Between Innovation and Reality: Teachers' Attitudes Toward ICT in Teaching

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***Abstract**. This study explores primary school teachers' experiences and perceptions about implementation of ICT in everyday educational practice. Between April and May 2023, 132 teachers (M age=43.44; SD=10.04; 93.9% female) were asked to rate their agreement with 17 statements about the use of digital technology, artificial intelligence and digital content in teaching. Study was designed as a cross-sectional study with a convenience sample. Results show that most teachers are confident using digital technologies and recognize their benefits in personal and professional life. Yet there are still major challenges - insufficient time to develop digital materials, unstable access to student devices and a preference for traditional teaching resources over digital content. Attitudes toward artificial intelligence are mixed, with some teachers expressing enthusiasm and others voicing concerns about its potential impact on job security. These findings indicate both teacher enthusiasm as well as barriers to digitalization of primary education and call for improved infrastructure and targeted professional support for successful implementation of ICT in education.*

Keywords. primary education, technology integration, barriers to digitalization, educational innovation, teachers' perceptions

1 Introduction

Digitalisation and artificial intelligence (AI) in primary education have created new opportunities as well as challenges for educators and students. In just the past decade, digital tools have transformed traditional classroom instruction into dynamic, student-centred experiences (Walter, 2024). The COVID-19 pandemic further accelerated this digital transformation, highlighting both the potential of technology to sustain educational continuity and the persistent barriers to equitable access and effective implementation.

Meta-analysis by Soriano-Sánchez (Soriano-Sánchez, 2025) demonstrates the significant positive impact of Information and Communication Technologies (ICT) on Natural Science learning in primary school students, particularly in supporting those with special educational needs. The findings highlight that interactive and adaptive digital technologies enhance academic performance, foster active participation, and increase intrinsic motivation by personalizing learning experiences and addressing diverse student needs. Interactive platforms, educational software, and AI-powered applications individualize instruction, formative assessment and real-time feedback to meet a variety of learning styles and develop critical 21st century skills including creativity, problem-solving and digital literacy. AI technologies have shown promise in primary education for personalizing learning, automating administrative tasks and providing adaptive support for students with varying abilities.

Digital technology adoption in primary education is dependent on several interrelated factors. The most important predictors of technology uptake and effective classroom use is teachers' digital competence and attitudes (Yu et al., 2023). Pezo reviewed recent literature on the adoption of ICT by primary school teachers, finding that while ICT use in primary schools has mixed effects on academic performance, its successful implementation depends on equitable access to devices and the internet, development of digital skills, curricular adaptation and adequate infrastructure. The study warns that without these conditions, poor ICT integration can hinder rather than support learning, potentially leading to frustration among the educational community (Pezo, 2024). The relationship between ICT use in schools and specific cognitive outcomes like memory, attention, and executive functioning is complex and multi-faceted. While ICT can enhance engagement and provide learning experiences that may support memory recall and motivation (Bautista-Vallejo et al, 2020), concerns persist regarding its potential to diminish sustained attention and impact executive functions such as working memory and inhibitory control (Maeneja et al, 2025). Ultimately, the impact often depends on the quality of the digital content, the pedagogical approach and whether technology is integrated thoughtfully to complement, rather than simply replace, traditional learning methods. Socioeconomic disparities can

further exacerbate the digital divide, affecting both teachers' and students' opportunities to benefit from educational technology (Wang et al., 2024).

Another level of complexity is introduced by attitudes regarding AI in education. Even though a lot of educators are aware of how AI might improve instruction, worries about job security, moral dilemmas and the changing dynamics of teacher-student relationships still exist. According to recent studies, it is critical to have professional development and policy frameworks that address these issues and give educators the tools they need to successfully and ethically incorporate AI into their teaching (Garcia et al., 2025).

Contextual variables like school leadership, digital culture, and digital content quality also influence technology integration. An effective professional development model characterized by sustained, collaborative, and contextually relevant training has been identified as essential for enhancing teachers' capacities to use digital tools effectively (Røkenes et al., 2022). More broadly, the existence of digital as well as traditional teaching resources reflects a pragmatic attitude of primary school teachers who tend to see technology as an addition to rather than an alternative to established pedagogical practices.

While the overarching benefits and common barriers to digital technology integration in education are extensively documented across European and global contexts (e.g., as highlighted by comprehensive frameworks like DigCompEdu (Ghomi et al., 2019), the nuances of implementation and the lived realities of teachers can vary significantly based on specific national and regional contexts. General surveys, while valuable for broad comparisons, often mask the granular challenges and unique attitudinal complexities faced by educators in diverse educational ecosystems.

