MedMax Publishers

ISSN: 2769-2310

International Journal of Environmental & Earth Sciences ResearchArticle

The Impact of Institutional Support on Teachers' Digital Competencies in Higher Education

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Received: 17 April 2026; Accepted: 23 April 2026; **Published**: 29 April 2026

Abstract

In the field of education, institutional support is of paramount importance as it involves goal setting, motivating individuals, and bringing them together around a shared purpose that transcends personal interests. Effective leadership is crucial for ensuring high-quality education and fostering a work environment that promotes teachers' well-being, productivity, and efficiency. Institutional policies play a key role in promoting the use of technology, while teachers' digital competencies represent one of the fundamental prerequisites for high-quality teaching and learning in higher education.

This paper examines the impact of institutional support in Croatian higher education institutions on the development of teachers' digital competencies, with a particular focus on the availability of resources, professional development, and organizational culture that encourages the use of digital technologies in teaching. The aim of the study is to determine whether differences exist in the perception of institutional support and the level of digital competencies among teachers, as well as how organizational culture and leadership style influence teachers' readiness to integrate digital technologies into the teaching process.
A high level of digital competence enables teachers to create interactive and engaging educational materials, access online resources, and foster collaborative learning. In this way, digital technologies contribute to the development of students' critical thinking, creativity, and problem-solving skills.

University leadership style significantly influences teachers' job performance, which in turn shapes the quality of education and enhances engagement and commitment. At the same time, organizational support is a key component in fostering and shaping a positive work environment in which all members participate in productive activities.
The study was conducted on a sample of 503 teachers employed at two public universities (University of Zagreb, University North) and two private universities in Croatia (Vern' University and the Catholic University of Croatia). Data were collected using an online survey questionnaire developed in the LimeSurvey tool. The results indicate a statistically significant relationship between the level of institutional support and the development of teachers' digital competencies, as well as their readiness to integrate digital tools into the educational process.

Keywords: Institutional Support, Higher Education, Teachers, Digital Competencies

Introduction

In the process of digital transformation in education, technology plays an important role; however, the teacher remains at the center of this transformation. It is the teacher, through their knowledge, attitudes, and readiness for change, who determines the success of implementing digital tools in teaching. Digital transformation does not merely involve the introduction of new technologies, but also changes in teaching methods, communication, and assessment. Teachers connect technology with pedagogical goals and create an environment in which digital skills become an integral part of teaching and learning. In a contemporary context marked by rapid technological change, teachers face the challenge of continuous adaptation and professional development.

The specificity of university teachers' work is reflected in their high level of autonomy in designing teaching content, as well as in their role as researchers actively involved in knowledge creation. Viewed through the lens of Maslow's theory of needs, this role provides opportunities for self-actualization, but also entails significant responsibility for the quality of teaching and learning outcomes. The professional development of university teachers includes the simultaneous development of teaching competencies, monitoring scientific advancements, and active engagement in research. In addition, it requires continuous monitoring of developments in educational technologies and the design and implementation of new teaching approaches.

Technology in education enables interactive and personalized learning, as well as access to a wide range of educational resources. This transformation also implies a paradigm shift—from a teaching-centered to a learning-centered approach, placing greater emphasis on the active role of the student. Faced with generations of students considered digital natives, teachers need to adapt their methods to enhance engagement and motivation. In this context, pedagogical innovations such as the flipped classroom, collaborative learning, and the use of artificial intelligence contribute to the development of modern, student-centered models of education.

Research has also shown varying levels of institutional readiness for the adoption of digital technologies [1]. As technology continues to evolve, both public and private universities are under pressure to adapt and innovate in order to meet the changing needs and expectations of students, teachers, and other stakeholders. Systematic support for teachers enables them to overcome challenges and fosters the development of digital competencies, which are a prerequisite for high-quality and modern higher education.

Institutional Support as a Prerequisite for the Implementation of Digital Technologies

In the field of education, leadership is of paramount importance, as it involves setting goals, motivating individuals, and uniting them around a shared purpose that transcends personal interests. Effective leadership is crucial for ensuring high-quality education and for fostering a work environment that supports the well-being, productivity, and effectiveness of teachers [2]. The leadership style of universities also significantly influences teachers' work performance, which in turn shapes the quality of education and enhances engagement and commitment. At the same time, organizational support is a key component in promoting and shaping a positive work environment in which all members participate in productive activities [3]. It encompasses instrumental, emotional, and informational dimensions and is largely determined by leadership, organizational culture, human resource management practices, and the relationship between employees and the organization.

