Generative Artificial Intelligence (GenAI) in K-12 Education

National Policy Perspectives from the Czech Republic, Israel, Latvia, and Slovakia

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Abstract: *The educational landscape of K-12 classrooms is undergoing changes because of the emerging influence of Generative Artificial Intelligence (GenAI). The tools are driving educational transformation through personalised learning experiences, streamlined teacher workflows, and improved curriculum design, which is leading educators and policymakers to challenge conventional educational methods in the digital age. The rapid informal adoption of these technologies by students, teachers, and parents has accelerated urgent discussions on how K-12 education systems should respond. At the same time, meaningful integration of GenAI requires more than technological readiness. It relies on coherent national policies, high-quality teacher preparation, strong ethical principles, and equitable access to digital infrastructure. This study explores how four countries, namely the Czech Republic, Israel, Latvia, and Slovakia, are responding to these demands. Through a qualitative comparative approach, the paper identifies shared directions, country-specific challenges, and emerging opportunities. The findings highlight differing levels of preparedness and coordination and offer practical insights for policymakers, educators, and stakeholders working to support the responsible and inclusive adoption of GenAI in schools.*

Keywords: *Generative Artificial Intelligence, K-12 Education, education policy, AI literacy framework, curriculum, teacher education*

1. Introduction

Artificial intelligence (AI) technologies are advancing rapidly and transforming numerous sectors, with education among those most noticeably affected. Generative Artificial Intelligence (GenAI), which refers to AI systems capable of creating original content such as text, images, code, and simulations, is increasingly influenc-

ing educational practices (OECD, 2021; Touretzky, Gardner-McCune, & Seehorn, 2022). Tools such as ChatGPT and DALL·E have become widely accessible, opening up new possibilities for personalising instruction and reducing administrative tasks for teachers in K-12 education.

In educational contexts, GenAI provides significant opportunities, including personalised learning experiences, reduced administrative workloads, and enhanced student skills in creativity, critical thinking, and problem-solving (Ng, Leung, & Chu, 2021; Yao, 2024). Students benefit from tailored feedback, automated task support, and educational resources specifically aligned with their individual learning needs and preferences (Cobo, Munoz-Najar, & Bertrand, 2024). However, alongside these benefits, the integration of GenAI poses considerable challenges. Important concerns include data privacy, algorithmic biases, misinformation, and unequal access to technology infrastructure, highlighting the critical need for robust and context-sensitive governance (UNESCO, 2021; Wang & Lester, 2023).

While global awareness of GenAI's educational potential is growing, its systematic implementation in K-12 education remains uneven and fragmented. Many education systems currently lack unified policies or clear instructional guidelines specifically aimed at the effective and ethical use of GenAI. Consequently, teachers and schools often need to navigate these complex technologies independently, frequently without adequate training or support (Ayyıldız & Yılmaz, 2023). Additionally, essential ethical considerations such as transparency, accountability, and safeguarding student welfare are often inadequately addressed within national policy frameworks, leading to inconsistencies in standards and practices across different educational contexts (European Commission, 2022; OECD, 2023).

Given these complexities, national education policies play an essential role in guiding how GenAI is integrated into schools. Some countries are proactively developing comprehensive strategies involving significant investment in AI literacy, curriculum innovation, and teacher professional development, while others are adopting a more reactive or fragmented approach. These differences raise crucial questions about how governments can create inclusive, ethically sound, and educationally effective conditions for implementing GenAI in their education systems (World Bank, 2023; Molina et al., 2024).

This paper explores the policy responses to GenAI in K-12 education across four countries: the Czech Republic, Israel, Latvia, and Slovakia. These nations were chosen on the basis of their involvement in the Erasmus+ AI-EmpaTe (*AI-Empowered Teaching: Unlocking the Future of Digital Education for Teachers*) project, their diverse paths in digital education transformation, and the availability of recent strategic documents. Despite differences in technological readiness and policy maturity, these countries share a common aim: to modernise their education systems and

prepare students better for the demands of an increasingly digital society.

This qualitative comparative approach addresses three key research questions:

Q1: How is GenAI conceptualised within national education policy frameworks in the Czech Republic, Israel, Latvia, and Slovakia?

Q2: What strategies are in place to support teacher readiness and student competencies regarding GenAI?

Q3: How do current education policies and practices address equity, infrastructure, and ethical concerns?

Using a qualitative comparative approach, this study examines national AI strategies, curriculum reforms, teacher training frameworks, and relevant institutional reports published from 2020 to 2025. The analysis draws upon the OECD's "AI and the Future of Skills" initiative (OECD, 2021), addressing four main areas: policy orientation and governance; curriculum and student competencies; teacher training and professional development, and ethical, infrastructural, and equity considerations.

The research provides immediate and detailed information about different national approaches to implementing GenAI in educational settings. The research results, along with suggested recommendations, offer useful advice to policymakers and educational leaders and international stakeholders who want to achieve maximum benefits from GenAI while preserving the integrity and equity and effectiveness of public education systems.

2. Literature Review

2.1 GenAI in the K-12 Educational Context

Building on the transformative potential outlined in the introduction, the emergence of GenAI signifies a pivotal advancement in educational technology. Unlike earlier AI applications primarily focused on adaptive learning or administrative automation, generative tools such as ChatGPT, DALL·E, and Claude can produce original textual, visual, and even musical content. These capabilities offer significant opportunities for creativity, personalised learning, and formative assessment while simultaneously introducing complex challenges related to ethics, teacher readiness, and institutional governance (Touretzky et al., 2022). The rapid informal adoption of these technologies by students, teachers, and parents has accelerated urgent discussions on how K-12 education systems should respond (Wang & Lester, 2023).

