Digital Transformation of Primary and Secondary Education Institutions: A Case of the Czech Republic

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Abstract
Digital transformation (DT) of primary and secondary (P&S) education in the Czech Republic has accelerated over the past decade, yet research on its impact and digital maturity (DM) remains limited. This gap is significant given the global emphasis on technology-driven learning environments and the evolving role of students, teachers, and parents. This study investigates how DT influences the quality of the education process and stakeholder interactions in Czech P&S institutions. Three research questions guide the analysis: students' perception of DT, their need for increased IT integration, and whether DT affects communication between students, teachers, and parents. An exploratory survey was conducted among 65 students aged 6–19 across all Czech regions. Findings indicate that DT is generally perceived positively, though attitudes toward increased IT use remain neutral, and its influence on communication is inconclusive. The study contributes by providing empirical evidence on DT and DM in Czech P&S education, highlighting regional disparities and offering a basis for future comparative research.

Keywords: Digital transformation, information technology, digital maturity, primary and secondary education.

Introduction

Digitalization is changing every aspect of human life, including education (Laterza et al., 2023). The digital literacy of the population then influences our entry and opportunities when engaging in the community of peers, in the family, in studies or in the labour market (Miškelová et al., 2025; European Commission (2024) Czechia Digital Decade, 2025). Digital transformation has become a priority for higher education institutions (HEIs) in the second decade of the 21st century, and this is a natural and necessary process for organizations that claim to be leaders of change and highly competitive in their domain (Benavides et al., 2020). As the educational landscape changes rapidly, secondary schools increasingly adopt digital technologies to transform teaching and learning experiences (Yuliandari et al., 2023). Digital Transformation (DT) initiatives are often implemented through projects (Rolf et al., 1995). The objective of DT in education is to realize a comprehensive vision that facilitates ongoing innovation and advancement in teaching and learning, concurrently streamlining administrative and management services for students, educators, and the community to enhance operational efficiencies. The penetration of IT projects into business is considered DT. DT is a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies (Vial, 2019). Students have a different, often critical view of DT. Teachers have a different view of DT by being drawn into the teaching process. Parents often do not express their views on DT in primary and secondary education, even if they perceive it as rather detached and distant. DT is an ongoing process that allows entities to move up to an upper level of digital maturity (DM). Digital education transformation is a slow process due to various obstacles that hinder the transformation of academic units into learning organizations (Kalogeratos, 2022). DM refers to a state of being complete, perfect, or ready (Lahrmann, 2011) and results from progress in developing a system (Teichert, 2019).

While DT/DM scholarship is extensive in HEI (e.g., documenting strategies, governance, and implementation projects, etc.), student-centered evidence from P&S schools remains comparatively limited, especially in the Czech Republic (Benavides et al, 2020); Fernández et al., 2023; Laterza et al., 2023). European studies illustrate variability in P&S maturity and practices (e.g., DT/DM assessments of schools in Bulgaria and Croatia), underscoring the need for nationally grounded analyses to inform school-level priorities (Balaban et al., 2018; Gaftandzhieva et al., 2021, Mišianiková et al., 2021). Czech research has predominantly addressed DT in public administration and enterprise architecture, offering system-level

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insights but not direct evidence on P&S education from the student perspective (Lukáš et al., 2022; Lukáš et al., 2023). Consequently, there is insufficient Czech-specific knowledge about how DT affects the perceived quality of the education process, the role of teacher digital competencies, and the contribution of parent/community engagement within P&S education.

Further, the article presents findings from a survey with respondents. Based on the survey, the differences in the complexity of the DT and the regions. were analyzed and identified. In the final section, findings are discussed and suggested further research (Mišianiková et al., 2021). The article consists of several sections, as follows.

The first section (Literature review) outlines the issues with the DT phenomenon and its relation to DM in the P&S education process and institutions, which are affected by the penetration of digital technologies into various aspects (e.g., students, teachers, and the wider community, including parents). It also illustrates how DT plays an essential role in the quality of the P&S education process and provides more specifics from he Czech Republic. The methodology part explains an electronic survey, designed to collect data from the Czech-speaking target group covered by sample data; the respondents involved came from different institutions of P&S education (The sample included only Czech-speaking students, regardless of nationality, to ensure consistent and comparable responses). The findings from a survey disseminated among a large professional audience spread across the Czech Republic (different regions and cities) are presented. The results summarize the differences in the target group's opinions on DM and DT (e.g., students, teachers, and the wider community, including parents). The study also identifies the differences between them and presents the results. The discussion presents the findings, discusses them, and suggests further topics for future research, as well as their limitations.