Universities should monitor changes related to implementation initiatives proposed by their staff and work on the continuous professional development of teachers in digital technologies. They should have a clear vision of digital technology within the organization and trust individuals with technical and specialized expertise to implement it effectively.

Teacher well-being manifests in many forms, as it is influenced by various factors such as work organization, leadership, workplace culture, stakeholder support, and job security [4]. Research by confirms that the organizational role of university leadership is a crucial factor in the adoption of technology [5]. It highlights that when university management recognizes the importance of digital education, resistance among teachers decreases, enabling faster progress and improvement in teaching. On the other hand, teachers' attitudes toward ICT and e-learning technologies in the educational process also depend on institutional conditions, such as the availability of computers and internet access. Teachers reported that their motivation to engage in e-learning would increase with accessible and systematic support for implementing new technologies, recognition of e-learning in promotion procedures, opportunities for professional development, examples of good practice, and institutional decisions mandating the use of e-learning.

A recent study by Scherer et al. identified teachers who perceived a high level of institutional support for online teaching and learning but reported low self-efficacy in using technology, concluding that outcomes largely depend on teachers' attitudes, beliefs, and perceptions of the usefulness of technology [6]. Additionally, teacher workload should be addressed by reducing administrative burdens and introducing policies that promote effective teaching rather than excessive paperwork and similar tasks, as incorporating organizational support in managing workloads contributes to innovation, process improvement, and overall advancement [7].

Researchers Guzman and Aguilar identified several key barriers to the successful implementation of digital technologies, including a lack of institutional support, limited opportunities for professional development, and resistance to change among teachers [8]. These challenges are often exacerbated by the rapid pace of technological advancement, which can overwhelm teachers and hinder the effective integration of new tools into teaching practices. One approach involves developing comprehensive professional development programs focused on building digital competencies that institutions must provide. Such programs should be tailored to the specific needs of teachers and offer practical training.

Institutional policies play a crucial role in promoting the use of technology in teaching. Criss et al. emphasize that institutions should encourage performance evaluation and provide appropriate incentives for teachers who effectively use technology [9]. Such measures can further motivate teachers toward continuous learning and facilitate the adoption of digital tools, ultimately improving teaching effectiveness.

Although some universities offer training, these programs often cover only the basics of digital tools and fail to provide comprehensive guidance on how to effectively conduct digital teaching. Without a clear strategic direction, teachers may lose motivation and confidence in long-term investment in digital skill development. These perceptions suggest that many institutions lack the necessary infrastructure and support systems to effectively promote digital advancement. Furthermore, teachers report a lack of structured training programs focused on the use of digital technologies, as the emphasis is primarily on technical skills rather than leadership strategies, leaving teachers without sufficient guidance on how to effectively integrate digital tools into teaching.

Due to economic conditions and policy constraints, it is not only curricula and teaching methods that require change, but also the provision of essential equipment necessary for training future professionals and developing their skills. However, given the rapid pace of technological change, it is difficult for any country to respond promptly and meet these sudden demands.

Moreover, most educational institutions face significant limitations in digital infrastructure and capacities, including technological equipment. Barot highlights that inadequate technological infrastructure, such as unreliable internet connections and outdated equipment, represents a major challenge for the effective implementation of digital transformation initiatives in educational settings [10]. Therefore, universities must invest in infrastructure upgrades and ensure adequate technical support to enable seamless access to digital resources, which places considerable pressure on their resources and organizational capacities. While large universities often have well-equipped digital learning centers, smaller institutions frequently lack the financial capacity to acquire advanced technologies. Consequently, teaching staff at less well-funded

institutions face difficulties in accessing advanced digital tools, leading to disparities in digital teaching capabilities across institutions.

Teachers who feel incompetent in the area of technology often perceive themselves as less capable of managing classroom activities. As a result, they tend to use technology less frequently and are less likely to explore new ways of integrating digital tools into teaching materials. When teachers feel competent, they are more inclined to adopt innovative teaching methods. To address these challenges, universities must not only invest in digital infrastructure but also prioritize teacher development in digital leadership and pedagogical competencies. This includes offering structured training programs, encouraging interdisciplinary collaboration, and integrating digital leadership competencies into professional development initiatives. Only by strengthening institutional support can universities effectively enhance teachers' digital capabilities and improve teaching effectiveness.