This study aims to bridge this analytical gap by offering a granular perspective from primary school teachers in Croatia. Despite Croatia's efforts towards digital transformation in education (e.g., through initiatives like the "e-Schools" program), specific local conditions can shape the actual "innovation-to-reality" pathway.

Much literature exists on digital technology adoption in education, but gaps remain in our understanding of the holistic experiences of primary school teachers - including attitudes, competences, infrastructural barriers and the emerging influence of AI. Addressing such gaps informs educational policy, guides professional development and ensures equitable digital transformation of primary education.

The aim of this research was to examine primary school teachers' attitudes toward various aspects of ICT integration in classroom instruction. This study investigates the experiences, perceptions, and challenges primary school teachers face regarding digital technology in their daily school activities, specifically exploring their current technology use, attitudes toward digital innovation and AI, and prevailing barriers to digital integration within primary school classrooms.

2 Methodology

The study addresses the integration of ICT in primary education. It investigates teachers' experiences, perceptions and challenges regarding digital technology application in everyday school activities.

2.1 Participants

The study employed a cross-sectional design with a convenience sample of 132 primary school teachers who completed the survey between April and May 2023. The survey was distributed through teacher groups in several primary schools in Karlovac County (Slunj, Eugen Kvaternik in Rakovica, Švarča, and Dragojla Jarnević Primary Schools) and via teacher groups on Facebook. The predominant demographic of respondents in the sample was female (93.9%), exceeding the national average of 85%. The teachers who participated in the survey had the following age distribution: 9.8% were between the ages of 21 and 30; 31.1% were between the ages of 31 and 40; 31.1% were between the ages of 41 and 50; 25% were between the ages of 51 and 60; and 3% were older than 60 years. The average age was 43.44 years with a standard deviation of 10.04 years.

The distribution of the surveyed teachers' teaching experience was as follows: 12.9% of teachers had zero to five years of experience, 15.2% had six to ten years, 37.1% had eleven to twenty years, 22.0% had twenty to thirty, and 12.9% had thirty to forty years of teaching experience. On average, teachers had 17.03 years of teaching experience with a standard deviation of 9.94 years.

2.2 Instrument

The research employed a quantitative survey instrument consisting of 17 statements rated on a 5-point Likert scale (1=Strongly disagree to 5=Strongly agree). The statements were constructed to assess both attitudes and reported behaviours regarding ICT use.

An exploratory factor analysis was conducted on these 17 items to examine attitudes and practices related to ICT in teaching, revealing three factors. The internal consistency of Factor 1 (reflecting the usefulness and frequency of digital technology in the classroom) was excellent, with McDonald's ω of 0.89 (95% CI: 0.86, 0.92) and Cronbach's α of 0.88 (95% CI: 0.85, 0.92). Similarly, Factor 2 (capturing teachers' preference for and creation of digital teaching materials) exhibited very good internal consistency, with McDonald's ω of 0.84 (95% CI: 0.79, 0.88) and Cronbach's α of 0.84 (95% CI: 0.79, 0.89).

2.3 Procedure

The study was designed as a cross-sectional survey. Data were collected through voluntary participation via self-administered questionnaires distributed to teachers in April and May 2023. Participation in the survey was entirely voluntary and all responses were collected anonymously to ensure confidentiality. Prior to participation, all respondents were informed about the study's purpose, data usage, and their right to withdraw at any time, with their completion of the survey signifying their informed consent.

3 Results

This section presents the key findings from our survey, detailing primary school teachers' reported patterns of ICT use and their attitudes towards it. The subsequent figures and tables provide a comprehensive overview of the collected data, offering granular insights into the innovation-to-reality pathway in Croatian primary education.

Table 1 presents the descriptive statistics for all 17 survey items. Among these, the item #1 "Digital technology makes my life easier" (Mean = 4.29, SD = 0.82) received the highest average score, closely followed by item #3 "I think I am good at handling new digital technologies for both private and professional purposes" (Mean = 4.26, SD = 0.83). This indicates a strong positive perception among teachers regarding the general use of digital technology and their confidence in using it. Conversely, the item #12 "My students regularly bring school tablets that are functional and charged, so we can use digital technology in class without any problems" (Mean = 2.01, SD = 1.23) had the lowest mean score, highlighting a significant and pervasive challenge related to student device reliability. Similarly, item #16 "I often conduct digital knowledge assessments" (Mean = 2.11, SD = 1.24) also scored very low, suggesting limited adoption of digital assessment tools.