Previous studies and research have lacked students' perspectives on teachers' digital skills, parents' digital skills in communicating with the school, which offers them digital communication opportunities, and students' perspectives on the intensity and quality of digital technology use in teaching.

This case study addresses this gap by contributing to the knowledge of a nationwide, student-centered survey of DT/DM in a selected sample of Czech P&S education (ISCED 1–4; age 6–19). It also examines their willingness to respond to the demands and challenges of an education system that is compatible with the digital era while ensuring the function of schools as educational organizations (Yuliandari et al., 2023).

Literature review

Digital transformation

DT integrates digital technologies into core and support processes across sectors such as business, education, manufacturing, and public administration. It consolidates multiple digitalization initiatives into an end-to-end strategic change requiring organizational-level shifts in competencies. Adopting new technologies entails a comprehensive transformation of information flows, processes, technologies, and human factors (McCusker, 2018).

DT involves changes in an organization's business model caused by adopting emerging digital technologies, which result in changes in organizational structures, products, or services (Hess et al., 2016). The DT of the university education system should have a broader focus and must include the modernization of corporate IT architecture management, which could contribute to structuring the efforts for innovation in education (Kaminskyi et al., 2018).

Digital transformation in P&S education

The rapid globalization trends of the 21st century have compelled organizations, including educational institutions, to undergo significant shifts toward digital transformation. According to the OECD Digital Economy Outlook, DT impacts economies and societies in intricate and interconnected ways, requiring sustainable strategic approaches (OECD, 2025). Organizations are increasingly embracing digital technologies such as cloud computing, big data, and artificial intelligence to maintain their relevance in an ever-evolving market (Sararuch et al., 2023).

Transformation of conventional education

The conventional method of education from schools (P&S education) to higher education (HEI) level is rapidly transforming into the digital mode of learning, and the cost of infrastructure installation is higher at once; later, the outcomes are valuable. The education system has been completely changed and shaped due to the transformation of traditional industries through digital technologies (Durakbasa, et al., 2028). Different aspects of using information and communication technologies promote effective teaching and learning for students with diverse needs (Bazalová, B., et al., 2025).

Global demands in P&S education

Education reforms are a significant element for the educational transformation; digital technologies depend on governments and policymakers. Adapting innovative technologies is difficult for individuals and educational institutes (Qureshi et al., 2021). Several sectors, especially the education industry, have

necessitated DT in pursuit of becoming highly competitive in their domains and acquiring the position of revolutionary leadership. The digital transformation of global society and markets has brought new social, economic, and technological opportunities. It implies that many life changes had long crossed the borders of continents and states. These changes based on digitalization have been naturally one of the priorities of the European Union and the Czech Republic (Gaftandzhieva et al., 2022).

Digital maturity

Much more difficult circumstances than starting DT are visible to keep the achieved level of DM and smoothly progress to the next - upper - level. On the other hand, DM goes beyond a merely technological interpretation, simply reflecting the extent to which an organization performs tasks and handles information flows by IT but also reflects a managerial interpretation describing what a company has already achieved in terms of performing DT efforts, including changes in products, services, processes, skills, culture, and abilities regarding the mastery of change processes (Gellweiler, 2020). Prasanna and Choudhury indicate that satisfied students are the best advertisement for a university (Prasanna et al., 2024). According to Fernández et al. (2023), the DM of education institutions will grow by adding the implementation of a) digitalization initiatives that are technologically driven, b) IT governance best practices, and c) DT initiatives. DM (in P&S education) supports and reflects upon DT of educational institutions across various organizational, infrastructural, teaching and learning, competency, and cultural issues. It is a "valuable proxy for indicating the extent of technology adoption across the whole ecosystem of a school" (Harrison et al., 2014). Those who have achieved such DM have now witnessed significant improvements in the company's operations and increased customer satisfaction. Analogically, keeping the student satisfied with P&S and HEI education supported by digital technology from a long-term point of view means maintaining or increasing DM at the same level and/or higher. DM at the EU country level is regularly captured each year, as part of the DESI index (DESI, 2023). Covers all national economic sectors, including ISCED 2011-classified education.

