

A MULTI-LEVEL MODEL OF SAFETY IN UPPER SECONDARY EDUCATION

DÁŠA PORUBČANOVÁ, KATARYZYNA FĄCZEWSKA WÓJT, MARTYNA SZABLEWSKA¹

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¹DTI University,
Dubnica nad Váhom
Slovak Republic

Contact:

doc. PaedDr. Dáša Porubčanová, PhD. - porubcanova@dti.sk

Mgr. Kataryzyna Frączewska-Wójt - wojt@dti.sk

Mgr. Martyna Szablewska - szablewska@dti.sk

Abstract:

This international study examines the determinants of teachers' self-efficacy (perceived competence) in both pre-service preparation and in-service practice when teaching digital technologies to school pupils in Poland and Slovakia. The research investigated the relationships among personal computer competence, outcome expectancy of instruction, perceived digital literacy, and self-efficacy for teaching digital technologies, with particular emphasis on the dimension of school safety (rule compliance, management of disruptive behaviour, safe digital practices, and well-being). The theoretical framework is grounded in the social cognitive concept of self-efficacy, distinguishing between personal efficacy and outcome expectancy. Data were collected using a snowball sampling method through an online

questionnaire and complemented by a content analysis of portfolios from compulsory teaching practice. The research design is qualimetric (quantitative–qualitative). The results of the regression models indicate the dominance of personal computer competence as a predictor of self-efficacy across research groups and highlight the importance of perceived digital literacy, particularly among in-service teachers. From the perspective of school safety, higher levels of self-efficacy are associated with the ability to guide pupils toward understanding rules, reduce disruptive behaviour, and stabilize a safe classroom climate, which is especially critical in linguistically and socially heterogeneous school environments.

Keywords: self-efficacy, digital technologies, digital literacy, school safety, school rules, portfolio, OSTES

Introduction

Current developments in educational systems indicate that digital technologies are becoming an integral part of curricula across countries; however, their implementation varies depending on national priorities and pedagogical traditions. Comparative analyses of global curricular approaches show that the focus is increasingly shifting from the isolated development of technical skills toward the cultivation of comprehensive digital competences, which also encompass ethical, safety, and social aspects of technology use (Akcaoğlu & Coşkun, 2024).

Research in the field of educational policy and curricular reforms simultaneously emphasizes that the mere introduction of digital technologies into teaching does not automatically lead to improvements in educational quality. On the contrary, without adequate teacher support and the development of their professional competences, technology use may remain superficial or ineffective (Cuban, 2001; Heggart et al., 2024). This discrepancy between curricular intentions and actual pedagogical practice increases pressure on teachers, who are often required to meet new demands without sufficient preparation.

The issue of safety in the school environment thus gains particular significance. Research on ICT integration indicates that digital technologies may intensify problematic student behaviour, disrupt the instructional process, and weaken traditional mechanisms of classroom management (Barnová et al., 2022; Poliaková et al., 2023; Ainley, Banks, & Fleming, 2002). In this context, the teacher's ability to create a safe and well-managed environment proves to be as important as technical competence itself.

Teachers' readiness to respond to these challenges is closely linked to their beliefs about their own professional efficacy. Social cognitive theory of self-efficacy emphasizes that an individual's behaviour is significantly influenced by the extent to which they believe in their ability to cope with demanding situations (Bandura, 1986). In the educational context, this belief translates into teachers' willingness to innovate instruction, manage classroom discipline, and maintain a safe environment even under the increased complexity of digital teaching.

Curriculum Reform and the Emphasis on Safety in the Educational Environment

Current curriculum reforms across Europe indicate a shift from content-oriented instruction toward a broader understanding of educational quality that also encompasses organizational, value-based, and safety-related dimensions of the educational process. Reforms are no longer perceived solely as changes in curricula, but rather as interventions in the functioning of the school as a social institution in which education, upbringing, and the provision of a safe environment for pupils are interconnected.

In the Polish context, curriculum reform is closely linked to debates on the decentralization of education, the responsibility of educational actors, and tensions between efficiency, competition, and the social function of schools. Szymczak (2024) points out that reform interventions in the education system significantly alter the roles of teachers and school principals by increasing their responsibility for educational quality, school climate, and the safety of the educational environment. In his analyses, school safety does not appear as an isolated category, but rather as an integral component of school quality, influencing parental trust, the stability of teaching staff, and students' educational outcomes.

