finnish evidence as an analytical reference for Ukrainian pedagogical specialists, focusing on self-efficacy, in-service training adequacy, digital activity, age, gender, and urbanization level. The empirical analysis is based on the Finnish Basic Education Teacher ICT Skills and Usage Dataset (N = 4,988) collected between 2017 and 2019, a subsample of 1,278 teachers with complete data was analysed using descriptive statistics, correlation analysis, multiple linear regression, and ANOVA with post-hoc comparisons in Stata. The results show that digital activity and self-efficacy are significant positive predictors of information competence, while age is a significant negative predictor. In-service training adequacy, gender, and urbanization level were not significant in the regression model. Rather than claiming direct measurement of Ukrainian teachers, the article interprets Finnish findings as a benchmark for Ukraine and formulates implications for practice-oriented teacher education, differentiated professional development, and equitable digital infrastructure.

KEYWORDS: Information competence. Teacher digital competence. Self-efficacy. professional development. Basic education.

RESUMO: *Este estudo investiga os fatores associados à competência informacional entre especialistas em pedagogia ucranianos, com foco na autoeficácia, na adequação da formação continuada, na atividade digital, na idade, no gênero e no nível de urbanização. A análise empírica baseia-se no Finnish Basic Education Teacher ICT Skills and Usage Dataset (N = 4.988) coletado entre 2017 e 2019, uma subamostra de 1.278 professores com dados completos foi analisada por meio de estatística descritiva, análise de correlação, regressão linear múltipla e ANOVA com comparações post hoc no Stata. Os resultados mostram que a atividade digital e a autoeficácia são preditores positivos significativos da competência informacional, enquanto a idade é um preditor negativo significativo. A adequação da formação em serviço, o gênero e o nível de urbanização não foram significativos no modelo de regressão. Em vez de afirmar uma mensuração direta de professores ucranianos, o artigo interpreta os achados finlandeses como parâmetro comparativo para a Ucrânia e formula implicações para formação docente orientada à prática, desenvolvimento profissional diferenciado e infraestrutura digital equitativa.*

PALAVRAS-CHAVE: *Competência informacional. Competência digital do professor. Autoeficácia. Desenvolvimento profissional. Educação básica.*

RESUMEN: *Este estudio analiza los factores relacionados con la competencia informacional docente utilizando evidencias finlandesas como referencia analítica para los especialistas en pedagogía de Ucrania, centrándose en la autoeficacia, la adecuación de la formación continua, la actividad digital, la edad, el género y el nivel de urbanización. Utilizando un conjunto de datos (N = 4.988) recopilado entre 2017 y 2019, se analizó una submuestra de 1.278 docentes con datos completos mediante estadísticas descriptivas, análisis de correlación, regresión lineal múltiple y ANOVA con comparaciones post hoc en Stata. Los resultados muestran que la actividad digital y la autoeficacia son predictores positivos significativos de la competencia informacional, mientras que la edad es un predictor negativo significativo. La adecuación de la formación continua, el género y el nivel de urbanización no fueron significativos en el modelo de regresión. En lugar de afirmar una medición directa de docentes ucranianos, el artículo interpreta los hallazgos finlandeses como referencia comparativa para Ucrania y formula*

implicaciones para la formación docente orientada a la práctica, el desarrollo profesional diferenciado y la infraestructura digital equitativa.

***PALABRAS CLAVE**: Competencia informacional. Competencia digital del profesorado. Autoeficacia. Desarrollo profesional. Educación básica.*

INTRODUCTION

The formation of information competence of future teachers is a key task of modern education in the context of digitalization (Reis-Andersson, 2022). Teachers must possess not only subject knowledge, but also developed digital skills, information literacy and the ability to work effectively with information (Alieksieienko et al., 2022; Williamson et al., 2020).

In Ukraine, this problem is especially relevant due to the digital transformation of education, intensified by the pandemic and war conditions (Kremen et al., 2022). Higher education institutions, in particular Borys Grinchenko Kyiv University, National Pedagogical Dragomanov University and H.S. Skovoroda Kharkiv National Pedagogical University, are actively integrating the development of information competence into teacher training (Bazyl & Orlova, 2023). The main environment for its formation is the study of professionally oriented disciplines (Lytvynova & Spirin, 2021). Despite a significant number of studies, there is a lack of comprehensive analysis of the factors of information competence formation (Demissie et al., 2022). This is especially important for basic education and in the context of reforming the education system of Ukraine in accordance with European standards (Bykov et al., 2023).