Barriers to Digital Transformation in Czech Schools

Digital transformation in Czech primary and secondary education faces several systemic and operational challenges. Infrastructure limitations remain a critical barrier, as many schools experience insufficient ICT integration and unreliable internet connectivity, particularly in rural areas (European Commission, 2023; Czech School Inspectorate, 2022). Teacher digital competencies represent another significant obstacle; fewer than one-third of teachers report feeling adequately prepared to use ICT in instruction, and computer anxiety persists among educators, limiting effective adoption (European Commission, 2023; Švaříček et al., 2021). Curricular and strategic gaps further hinder progress. Although revisions to the Framework Educational Program introduced digital competencies, their implementation across subjects has been uneven and slow (Ministry of Education, Youth and Sports, 2021). At the institutional level, many schools lack comprehensive digitalization strategies and leadership support (European Commission, 2023). Equity concerns also emerge, as disparities in access to devices and connectivity deepen the digital divide among students, particularly between urban and rural schools (Czech School Inspectorate, 2022). Finally, the growing reliance on online platforms raises cybersecurity and data protection challenges, requiring robust governance and secure management of student information (European Commission, 2023).

Methodology

The current situation in DT and DM areas in the Czech Republic varies regionally in P&S education institutions. The aim is to contribute to a wider understanding of it across the regions of the Czech Republic and summarize it for future research studies. Based on the empirical evidence, which is partially mentioned here in this chapter and/or in the next chapter, the three research questions (RQ) are formulated, that examine and search for proof of evidence of how mature P&S education institutions of the Czech Republic are from the view of students, which also covers their perception of how digitally mature the teachers are as well as wider community (e.g., parents).

RQ#1: Is there an argument that students positively perceive the digital transformation of P&S education institutes? RQ#2: Is there, among the respondents, a need for more IT use in the ground and P&S education process? RQ#3: Does digital transformation enter more into the relationship between student and teacher or student and parents?

Regarding the limited empirical results on DT and DM in P&S education institutions in the Czech Republic, as mentioned in this article, and their practical relevance to the education sector, an exploratory survey was conducted across regions of the Czech Republic. The survey instrument for detailed analysis was constructed (Czech School Inspectorate, 2022). This survey consists of 17 questions spread into three sections. The first section collected identification information through three questions, in which respondents were asked to provide information about the region they belong to, the type of P&S education institution they studied, and the city of residence where the respondent originally lived. The second section, the main section of the survey, was dedicated to the questions about respondents' perception of DT

and DM of P&S education institutions. There were, in total, nine questions belonging to this section. The last and third sections gathered information about how the respondents perceive teachers' digital skills, whether P&S education institutions are digitally transformed and/or matured, and how the wider community (e.g., parents) is involved in DT and DM of the P&S education process.

The survey design process begins with formulating the survey questions and refining them to be as specific as necessary. Each item was examined to ensure clarity for respondents, prevent monotony, and encourage engagement in answering. However, the survey is a non-exhaustive set of questions covering DT and DM of P&S education institutions. The survey examines respondents' perceptions of DT and DM in this area. Once the researchers had finished the survey design process, the optimization phase was initiated. The survey was piloted with four participants, each representing a different region of the Czech Republic (north, south, east, and west). Based on the pilot feedback, which was valuable for researchers, the survey layout was partially redesigned, and the survey questions were slightly rephrased. To obtain relevant and accurate information, the survey targeted students at ISCED 2011 levels 1 to 4. These students were aged between 6 and 19 years. The sample included respondents from all regions of the Czech Republic. The final version of the survey was disseminated electronically via Google Forms to the target group of respondents, which consisted of 140 individuals. The survey was distributed via email and accompanied by a brief explanatory letter (Zizikova et al., 2023). It meant sending out 140 survey invitations, which included a personalized cover letter with a link redirecting respondents to the survey; 65 responses received (46,4 % of responses). Participants were recruited through electronic channels, and the sample included students from different types of schools and regions. Despite these efforts, the sample does not reflect the entire Czech student population. The electronic distribution method may have introduced bias by favoring respondents with reliable internet access and higher digital literacy. However, internet availability among students is high. And, the participation was voluntary, which could result in self-selection bias and limit the generalizability of the findings.