These considerations are further developed by Śliwerski (2015), who emphasizes the risks associated with an excessive market-oriented logic in education within the Polish reform discourse. According to the author, weakening the social and educational function of schools may lead to reduced attention to safety, relationships, and the value-based grounding of the educational process. Reforms primarily oriented toward performance and competitiveness may thus unintentionally create environments of increased pressure, complicating teachers' efforts to maintain rules and safe conditions for learning.

In the Slovak context, reform efforts focus on the modernization of educational

content, the development of digital competences, and the strengthening of the quality of the educational process (Tamášová et al., 2022). Analyses of reform documents and scholarly debates (Olejníková, 2024; Szókö & Gabrhelová, 2024; Jakabová, 2022; Hanuliaková et al., 2024b) indicate a growing emphasis on school climate, the prevention of risk behaviour, and the systematic construction of a safe environment as a prerequisite for effective learning. Safety is thus gradually moving from a peripheral area of school management to the centre of pedagogical thinking, where it is understood as a condition for the development of both cognitive and social competences of pupils.

In both contexts—Polish and Slovak—it becomes evident that curriculum reform places increased demands on teachers' professional competence. Teachers are no longer merely implementers of curricular content, but also actors responsible for the organization of instruction, the enforcement of rules, and the regulation of behaviour in digitally supported learning environments (Hanuliaková et al., 2024a). In this respect, teachers' self-efficacy gains particular importance, as it influences their ability to manage reform-related changes, respond to emerging risks, and maintain a safe educational environment.

Incorporating the perspective of curriculum reform into research on teachers' self-efficacy enables a deeper understanding of how systemic changes affect subjective experiences of professional competence and how school safety becomes an implicit yet fundamental component of the quality of digital technology education.

Teacher Preparation, Self-Efficacy, and the Methodological Grounding of Research in the Context of Curriculum Reforms

Curriculum reforms in contemporary educational systems significantly reshape the professional demands placed on teachers. The increased emphasis on digital competences, the safe use of technologies, and the regulation of classroom behaviour intensifies the complexity of the teaching role while simultaneously revealing tensions between formal teacher preparation and the actual requirements of pedagogical practice. In this context, a key phenomenon is the mismatch between the declared professional self-confidence of pre-service teachers and their actual ability to cope with challenging situations in school environments.

Research focusing on student teachers and novice teachers repeatedly shows that prior to entering practice they report relatively high levels of self-efficacy;

however, during the first years of professional practice this confidence is often confronted with the realities of classroom management, working with heterogeneous groups of pupils, and addressing disruptive behaviour (Gabrhelová & Lajčín, 2021; Trudel et al., 2023). This discrepancy is particularly pronounced in areas closely related to school safety, such as rule enforcement, behaviour regulation, and the maintenance of a productive learning atmosphere in digitally supported instruction.

Curriculum reforms in both Poland and Slovakia further intensify these demands. Reforms place increased responsibility on teachers as actors who not only deliver educational content but also actively create safe and well-managed educational environments. As analyses of reform processes indicate, teachers' ability to establish clear rules, prevent the escalation of risks, and manage disruptive behaviour becomes an implicit criterion of educational quality (Szymczak; Śliwerski). In this context, teachers' self-efficacy is not manifested solely at the didactic level, but also substantially influences their capacity to respond to systemic changes and emerging forms of pedagogical strain.

Research findings also suggest that theoretical preparedness and knowledge of curricular documents alone do not guarantee successful management of real educational situations. Classroom management and work with problematic behaviour are among the dimensions of the teaching profession in which the gap between subjectively perceived and practically applicable self-efficacy is most evident. For this reason, several authors emphasize the need to link the measurement of self-efficacy with the analysis of concrete pedagogical experiences and systematic reflection on practice (Shulman, 1987; Ross & Bruce, 2007).

From a methodological perspective, this approach is supported by the combination of quantitative and qualitative research strategies. Questionnaire-based instruments make it possible to capture the structure and level of teachers' perceived professional competence across different domains of their work, while qualitative methods provide deeper insight into the processes through which self-efficacy is formed in authentic pedagogical situations (Sheu et al., 2018). This combination is particularly suitable for examining school safety (Emmerová, 2024), as it allows for the integration of teachers' subjective beliefs with their concrete practices in rule enforcement, conflict resolution, and behaviour regulation in the classroom.