GenAI is increasingly recognised for its potential to significantly enhance teaching and learning in primary and secondary education. Its applications include automating feedback, enabling differentiated instruction, and fostering inquiry-based and creative learning environments (Ng, Leung, & Chu, 2021; Yao, 2024). For example, large language models such as ChatGPT provide real-time scaffolding for learners, support reflective writing tasks, and simulate interactive dialogues for language

practice. Moreover, recent empirical studies indicate that GenAI can notably increase student engagement and motivation when integrated thoughtfully into classroom activities (Cobo et al., 2024). A recent systematic review by Xiaoyu, Zainuddin, and Hai Leng (2025) provides further empirical grounding, synthesising studies from 2022 to 2024 on GenAI in pedagogy and highlighting key trends, benefits, and limitations in real-world educational settings. Nevertheless, the effectiveness of these tools is highly dependent on their deliberate and pedagogically sound integration into educational practices. Without appropriate alignment with developmental stages and educational objectives, the application of GenAI risks superficial outcomes that may not truly benefit learners (Filo, Rabin, & Mor, 2024).

The formal adoption of GenAI in educational institutions has not yet reached widespread implementation despite increasing interest. The majority of GenAI implementations exist through teacher-led initiatives and experimental pilot programmes. The current lack of national strategies and institutional frameworks demonstrates the necessity for comprehensive guidance to support responsible and effective GenAI deployment in education (UNESCO, 2024; European Commission, 2022). The OECD (2023) and researchers and policymakers agree that GenAI requires both coherent policies and structured frameworks to enable responsible educational applications.

2.2 Emerging Frameworks for AI Literacy

Several international frameworks have emerged to outline the competencies needed to engage with AI critically and creatively. The OECD's "AI and the Future of Skills" initiative identifies key competencies such as data literacy, algorithmic thinking, and ethical awareness, recommending their integration into student learning pathways (OECD, 2021). Complementing these efforts, UNESCO (2024) proposed a comprehensive AI competency framework for students and teachers, advocating inclusive and human-centred approaches that take local educational priorities into consideration.

European frameworks such as Dig-Comp and DigCompEDU provide broad guidance on digital competence, covering aspects such as evaluating digital content, incorporating AI into instructional practices, and promoting digital wellbeing (European Commission, 2020). In line with these efforts, EDUsummIT 2023 emphasises the need for globally informed yet locally responsive strategies that support teacher development, inclusive innovation, and ethical awareness in the use of GenAI in classrooms (Phillips & Fisser, 2023). Building upon these foundations, Tenberga and Daniela (2024) developed a GenAI-specific teacher self-assessment tool designed to help educators evaluate their confidence, ethical reasoning, and pedagogical use of GenAI. This innovative tool, piloted across several Central and Eastern European countries, repre-

sents one of the first regionally tailored frameworks dedicated explicitly to teachers' use of GenAI.

Despite their promise, these frameworks currently vary considerably in terms of their detail and practical applicability. Their implementation in schools often depends on local priorities and external projects rather than systemic curriculum integration. National curricula typically lack clear progression pathways for AI literacy, frequently integrating GenAI within broader digital competencies rather than addressing it explicitly (Ng et al., 2021; Yao, 2024). Thus, stronger alignment between educational policy, curricular development, and professional training for teachers is urgently required.

2.3 Ethical and Equity Considerations

Introducing GenAI into educational settings raises critical ethical and equity-related concerns. Key issues include intellectual authorship, the reliability of AI-generated content, algorithmic bias, and privacy concerns. These challenges are particularly significant in primary and lower secondary education, where students' capacity to assess digital sources critically and differentiate between human- and AI-generated content is still developing (Wang & Lester, 2023). Various institutions, including the European Commission (2022), have developed ethical guidelines; however, these guidelines are inconsistently translated into classroom practices.

Equity remains a significant barrier as schools in rural and economically disadvantaged communities frequently lack sufficient infrastructure and professional development opportunities necessary for the effective adoption of GenAI (OECD, 2023). Teachers' confidence and competencies regarding AI tools also vary widely depending on age, experience, and access to training resources. Matoušek (2025) found that many teachers in the Czech Republic feel inadequately prepared to use basic digital technologies, let alone complex AI systems. Without targeted interventions, the adoption of GenAI risks exacerbating existing educational inequalities rather than mitigating them.

2.4 National Policy Responses and Research Gaps

The rise of GenAI has drawn renewed attention to educational digital transformation, yet only a few countries have established explicit policies guiding its integration into K-12 settings. Israel's Ministry of Education (2025a, 2025b) has notably developed a comprehensive national strategy addressing teacher training, ethical considerations, and curriculum integration (Ben-Israel et al., 2020). Latvia has incorporated GenAI competencies within its broader Skola2030 curriculum reform, aligned with EU digital education goals but without explicitly focusing on GenAI (Ministry of Economics, Latvia, 2020).