The distribution of respondents by region of the Czech Republic is illustrated in Table 1, with the largest share of the Central Bohemia Region (47,71%, 31 respondents), followed by the Capital City Prague (13,8%, 9 respondents), and then by the South Bohemia Region, the Pilsen Region, the South Moravia Region, Moravian-Silesian Region.

To achieve this level of response, participation in the survey was encouraged through diplomatic outreach via personal and social network connections. The respondents (students) responded to the emergency in a friendly and understanding way; they saw the meaning in the questionnaire survey. Additionally, the survey in the Google Forms platform between August 2023 and February 2024 was published. The target group did not cover either the teachers or the parents. Only students' feedback and perceptions on how they view their involvement in DT and their skills in terms of DM were gathered. As much research on DT and DM (as well as enterprise architecture) is conducted in HEI, there is a focus on DT and DM in P&S education institutions in the Czech Republic.

Table 1. Regional distribution of respondents

Region in Czech Republic	Amount	%
Capital city Prague	9	13,8
Central Bohemia Region	31	47,7
South Bohemia Region	3	4,6
Pilsen Region	3	4,6
Karlovy Vary Region	1	1,5
Ústí Region	2	3,1
Liberec Region	2	3,1
Hradec Králové Region	2	3,1
Pardubice Region	1	1,5
Vysočina Region	2	3,1
South Moravia Region	3	4,6
Zlín Region	1	1,5
Olomouc Region	2	3,1
Moravian-Silesian Region	3	4,6
Total	**65**	**100**

The Czech Republic is located in the middle of Europe and has been a member of the European Union since 2004. There are approximately 10 million inhabitants living in a territory with an area of approximately 78,000 square kilometers. The capital city is Prague, where most people live (≈ 1 million). The Czech Republic has 14 regions/districts (see Table 1). The regional city administers each region. The Czech Republic borders the following countries: Poland (to the north), Slovakia (to the east), Austria (to the south), and Germany (to the west and north).

In contrast, Table 2 shows the type of educational institutions from which the individual respondents are. The ratio of respondents from Elementary school to respondents from vocational school to respondents from Gymnasium/Grammar school is 13:31:21.

The ISCED was designed in the early 1970s to serve as an instrument suitable for assembling, compiling, and presenting education statistics both within countries and internationally. The first version, known as ISCED 1976, was approved by the International Conference on Education in Geneva in 1975 and was subsequently endorsed by UNESCO. The second version, known as ISCED 1997, was approved

by UNESCO as part of efforts to increase the international comparability of education statistics.

Table 2. Respondent's school type

School type	ISCED2011	Amount	%
Gymnasium/Grammar school (4 years)	ISCED 3&4	8	12,3
Gymnasium/Grammar school (8 years)	ISCED 2&3	5	7,7
Vocational school	ISCED 3	3	4,6
Vocational college	ISCED 3	24	36,9
Secondary vocational school	ISCED 3	4	6,2
Elementary School	ISCED 1&2	21	32,3
Total		**65**	**100**

Table 3 offers a demographic view of the size of the cities that individual respondents come from or live in. Usually, these are not cities and towns where educational institutions are located. Cities were categorized demographically according to the national methodology established by the Czech Statistical Office, https://csu.gov.cz (Czech Statistical Office, 2025). Therefore, Table 3 does not include data on the size of cities and municipalities in which educational institutions are located. Table 3 shows the population volume. 29,2% of respondents came from cities with 50,000 or more inhabitants, followed by 12,5% for a set of cities with 10,000 – 19,999 inhabitants, 2,000 – 4,999 inhabitants, and 1,000 – 1,999 inhabitants.

Table 3. Population of the respondent city/town

Population	*Amount*	*%*
up to 199 inhabitants	1	4,2
200 - 499 inhabitants	1	4,2
500 - 999 inhabitants	2	8,3
1 000 - 1 999 inhabitants	3	12,5
2 000 - 4 999 inhabitants	3	12,5
5 000 - 9 999 inhabitants	2	8,3
10 000 - 19 999 inhabitants	3	12,5
20 000 - 49 999 inhabitants	2	8,3
50 000 and more inhabitants	7	29,2
Total	**24**	**100**

As described above, the online survey consisted of three sections. The first is the identification section. Hence, Tables I, II, and III are extracted from the responses to the identification section.