Additionally, teaching staff often face resistance to change due to a lack of motivation and institutional incentives. Without clear institutional incentives and recognition mechanisms, teachers are often reluctant to invest time and effort in developing digital and pedagogical competencies. These challenges are further intensified by the rapid pace of technological advancement, which can overwhelm teachers and hinder the effective integration of new tools into teaching practices [11].

Private and Public Universities – Different Approaches to Digital Competencies

Higher education institutions that effectively integrate digital technologies are better positioned to attract and retain students by offering enhanced learning experiences and broader access through online programs. The success of digital transformation initiatives in educational institutions also shows significant variation. In some cases, private universities successfully use digital technologies to enhance their educational offerings, while others face barriers such as resistance from teaching staff and a lack of adequate training. This highlights the need for effective change management strategies and strong leadership in promoting digital transformation [12].

Research indicates that digital adaptation must be implemented; otherwise, institutions risk falling behind, as today's students expect digitally oriented experiences that can compete with their preferred online platforms [13]. Therefore, universities must be leaders rather than followers in responding to these expectations, which places significant pressure on both public and private universities. This again emphasizes the need for effective change management strategies and strong leadership in driving digital transformation [12].

Public and private universities operate within different regulatory, cultural, and economic environments, which influence their responses to digital transformation. The public sector is generally more bureaucratic and slower to change, while the private sector adapts more quickly to market demands. Research shows that the implementation of digital tools in teaching varies significantly depending on the type of institution, political and cultural context, and available technological resources [14]. Furthermore, the integration of digital technology within institutions with different organizational structures leads to different approaches to teaching. The global implications of digital transformation in higher education highlight the necessity for institutions worldwide to strategically embrace technological advancement, ensuring not only improved educational performance and accessibility but also effective responses to diverse cultural and economic contexts [15].

While some private universities have made substantial investments in digital infrastructure and pedagogical innovation, many public universities still struggle with significant resource and infrastructure limitations [16]. Public universities often face bureaucratic barriers, financial constraints, and legacy systems, which can hinder the pace and scope of digital innovation. In contrast, private universities demonstrate greater flexibility, autonomy, and agility in adopting and implementing digital initiatives driven by market forces and competitive pressures. This also affects teaching staff, who are key actors in implementing digital transformation [1].

Despite both public and private universities facing challenges in developing teachers' digital competencies, private universities tend to be more proactive in implementing training programs related to digital technologies. Private universities recognize that a comprehensive approach that integrates both digital and traditional promotional efforts is essential for success, and through seamless alignment of these strategies, institutions can create a coherent and attractive narrative that resonates with prospective students [17].

A comparative analysis of foreign public and private universities indicates that private universities, due to their competitive nature, are often more active in promoting continuous professional development among their academic staff [18]. Public universities, on the other hand, face greater challenges in organizing training programs for digital competencies, which may result from bureaucratic procedures and a lack of flexibility in educational policies.

In this context, public universities increasingly face difficulties, as traditional face-to-face classroom teaching is becoming less aligned with students' needs and is often perceived as monotonous and unproductive. In contrast, online environments enable more flexible, decentralized, engaging, and dynamic learning, which private universities, due to their organizational agility, adopt more quickly [19]. Unlike public universities, private institutions have greater flexibility in responding to market demands and labor market changes, which was particularly evident during the COVID-19 pandemic, when private universities were more readily able to adapt to online teaching challenges.

Continuous professional development in digital competence is essential for maintaining up-to-date digital skills among teachers, improving their educational effectiveness, and reducing the digital divide between students and teachers. Therefore, it is necessary to intensify efforts by both public and private universities to enhance teachers' digital competencies, promote their pedagogical adaptation to various tools, platforms, and applications, and tailor these to the specific characteristics of each field of knowledge being taught.

Finally, successful digital transformation depends on institutional support, continuous professional development, and a strategic approach to digital competence development. Ongoing teacher training is crucial for maintaining up-to-date digital skills, reducing the digital divide between students and teachers, and ensuring the relevance of education in

Methodology and Research

A total of 503 respondents participated in the study, of whom 409 were employed at public universities (University of Zagreb, University North) and 94 at private universities (Vern' University,

Catholic University of Croatia).” In the overall sample, 81% of teachers were employed at public universities, while 19% were from private universities, confirming the dominant role of public institutions in this sample.

Respondents assessed their level of agreement with statements related to organizational support for teachers in the implementation of digital technologies in teaching. A five-point Likert scale was used for the assessment (1 – strongly disagree to 5 – strongly agree). The tables present descriptive statistics for individual statements, including the percentage of responses, the median (C) as a measure of central tendency, and the interquartile range (Q3-1) as a measure of variability.