Table 1. Descriptive statistics

Item	Statement	Mean	Std. deviation	Skewness
1.	Digital technology makes my life easier	4.29	0.82	-1.35
2.	I often use digital technology for relaxation and entertainment	3.93	1.03	-0.85
3.	I think I am good at handling new digital technologies for both private and professional purposes	4.26	0.83	-1.42
4.	I am pleased with the progress of artificial intelligence	2.93	1.21	-0.11
5.	I think that the development of artificial intelligence could threaten my job	2.57	1.24	0.23
6.	I often use digital technology in the teaching process	4.05	0.90	-0.74
7.	I believe that digital technology significantly improves the teaching process	3.89	0.96	-0.68
8.	It is easier to conduct classes with the use of digital technology	3.86	1.00	-0.79
9.	Students learn more when the material is taught and practiced with the help of digital technology	3.43	1.06	-0.48
10.	I have enough time to design digital teaching materials for my students	2.79	1.22	0.13
11.	I like to explore and use new digital tools that can improve my teaching	3.47	1.21	-0.32
12.	My students regularly bring school tablets that are functional and charged, so we can use digital technology in class without any problems	2.01	1.23	1.08
13.	I use digital technology every day in the teaching process	3.66	1.16	-0.59
14.	I often use ready-made digital materials provided by the textbook publisher I use (IZZI, e-sfera, and similar)	3.58	1.30	-0.54
15.	I use digital teaching materials (games, quizzes) more frequently than workbooks and worksheets to practice the content.	3.11	1.15	-0.15
16.	I often conduct digital knowledge assessments	2.11	1.24	0.86
17.	I give preference to digital teaching content over traditional ones	2.50	1.23	0.35
	Factor 1 - Use of digital technology in the classroom	*3.82*		
	Factor 2 - Preference for use and creation of digital teaching materials	*2.80*		

An exploratory factor analysis was conducted on 17 Likert-type items to examine attitudes and practices related to ICT in teaching. The Kaiser-Meyer-Olkin measure was 0.896, indicating excellent suitability for factor analysis. Bartlett's test was significant ($\chi^2(136) = 1109.93$, $p < .001$), confirming that inter-item correlations were sufficient. Table 2 presents the pattern matrix loadings obtained from this analysis.

Table 2. Results of factor analysis

	Factor 1	Factor 2	Factor 3	Uniqueness
7. I believe that digital technology significantly improves the teaching process	1.059			0.123
8. It is easier to conduct classes with the use of digital technology	0.836			0.238
9. Students learn more when the material is taught and practiced with the help of digital technology	0.667			0.534
6. I often use digital technology in the teaching process	0.651			0.274
14. I often use ready-made digital materials provided by the textbook publisher I use (IZZI, e-sfera, and similar)	0.528			0.788
13. I use digital technology daily in the teaching process	0.505			0.496
1. Digital technology makes my life easier	0.441			0.371
16. I often conduct digital knowledge assessments		0.987		0.308
15. I practice the material more often using digital teaching materials (quizzes, games) than with workbooks and worksheets		0.736		0.494
17. I give preference to digital teaching content over traditional ones		0.691		0.399
10. I have enough time to design digital teaching materials for my students		0.569		0.568
11. I like to explore and use new digital tools that can improve my teaching		0.518		0.519
3. I think I am good at handling new digital technologies for both private and professional purposes			1.028	0.085
2. I often use digital technology for relaxation and entertainment				0.824
4. I am pleased with the progress of artificial intelligence				0.660
5. I think that the development of artificial intelligence could threaten my job				0.993
12. My students regularly bring school tablets that are functional and charged, so we can use digital technology in class without any problems				0.894

Notes:
Factor 1 – Use of digital technology in the classroom
Factor 2 – Preference for use and creation of digital teaching materials

Using principal axis factoring and Promax rotation, three factors were extracted, explaining 45.9% of the total variance. The pattern matrix loadings are displayed in Table 2. Factor 1 reflected the usefulness and frequency of use of digital technology in the classroom. Factor 2 captured teachers' preference for and creation of digital teaching materials. Item 3 ("I think I am good at handling new digital technologies for both private and professional purposes"), which initially loaded as a separate factor, exhibited significant negative skewness (Skewness = -1.42), suggesting a strong ceiling effect where most teachers reported very high digital self-efficacy. From a psychometric standpoint, a single item cannot constitute a valid factor. Consequently, due to its limited discriminatory power and psychometric invalidity as a standalone factor, Item 3 will be excluded from subsequent factor and correlational analyses.