The novelty of the data sample shown in Table 2 is: the sample provides indicative patterns across ISCED school types (elementary, gymnasium, vocational) that are valuable because no other case studies cover this theme in Czech Republic, and it offers a real-world snapshot of institutional composition, useful for linking digital maturity or readiness to school type.

Results

The statistical internal reliability of the 12 answers in the second and third sections of the survey, calculated with the Cronbach's alpha test, is 0,8027. The variance of each answer to the mentioned sections fluctuates between 0,5802 and 1,5737. The statistically verified data collected are considered reliable and valuable.

The survey's essential key findings are summarised in Tables 4, 5, and 6 (Schemas 1, 2, and 3). The results of the online survey are presented as follows. Table 4 is devoted to the second section of the online survey, which focused on respondents' perceptions of the delivery and management of P&S education institutions. The survey's third section is presented in Table 5 (which covers the wider community, specifically parents) and Table 6 (which covers teachers' digital skills). The indicators in Table 4 illustrate how the respondents judge the quality aspects of DT & DM. Interestingly, most respondents (43,1%, 28 respondents) perceive ICT classroom equipment positively. The same perception is Online learning materials (32,3%, 21 respondents) and the Online education process (33,8%, 22 respondents). In contrast, a minority of respondents view ICT classroom equipment negatively (4,6%, 3 respondents). A similar situation occurs in the section Online learning materials (6,2%, 4 respondents) and Online education process (6,2%, 4 respondents). However, 21,5%, 14 respondents, for very positive, and 23,1%, 15 respondents, for negative perceptions of the indicator of the Online education process might be considered alarming. These numbers are almost similar. The question is, why do 1/5 of respondents see the quality of DT & DM in their P&S education institutions negatively and very positively? What are the inhibitors and drivers for that? Although this difference between 21,5%, 14 respondents (very positively) and 23,1%, 15 respondents (negatively) is small, it would be interesting to ascertain why it is so through further research.

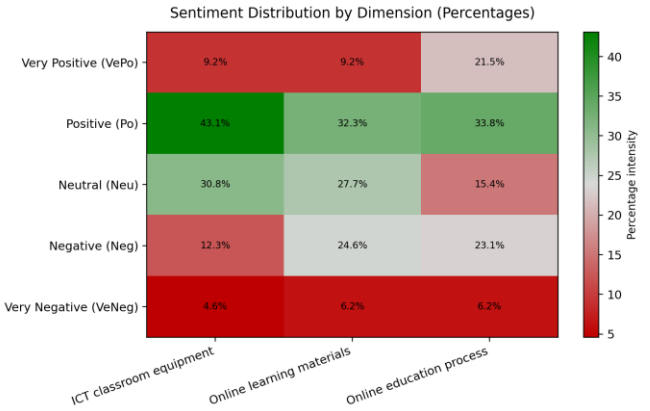
Sections A, B, and C of Table 4 present several pieces of empirical evidence and arguments (as detailed above) that the digital transformation of P&S education institutions is positively perceived by the respondents. The amounts for all sections are in total and in %, the highest for the Po indicator (positive: A = 43,1%, 28 respondents; B = 32,3%, 21 respondents; C = 33,8%, 22 respondents).

Table 4. DT & DM quality aspects

	A) ICT classroom equipment		B) Online learning materials		C) Online education process	
	Amount	%	Amount	%	Amount	%
VePo	6	9,2	6	9,2	14	21,5
Po	28	43,1	21	32,3	22	33,8
Neu	20	30,8	18	27,7	10	15,4
Neg	8	12,3	16	24,6	15	23,1
VeNeg	3	4,6	4	6,2	4	6,2
Total	**65**	**100**	**65**	**100**	**65**	**100**

Legend: VePo =Very Positively, Po = Positively, Neu = Neutral, Neg = Negatively, VeNeg = Very Negatively.