Table 1: Overview of the proportion of organizational support for teachers at the public universities

		Public univerisities						
	At the public university at which I work...	1	2	3	4	5	C	Q_3-1
OP_1	Surveys are regularly conducted among teachers to identify the need for the development of digital competencies.	30,8	26,7	24,0	12,5	6,1	2,00	2,00
OP_2	Teachers are provided with training for the use of digital technologies	13,2	17,4	32,3	24,7	12,5	3,00	2,00
OP_3	Teachers are provided with pedagogical training for the implementation of digital technologies in teaching.	23,5	28,1	26,4	14,4	7,6	2,00	1,00
OP_4	Teachers are encouraged to use innovative digital technologies in teaching.	13,4	17,1	28,4	27,4	13,7	3,00	2,00
OP_5	Teachers who successfully integrate digital technologies into their teaching are recognized and rewarded.	41,6	24,0	19,6	10,5	4,4	2,00	2,00
OP_6	Teachers are encouraged to deliver mixed (hybrid) forms of teaching.	39,9	23,7	24,2	6,8	5,4	2,00	2,00
OP_7	Teachers are provided with accessible and high-quality equipment for using digital technologies in teaching	23,0	24,2	27,1	16,4	9,3	3,00	2,00
OP_8	Teachers are provided with a fast and reliable internet connection at the higher education institution.	8,6	11,0	18,3	28,4	33,7	4,00	2,00
OP_9	Teachers are provided with technical support for the use of digital technologies.	15,4	19,1	28,4	22,2	14,9	3,00	2,00
OP_10	Data security is ensured for teachers.	13,0	14,2	34,5	22,0	16,4	3,00	2,00
OP_11	Teachers are encouraged to collaborate with other institutions to integrate digital technologies through examples of good practice.	29,3	26,4	24,7	13,2	6,4	2,00	2,00
OP_12	Teachers are allowed to independently choose which available digital tools to use in teaching.	4,9	8,3	20,0	30,8	35,9	4,00	2,00
OP_13	Teachers are given time within their working hours to learn and adapt for the implementation of digital technologies in teaching.	25,4	16,1	26,9	16,4	15,2	3,00	3,00

Table 2: Overview of the proportion of organizational support for teachers at the surveyed private universities

		Private universities						
	At the private university at which I work...	1	2	3	4	5	C	Q3-1
OP_1	Surveys are regularly conducted among teachers to identify the need for the development of digital competencies.	25,5	29,8	25,5	12,8	6,4	2,00	2,00
OP_2	Teachers are provided with training for the use of digital technologies	14,9	21,3	27,7	26,6	9,6	3,00	2,00
OP_3	Teachers are provided with pedagogical training for the implementation of digital technologies in teaching.	20,2	21,3	30,9	21,3	6,4	3,00	2,00
OP_4	Teachers are encouraged to use innovative digital technologies in teaching.	10,6	17,0	37,2	22,3	12,8	3,00	2,00
OP_5	Teachers who successfully integrate digital technologies into their teaching are recognized and rewarded.	36,2	21,3	25,5	12,8	4,3	2,00	2,00
OP_6	Teachers are encouraged to deliver mixed (hybrid) forms of teaching.	33,0	22,3	23,4	19,1	2,1	2,00	2,00
OP_7	Teachers are provided with accessible and high-quality equipment for using digital technologies in teaching.	7,4	9,6	30,9	27,7	24,5	4,00	1,25
OP_8	Teachers are provided with a fast and reliable internet connection at the higher education institution.	1,1	3,2	4,3	28,7	62,8	5,00	1,00
OP_9	Teachers are provided with technical support for the use of digital technologies.	2,1	6,4	22,3	24,5	44,7	4,00	2,00
OP_10	Data security is ensured for teachers.	3,2	5,3	25,5	28,7	37,2	4,00	2,00
OP_11	Teachers are encouraged to collaborate with other institutions to integrate digital technologies through examples of good practice.	17,0	22,3	23,4	25,5	11,7	3,00	2,00
OP_12	Teachers are allowed to independently choose which available digital tools to use in teaching.	3,2	11,7	17,0	18,1	50,0	4,50	2,00
OP_13	Teachers are given time within their working hours to learn and adapt for the implementation of digital technologies in teaching.	22,3	14,9	27,7	17,0	18,1	3,00	2,00

To examine whether there is a statistically significant difference in the evaluation of individual statements related to organizational support for teachers in the implementation of digital technologies in teaching between teachers at public and private universities, Mann–Whitney U tests were conducted. Results of the Mann–Whitney U tests for individual statements related to organizational support for teachers in the implementation of digital technologies in teaching.