Conversely, the Czech Republic and Slovakia have yet to formulate dedicated

national strategies. Both countries are developing their national AI policy for education as part of a broader digital transformation strategy in accordance with EU-wide initiatives. The implementation of GenAI in these countries often relies on university projects, academic community networks, or non-profit organisations such as AI dětem (see aidetem.cz). An important role in setting the strategy for the inclusion of AI in education and school life in the Czech Republic is played by the National Pedagogical Institute (NPI ČR), managed by the Czech Ministry of Education, Youth and Sports (MŠMT). In Slovakia, the main responsibility for the integration of GenAI into education lies with the Ministry of Education, Research, Development and Youth, which governs the National Institute of Education and Youth (NIVAM), responsible for the quality of school educational programmes and the development of methodological materials for the curriculum in Slovakia.

There is also an evident research gap, with limited comparative studies focusing explicitly on GenAI at the K-12 level. Existing research tends to concentrate separately on technical or pedagogical aspects, neglecting the comprehensive policy and governance frameworks essential for systematic implementation (Ayyıldız & Yılmaz, 2023; Molina et al., 2024).

This article addresses this gap by examining how four countries, the Czech Republic, Israel, Latvia, and Slovakia, are approaching the challenges and opportunities associated with the integration of GenAI into their education systems. The insights that are provided contribute to a deeper understanding of what effective, inclusive, and context-sensitive GenAI integration could look like within diverse educational contexts.

3. The Study

This study used a qualitative comparative approach (Steiner-Khamsi, 2024; Pandey, 2025), rooted in recent developments in comparative education research. This approach is well suited to exploring differences and similarities across national contexts while maintaining sensitivity to local policy environments. To operationalise this comparative lens, the study employed systematic document analysis (Blair-Walcott, 2023; Harris & Smith, 2024) as the primary method for data collection and interpretation, consistently with recent methodological syntheses that integrate comparative reasoning with text and content analysis. The analysis focused explicitly on four critical areas: policy orientation, curricular integration, teacher preparedness, and ethical considerations regarding the use of GenAI in primary and secondary education (K-12) in four countries: the Czech Republic, Israel, Latvia, and Slovakia. Although the primary focus was the school sector, references to higher education contexts were included where relevant, particularly regarding teacher training and institutional leadership.

The methodological framework was further informed by established comparative education techniques commonly employed by international organisations

such as the Organisation for Economic Co-operation and Development (OECD) and the European Commission (European Commission, 2022; OECD, 2021). By systematically reviewing policy documents, institutional guidelines, and national strategies, the research aimed to produce contextually relevant insights into how each country is approaching the integration of GenAI in an educationally sound, ethically informed, and practically feasible manner.

3.1 Data Sources and Selection Criteria

The dataset comprised official policy and strategic documents published between 2020 and 2025. The collected sources included policy papers from national ministries of education, national artificial intelligence strategies, digital transformation agendas, curriculum reform frameworks, institutional reports from universities, teacher training guidelines, and relevant academic publications. These materials were either publicly available in English or translated into English within the scope of the Erasmus+ AI-EmpaTe project, ensuring consistency and reliability in interpretation.

To ensure data rigour and relevance, only official documents from government bodies, national authorities, or accredited academic institutions were included. Priority was given to documents explicitly addressing the integration of GenAI, the development of digital competency, teacher education frameworks, or ethical

governance in K-12 education contexts. Documents focused on local-level or pilot initiatives were generally excluded unless they provided significant insights or had implications at a national policy level.

3.2 Analytical Framework

The analytical framework of this study was adapted from the OECD's "AI and the Future of Skills" framework (OECD, 2021) and recent European models on digital education policy (European Commission, 2022). This structured approach enabled a clear comparison of national strategies across four key dimensions:

- **Policy Orientation and Governance:** Examining the strategic priorities, regulatory frameworks, and coordination mechanisms guiding the integration of GenAI in national education systems.
- **Curriculum and Student Competencies:** Analysing how GenAI-related skills, knowledge, and attitudes are embedded within curricula and what learning outcomes are intended for students.
- **Teacher Training and Professional Development:** Investigating the extent and manner in which GenAI is included in pre-service and in-service teacher education programmes.
- **Ethics, Equity, and Infrastructure:** Evaluating how issues such as data privacy, algorithmic fairness, inclusive access, and digital infrastructure are considered within policy documents.

Thematic content analysis was employed, allowing detailed within-case and

cross-case analyses. Each document was reviewed systematically to identify policy narratives, practical implementation strategies, and potential areas of ambiguity or inconsistency. Patterns and unique national approaches were then synthesised into comparative insights.

3.3 Limitations

This research is limited by its reliance on secondary, document-based data, reflecting policy intentions rather than actual implementation or direct educational outcomes. Consequently, the study does not capture the lived experiences of teachers or students interacting with GenAI in classrooms. To address this limitation, future studies should incorporate primary data collection methods such as interviews, surveys, and ethnographic observations, which could validate and extend these findings from practitioner and learner perspectives (Ayyıldız & Yılmaz, 2023; Molina et al., 2024).

Additionally, the scope of the analysis is limited to four countries participating in a European project (the Czech Republic, Israel, Latvia, and Slovakia). Although these countries represent diverse educational and digital readiness contexts, the findings may not be directly generalisable to other international contexts. Nonetheless, this research provides valuable insights and contributes foundational knowledge for subsequent cross-national and longitudinal studies on the integration of GenAI into education.