The experience of Finland is valuable because the Finnish education system combines universalist policy commitments, relatively strong digital infrastructure, and sustained investment in teacher professionalization (Kalalahti & Varjo, 2021). However, the present article does not assume that Finnish results can be transferred mechanically to Ukraine. Instead, the Finnish case is used as a comparative benchmark: it allows the identification of factors that operate in a consolidated European educational context and then supports a discussion of how these factors may inform Ukrainian teacher education under different institutional, infrastructural, and wartime conditions. This distinction is essential because Ukraine faces specific challenges related to uneven access to digital resources, emergency remote and hybrid education, and the need to align teacher training with European competence frameworks (Alieksieienko et al., 2022; Williamson et al., 2020; UNESCO, 2023).

Accordingly, the research questions are: (1) Which factors predict information competence among Finnish basic education teachers in the analyzed dataset? (2) What do these predictors suggest for the design of Ukrainian teacher education and professional development programs? (3) Which contextual differences limit direct transfer from Finland to Ukraine and require adaptation? By articulating the empirical Finnish analysis with the Ukrainian reform context, the study aims to move from statistical description to policy-oriented educational interpretation.

LITERATURE REVIEW

Information competence (digital competence, information literacy) encompasses the ability to find, evaluate, process and use information in professional activities (Trixa & Kaspar, 2024). For teachers, it includes the integration of technology into learning and the critical use of digital resources (Skakun, 2021). In Ukraine, its formation is a priority, especially in the context of distance and blended learning (Lytvynova & Spirin, 2021), and is theoretically based on constructivist approaches (Kremen et al., 2022). An important reference point is the European DigCompEdu framework, which defines key areas of digital competence for teachers (Stadler-Altmann, 2024). Ukraine integrates these approaches into teacher training (Ovcharuk et al., 2022; Bazyl & Orlova, 2023). Self-efficacy is a significant factor: teachers with higher confidence are more likely to use technology (Dolighan & Owen, 2021; Almulla, 2022), which is also confirmed in Ukraine (Kulyk et al., 2023). At the same time, the quality of professional development plays an important role, not just its volume (Martín et al., 2019).

The active use of digital technologies is directly related to the development of information literacy (Fraillon et al., 2020; Scherer et al., 2019), which was especially evident in Ukraine during the transition to distance learning (Bykov et al., 2023). Age, gender, and urbanization also influence the level of competence: younger teachers tend to have higher digital skills, but development is possible with training (Kulyk et al., 2023; Trixa & Kaspar, 2024; Ovcharuk et al., 2022), while access to resources in rural areas remains limited (Bykov et al., 2023).

Despite a significant amount of research, the complex impact of these factors in combination has not been sufficiently studied. The Finnish experience, due to its high level of education development, is indicative for such an analysis (Kalalahti & Varjo, 2021) and useful for Ukraine, which is reforming its teacher training system (Alieksieienko et al., 2022).

For the purposes of this article, the Finnish dataset is treated as a source of comparative evidence rather than as a proxy for Ukrainian teachers. The transfer from Finland to Ukraine is therefore propositional and conditional. Digital activity, self-efficacy, professional development, age, and urbanization are examined empirically in Finland and then reinterpreted in relation to Ukrainian teacher education. This approach is consistent with the use of European reference frameworks such as DigCompEdu, which can guide regional and national tools while requiring contextual adaptation (Punie, 2017). In the Ukrainian case, adaptation must consider

wartime disruption, displaced learners and teachers, hybrid schooling, and unequal digital access (Afzal et al., 2023; Li, 2024; Pittman et al., 2021; UNESCO, 2023).

MATERIALS AND METHODS

This study employs a quantitative cross-sectional design to examine factors associated with information competence in a Finnish teacher dataset and to derive implications for the professional training of Ukrainian pedagogical specialists. The empirical object of analysis is Finland; the Ukrainian dimension is addressed through an interpretive and propositional discussion based on the statistical results, the literature on Ukrainian digital education, and European frameworks for teacher digital competence. The theoretical framework draws from social cognitive theory and the European Framework for the Digital Competence of Educators, which emphasize the role of self-efficacy, training, and professional practice in developing digital competence (Punie, 2017). The primary hypothesis is that self-efficacy, in-service training adequacy, digital activity, and demographic characteristics collectively predict information competence among pedagogical specialists.