Table 3: Comparison of public and private universities with regard to organizational support for teachers

		Sveučilište	N	Mean rank	Rank sum	Mann-Whitney U	p value
OP_1	Surveys are regularly conducted among teachers to identify the need for the development of digital competencies.	Public	409	249,95	102228,00	18383,00	0,495
		Private	94	260,94	24528,00		
OP_2	Teachers are provided with training for the use of digital technologies	Public	409	254,32	104018,00	18273,00	0,441
		Private	94	241,89	22738,00		
OP_3	Teachers are provided with pedagogical training for the implementation of digital technologies in teaching.	Public	409	247,66	101293,00	17448,00	0,151
		Private	94	270,88	25463,00		
OP_4	Teachers are encouraged to use innovative digital technologies in teaching.	Public	409	252,72	103362,00	18929,00	0,812
		Private	94	248,87	23394,00		
OP_5	Teachers who successfully integrate digital technologies into their teaching are recognized and rewarded.	Public	409	248,40	101595,00		
		Private	94	267,67	25161,00		
OP_6	Teachers are encouraged to deliver mixed (hybrid) forms of teaching.	Public	409	246,95	101004,00	17159,00	0,089
		Private	94	273,96	25752,00		
OP_7	Teachers are provided with accessible and high-quality equipment for using digital technologies in teaching.	Public	409	234,03	95719,00	11874,00**	0,000
		Private	94	330,18	31037,00		
OP_8	Teachers are provided with a fast and reliable internet connection at the higher education institution.	Public	409	234,28	95820,00	11975,00**	0,000
		Private	94	329,11	30936,00		
OP_9	Teachers are provided with technical support for the use of digital technologies.	Public	409	231,25	94582,50	10737,50**	0,000
		Private	94	342,27	32173,50		
OP_10	Data security is ensured for teachers.	Public	409	235,41	96284,00	12439,00**	0,000
		Private	94	324,17	30472,00		
OP_11	Teachers are encouraged to collaborate with other institutions to integrate digital technologies through examples of good practice.	Public	409	241,20	98650,00	14805,00**	0,000
		Private	94	299,00	28106,00		
OP_12	Teachers are allowed to independently choose which available digital tools to use in teaching.	Public	409	247,39	101182,50	17337,50	0,120
		Private	94	272,06	25573,50		
OP_13	Teachers are given time within their working hours to learn and adapt for the implementation of digital technologies in teaching.	Public	409	249,36	101989,00	18144,00	0,384
		Private	94	263,48	24767,00		

**$p < 0,01$

A statistically significant difference was found between teachers at public and private universities in the evaluation of the following statements:

- OP_7 Teachers are provided with accessible and high-quality equipment for the use of digital technology in teaching ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with the statement compared to teachers at public universities.
- OP_8 Teachers are provided with a fast and reliable internet connection at the higher education institution ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with the statement compared to teachers at public universities.
- OP_9 Teachers are provided with technical support for the use of digital technology ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with the statement compared to teachers at public universities.
- OP_10 Teachers are guaranteed data security ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with the statement compared to teachers at public universities.
- OP_11 Teachers are encouraged to collaborate with other institutions to integrate digital technologies through examples of good practice ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with the statement compared to teachers at public universities.

No statistically significant differences were found for the remaining statements.

The analysis of teachers' perceptions of organizational support for the implementation of digital technologies in teaching reveals differences between public and private universities. At public universities, a lack of systematic monitoring of needs for the development of digital competencies is frequently highlighted, with most teachers indicating that surveys are rarely conducted.

Training for the use of digital technologies and pedagogical training are present but not consistently available to all teachers, while encouragement for innovative use of technologies and systematic recognition of successful teachers are implemented only sporadically. Technical equipment and internet access are rated as moderate, and technical support and data security are also not at a high level. Teachers' autonomy in choosing digital tools and the time allocated for adapting teaching practices are limited.

In contrast, private universities provide stronger technical support, higher-quality equipment, and faster internet connections, while teachers have greater autonomy in selecting digital tools and more time for their implementation in teaching. However, even in the private sector, surveys for identifying needs and the systematic rewarding of teachers are rarely conducted, and training and encouragement of innovation are still not consistently integrated into institutional practice.
The results indicate a need to improve institutional strategies that would systematically identify teachers' needs, ensure continuous training, and encourage the innovative use of digital technologies in teaching. While private universities demonstrate greater flexibility and support in technical aspects, public universities need to further strengthen infrastructure and systematically monitor the development of teachers' digital competencies.