4. Findings

This section presents the core findings from a comparative policy analysis examining how GenAI is addressed within K-12 education systems in the Czech Republic, Israel, Latvia, and Slovakia. The findings are structured around four key analytical dimensions: **(1) policy orientation and governance, (2) curriculum and student competencies, (3) teacher training and professional development, and (4) ethics, equity, and infrastructure**. Together, these dimensions illustrate both common trends and distinct country-specific approaches.

4.1 Policy Orientation and Governance

Compared to the other countries examined, Israel's approach appears more centralised, as evidenced by the collaboration between national ministries and the publication of a unified strategy in 2025 when Israel's Ministry of Education, in collaboration with the Ministry of Innovation, Science, and Technology, launched a detailed national strategy. This strategy clearly defines implementation stages, aligns closely with global frameworks, and covers essential aspects such as ethical guidelines, the development of infrastructure, and comprehensive teacher training. The centralised governance structure facilitates consistent communication, adequate resources, and effective monitoring, fostering policy coherence and institutional commitment.

Latvia is addressing GenAI within its broader national framework for digital transformation, notably through the Latvian AI Strategy 2020 to 2025 and the Skola2030 curriculum reform. While Latvia lacks a standalone GenAI policy, it is integrating AI-related principles effectively within broader strategic initiatives. The Ministry of Education and Science encourages collaboration across academia, government agencies, and the private sector. Although this horizontal governance approach allows flexibility, it occasionally results in fragmented policy.

The Czech Republic has been preparing for the adoption of artificial intelligence (AI) across diverse areas of public and private life, including industry, trade, the labour market, education, and science. Among the first EU member states to define a national vision for AI, the country adopted the *National Strategy for Artificial Intelligence* in 2019, with the ambition of becoming a model for Europe by combining technological innovation with responsible governance.

This vision was further developed on 24 July 2024, when the government approved the *National Strategy for Artificial Intelligence of the Czech Republic 2030*, created by the Ministry of Industry and Trade (MPO, 2024). The document outlines long-term goals for enhancing competitiveness and addressing not only technological progress but also social, security, and economic impacts. The MPO coordinates AI policy at the national level, supported by other ministries and institutions, including the Office of the Government, the Ministry of Education, Youth and Sports (MŠMT), the Ministry of the Interior, the Ministry of Labour and Social Affairs, the Ministry of Justice, and the Ministry of Foreign Affairs, as well as sectors where AI has direct applications, such as transport, healthcare, and agriculture. Within this framework, the *Committee for Artificial Intelligence*, which operates under the MPO and forms part of the Government Council for the Information Society, was appointed as the leading institution for managing and implementing the strategy.

The integration of AI is also emphasised in several broader strategic documents, including *Digitální Česko*, *Dlouhodobý záměr vzdělávání ČR (2023–2027)*, *Strategie 2030+*, and *Národní strategie kybernetické bezpečnosti ČR* (see NÚKIB, 2020, 2021, and MŠMT, 2020, 2023). Collectively, these initiatives highlight the government's recognition of AI as a cross-cutting priority with implications for education, security, and wider social development.

In the educational sphere, the adoption of AI has largely been driven by local initiatives, university-led projects, and the work of non-profit organisations such as AI dětem. Insights and experiences from these initiatives have shaped curriculum reforms, resulting in the integration of AI-related content into the compulsory subject *Informatics* within the Framework Educational Programme (RVP). Since 1 September 2023, the curriculum has explicitly included AI and GenAI topics, with one of the key expected outcomes articulated as INF-INF-001-ZV9-004:

a student trains a machine learning model and evaluates how well the model works (https://prohlednout.rvp.cz/ovu/inf-inf-001-zv9-004).

To facilitate this process, the NPI ČR, under the authority of the MŠMT, is playing a central role in shaping strategies for AI in schools. Surveys carried out by the NPI ČR and the Czech School Inspectorate (ČŠI) provide insights into how schools are adopting AI, how leaders view its integration, and the interest of teachers in GenAI tools. Together, these efforts illustrate how the Czech Republic is building a systematic and responsible foundation for AI in education.

Slovakia does not possess a dedicated national GenAI strategy. Despite recent curricular reforms within the National Recovery and Resilience Plan, which introduced Informatics from early primary education, GenAI remains largely overlooked at the policy level. Current initiatives related to GenAI are generally small-scale, university-driven, or led by non-profit organisations. This cautious stance is compounded by systemic challenges, such as shortages of specialised educators and limited digital infrastructure. The Minister of Education in Slovakia is proposing a strategic change and wants more active involvement in European initiatives in the field of the development of large language models. Slovakia will host the OECD Global Education Forum in Bratislava at the end of November 2025. The event will include a high-level meeting focused on the role of artificial intelligence in education. According to the minister: "Slovakia will be an active creator of their meaningful use for the benefit of education."

4.2 Curriculum and Student Competencies

Among the four countries examined, Israel has incorporated a structured framework for GenAI-related competencies into its national curriculum. These competencies encompass an understanding of GenAI operations, prompt engineering, ethical decision making, and interdisciplinary applications (Filo, Rabin, & Mor, 2024). Educational platforms such as Albert the Bot and PeTeL actively incorporate GenAI, fostering student engagement and self-efficacy, enhancing practical experience, and contributing to improved academic achievement (Aviran & Blonder, 2023).