Table 3. Correlation analysis

	Factor 1 *(Use of digital technology in the classroom)*	Factor 2 *(Preference for use and creation of digital teaching materials)*	Age	Teaching experience
Factor 1 *(Use of digital technology in the classroom)*	1.00	0.71	-0.01	0.03
Factor 2 *(Preference for use and creation of digital teaching materials)*	0.71	1.00	0.15	0.07
Age	-0.01	0.15	1.00	0.79
Teaching experience	0.03	0.07	0.79	1.00

The correlation analysis reveals strong positive interrelationships among the identified factors. Factor 1 showing a particularly high correlation with Factor 2 (r=0.71). Conversely, there were negligible correlations between these technology-related factors and demographic variables such as age and teaching experience. Notably, as expected, age and teaching experience demonstrated a very strong positive correlation (r=0.79), indicating that older teachers generally possess more years of experience.

The data for statement "Digital technology makes my life easier" in the Fig. 1 indicates widespread agreement with 53 teachers who agreed and 61 strongly agreeing (86.5%), while only 3 respondents disagreed (2.3%). This indicates that digital technology is considered a facilitator for personal and professional life. Improved efficiency, easier communication and simplified administrative tasks help teachers see technology as an asset in everyday life.

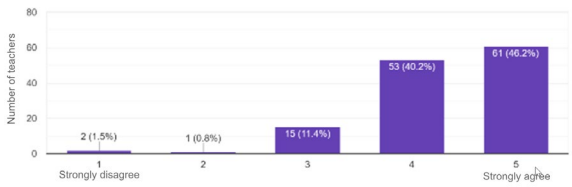

Figure 1. Digital technology makes my life easier

Answers in Fig. 2 present that 69.6% of teachers often use digital technology for leisure (46 agree, 46 strongly agree), with only 10 teachers disagreeing. This suggests that technology is also a form of personal enjoyment and relaxation. This incorporation into everyday life could also make teachers feel at ease with digital platforms and thus indirectly support their use in education contexts.

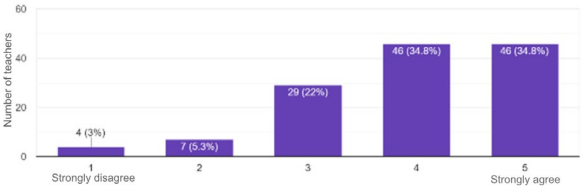

Figure 2. I often use digital technology for relaxation and entertainment

From answers presented in Fig 3. it is evident that 87.9% of teachers have high confidence in their digital skills, with 59 agreeing and 57 strongly agreeing while only 5 teachers disagreed (3.8%). A high level of confidence is essential for the successful integration of technology in the classroom because competent teachers are more inclined to try out and use new technologies, which improves their instruction and increases student engagement.

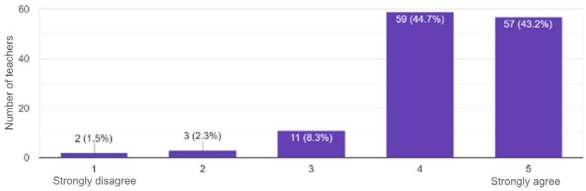

Figure 3. I think I am good at handling new digital technologies for both private and professional purposes

Responses presented in Fig. 4 to a statement "I am pleased with the progress of artificial intelligence" are mixed: 43 disagree or strongly disagree (32.6%), 46 are neutral (34.8%) and 43 agree or strongly agree (32.6%). This ambivalence may reflect uncertainty about AI's educational applications or scepticism about its broader societal impact. Some teachers may feel unprepared for rapid changes or lack information about AI's benefits and risks.

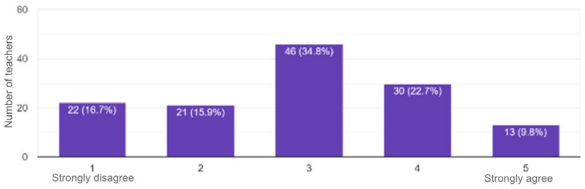

Figure 4. I am pleased with the progress of artificial intelligence

A significant portion 44.7% (36 strongly disagree, 23 disagree) do not feel threatened by AI, but 34.1% (45 teachers) are neutral and 21.2% (28 teachers) express concerns. This indicates underlying anxiety about automation and job security, even if most teachers do not see AI as an immediate threat. Ongoing professional development and clear communication about the role of AI in education could help address these concerns.