Data were obtained from the Finnish Basic Education Teacher ICT Skills and Usage Dataset, which contains information on teachers' digital skills and technology usage across Finland (Kaarakainen & Saikkonen, 2020). The dataset was collected between 2017 and 2019 and is publicly available under the CC0 1.0 Universal Public Domain Dedication license. Because the dataset is Finnish, the statistical findings are not presented as direct evidence about Ukrainian teachers. They are analyzed as a structured European case from which cautious implications for Ukrainian teacher education can be formulated.

The initial Dataset comprised 4,988 observations. Following data cleaning and filtering, only teachers (teacher_type = 1) were retained for analysis. After excluding cases with missing values for key variables (self-efficacy, in-service training adequacy, and digital activity), the final analytical sample comprised 1,278 teachers. This sample size provides sufficient statistical power for the planned analyses, with over 1,200 degrees of freedom for regression models.

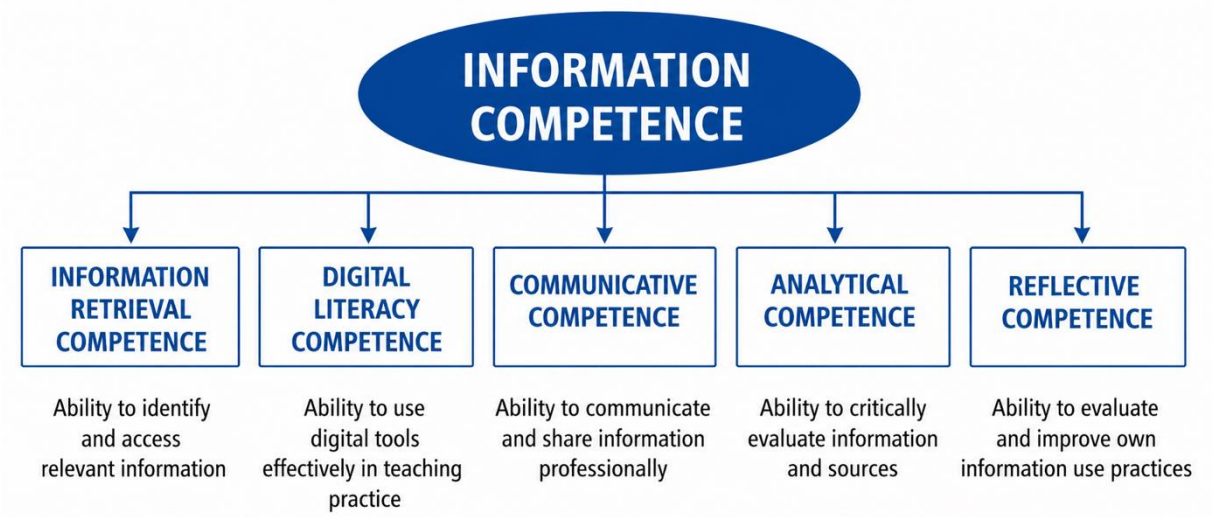
Information competence, the primary outcome of interest, was measured using the Information Skills variable. This variable represents a summative measure of teachers' ability to identify, retrieve, process, and share information in professional contexts (Kaarakainen & Saikkonen, 2020). Higher scores indicate greater information competence.

Four primary predictor variables were examined. Self-efficacy was measured as teachers' perceived confidence in their digital skills, ranging from 0 to 1. In-service training adequacy was measured as teachers' perception of whether the digital skills training they received was adequate, ranging from 0 to 1. Digital activity was measured as the frequency with which teachers used digital technologies, ranging from 0 to 1. Age was measured as a continuous variable in years. Gender was coded as 0 for female and 1 for male. Urbanization level was coded as 1 for low, 2 for medium, and 3 for high urbanization. Data analysis was conducted using Stata. Descriptive statistics were computed for all variables. Pearson correlation coefficients were calculated to examine bivariate relationships between information competence and each predictor variable. Multiple linear regression was employed to identify significant predictors of information competence, with self-efficacy, in-service training adequacy, digital activity, age, gender, and urbanization level entered simultaneously as independent variables. To examine differences in information competence across urbanization levels, a one-way analysis of variance (ANOVA) was conducted, followed by post hoc comparisons using Tukey's HSD test to identify which groups differed significantly. Similarly, teachers were categorized into age groups (26–35, 36–50, and 51+) to examine age-related differences in information competence using ANOVA with Tukey's post hoc comparisons. Statistical significance was set at $p < 0.05$ for all analyses.