Schema 1. Heat map of DT & DM quality aspects



Key findings

This evidence confirms RQ#1, which is that respondents perceive the digital transformation of P&S education institutions positively. The VePo indicator (very positive: A = 9,2%, 6 respondents; B = 9,2%, 6 respondents; C = 21,5%, 14 respondents) also supports that idea. The amounts and % for VePo indicators are higher than those of VeNeg indicators (very negative: A = 4,6%, 3 respondents; B = 6,2%, 4 respondents; C = 6,2%, 4 respondents). Why the Neg indicator shows these numbers can be the follow-up and the specific scope of further research in the Czech Republic as well as in the context of Europe.

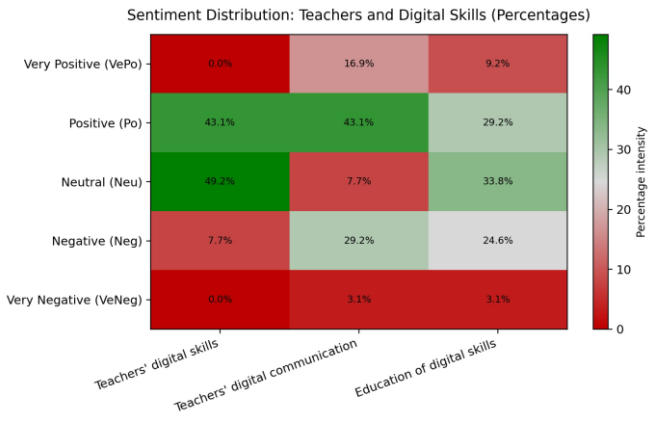
For the answer to RQ#2,-the numbers from Table 4, section A), especially the Neu & Po indicators. Based on that evidence, it is not easy to prove that the respondents have the need for more IT use because the amount of the Neu indicator (neutral: 49,2%; 32 respondents) prevails over the Po indicator (positive: 43,1%; 28 respondents). The needs of respondents for more IT use in P&S education institutions in the Czech Republic are mostly neutral.

Table 5 indicates respondents' perception of the DT & DM Teachers' Skill Aspect. The general view is neutral. Table 5 reveals certain differences in its section. For example, almost half of the respondents perceive teachers ' digital skills as neutral (49,2%, 32 respondents). The second place is devoted to positive perceptions (43,1%, 28 respondents), which is also with a little goodwill a half of the respondents. Interestingly, most respondents (43,1%, 28 respondents) judge teachers ' digital communication positively. Section of Education of digital skills. Neutral perception (33,8%, 22 respondents) for Education of digital skills is a little surprising. However, in comparison to teachers' digital skills and their digital communication, it is not a big surprise. No respondent indicated very positive or very negative feedback regarding teachers' digital skills.

Table 5. DT & DM teacher's skill aspect

	A) Teachers' digital skills		B) Teachers' digital communication		C) Education of digital skills	
	Amount	%	Amount	%	Amount	%
VePo	0	0	11	16,9	6	9,2
Po	28	43,1	28	43,1	19	29,2
Neu	32	49,2	5	7,7	22	33,8
Neg	5	7,7	19	29,2	16	24,6
VeNeg	0	0	2	3,1	2	3,1
Total	**65**	**100**	**65**	**100**	**65**	**100**

Schema 2. Heat map of DT&DM teachers' skill aspect



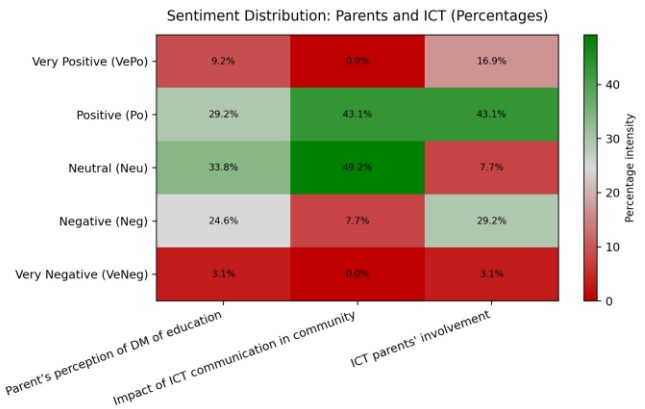
The respondents' perception of the digitalization of the wider community, particularly among parents, is illustrated in Table 6. Surprisingly, 29,2%, 19 respondents indicate a positive perception of DM in education. However, a higher number of parents evaluate it neutrally, as is unsurprising. The second section of Table 6 (impact of ICT communication in the community) demonstrates a neutral perception. There is no very positive rating. The positive rating is about 6% lower than the neutral rating, which should be considered as a surprise. The reasons why this is so can be the subject of further research. The rest of the