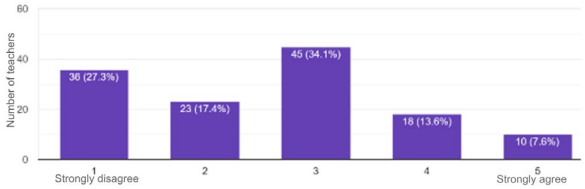

Figure 5. I think that the development of artificial intelligence could threaten my job

Frequent use of digital technology in the teaching process is reported by 75.0% of teachers (51 agreeing and 48 strongly agreeing), with only 5.3% disagreeing. This shows that digital tools are well integrated into teaching routines, likely enhancing lesson delivery, student engagement, and access to diverse resources. However, the small number of dissenters may reflect infrastructural or attitudinal barriers in specific contexts.

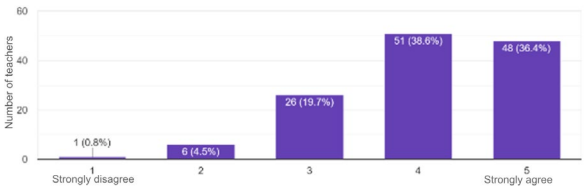

Figure 6. I often use digital technology in the teaching process

Data in Fig. 7 presents that 69.7% of teachers (53 agree, 39 strongly agree) believe technology enhances teaching, with only 8.3% disagreeing. This supports the view that digital tools contribute to more effective, dynamic and interactive instruction, potentially leading to better student outcomes and more efficient classroom management.

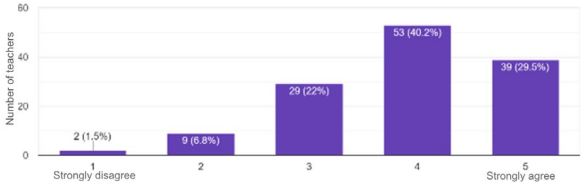

Figure 7. I believe that digital technology significantly improves the teaching process

Fig. 8 presents that 70.5% of teachers (55 agree, 38 strongly agree) think that technology makes teaching easier, while only 10.6% disagree. This suggests that digital tools help streamline lesson planning, resource sharing and classroom activities, reducing teacher workload and improving organization.

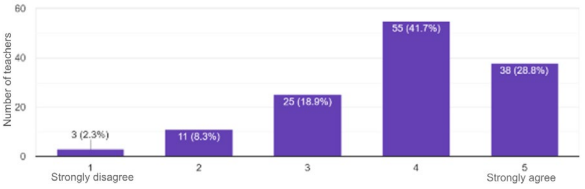

Figure 8. It is easier to conduct classes with the use of digital technology

On statement "Students learn more when the material is taught and practiced with the help of digital technology" opinions are more divided: 50.8% (47 agree, 20 strongly agree), 16.7% (22 teachers) disagree and 32.6% are neutral. While many see benefits for student learning, others are cautious, possibly due to variability in student access, digital literacy, or the quality of digital resources.

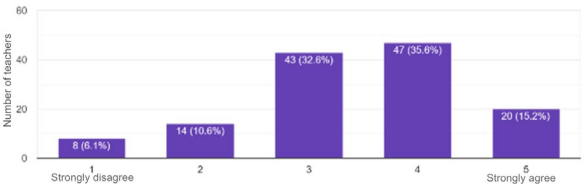

Figure 9. Students learn more when the material is taught and practiced with the help of digital technology

Data in Fig. 10 display that time constraints are evident, with 40.2% teachers disagreeing that they have enough time to design digital teaching materials for their students (24 strongly disagreeing, 29 disagreeing), 32.6% neutral and only 27.3% agreeing with that statement. This barrier may limit the creation of tailored digital resources and slow the pace of technology integration, emphasizing the need for institutional support and better workload management.

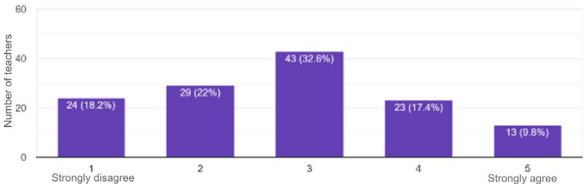

Figure 10. I have enough time to design digital teaching materials for my students

Teachers' enthusiasm for technology exploration is moderate: 51.5% agree that they like to explore and use new digital tools, but 23.5% disagree or strongly disagree and 25.0% are neutral. This split may reflect differences in personal motivation, available training, or perceived relevance of new tools. Professional development and peer support could encourage more teachers to innovate and be willing to explore the use of new digital tools in their everyday teaching.