Latvia has adopted a cross-curricular approach through the Skola2030 reform, aiming to embed AI and GenAI principles within broader competency frameworks. While AI is not being introduced as a standalone subject, policy efforts focus on increasing awareness and promoting integration across disciplines. However, the systematic use of tools such as ChatGPT in classroom practice remains limited, and progression standards for AI-related competencies across grade levels are still under development (European Commission, 2021; Kalnina, Nimante, & Baranova, 2024).

As part of a major national curricular revision, the Czech Republic has updated

the curriculum for all levels of education with an emphasis on the development of digital competence and the inclusion of the compulsory subject Informatics. An AI curriculum has been included in the secondary education curriculum, but explicit integration of GenAI is limited. Some schools are implementing pilot teaching plans focused on basic AI concepts, typically through elective activities or extracurricular projects. Involvement at the grassroots level is not yet great; teaching materials are provided mainly by initiatives such as AI dětem. However, NPI (2023) has issued recommendations addressed to school management, teachers, and pupils on how to use GenAI for learning purposes (see Digitalizace ve vzdělávání, n.d.; NPI, 2024).

Slovakia has incorporated basic digital literacy and computational thinking into its curriculum starting from primary education, though GenAI remains peripheral. References to AI predominantly appear in elective courses such as robotics and programming at upper secondary levels, and a structured, national-level competency framework is lacking. The government is considering the inclusion of generative AI (GenAI) in K-12 education as a transformative tool for personalised and innovative learning. Initiatives under review aim to pilot GenAI technologies in classrooms to support individualised learning experiences, creative problem-solving, and enhanced engagement. In these pilot projects, emphasis is placed on addressing ethical concerns, data privacy, and adapting teaching methods to leverage GenAI without disrupting traditional educational frameworks.

4.3 Teacher Training and Professional Development

Israel offers a robust professional development environment for teachers regarding GenAI. The "Academia 360" initiative mandates digital competencies across all academic tracks and study programmes, including all teacher education programmes, incorporating GenAI extensively into both undergraduate and post-graduate curricula. The Ministry of Education also supports ongoing professional development through webinars, online resources, and dedicated training hubs, focusing on ethical AI usage, prompt engineering, and digital literacy.

Latvia has integrated GenAI training into pre-service teacher education programmes at institutions such as the University of Latvia and Riga Technical University. Professional development for practising teachers is available through workshops under national digitisation initiatives, emphasising ethical usage, inclusivity, and critical reflection on AI.

Under programmes of teacher professional development, workshops, webinars, or seminars focused on GenAI for practising Czech teachers are available through courses managed by the NPI ČR and organised by regional training centres, faculties of education, or technical universities or local initiatives, and mainly by AIdetem.cz or Aignos. However, the absence of a national framework and the

high level of autonomy of schools has led to significant variability in teacher preparedness, particularly among older teachers or those in rural areas. The inclusion of Informatics as a compulsory subject in the school curriculum required faculties of education to pay great attention to the content (including GenAI) and methodological preparation of all pre-service and in-service teachers (including primary education teachers).

Slovakia faces systemic challenges in developing teacher expertise, with chronic shortages of qualified Computer Science teachers. Universities that educate pre-service teachers of computer science have implemented courses focused on educational methodologies using GenAI. Some of them, together with teacher training organisations in Slovakia, provide free training for teachers on using GenAI in teaching. From another subject point of view, limited electives on AI are available at universities; professional development opportunities remain sparse, though pilot initiatives led by NGOs occasionally fill this gap (Panáčková & Barčiaková, 2024).

These country-specific experiences echo broader international recommendations that stress the importance of coordinated policy-backed teacher professional development for the meaningful integration of AI into education (Phillips & Fisser, 2023).

4.4 Ethics, Equity, and Infrastructure

Israel has developed the most comprehensive ethical guidelines among the four countries. These guidelines detail age-appropriate use, parental consent, and teacher responsibilities, emphasising fairness, transparency, and reflective practice (Ministry of Education, Israel, 2025b).

Latvia aligns with European Union ethical standards, particularly GDPR compliance, algorithmic accountability, and inclusivity (Ministry of Economics, Latvia, 2020). Implementation, however, varies considerably between urban and rural areas.

Czech schools do have a number of recommendations and guidelines for using GenAI in schools developed by NPI (see in Resources); however, we must state that the Czech Republic lacks specific ethical guidelines for GenAI, relying on broader digital competencies frameworks that encourage the responsible use of technology. Schools often interpret and implement these guidelines independently, lacking centralised support to manage algorithmic bias or data privacy issues effectively.

Slovakia also lacks GenAI-specific ethical protocols for using GenAI. Infrastructure disparities exacerbate equity issues further, with rural schools often facing challenges in digital access and stable connectivity.

Overall, infrastructure disparities have a significant influence on the scalability and equitable adoption of GenAI. Israel and Latvia have invested extensively in national-level digital infrastructures such as AI platforms and analytics systems, while the Czech Republic and Slovakia rely heavily on regional and external funding, resulting in inconsistent readiness and access.

5. Discussion

This study has examined how four national education systems (the Czech Republic, Israel, Latvia, and Slovakia) are responding to the rise of GenAI in the K-12 sector. The findings indicate that, while GenAI is increasingly recognised as a transformative force, the strategic, curricular, and ethical responses to its integration vary widely. This discussion reflects on the significance of these differences and synthesises implications across four key areas: (1) policy orientation and governance, (2) curriculum and student competencies, (3) teacher training and professional development, and (4) ethics, equity, and infrastructure.