In the context of ongoing curriculum reforms, the methodological grounding of research on self-efficacy thus goes beyond a purely diagnostic function. It becomes a tool for understanding how teachers' professional beliefs are shaped through interaction with systemic changes and how these beliefs influence

their ability to create safe educational environments in conditions of digitalized schooling. At the same time, this approach provides space for identifying areas in which teacher preparation and professional support need to be strengthened in line with the objectives of contemporary curriculum reforms.

Methodological Framework of the Study

The methodological framework of the present study draws on Polish and Slovak research instruments focused on teachers' professional preparedness, school safety, and the implementation of digital education in the context of ongoing curriculum reforms. The study builds on pedagogical and psychological approaches that emphasize the importance of teachers' subjectively perceived professional competence as one of the key prerequisites for instructional quality and the safe functioning of schools (Duda et al., 2022; Olejníková et al., 2025).

The theoretical foundation of the methodological framework is the concept of self-efficacy, which in both Polish and Slovak studies is interpreted as teachers' beliefs in their own ability to manage educational tasks, regulate student behaviour, and maintain structured and safe instructional environments. In this context, self-efficacy is not limited solely to didactic competence, but also encompasses the ability to enforce rules, prevent risk behaviour, and respond to demanding situations associated with the use of digital technologies in schools.

From a methodological perspective, research on teacher preparedness is characterized by a combination of quantitative and qualitative approaches. Questionnaire-based data collection makes it possible to capture the level of teachers' perceived professional competence in the areas of instruction, classroom management, and rule enforcement, while qualitative methods provide deeper insight into how these beliefs are enacted in pedagogical practice. This mixed-methods research design is particularly effective in examining complex phenomena such as school safety and digital education in heterogeneous educational environments.

In the present study, the methodological framework is based on the adaptation of existing instruments for measuring teachers' self-efficacy and professional competences, which were contextually adjusted to the conditions of the Polish and Slovak educational systems. These adaptations reflect the specific features of national curriculum documents, as well as the growing emphasis on the safe use of digital technologies, the prevention of risk behaviour, and the promotion of students' psychosocial well-being.

The qualitative component of the study focuses on the analysis of reflective outputs from teaching practice, which document concrete situations related to rule enforcement, the management of problematic behaviour, and the обеспечение of safety in digitally supported instruction. This approach allows for linking teachers' declared beliefs with their actual pedagogical strategies and for identifying areas in which self-efficacy is strengthened or weakened.

The methodological framework of the study is also closely connected to the context of curriculum reforms in Poland and Slovakia. Reform-driven changes place increased demands on teachers' professional competence and shift responsibility for school safety directly into the core of pedagogical work. Examining self-efficacy in this context makes it possible to better understand how teachers perceive their role in a changing educational environment and how prepared they are to respond to new challenges associated with the digitalization of education.

Conceptualized in this way, the methodological framework provides a foundation for empirical investigation of teachers' professional preparedness within the Polish and Slovak educational systems and allows the research findings to be interpreted in line with current theoretical and curricular frameworks in both countries.

Research Sample

The research sample consisted of 452 in-service teachers and pre-service teachers from Poland and Slovakia. Participants were selected with the aim of reaching a geographically dispersed population. The questionnaire was distributed nationwide via email, professional discussion forums, and social networking platforms (LinkedIn, Facebook), as well as through professional teacher associations, networks of university departments responsible for teacher education, and regional methodological centres. Participants were asked to further share the questionnaire within their professional networks, thereby expanding the respondent base through snowball sampling.

Data collection took place between 15 September 2024 and 30 April 2025. A total of 497 responses were recorded; after excluding incomplete or invalid records, 452 valid responses were included in the analysis. Respondents represented various regions in both countries and schools with diverse social and cultural contexts, allowing the heterogeneity of school environments to be captured.

For analytical purposes, participants were divided into five research groups:

- pre-service teachers (n = 158),

- in-service teachers (n = 236),
- primary-level teachers/pre-service teachers (n = 128),
- secondary-level teachers/pre-service teachers teaching digital technologies or informatics (n = 121),
- secondary-level teachers/pre-service teachers teaching other subjects (n = 103).

This categorization enabled a differentiated analysis of self-efficacy predictors across the research groups.