respondents can be considered a minority because those who answered positively and neutrally make up 92,3%, 60 respondents, which is the overwhelming majority. The third section of Table 6 demonstrates how the parents are involved in the ICT area (from the respondents' point of view). The distribution of answers shows differences in comparison to the previous two sections mentioned. Almost 1/6 of respondents indicate that their parents are involved in ICT, and they use ICT. Only 3,1%, 2 respondents, judge their parents very negatively. Surprisingly, 43,1%, 28 respondents' parents are perceived positively in ICT usage. This can be seen as an award for parents. Generally, Table 6 shows the respondents' view of their wider community and provides overall results about the parents having their children between 6 – and 19 years. Based on the available evidence, it cannot be confirmed that digital transformation influences communication between students and teachers or between students and the wider community (e.g., parents).

Table 6. DT & DM parents' skill aspect

	A) Parent's perception of DM of education		B) Impact of ICT communication in community		C) ICT parents' involvement	
	Amount	%	Amount	%	Amount	%
VePo	6	9,2	0	0	11	16,9
Po	19	29,2	28	43,1	28	43,1
Neu	22	33,8	32	49,2	5	7,7
Neg	16	24,6	5	7,7	19	29,2
VeNeg	2	3,1	0	0	2	3,1
Total	**65**	**100**	**65**	**100**	**65**	**100**

Schema 3. Heat map of DT & DM parents' skill aspect



All Po indicators for Table 5, section B, Table 6, section B, and C present the same amount and the same % (43,1%, 28 respondents). The key differentiator (with the deeper study of the mentioned sections of tables) is the other indicators, namely the Neu indicator for all of them.

Discussion

As evidenced by a sample of students who participated in the survey and are from P&S education institutions spread across the Czech Republic, the answers to the research questions are coherent. They detect that the DT of P&S education institutions of the Czech Republic is perceived positively (by students aged 6-19). The internal reliability of the survey instrument was assessed using Cronbach's alpha, which yielded a value of 0.8027. This exceeds the commonly accepted threshold of 0.7, indicating good internal consistency among the items. Therefore, the instrument can be considered reliable, supporting the credibility of the findings presented in the analysis.

Some respondents are lax in expressing their need for more IT equipment in the classrooms; the needs of respondents for increased IT use in P&S education institutions in the Czech Republic are mostly neutral. It is unsurprising that individuals of a similar age tend to express their opinions openly. Many perceive the P&S education process and its related resources, such as IT equipment, as insufficient or morally outdated. The predominant neutral attitude in response to more IT needs is understandable and seems to align with researchers' expectations. It is aligned with Yuliandari et al. (2023), where authors see "the smart learning environment is a combined educational system incorporating intelligent tools and techniques to create a delightful learning experience for learners and other individuals involved". As mentioned in the Results chapter, based on the evidence, it cannot be confirmed that DT enters and influences, to a greater or lesser extent, the communication between students and teachers, or the communication between students and the wider community in the Czech Republic. These case study results align with the global trends of DT in P&S education institutions, as is argued in a similar article for another European country - Bulgaria (Gaftandzhieva et al., 2022). Another comparable worldwide example is in Shermaine et al. (2024). According to Yuliandari et al. (2023), the results presented in this article generally align with the worldwide trends in P&S education institutions, specifically in terms of DT governance, DT leadership, DT implementation & methods, and the actors involved in DT.

Implications for interpretation.