5.1 Policy Orientation and Governance

The contrast in national responses to GenAI reveals a spectrum of policy maturity. Israel's approach stands out for its strategic clarity and institutional coherence. The development of a dedicated national GenAI policy, embedded within broader digital transformation agendas and supported by inter-ministerial coordination, reflects a proactive stance. This aligns with research indicating that centralised strategies tend to facilitate more consistent implementation and clearer accountability structures (OECD, 2021; UNESCO, 2024). Latvia similarly demonstrates strategic alignment, albeit through integration with EU-level frameworks rather than a standalone GenAI

policy. The Skola2030 initiative exemplifies how cross-curricular innovation can be used to operationalise AI-related competencies without overburdening the existing curriculum.

In contrast, the Czech Republic and Slovakia illustrate the limitations of decentralised or underdeveloped policy environments. Without national-level GenAI strategies, these systems risk fragmentation and an ever-growing gap between schools and scholars, relying heavily on individual institutions or NGO-led initiatives. While such grassroots innovation can yield promising results, it may exacerbate regional disparities and limit scalability. Moreover, the absence of clear policy direction may leave educators without the necessary support to engage critically and productively with GenAI technologies (Matoušek, 2025; Panáčková & Barčiaková, 2024).

These findings emphasise the importance of national leadership in orchestrating coherent responses to emerging technologies. Countries that provide specific and actionable policy guidance on GenAI, including the curriculum, ethics, infrastructure, and teacher training, are better positioned to harness its benefits and mitigate the associated risks.

5.2 Curriculum Innovation and Student Competencies

Curricular integration of GenAI is another area marked by significant divergence. Israel's structured competency framework, which maps GenAI-related skills across grade levels, provides a valua-

ble model. It demonstrates how AI literacy can be conceptualised not only as technical proficiency but also as a combination of critical thinking, ethical awareness, and cross-disciplinary understanding (Filo et al., 2024). This resonates with the emerging consensus on the need to move beyond purely functional digital skills towards more holistic conceptions of AI competence (Ng et al., 2021; Wang & Lester, 2023).

Latvia's approach through Skola2030 also offers useful insights. By embedding GenAI tools into multiple subject areas and encouraging students to evaluate and reflect on AI-generated content, Latvia promotes a pedagogically integrated model that emphasises digital agency. However, the lack of standardised progression models means that learning outcomes may vary across schools and year levels.

The Czech Republic and Slovakia have not established specific learning paths for GenAI. The educational community shows increasing awareness about AI's educational value but current initiatives focus on Informatics education or project-based experimentation. The lack of national benchmarks and progression models has resulted in inconsistent exposure to GenAI, which mainly occurs in digitally advanced schools.

The research findings demonstrate that curriculum developers must develop GenAI literacy through developmental frameworks. The development of GenAI-related skills should follow a developmental approach through age-specific learning outcomes which should be progressively introduced throughout the schooling period. The successful implementation of such a curriculum depends almost entirely on teacher expertise and professional abilities to integrate GenAI effectively into their teaching methods. The absence of a proper structure and teacher capacity development creates a risk that GenAI will be introduced through superficial methods which fail to match learners' developmental needs.

5.3 Teacher Capacity and Professional Development

A consistent theme across all four countries is the centrality of teacher preparedness to the successful integration of GenAI. This aligns with existing literature showing that educator confidence, knowledge, and beliefs are critical to the adoption of any technology in classrooms (Ng et al., 2021; OECD, 2023). Israel and Latvia are leading efforts to embed GenAI into both pre-service and in-service teacher training. Israel's "Academia 360" initiative and Latvia's teacher education programmes at the University of Latvia exemplify national-level support structures that go beyond isolated training modules to embed GenAI within broader pedagogical development.

In the Czech Republic and Slovakia, however, the picture is more uneven. While some faculties of education and initiatives are introducing GenAI-focused workshops or elective modules, there is no national co-ordination or expectation that teacher education programmes should address these topics. This leads to variability

in teacher confidence and competence and a lack of conviction among teachers about the need to address GenAI in school education, particularly in regions where access to professional development is limited.

The Slovak case also illustrates how systemic barriers, such as the acute shortage of Informatics teachers, can hinder the scaling of AI-related education. With only a small percentage of teacher graduates specialising in digital fields, the burden of integrating GenAI falls on an already overstretched workforce.

These disparities point to the need for a reimagining of teacher education. GenAI should not be treated as a specialised skill confined to Informatics teachers, but rather as a core pedagogical concern that is relevant across disciplines. Teacher education programmes should include exposure to GenAI tools, frameworks for ethical use, and strategies for classroom integration. National policies must also ensure that rural and under-resourced schools receive targeted support to avoid entrenching existing inequities.

5.4 Ethics, Equity, and Infrastructure

Perhaps the most challenging dimension of GenAI integration is ensuring ethical and equitable implementation. While all four countries acknowledge the importance of ethical considerations, their responses vary significantly. Israel's age-based guidelines, consent protocols, and focus on reflective practice stand as a rare example of comprehensive ethical governance. Latvia also aligns with EU ethical standards, though implementation varies regionally. By contrast, the Czech Republic and Slovakia have yet to develop specific ethical guidelines for the use of GenAI in schools. Teachers are left to interpret ethical principles independently, a situation that can lead to confusion, risk-averse behaviours, or inconsistent practices.