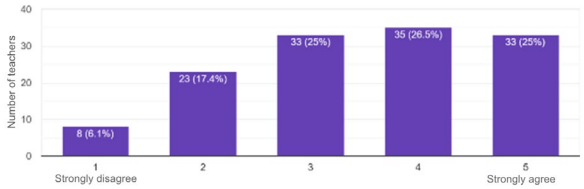

Figure 11. I like to explore and use new digital tools that can improve my teaching

A clear majority of teachers (89.3%; 65 strongly disagree, 25 disagree, 28 neutral) report unreliable student devices, with only 10.6% (14 teachers) agreeing. This is a significant infrastructural challenge, as access to functional technology is essential for effective digital teaching. Addressing this issue is critical for equitable technology integration.

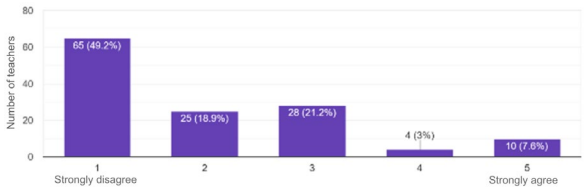

Figure 12. My students regularly bring school tablets that are functional and charged, so we can use digital technology in class without any problems

Majority of teachers use digital technology every day in the teaching process (85.6%; 38 agree, 38 strongly agree), but 19 disagree or strongly disagree (14.4%). This suggests that while technology is widely used, some teachers or schools still face obstacles, possibly related to resources, training, or attitudes.

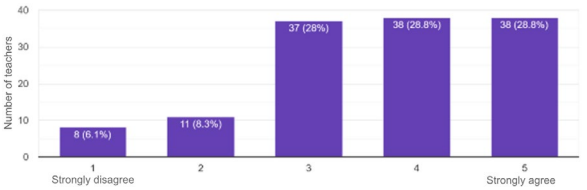

Figure 13. I use digital technology every day in the teaching process

Many teachers (56.8 %; 33 agree, 42 strongly agree) rely on publisher-provided digital content, showing the importance of accessible, high-quality resources. This reliance may be due to time constraints or a lack of confidence in creating original materials.

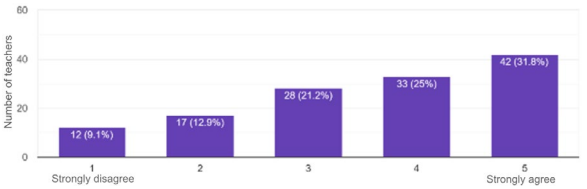

Figure 14. I often use ready-made digital materials provided by the textbook publisher I use (IZZI, e-sfera, and similar)

Responses are mixed: 33 agree, 16 strongly agree, 37 disagree or strongly disagree, and 46 neutral. There is no clear preference, reflecting varied teaching styles and possibly differences in digital teaching materials quality or subject matter suitability.

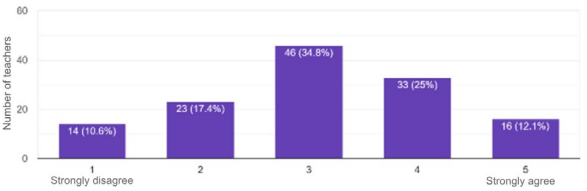

Figure 15. I use digital teaching materials (games, quizzes) more frequently than workbooks and worksheets to practice the content

Most teachers (65.2%; 58 strongly disagree, 28 disagree) do not frequently use digital assessments, with only 19 agreeing (14.4%). This may be due to technical barriers, lack of training, or preference for traditional assessment methods. Increasing support for digital assessment could enhance formative feedback and student tracking.

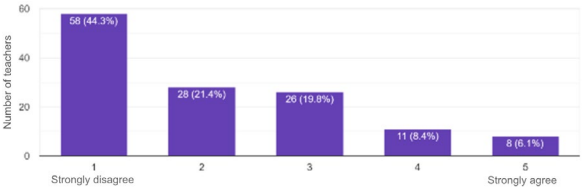

Figure 16. I often conduct digital knowledge assessments

Almost half (48.5%; 37 strongly disagree, 27 disagree) prefer traditional resources, with only 25 agreeing (18.9%). Digital content is seen as supplementary rather than a replacement, underscoring the enduring value of conventional materials, especially in primary education where tactile and interpersonal experiences are crucial.