The Cronbach's alpha coefficient for the scale of organizational support for teachers in the implementation of digital technologies in teaching, consisting of 13 items, is 0.90, indicating high reliability of the scale. Reliability coefficients were also calculated for subsamples of respondents employed at public universities ($\alpha = 0.90$) and those employed at private universities ($\alpha = 0.90$).
Excluding individual items would not increase the reliability of the scale. All corrected item–total correlations are above 0.30 (the lowest item–total correlation is 0.37 for item OP_12).

Descriptive statistics and reliability indicators for individual

Table 4: Overview of the reliability analysis for the scale of organizational support for teachers at the surveyed universities

		M	SD	rit	Cronbach's alpha if the item is deleted
OP_1	Surveys are regularly conducted among teachers to identify the need for the development of digital competencies.	2,38	1,21	0,52	0,90
OP_2	Teachers are provided with training for the use of digital technologies	3,04	1,20	0,63	0,89
OP_3	Teachers are provided with pedagogical training for the implementation of digital technologies in teaching.	2,58	1,21	0,67	0,89
OP_4	Teachers are encouraged to use innovative digital technologies in teaching.	3,11	1,22	0,69	0,89
OP_5	Teachers who successfully integrate digital technologies into their teaching are recognized and rewarded.	2,15	1,19	0,55	0,90
OP_6	Teachers are encouraged to deliver mixed (hybrid) forms of teaching.	2,18	1,18	0,55	0,90
OP_7	Teachers are provided with accessible and high-quality equipment for using digital technologies in teaching.	2,81	1,29	0,69	0,89
OP_8	Teachers are provided with a fast and reliable internet connection at the higher education institution.	3,83	1,24	0,52	0,90
OP_9	Teachers are provided with technical support for the use of digital technologies.	3,21	1,30	0,65	0,89
OP_10	Data security is ensured for teachers.	3,29	1,24	0,67	0,89
OP_11	Teachers are encouraged to collaborate with other institutions to integrate digital technologies through examples of good practice.	2,50	1,24	0,72	0,89
OP_12	Teachers are allowed to independently choose which available digital tools to use in teaching.	3,87	1,16	0,37	0,90
OP_13	Teachers are given time within their working hours to learn and adapt for the implementation of digital technologies in teaching.	2,82	1,39	0,63	0,89

The score on the scale of organizational support for teachers in the implementation of digital technologies in teaching was calculated as the arithmetic mean of responses to 13 items. The table presents descriptive statistics and the results of the Kolmogorov–Smirnov test for this scale. Although the result of the Kolmogorov–Smirnov test for the subsample of teachers at public universities is statistically significant and indicates a deviation from normality, the Skewness and Kurtosis indices show that this deviation is negligible.

Table 5: Overview of Skewness and Kurtosis indices for the scale of organizational support

University	N	Min	Max	M	SD	Skewness	Kurtosis
Public	409	1,00	5,00	2,84	0,83	0,28	-0,18
Private	94	1,38	5,00	3,20	0,79	0,07	-0,43

Result of the Kolmogorov–Smirnov test for the scale of organizational support for teachers in the implementation of digital technologies in teaching

Table 6: Overview of the Kolmogorov–Smirnov test results for the scale of organizational support

	Kolmogorov-Smirnov		
University	Statistik	df	p - value
Public	0,05	409	0,023
Private	0,07	94	0,200

An independent samples t-test was conducted to examine whether there is a statistically significant difference in the mean score on the scale of organizational support for teachers in the implementation of digital technologies in teaching between teachers at public and private universities. The result of Levene's test was not significant (Levene's $F = 0.40$; $p = 0.53$), indicating that the assumption of homogeneity of variances for conducting the independent samples t-test was met.

The t-test result shows that there is a statistically significant difference in the mean score on the scale of organizational support for teachers in the implementation of digital technologies in teaching between teachers at public and private universities ($t(501) = 3.90$; $p < 0.01$), with teachers at public universities reporting a significantly lower level of organizational support ($M = 2.84$; $SD = 0.83$) compared to teachers at private universities ($M = 3.20$; $SD = 0.79$).