The issue of equity is similarly multi-faceted. Israel and Latvia have invested in national infrastructure to support GenAI integration, including teacher dashboards, AI labs, and adaptive learning platforms. Meanwhile, the Czech Republic and Slovakia rely more heavily on regional funding and international projects or local initiatives, resulting in considerable disparities in access. Without national investment in digital infrastructure and teacher support, GenAI is likely to worsen existing educational inequalities rather than reduce them (OECD, 2023; Yao, 2024).

These findings suggest that national GenAI strategies should adopt a holistic lens that includes infrastructure development, ethical safeguards, and inclusion-oriented design. Simply introducing GenAI tools into classrooms without addressing these systemic conditions risks superficial adoption and potential harm.

6. Conclusion

Education systems across the world are facing both opportunities and challenges as a result of the emergence of GenAI. The comparative analysis shows that the Czech Republic, together with Israel,

Latvia, and Slovakia, recognises the importance of GenAI in K-12 education; however, their policy approaches differ in scope, ambition, and coherence.

Israel demonstrates a centralised structure through which GenAI is integrated across the educational curriculum, teacher education and training, and ethical governance systems. The Latvian model illustrates how GenAI is becoming part of broader EU digital strategies through cross-sectoral alignment. In contrast, the adoption of GenAI in the Czech Republic and Slovakia faces challenges, as their governance remains fragmented and innovation occurs mainly through local initiatives supported by external funding. The analysis yields four essential recommendations for future action.

First, each country should develop GenAI-specific national strategies that align with its educational reform plans, combining clear policy objectives, ethical standards, and detailed implementation schedules. Second, GenAI literacy should be embedded in the curriculum through specific learning outcomes for different age groups and the continuous development of AI literacy across multiple subjects. Third, education systems should invest in comprehensive teacher education programmes that include the integration of GenAI into both pre-service teacher education and ongoing professional teacher development, with a particular focus on equitable access and support. Fourth, implementation should prioritise ethical and equitable practices through clear usage guidelines, robust data protection protocols, and targeted infrastructure support for under-resourced schools.

As GenAI technologies continue to evolve, education systems should shift from experimental phases to permanent, system-wide integration. The successful adoption of GenAI requires technological preparedness, ethical and pedagogical clarity, teacher understanding of the values and risks associated with GenAI, and sustained policy support. Countries that develop inclusive, human-centred GenAI education strategies will be better positioned to transform this progressive technology into a powerful tool for classroom equity, teacher and student empowerment, and educational innovation.

REFERENCES

AI dětem. (n.d.). *Artificial Intelligence Curriculum.* https://kurikulum.aidetem.cz/en.

Aviran, E., & Blonder, R. (2023). The influence of learning with an online, personalized environment on students' attitudes, beliefs, and outcomes. *Journal of Science Education, 32(*5), 722–742.

Ayyıldız, P., & Yılmaz, A. (2023). A New Chapter is Being Written About Writing Instruction: Instructional Leadership at K-12 Levels in The Age of Artificial Intelligence (AI). *Educational Policy Analysis and Strategic Research, 18*(4), 82–101.

Ben-Israel, I., et al. (2020). *The national strategy for artificial intelligence in Israel*. Government of Israel. https://www.gov.il

Blair-Walcott, K. (2023). Comparative analysis. In J. M. Okoko, S. Tunison, & K. D. Walker (Eds.), *Varieties of Qualitative Research Methods* (pp. 79–84). Springer.

Cobo, C., Munoz-Najar, A., & Bertrand, M. (2024). *100 student voices on AI and education*. World Bank Publications. Brief No. 3. World Bank. http://hdl.handle.net/10986/42579

ČAUI. (2024). *Schváleno! Toto je Národní strategie umělé inteligence České republiky 2030 (NAIS).* Česká asociace umělé inteligence. https://asociace.ai/, https://asociace.ai/schvaleno-toto-je-narodni-strategie-umele-inteligence-ceske-republiky-2030-nais/

Digitalizace ve vzdělávání. https://digitalizace.rvp.cz/ke-stazeni#doporuceni-pro-ai

Digitální Česko. https://digitalnicesko.gov.cz/

European Commission. (2020). *Digital Education Action Plan 2021–2027: Resetting education and training for the digital age*. Publications Office of the European Union. https://education.ec.europa.eu/focus-topics/digital-education/action-plan

European Commission. (2021). *AI Watch: National strategies on Artificial Intelligence – A European perspective: 2021 edition – Latvia country report*. Publications Office of the European Union. https://ai-watch.ec.europa.eu/countries/latvia-0/latvia-ai-strategy-report_en

European Commission. (2022). *Ethical guidelines on the use of artificial intelligence and data in teaching and learning for educators*. Publications Office of the European Union. https://education.ec.europa.eu/news/ethical-guidelines-on-the-use-of-artificial-intelligence-and-data-in-teaching-and-learning-for-educators

Filo, Y., Rabin, E., & Mor, Y. (2024). An artificial intelligence competency framework for teachers and students: Co-created with teachers. *European Journal of Open, Distance and E-Learning, 26*(S1), 93–106.