Table 1 Geographic and demographic characteristics of the study participants (Poland and Slovakia)

Variable	Category	% of participants
Country	Poland	54%
	Slovakia	46%
Gender	Male	34%
	Female	64%
	Non-binary / Prefer not to say	2%
Age	Younger than 30	35%
	31–40 years	23%
	41–50 years	19%
	51–60 years	18%
	Older than 60	5%
Professional status	Pre-service teachers	35%
	In-service teachers	65%
Years of teaching experience (in-service teachers)	Less than 5 years	27%
	6–10 years	21%
	More than 10 years	52%

Teaching level	Primary education	28%
	Secondary education – Digital Technologies / Informatics	27%
	Secondary education – other subjects	45%

Note. Percentages are rounded and may not sum to 100 due to rounding.

The questionnaire was administered online via an academic data collection platform and was designed to require approximately 10–15 minutes to complete. The first section of the questionnaire collected demographic information (age, gender, country, region, years of teaching experience, type of school, and subject taught), including an indication of whether the respondent was an in-service teacher or a pre-service teacher.

The second section measured the following constructs corresponding to the predictor model of teachers’ self-efficacy in digital education:

- Self-Efficacy for Teaching Digital Technologies and Safety in Digital Instruction (SE) – 11 items,
- Outcome Expectancy (OE) – 9 items,
- Computing Values and Beliefs (CVB) – 11 items,
- Personal Computing Ability (PCA) – 15 items,
- Perceived Digital Literacy (PDL) – 12 items.

The SE and OE scales were formulated to be applicable to both in-service and pre-service teachers (with adaptations of item wording into future and conditional tense for pre-service teachers, e.g., “my teaching will include...”). The CVB and PCA scales captured beliefs about the importance of digital technologies and perceived personal competence. The PDL scale was designed to encompass, in addition to general digital literacy, explicit dimensions of digital safety and well-being, particularly safe device use, risk prevention, regulation of rules for technology use, protection of privacy, and the promotion of students’ safe behaviour in online environments.

All items were rated on a 7-point Likert scale ranging from 1 (“strongly disagree”) to 7 (“strongly agree”). The study was conducted in accordance with university research ethics standards; participants provided informed consent and data collection was anonymized.

Statistical Analysis

Confirmatory factor analysis (CFA) was employed to verify the factor structure of the SE, OE, CVB, PCA, and PDL constructs. The procedure included:

1. specification of the expected factor structure,
2. assessment of assumptions (normality, sample size adequacy),
3. model estimation using the maximum likelihood method in a specialized statistical environment,
4. evaluation of model fit based on factor loadings and goodness-of-fit indices (CFI, TLI, RMSEA, SRMR).

The following thresholds were used as indicators of acceptable model fit: CFI/TLI ≥ 0.90 ; RMSEA ≤ 0.08 (optimal ≤ 0.06); SRMR ≤ 0.10 (optimal ≤ 0.08). Scale reliability was assessed using Cronbach's alpha and McDonald's omega coefficients.

After confirmation of the factor structure, the SE, OE, CVB, PCA, and PDL variables were treated as continuous scales. Subsequently, multiple regression analysis was conducted with SE as the dependent variable and OE, CVB, PCA, and PDL as predictors. The model was tested separately for each of the five research groups.

Table 2 Descriptive statistics of the scale scores (raw score)

Research group	Variable	M	SD	Skewness	Kur- tosis	SE
Pre-service teachers (N = 158)	SE	4.48	1.19	−0.24	−0.51	0.09
	OE	4.60	0.86	−0.39	0.72	0.07
	CVB	5.29	0.88	−0.41	−0.20	0.07
	PCA	3.92	1.27	0.28	0.14	0.10
	PDL	5.30	1.12	−0.38	−0.47	0.09
In-service tea- chers (N = 236)	SE	5.08	1.31	−0.66	−0.27	0.09
	OE	4.63	1.07	−0.42	0.41	0.07
	CVB	5.34	0.84	−0.35	−0.14	0.05
	PCA	4.81	1.29	−0.23	−0.55	0.08
	PDL	5.75	0.98	−0.64	−0.23	0.06
Primary-level teachers / PST (N = 128)	SE	4.66	1.33	−0.21	−0.62	0.12
	OE	4.70	1.02	−0.60	0.47	0.09
	CVB	5.36	0.89	−0.48	−0.15	0.08
	PCA	4.18	1.25	0.05	−0.39	0.11
	PDL	5.44	1.13	−0.40	−0.79	0.10
Secondary-level DT teachers / PST (N = 121)	SE	5.40	1.15	−0.77	−0.19	0.10
	OE	4.77	0.94	−0.27	0.38	0.09
	CVB	5.39	0.82	−0.51	0.09	0.07
	PCA	5.14	1.26	−0.31	−0.66	0.11
	PDL	5.85	0.93	−0.83	0.40	0.09
Secondary-level non-DT tea- chers / PST (N = 103)	SE	4.54	1.27	−0.08	−0.55	0.12
	OE	4.36	1.04	−0.58	0.75	0.10
	CVB	5.22	0.96	−0.29	−0.49	0.09
	PCA	3.98	1.17	0.18	0.10	0.11
	PDL	5.50	0.99	−0.21	−0.95	0.10