Results of the Analysis

A statistically significant difference was found between teachers at public and private universities in the evaluation of the following statements:

- OP_7 Teachers are provided with accessible and high-quality equipment for the use of digital technologies in teaching ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with this statement compared to teachers at public universities.
- OP_8 Teachers are provided with a fast and reliable internet connection at the higher education institution ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with this statement compared to teachers at public universities.
- OP_9 Teachers are provided with technical support for the use of digital technologies ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with this statement compared to teachers at public universities.
- OP_10 Teachers are guaranteed data security ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with this statement compared to teachers at public universities.
- OP_11 Teachers are encouraged to collaborate with other institutions in order to integrate digital technologies through examples of good practice ($p < 0.01$), with mean ranks indicating that teachers at private universities show a higher level of agreement with this statement compared to teachers at public universities.

The analysis of teachers' perceptions of organizational support for the implementation of digital technologies in teaching reveals differences between public and private universities. At public universities, a lack of systematic monitoring of the need for the development of digital competencies is frequently highlighted, with the majority of teachers indicating that surveys are conducted infrequently. Training for the use of digital technologies and pedagogical education are present, but not consistently available to all teachers, while encouragement for innovative use of technology and systematic recognition of successful teachers are implemented only sporadically. Technical equipment and internet access are rated as moderate, while technical support and data security are also not at a high level. Teachers' autonomy in selecting digital tools and the time allocated for adapting teaching practices are limited. No statistically significant differences were found for the remaining statements.

In contrast, private universities provide stronger technical support, higher-quality equipment, and faster internet connections. Teachers also report greater autonomy in choosing digital tools and more time for their implementation in teaching. However, even in the private sector, surveys for identifying teachers' needs and systematic reward systems are rarely implemented, and training and the promotion of innovation are still not consistently integrated into institutional practice.The results indicate the need to improve institutional strategies that would systematically identify teachers' needs, ensure continuous professional development, and encourage the innovative use of digital technologies in teaching. While private universities demonstrate greater flexibility and support in technical aspects, public universities need to further strengthen their infrastructure and systematically monitor the development of teachers' digital competencies.

Additionally, a reliability analysis was conducted for the scale measuring organizational support for teachers in the implementation of digital technologies in teaching. The Cronbach's alpha coefficient for the scale, which consists of 13 items, is 0.90, indicating high reliability. Reliability coefficients were also calculated for subsamples of respondents employed at public universities ($\alpha = 0.90$) and private universities ($\alpha = 0.90$).

The removal of individual items would not increase the reliability of the scale. All corrected item-total correlations exceed 0.30 (the lowest value being 0.37 for item OP_12).

An independent samples t-test was conducted to examine whether there is a statistically significant difference in the mean score on the scale of organizational support for teachers in the implementation of digital technologies in teaching between teachers at public and private universities. The result of Levene's test was not significant (Levene's $F = 0.40$; $p = 0.53$), indicating that the assumption of homogeneity of variances was met for conducting the independent samples t-test.

The results of the t-test show that there is a statistically significant difference in the mean score on the organizational support scale between teachers at public and private universities ($t(501) = 3.90$; $p < 0.01$). Teachers at public universities reported a significantly lower level of organizational support for the implementation of digital technologies in teaching ($M = 2.84$; $SD = 0.83$) compared to teachers at private universities ($M = 3.20$; $SD = 0.79$).

Discussion

In the context of higher education, the level of organizational support can either accelerate or hinder the process of technology adoption among teachers. Researches consistently show that organizational support functions as a key moderating variable that can either catalyze rapid technology integration or create

insurmountable barriers that impede progress, which is also confirmed by this study [20].

The results of this study confirmed the existence of significant differences in the level of organizational support between public and private universities in the context of implementing digital technologies in the teaching process, as also supported by previous studies [21]. Teachers employed at private universities reported higher levels of agreement with statements related to the availability and quality of technical resources and institutional support for the use of digital technologies, thus confirming the research hypothesis.

Specifically, teachers at private universities more strongly agreed that they are provided with accessible and high-quality equipment for using digital technologies in teaching, as well as fast and reliable internet connections within their institutions. Digital infrastructure and reliable technical support represent fundamental prerequisites that either enable or hinder technology adoption, as confirmed by previous research [22]. Furthermore, results indicate that teachers at private universities expressed higher agreement with statements regarding the availability of technical support and ensured data security, whose importance is emphasized in the study by Taylor et al. [23]. Additionally, private universities more frequently encourage collaboration with other institutions for the exchange of experiences and best practices in integrating digital technologies. Teachers at private universities also reported better access to pedagogical training related to the implementation of digital technologies, which may be attributed to a more individualized approach to teachers [24].