RESULTS

The concept of information competence of pedagogical education specialists in the context of professional training in higher education institutions can be structured into several interrelated components (Figure 1). First, information retrieval competence reflects the ability to identify, locate, and access relevant information for professional tasks. Second, digital literacy competence encompasses the effective use of digital tools and technologies in pedagogical practice. Third, communicative competence involves the ability to exchange and present information in professional and educational contexts. Fourth, analytical competence refers to the capacity to evaluate information sources and interpret data critically. Finally, reflective competence is the ability to assess and improve one's own information practices during professional development. These components collectively define the multidimensional nature of information competence formation among future educators.

Figure 1.
Information Competence



Note. The Authors.

The concept of information competence of pedagogical education specialists in the context of professional training in higher education institutions can be structured into several interrelated components. Information retrieval competence reflects the ability to identify and access relevant information. Digital literacy competence involves the effective use of digital tools in pedagogical practice. Communicative competence refers to the ability to exchange and present information in professional contexts. Analytical competence includes the ability to evaluate information and its sources critically. Reflective competence represents the capacity to assess and improve one's own information practices. Together, these components define the multidimensional nature of information competence formation among future educators.

A total of 1,278 teachers with complete data were analyzed. Table 1 presents descriptive statistics for all key variables. The mean Information Skills score, which serves as the primary measure of information competence in this study, was 1.322 (SD = 0.306), ranging from 0 to 1.972. Self-efficacy in digital skills averaged 0.639 (SD = 0.360), indicating moderate confidence levels. Perceived adequacy of in-service training averaged 0.377 (SD = 0.383), suggesting that teachers reported relatively low satisfaction with training adequacy. Digital activity frequency averaged 0.484 (SD = 0.105), indicating moderate levels of technology use. The mean age of teachers was 44.9 years (SD = 9.34), ranging from 26 to 66 years. Gender distribution showed 27.0% male and 73.0% female teachers. Urbanization level averaged 2.51 (SD = 0.742), with 1 = low, 2 = medium, and 3 = high urbanization.

Table 1.
Descriptive statistics of key variables

Variable	n	Mean	SD	Min	Max
Information Skills	1,278	1.322	0.306	0.000	1.972
Self-Efficacy	1,278	0.639	0.360	0.000	1.000
In-Service Training Adequacy	1,278	0.377	0.383	0.000	1.000
Digital Activity	1,278	0.484	0.105	0.175	0.900
Age	1,278	44.94	9.337	26	66
Gender (1=Male)	1,278	0.270	0.444	0	1
Urbanization Level	1,278	2.506	0.742	1	3

Note. Kaarakainen and Saikkonen (2020). Self-efficacy, in-service training adequacy, and digital activity are measured on 0-1 scales, with higher values indicating greater competence, adequacy, and activity, respectively. Urbanization level ranges from 1 (low) to 3 (high).

The study included 1,278 teachers with complete data. The mean Information Skills score was 1.322 (SD = 0.306; range 0–1.972). Self-efficacy in digital skills was at an average level of 0.639 (SD = 0.360). The assessment of the adequacy of professional development was low at 0.377 (SD = 0.383). Digital activity was 0.484 (SD = 0.105), which corresponds to moderate use of technology. The mean age of respondents was 44.9 years (SD = 9.34; 26–66 years). Gender distribution: 27.0% male and 73.0% female. The mean level of urbanization was 2.51 (SD = 0.742). Correlation analysis (Table 2) showed several statistically significant relationships. Information Skills has a moderate positive relationship with self-efficacy ($r = 0.359$, $p < 0.001$), adequacy of in-service training ($r = 0.233$, $p < 0.001$) and digital activity ($r = 0.398$, $p < 0.001$), indicating the importance of experience using technology and learning. Age has a moderate negative relationship ($r = -0.391$, $p < 0.001$), meaning younger teachers demonstrate higher competence. Gender ($r = 0.014$, $p = 0.609$) and level of urbanization ($r = 0.019$, $p = 0.509$) did not show a statistically significant relationship.