Considering these factors, differences between Czech and other European results likely reflect structural program choices, teacher personal development ecosystems, national digital policy contexts, and family engagement dynamics, rather

than measurement artefacts alone. Interpreting Czech findings through this lens enhances the explanatory soundness of the discussion and situates the results within the broader European evidence (Černý et al., 2023; European Commission/EACEA/Eurydice, 2023; European Commission, 2025; Fraillon, 2024; IEA, 2024)

Conclusion

A distinct and independent viewpoint is advanced in (Kopp et al., 2019). The students demonstrate readiness for digital transformation, whereas teachers exhibit gaps in competence (teachers remain insufficiently competent). This information is presented to provide context rather than to confirm or refute the claim. The finding may appear somewhat unexpected, particularly in the post-COVID era, yet the results indicate this trend. Consequently, digital transformation and digital maturity in P&S education institutions in the Czech Republic continue to increase annually. The contribution of the article is two-fold. First, the analysis demonstrates that students in P&S education are not indifferent to the issues of digital transformation and digital maturity. They show interest in topics extending beyond the teaching process and are willing to express their opinions. The results of the questionnaire survey confirm this observation. It corresponds to the research mentioned by Demartini et al. (2020) that 19% of respondents see DT and DM "like innovative teaching". Second, an overview was provided of how students aged 6–19 perceive the support of the P&S education process through IT equipment and related resources. The analysis also addressed their views on the quality of the education process facilitated by IT and on broader communication between P&S education institutions and parents. A holistic EA approach in the Czech Republic primarily focuses on supporting the development and management of P&S education institutions' data and digital transformation. Hence, P&S education institutions are part of the state education process; they must fulfill the requirements. Due to the requirement to approve digitization projects with budgets over 6 million CZK in the Czech Republic, the P&S education institutions are obligated by the Department of the Chief Architect of eGovernment of the Ministry of the Interior (Lukáš et al., 2023; Lukáš et al., 2022). Practically, the article highlights trends, including concerns about DT and DM in the Czech Republic.

The research results align with international trends. For example, in Slovakia (the eastern neighbor of the Czech Republic), the students' digital competencies, ranked at 48,6% (Zizikova et al., 2023), might be considered confirmation of a positive perception for sections A), B), and C), Table 4. Another study (Mišianiková et al., 2021) indicates that the following trends are similar to those used in our research. The mapping between them is as follows: "technologies allow to experiment with pedagogy and get instant feedback" (compare to Table 4, section A, C; Table 5, section B), "can help teachers automate or simplify a number of tasks" (compare to Table 4, section B), "provide instant access to the necessary information and develop important skills for working with sources" (compare to Table 4, section B; Table 5, section A), "interactive forms of activity allow developing communicative competence" and "the development of communicative skills by solving tasks and situations (compare to Table 5, section C; Table 6, section A, B).

Self-reported perceptions are inherently subjective and prone to social desirability bias, leading respondents to overstate positive experiences or underreport challenges. Age ranges among teachers, parents, and students introduce variability in digital literacy, leading to inconsistent interpretations across respondents. Additionally, these measures lack behavioral validation (high positive ratings may not accurately reflect actual competence or engagement) and rely on recall, which can lead to accuracy distortion. Finally, the prevalence of neutral responses suggests ambiguity that quantitative scales alone cannot resolve, underscoring the need for triangulation with objective data.

The limitations of the study and future research

Despite the limited length of the current article, the following limitations should be carefully considered: 1) the young respondents are not IT specialists but use IT actively in the education process; 2) the young respondents do not represent all age of students and are drawn from only one country, in Czech Republic, since digitalization of education is a global trend (Muthu et al., 2023); 3) the answers about DT and DM of P&S education institutions were influenced by the fact that all respondents are not able (due to their age) to consider broader contexts about the ends of education they receive, 4) due to the nature of RQ, the researchers neglected the teachers' and parents' points of view, similarly to Muthu et al. (2023), and 5) this research was limited to trends in P&S education institutions in a specific period of time (August 2023 - February 2024), (Shermaine at el., 2024), 6) the survey employed structured response formats without open-ended items; therefore, qualitative depth was limited. Future work will incorporate interviews or open-ended questions to enrich the interpretation of students' perceptions, 7. Findings may be affected by unit non-response, as response propensity could correlate with digital attitudes; response rates alone do not indicate bias. The sample underrepresents certain types of schools, ownership categories, regions, or urban–rural areas, which can affect generalizability. Post-stratification can mitigate representation error, but residual bias may still remain; clustering by school inflates variance.

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Conflict of Interest

No conflicts of interest exist.

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