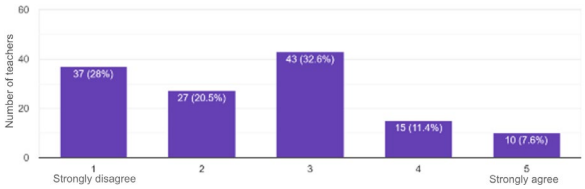

Figure 17. I give preference to digital teaching content over traditional ones

4 Discussion

The survey findings describe primary school teachers' experiences, attitudes and barriers to integrating digital technology and artificial intelligence in education. Quantitative data analysis reveals several central themes that affect educational policy, school leadership, professional development and future research.

Our results indicate a high degree of acceptance and self-efficacy among primary school teachers regarding digital technology. Specifically, teachers overwhelmingly agreed that "Digital technology makes my life easier" (Mean=4.29) and reported high confidence in their digital skills, as shown by their agreement with "I think I am good at handling new digital technologies for both private and professional purposes" (Mean=4.26). This aligns with findings by Yu et al. (2023), who identified teachers' digital competence and positive attitudes as crucial predictors of technology uptake. Furthermore, the frequent use of digital technology for personal relaxation and entertainment (Mean=3.93) suggests a comfort level that likely facilitates its professional adoption. This high level of digital self-efficacy represents a strong foundation for continued digital innovation in schools, empowering teachers to explore and adapt to new technological tools.

Teachers largely agree that digital technology improves the teaching process, makes lesson delivery easier and is regularly used in classroom practice. Many recognize the potential for digital tools to enhance student learning, although this perception is less unanimous, with a substantial minority expressing neutrality or skepticism. This suggests that while the infrastructure for digital integration is present, the perceived pedagogical value may depend on subject area, student readiness or the quality of digital resources available.

Barriers still exist despite high levels of digital involvement. The two biggest ones are infrastructure issues and timing restrictions. The great usage of publisher resources may be explained by the fact that nearly all teachers state that they don't have enough time to create their own digital teaching materials. Such reliance demonstrates the need for quality, curriculum-aligned digital content from educational publishers, but also for greater institutional support for instructors in developing and customizing resources for their context.

Despite the high levels of digital involvement reported by teachers, significant infrastructural barriers persist, notably concerning student device reliability. Our findings indicate that nearly 90% of teachers reported issues with students regularly bringing functional and charged school tablets to class (Mean = 2.01). This directly impedes the delivery of planned digital lessons and prevents the full realization of digital education's potential. Such challenges align with the broader literature on ICT adoption, which consistently identifies equitable access to devices and adequate infrastructure as critical prerequisites for successful technology implementation (Pezo, 2024). Furthermore, this structural deficit risks exacerbating existing educational inequalities between students with and without reliable access to technology, a concern widely documented in research on the digital divide, especially as it relates to socioeconomic disparities (Wang et al., 2024). When technology integration is hindered by such fundamental issues, it can lead to frustration within the educational community, undermining efforts to enhance learning through digital tools (Pezo, 2024).

While digital technology is widely used in Croatian primary schools, as evidenced by teachers' frequent reported use, the data unequivocally suggests that traditional teaching materials remain deeply valued, serving as a complement rather than being supplanted by digital content. Most teachers reported not giving preference to digital content over conventional resources (Mean = 2.50), and digital assessments are not yet routine (Mean = 2.11). This aligns with a growing body of literature that advocates for a balanced, blended pedagogical approach, recognizing that digital tools serve to enhance and augment, rather than simply replace, established educational practices (Vidal-Esteve, M. I., & Martín-Gómez, S., 2023).

The data suggests that, for many educators, digital tools serve as a supplement rather than a replacement for established pedagogical practices. This coexistence highlights the enduring importance of tactile, interpersonal, and contextually rich learning experiences, especially in primary education.

The study's findings reveal a divided stance among primary school teachers regarding artificial intelligence (AI). While a segment expresses optimism and pleasure with AI's progress (Mean = 2.93, with 32.6% agreeing or strongly agreeing), a notable portion remains neutral or expresses concerns about potential job security threats (Mean = 2.57, with 21.2% expressing concerns). This ambivalence reflects

broader societal uncertainties about AI's evolving role in the workforce and within educational contexts. Research shows that educators, despite acknowledging AI's potential, often harbor concerns about job displacement, ethical implications, and the changing dynamics of human-computer interaction in teaching (Cojean et al, 2023). As highlighted by Garcia et al. (2025) in their systematic review, addressing these concerns is critical. The observed mixed perceptions underscore the urgent need for targeted professional development and clear policy frameworks that not only educate teachers about AI's practical applications and limitations but also alleviate anxieties by demonstrating how AI can augment, rather than replace human educators, thereby fostering successful and ethical integration.