Table 2.
Correlation matrix: information competence with predictor variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Information Skills	1.000						
(2) Self-Efficacy	0.359	1.000					
(3) In-service Training	0.233	0.643	1.000				
(4) Digital Activity	0.398	0.302	0.238	1.000			
(5) Age	–0.391	–0.277	–0.154	–0.277	1.000		
(6) Gender	0.014	0.150	0.163	0.050	0.051	1.000	
(7) Urbanization Level	0.019	0.058	0.013	0.078	–0.094	–0.023	1.000

Note. Kaarakainen and Saikkonen (2020). $n = 1,278$. $p < 0.05$. Self-efficacy, in-service training, and digital activity were measured on 0-1 scales. Gender: 0 = Female, 1 = Male.

A multiple linear regression analysis was conducted to examine factors associated with information competence, measured by Information Skills. Six predictor variables were entered

into the model: self-efficacy, in-service training adequacy, digital activity, age, gender, and urbanization level. Table 3 presents the regression results.

The regression model was statistically significant ($F(6, 1271) = 83.57$, $p < 0.001$), explaining 28.3% of the variance in information competence ($R^2 = 0.283$). Three variables emerged as significant predictors of information competence.

Digital activity was the strongest predictor ($\beta = 0.778$, $p < 0.001$), indicating that teachers who used digital technologies more frequently demonstrated significantly higher information competence. Self-efficacy also showed a significant positive relationship ($\beta = 0.182$, $p < 0.001$), suggesting that teachers with greater confidence in their digital skills possessed higher information competence. Age demonstrated a significant negative relationship ($\beta = –0.009$, $p < 0.001$), indicating that younger teachers exhibited higher information competence than older teachers. In-service training adequacy ($\beta = –0.004$, $p = 0.888$), gender ($\beta = –0.012$, $p = 0.458$), and urbanization level ($\beta = –0.016$, $p = 0.097$) were not statistically significant predictors of information competence in this model.

Table 3.
Regression analysis: predictors of information competence

Variable	Coefficient	Std. Error	t	p-value	95% CI
Self-Efficacy	0.182	0.028	6.61	0.000	[0.128, 0.236]
In-Service Training Adequacy	–0.004	0.025	–0.14	0.888	[–0.053, 0.046]
Digital Activity	0.778	0.075	10.41	0.000	[0.632, 0.925]
Age	–0.009	0.001	–10.26	0.000	[–0.010, –0.007]
Gender	–0.012	0.017	–0.74	0.458	[–0.045, 0.020]
Urbanization Level	–0.016	0.010	–1.66	0.097	[–0.036, 0.003]
Constant	1.260	0.064	19.58	0.000	[1.134, 1.386]

Note. Kaarakainen and Saikkonen (2020). $R^2 = 0.283$, Adjusted $R^2 = 0.280$, $F(6, 1271) = 83.57$, $p < 0.001$. Dependent variable: Information Skills (information competence).

A one-way analysis of variance (ANOVA) was conducted to examine whether information competence differed significantly across teachers in low-, medium-, and high-urbanization areas. Table 4 presents the results. The ANOVA revealed a statistically significant difference in information competence across urbanization levels ($F(2, 1275) = 3.56$, $p = 0.029$). The model explained 0.55% of the variance in information competence ($R^2 = 0.0055$).

Table 4.
ANOVA: information competence by urbanization level

Source	SS	df	MS	F	p-value
Between Groups	0.665	2	0.332	3.56	0.029
Within Groups	119.169	1275	0.093		
Total	119.834	1277	0.094		

Note. Kaarakainen and Saikkonen (2020). $R^2 = 0.0055$. Urbanization levels: 1 = Low, 2 = Medium, 3 = High.