Results

Confirmatory factor analysis confirmed the expected factor structure of all five scales. Items for the individual constructs exhibited adequate to high factor loadings, and the scales demonstrated good to excellent reliability.

- SE (11 items): factor loadings ranged approximately from 0.38 to 0.89; reliability was high ($\alpha \approx 0.93$; $\omega \approx 0.94$).

- OE (9 items): factor loadings ranged approximately from 0.55 to 0.81; reliability was good ($\alpha \approx 0.88$; $\omega \approx 0.88$).

- CVB (11 items): reliability was moderate ($\alpha \approx 0.79$; $\omega \approx 0.72$); weaker loadings were typically associated with negatively worded items.

- PCA (15 items): reliability was high ($\alpha \approx 0.92$; $\omega \approx 0.90$); the majority of items showed strong factor loadings.

- PDL (12 items): reliability was very high ($\alpha \approx 0.94$; $\omega \approx 0.94$); factor loadings were consistently high, particularly within the domains of safety and risk regulation.

Results of Multiple Regression Analysis

The regression models revealed a stable pattern of predictors of self-efficacy across the research groups.

1. PCA (personal computing ability) emerged as the strongest predictor of SE across all research groups (standardized β approximately in the range of 0.34–0.52; $p < 0.001$).

2. OE (outcome expectancy) was a significant predictor in all research groups, although with a smaller effect size than PCA (β approximately 0.17–0.29; $p < 0.05$ to $p < 0.001$).

3. PDL (perceived digital literacy, including safety and well-being) was statistically significant primarily among in-service teachers and secondary-level teachers; among pre-service teachers, the effect was at the threshold of statistical significance.

4. CVB (computing values and beliefs) did not emerge as a significant predictor of SE in any research group ($p > 0.05$).

Overall, the models explained a moderate to substantial proportion of variance in SE (R^2 approximately 0.45–0.67, depending on the research group).

Discussion

The aim of this study was to examine the determinants of teachers' self-efficacy for teaching digital technologies in the context of school safety, drawing on a methodological framework adapted from international research and applied to the educational environments of Poland and Slovakia. The findings provide several important insights into how teachers' perceived competencies, beliefs, and expectations shape their readiness to implement digital technologies in a manner that is both pedagogically effective and safe.

Across all research groups, personal computing ability (PCA) emerged as the strongest and most consistent predictor of self-efficacy for teaching digital technologies and managing safety-related aspects of instruction. This finding aligns with previous international research indicating that teachers' confidence in their own technical competence plays a central role in shaping their instructional self-efficacy. In the Polish and Slovak contexts, this result gains particular significance in light of ongoing curricular reforms that place increased demands on teachers to integrate digital tools while simultaneously addressing issues such as cyber safety, responsible technology use, and the prevention of digital risk behaviours.

The strong association between PCA and self-efficacy suggests that teachers who perceive themselves as digitally competent are more likely to feel capable of maintaining structured, predictable, and safe learning environments when using digital technologies. This is especially relevant in classrooms where the use of digital tools can amplify challenges related to classroom management, rule enforcement, and student behaviour. The findings therefore support the argument that technical competence should be understood not merely as an instructional asset, but as a foundational prerequisite for ensuring safety and stability in digitally mediated learning environments.

Perceived digital literacy was found to be a significant predictor of self-efficacy for most research groups, particularly among in-service teachers. This result highlights the importance of broader digital literacy skills, including digital safety, well-being, communication, and responsible technology use, in shaping teachers' confidence to teach digital technologies effectively.