A particularly noteworthy finding, challenging common assumptions about technology adoption, is the lack of significant correlation between teachers' age or teaching experience and their positive attitudes towards ICT integration (Factor 1: Use of digital technology in the classroom; Factor 2: *Preference for use and creation of digital teaching materials*). This outcome is especially interesting as it runs counter to a prevalent perception that older, more experienced individuals, including educators, might be less knowledgeable or more sceptical about new technologies like ICT and AI. Instead, our data from primary school teachers in Croatia suggest that engagement with and positive perceptions of digital tools are not solely confined to younger, less experienced educators.

This finding aligns with more nuanced views in the literature, including research by Šabić, Baranović, & Rogošić (2022), which, while identifying gender and age interaction effects, also points to the high self-efficacy of teachers in using ICT, even among older cohorts. Their work suggests that experience, though often correlated with age, does not inherently dictate lower digital self-efficacy or less positive attitudes. This implies that, regardless of their career stage, primary school teachers in Croatia are actively embracing digital tools. This is a positive indicator for sustainable digital transformation, as it suggests that well-designed training and supportive environments can empower all teachers, rather than just a specific demographic cohort, to effectively leverage technology in their classrooms. Future research could explore the specific mechanisms or types of support that contribute to this age-independent integration of ICT.

Despite its strengths, this study has several limitations that warrant consideration. The most significant is the sampling methodology. The use of a convenience sample, primarily distributed through teacher groups in specific primary schools and via Facebook, introduces the potential for self-selection bias. It is plausible that teachers who are more digitally engaged, comfortable with online surveys, or already possess a more positive predisposition towards technology were more inclined to participate. This could lead to an overrepresentation of technologically enthusiastic teachers in our sample, potentially inflating the reported levels of digital competence, comfort, and positive attitudes towards ICT integration. Consequently, the findings, particularly those related to the prevalence of technology use and positive perceptions, may not be fully generalizable to the broader population of primary school teachers in Croatia, especially those who are less digitally inclined or have limited access to online teacher communities.

Another limitation pertains to the cross-sectional design of the study. While it provides a snapshot of attitudes at a specific point in time (April-May 2023), it cannot capture the evolution of teachers' attitudes or the long-term impact of ICT integration. Longitudinal studies would offer deeper insights into how these perceptions change over time, especially with ongoing technological advancements and policy shifts.

Finally, while the survey instrument covered several domains, the reliance on self-reported data means that the findings reflect teachers' perceptions rather than direct observations of their classroom practices. There might be discrepancies between reported and actual behaviours. For instance, while most teachers report frequent use of digital technology, the depth and pedagogical effectiveness of this use are not captured by the survey. Additionally, the quantitative nature of the survey, while efficient for broad data collection, does not delve into the qualitative nuances behind teachers' responses, particularly regarding the mixed attitudes towards AI or the reasons behind preferring traditional resources.

5 Conclusion

This study provides timely insights into primary school teachers' perceptions and experiences with ICT and AI integration in Croatia. Our findings indicate a predominantly digitally confident and active teaching workforce that recognizes the positive impact of technology on their professional lives and teaching effectiveness. Key challenges remain, particularly the widespread issue of unreliable student devices and significant time constraints for digital material development. Teachers also exhibit mixed attitudes toward AI, balancing optimism with concerns about job security.

To foster more effective and equitable digital integration, our results underscore the need for targeted institutional support. This includes direct interventions to ensure student device functionality, enhanced access to efficient digital content creation tools and specialized professional development addressing AI literacy, ethical considerations and practical applications. Such initiatives should emphasize pedagogical approaches that thoughtfully blend digital and traditional methods.

While offering a valuable snapshot of these dynamics, the study's reliance on a convenience sample necessitates caution in generalizing findings. Future research should employ more representative sampling strategies and consider mixed-methods approaches to delve deeper into the nuanced factors influencing teachers' technology adoption. Ultimately, this research highlights a critical dual reality in Croatian primary education: a capable teaching force ready for digital transformation yet hindered by persistent infrastructural and systemic barriers. Addressing these will be crucial for sustained digital progress.

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