To identify which urbanization levels differed significantly, post-hoc comparisons using Tukey's HSD test were conducted. Table 5 presents the pairwise comparison results. Teachers in medium-urbanization areas (M = 1.341) had significantly higher information competence than teachers in low-urbanization areas (M = 1.263), with a mean difference of 0.078 (p = 0.024). No significant differences were found between high-urbanization areas (M = 1.300) and low-urbanization areas (p = 0.311), nor between high- and medium-urbanization areas (p = 0.156).

Table 5.
Post-hoc comparisons: information competence by urbanization level (Tukey HSD)

Comparison	Mean Difference	Std. Error	95% CI	p-value
Medium (2) vs Low (1)	0.078	0.029	[0.009, 0.147]	0.024
High (3) vs Low (1)	0.036	0.024	[–0.021, 0.094]	0.311
High (3) vs Medium (2)	–0.041	0.022	[–0.093, 0.011]	0.156

Note. Kaarakainen and Saikkonen (2020). Teachers in medium-urbanization areas demonstrated significantly higher information competence than those in low-urbanization areas (p = 0.024), while no significant differences were observed between high- and low-urbanization areas or between high- and medium-urbanization areas.

Teachers from medium-urbanized regions (M = 1.341) had a statistically higher level of information literacy compared to teachers from small-urbanized areas (M = 1.263), the difference was 0.078 (p = 0.024). At the same time, no statistically significant differences were found between high (M = 1.300) and low urbanization (p = 0.311), as well as between high and medium urbanization (p = 0.156).

A one-way analysis of variance (ANOVA) was conducted to examine whether information competence differed significantly across teachers aged 26-35, 36–50, and 51+ years. The ANOVA revealed a statistically significant difference in information competence across age groups ($F(2, 1275) = 92.37$, $p < 0.001$). The model explained 12.7% of the variance in information competence ($R^2 = 0.127$) (Table 6).

Table 6.
ANOVA: Information Competence by Age Group

Source	SS	df	MS	F	p-value
Between Groups	15.166	2	7.583	92.37	0.000
Within Groups	104.668	1275	0.082		
Total	119.834	1277	0.094		

Note. Kaarakainen and Saikkonen (2020). Age groups: 26-35 years (n = 231), 36-50 years (n = 654), 51+ years (n = 393). $R^2 = 0.127$.

To identify which age groups differed significantly, post-hoc comparisons using Tukey's HSD test were conducted. Table 7 presents the pairwise comparison results. Teachers aged 26-35 years demonstrated the highest information competence (M = 1.450), followed by teachers aged 36–50 years (M = 1.299), and teachers aged 51+ years (M = 1.135). All pairwise comparisons were statistically significant. Teachers aged 36-50 years had significantly lower information competence than teachers aged 26-35 years, with a mean difference of –0.151 ($p < 0.001$). Teachers aged 51+ years had significantly lower information competence than teachers aged 26-35 years, with a mean difference of –0.315 ($p < 0.001$). Teachers aged 51+ years also had significantly lower information competence than teachers aged 36-50 years, with a mean difference of –0.164 ($p < 0.001$).

Table 7.
Post-hoc comparisons: information competence by age group (Tukey HSD)

Comparison	Mean Difference	Std. Error	95% CI	p-value
36–50 vs 26–35	–0.151	0.022	[–0.203, –0.100]	< 0.001
51+ vs 26–35	–0.315	0.024	[–0.371, –0.259]	< 0.001
51+ vs 36–50	–0.164	0.018	[–0.207, –0.121]	< 0.001

Note. Kaarakainen and Saikkonen (2020). Younger teachers demonstrated significantly higher information competence than their older counterparts, with a clear linear decline in competence as age increased.

The Finnish evidence indicates three points that are especially relevant for Ukraine. First, digital activity was the strongest predictor of information competence. For Ukrainian pedagogical universities and in-service teacher training centers, this suggests that digital competence should not be treated only as a theoretical module or as a short-term technical course. It should be embedded in professional training disciplines through repeated digital practice: searching and evaluating information, designing digital learning materials, communicating through learning platforms, and reflecting on data-informed pedagogical decisions.

Second, the positive role of self-efficacy suggests that professional development in Ukraine should strengthen teachers' confidence through guided practice, mentoring, peer

exchange, and feedback, rather than relying exclusively on abstract instruction about digital tools. This is especially important in conditions of war, when teachers may be required to move between face-to-face, remote, and hybrid modes of teaching with little preparation time.