The analysis of teachers' perceptions of organizational support further highlights structural differences between public and private institutions. At public universities, a lack of systematic monitoring of teachers' needs for developing digital competencies is frequently emphasized, with many teachers noting that evaluations and surveys are conducted infrequently, thereby limiting opportunities for improvement [25,26]. It has been found that evaluations providing meaningful feedback and support for professional development have a stronger impact on improving teaching performance than those designed solely as control mechanisms. Recent research by Balić et al. also confirmed lower levels of pedagogical competencies among teachers in the application of digital technologies at public universities, while Pettersson suggests that the positive effects of digital competencies are largely mediated by the organizational context [27,28].

Although training in the use of digital technologies and pedagogical workshops are available, teachers need to engage in continuous professional development and transformation of their teaching practices, critically reflecting on their knowledge. Encouragement for innovative use of technology, as well as systematic recognition and rewarding of teachers who demonstrate excellence in this area, are still implemented only sporadically. Teachers' assessments indicate that technical equipment, internet connectivity, and support are of moderate quality, while data security remains relatively low. According to Balić et al., there is a clear need for organizational support to overcome technical and logistical barriers to digital teaching and learning. At public universities, teachers often rely on digital tools provided by their institutions [27].

In contrast, private universities are characterized by stronger institutional and technical support. Teachers report better-equipped classrooms, faster internet connections, and greater autonomy in selecting digital tools. They are also provided with more time for adapting and implementing technology in teaching. However, even in this context, evaluations of teachers' needs and systematic reward systems are not conducted frequently, while training and professional development are not fully integrated into institutional policies. Nevertheless, this study confirms an advantage of private universities in terms of reward systems for the use of digital technologies in teaching.

Accordingly, the findings point to the need for improving institutional strategies that would enable systematic monitoring of teachers' needs, ensure continuous professional development, and encourage innovative use of digital technologies in teaching. While private universities demonstrate greater flexibility and effectiveness in technical support, public universities need to invest further in infrastructure development, strengthen teacher autonomy, and establish systematic mechanisms for monitoring and fostering the development of digital competencies.

Conclusion

The research results confirm that teachers' digital competencies are a key prerequisite for high-quality and modern teaching in higher education, regardless of whether it concerns private or public universities. Their development does not depend solely on individual efforts, but largely on the level and quality of organizational support, including the availability of technical resources, professional and pedagogical training, and a supportive institutional environment. Organizational support has proven to be an important factor that can significantly facilitate the integration of digital technologies into the teaching process, but also a potential barrier in its absence. The findings indicate the need for systematic and continuous development of digital competencies through lifelong learning, alongside the provision of adequate infrastructure and technical support. Particular importance lies in fostering an organizational culture that promotes innovation, collaboration, and the exchange of best practices among teachers. It is also essential to establish mechanisms for regularly monitoring teachers' needs, as well as evaluating and encouraging their use of digital technologies in teaching [29-33].

Ultimately, improving teachers' digital competencies requires an integrated approach that connects institutional strategies, professional development, and everyday teaching practice, with the aim of ensuring a more effective, higher-quality, and student-centered educational process.

Research Limitations

The findings cannot be considered universally generalizable due to several methodological and contextual limitations that should be taken into account when interpreting the results.

First, the study was limited to a sample of teachers from two public and two private universities, rather than all universities in Croatia, which restricts the generalizability of the findings to the entire higher education system. The sample of 503 respondents, including 409 from public and 94 from private universities, shows a certain imbalance that may affect the representativeness of the results. Additionally, respondents came from different scientific fields, had varying lengths of work experience, interests, and levels of digital literacy, which may have influenced differences in perceptions and evaluations of professional development.

It is also important to consider the possibility of subjectivity in responses, as participants evaluated the institutional support and management structures of their own universities. Despite the assurance of anonymity, some teachers—particularly those employed at private universities—may have experienced discomfort or concern about potential consequences of providing

honest responses, which could affect the reliability of the results. Furthermore, part of the questionnaire referred to the assessment of the use of technologies in teaching, where responses may have been limited by respondents' awareness of available resources and actual technological practices within their institutions.

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Citation: Marija Jakovljević, Sandra Kučina Softić and Marko Odak. The Impact of Institutional Support on Teachers' Digital Competencies in Higher Education. Int J Envi & Eart Scie 2026, 6: 1-9