In the context of Poland and Slovakia, where schools increasingly face challenges related to cyberbullying, inappropriate content, and the misuse of digital devices, digital literacy appears to function as a protective factor. Teachers who perceive themselves as digitally literate may be better equipped to anticipate risks, establish clear rules for technology use, and guide students toward responsible

digital behaviour. The weaker relationship between PDL and self-efficacy among pre-service teachers suggests that digital literacy alone may not translate into instructional confidence without sustained classroom experience and exposure to real-life school situations.

The results indicate that outcomes expectancy consistently contributes to teachers' self-efficacy across all research groups, although its predictive strength is lower than that of PCA. Teachers who believe that their instructional efforts can positively influence student learning and behaviour tend to report higher levels of self-efficacy. In the context of digital education, this belief may extend beyond academic outcomes to include students' adherence to rules, responsible online behaviour, and overall well-being.

This finding is particularly relevant for educational reforms in Poland and Slovakia, where policy documents often emphasise digital competencies without sufficiently addressing teachers' beliefs about their capacity to shape student behaviour in digital environments. Strengthening outcome expectancy may therefore be an important target for both initial teacher education and in-service professional development, especially in relation to safety-oriented instructional practices. The weaker relationship between PDL and self-efficacy among pre-service teachers suggests that digital literacy alone may not translate into instructional confidence without sustained classroom experience and exposure to real-life school situations.

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Limited role of computing values and beliefs

In contrast to other predictors, computing values and beliefs did not significantly predict self-efficacy in any research group. Although teachers generally expressed positive attitudes toward the importance of digital technologies in education, these values did not translate into greater confidence in teaching digital technologies safely and effectively. This finding suggests a potential disconnect between normative support for digital education and practical instructional readiness.

One possible explanation lies in the structure of curricular reforms in Poland and Slovakia, where expectations related to digital education are often framed at a policy level, while concrete guidance and support for classroom implementation remain limited. Teachers may value digital technologies in principle, yet still feel underprepared to manage their pedagogical and safety-related demands. This underscores the importance of moving beyond value-oriented discourse toward competence-based and practice-oriented teacher preparation.

Conclusion

This study examined key determinants of teachers' self-efficacy for teaching digital technologies in the context of school safety, drawing on an internationally validated methodological framework and adapting it to the educational environments of Poland and Slovakia. The findings demonstrate that teachers' readiness to implement digital technologies in a safe and structured manner is shaped primarily by their perceived personal computing ability, supported by perceived digital literacy and outcomes expectancy, rather than by general values or beliefs about the importance of digitalisation.

The results highlight personal computing ability as the most influential factor across all research groups, underscoring the central role of practical digital competence in fostering teachers' confidence. Teachers who perceive themselves as digitally capable are more likely to feel able to manage classroom processes, enforce rules, and prevent safety risks associated with the use of digital technologies. This finding reinforces the argument that technical competence is not merely an instructional asset but a core condition for maintaining safe learning environments in digitally mediated classrooms.

Perceived digital literacy also emerged as an important contributor to self-efficacy, particularly among in-service teachers. This suggests that competencies

related to digital safety, responsible technology use, and student well-being become increasingly meaningful through professional experience. In contrast, the weaker role of digital literacy among pre-service teachers points to the need for more practice-oriented training that connects theoretical knowledge with real classroom situations.

Outcomes expectancy was consistently associated with self-efficacy, indicating that teachers' belief in their capacity to positively influence student learning and behaviour remains an important motivational factor. Conversely, computing values and beliefs showed no independent predictive effect, suggesting that acknowledging the importance of digital technologies at a declarative level does not automatically translate into confidence for safe and effective teaching.

From a practical perspective, the findings imply that teacher education and professional development in Poland and Slovakia should prioritise the development of hands-on digital competencies and explicitly integrate issues of school safety, behavioural regulation, and digital well-being. Curriculum reforms that emphasise digital competencies need to be accompanied by systematic support that enables teachers to translate policy expectations into classroom practice.

Overall, this study contributes to a deeper understanding of how self-efficacy for digital education is formed within reform-oriented educational systems. By highlighting the central role of practical competence and safety-oriented digital literacy, the findings offer evidence-based directions for strengthening teacher preparedness and supporting the sustainable and safe integration of digital technologies in schools.

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