Third, the negative association between age and information competence points to the need for differentiated professional development. In Ukraine, this does not mean treating older teachers as deficient, but designing supportive pathways that respond to distinct professional biographies and levels of digital exposure. Finally, the weak role of urbanization in the Finnish regression model cannot be directly generalized to Ukraine, where regional disparities, damage to infrastructure, displacement, and unequal connectivity may make territorial inequality more consequential than in Finland. Therefore, the Finnish pattern should be read as an aspirational benchmark that requires adaptation to Ukrainian infrastructural realities.

DISCUSSION

The study analyzed Finnish data in order to identify factors that may inform the formation of information competence among Ukrainian pedagogical specialists in the context of digital transformation, European integration, and wartime educational disruption. The strongest predictor in the Finnish model was digital activity ($\beta = 0.778$, $p < 0.001$), which confirms the importance of regular technology use for the development of information competence (González-Salamanca et al., 2020; Astuti et al., 2021). For Ukraine, this finding suggests that professional training disciplines should include systematic digital practice across the curriculum, rather than limiting digital competence to isolated courses or optional workshops.

Self-efficacy also had a positive effect on competence ($\beta = 0.182$, $p < 0.001$), which is consistent with research showing that teachers' confidence influences their adoption and pedagogical use of digital technologies (Scherer et al., 2019; Skakun, 2021). In Ukrainian teacher education, this implies that digital competence programs should combine technical training with opportunities for successful practice, collaborative reflection, and feedback. The negative association between age and information competence reinforces the need for age-sensitive and experience-sensitive professional development, especially for senior teachers who may require sustained support rather than short-term training (Fernández-Batanero et al., 2020; Khan & Vuopala, 2019). At the same time, the Finnish finding that urbanization was not significant in the regression model must be interpreted cautiously. In Ukraine, digital inequality

may be intensified by war-related displacement, damage to infrastructure, and regional differences in connectivity (Afzal et al., 2023; Pittman et al., 2021; UNESCO, 2023).

The main contribution of the Finnish case to the Ukrainian context is therefore not a direct diagnosis of Ukrainian teachers, but a set of evidence-based priorities: sustained digital engagement, self-efficacy-oriented training, differentiated support for older teachers, and infrastructure-sensitive policy design. These priorities can inform the redesign of professional training disciplines in Ukrainian pedagogical universities, including Borys Grinchenko Kyiv University, National Pedagogical Dragomanov University, H.S. Skovoroda Kharkiv National Pedagogical University, Taras Shevchenko National University of Kyiv, and Ivan Franko National University of Lviv. The findings also suggest that Ukrainian reforms should align teacher education with European frameworks such as DigCompEdu while adapting them to national and wartime conditions (Ovcharuk et al., 2022; Punie, 2017).

FINAL CONSIDERATIONS

The study analyzed factors associated with teachers' information competence using Finnish empirical evidence as a comparative reference for Ukrainian teacher education. The analysis showed that digital activity and self-efficacy are the strongest positive predictors of information competence, while age has a significant negative effect. In-service training adequacy, gender, and urbanization level were not significant predictors in the Finnish regression model. These results indicate that information competence is formed less through formal training as a declared variable and more through sustained digital practice combined with teachers' confidence in their own capacities.

For Ukraine, the findings should be interpreted as implications rather than direct empirical conclusions. The Finnish case suggests that Ukrainian pedagogical education should strengthen practice-oriented digital tasks across professional training disciplines, develop mentoring and feedback systems that reinforce self-efficacy, and create differentiated support for teachers with different levels of digital experience. In the context of war and accelerated digitalization, this also requires attention to equitable infrastructure, access to devices, stable connectivity, and institutional support for hybrid and distance learning. The study is limited by the fact that the quantitative data are Finnish and were collected before the full-scale Russian invasion of Ukraine; therefore, the results cannot be used to describe Ukrainian teachers statistically. Future research should combine comparative European datasets with primary

Ukrainian data, including surveys and interviews with teachers, teacher educators, and students in different regions. Longitudinal studies are also needed to assess how information competence develops during teacher training and how specific professional development programs affect digital practice and self-efficacy in wartime and post-war reconstruction contexts.

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