Harris, K., & Smith, T. (2024). Qualitative comparative analysis and content analysis. In D. Kaczynski, M. Salmona, & T. Smith (Eds.), *How to conduct qualitative research in finance* (pp. 97–106). Edward Elgar Publishing.

Kalnina, D., Nimante, D., & Baranova, S. (2024). Artificial intelligence for higher education: Benefits and challenges for pre-service teachers. *Frontiers in Education, 9*, 1501819.

Matoušek, R. (2025). *Most teachers are prepared to develop students' digital competencies in teaching*. Digitalizace RVP (23. 1. 2025). https://digitalizace.rvp.cz/clanky/vetsina-ucitelu-je-na-rozvoj-digikompetenci-zaku-pripravena

Ministry of Economics of the Republic of Latvia. (2020). *Latvian National Artificial Intelligence Strategy 2020–2025*. https://www.em.gov.lv

Ministry of Education, Israel. (2025a). *Education in the Age of Artificial Intelligence – The Strategic Plan*. https://ai.education.gov.il/lobby/

Ministry of Education, Israel. (2025b). *Guidelines for using AI tools in the education system*. https://meyda.education.gov.il/files/Pop/0files/lemida-metukshevet/AI/Guidelines.pdf

Molina, E., Cobo, C., Pineda, J., & Rovner, H. (2024). *AI revolution in education: What you need to know* (Digital Innovations in Education Brief No. 1). World Bank. http://hdl.handle.net/10986/41806

MPO. (2024). *Národní strategie umělé inteligence ČR 2030*. Ministry of Industry and Trade. https://asociace.ai/wp-content/uploads/2024/07/AI_strategie.pdf

MŠMT. (2020). *Strategie vzdělávací politiky ČR do roku 2030+*. Ministry od Education, Youth, and Sports. https://msmt.gov.cz/uploads/brozura_S2030_en_fin_online.pdf

MŠMT. (2023). *Dlouhodobý záměr vzdělávání ČR (2023–2027)*. https://msmt.gov.cz/file/61987/

Ng, W., Leung, C., & Chu, S. K. W. (2021). Conceptualizing AI literacy: An exploratory review. *Discover Education, 2*(1), 100041.

NPI. (2023). *Tisková zpráva. Národní pedagogický institut České republiky vydal doporučení školám, jak pracovat s umělou inteligencí*. National Pedagogical Institute of the Czech Republic. https://www.npi.cz/images/tiskove_zpravy/umela_inteligence.pdf

NPI. (2024). *Umělá intelligence ve výuce. Nejčastější otázky a odpovědi o generativní AI*. National Pedagogical Institute of the Czech Republic. https://digitalizace.rvp.cz/files/7200-faq-ai-umela-inteligence-ve-vyuce-web.pdf

NPI. *FAQ – Frequently Asked Questions on Generative AI*. National Pedagogical Institute of the Czech Republic. https://digitalizace.rvp.cz/napric-predmety/ai/faq-umela-inteligence

NÚKIB. (2020). *The National Cyber Security Strategy of the Czech Republic*. National Cyber and Information Security Agency (NÚKIB). https://mozaika-ur.cz/cz/metodiky/narodni-strategie-kyberneticke-bezpecnosti-cr-2021-2025

NÚKIB. (2021). *Action plan for the national cybersecurity strategy of the Czech Republic from 2021 to 2025*. National Cyber and Information Security Agency (NÚKIB). https://nukib.gov.cz/download/publications_en/strategy_action_plan/NSKB-AP_ENG.pdf

OECD. (2021). *AI and the Future of Skills, Volume 1: Capabilities and Assessments, Educational Research and Innovation*. OECD Publishing.

OECD. (2023). *Education at a glance 2023: OECD indicators*. OECD Publishing.

Panáčková, R., & Barčiaková, R. (2024). *Report on the implementation of the international ICILS 2023 study*. National Institute for Education and Youth. https://www2.nucem.sk/dl/5988/Správa%20ICILS%202023_final.pdf

Pandey, M. P. (2025). Innovative research methods in comparative education. *Prospects, 55*(1), 101–118.

Phillips, M., & Fisser, P. (Eds.). (2023). *Moving forward to new educational realities in the digital era: Report of EDUsummIT 2023*. EDUsummIT. https://bridges.monash.edu/articles/report/EDUsummiT_2023_-_eBook/24978531

Steiner-Khamsi, G. (2024). Qualitative comparative policy studies. *Journal of Comparative Policy Analysis: Research and Practice, 26*(1), 1–7.

Tenberga, I., & Daniela, L. (2024). Artificial intelligence literacy competencies for teachers through self-assessment tools. *Sustainability, 16* (23), 10386.

Touretzky, D. S., Gardner-McCune, C., & Seehorn, D. (2022). Machine learning and the five big ideas in AI. *International Journal of Artificial Intelligence in Education*.

UNESCO. (2021). *AI and education: Guidance for policy-makers*. UNESCO Publishing. https://www.unesco.org/en/articles/ai-and-education-guidance-policy-makers

UNESCO. (2024). *AI and education: Guidance for policy-makers*. UNESCO Publishing. https://unesdoc.unesco.org/ark:/48223/pf0000386697

Wang, N., & Lester, J. (2023). K-12 education in the age of AI: A call to action for K-12 AI literacy. *International Journal of Artificial Intelligence in Education, 33*, 228–232.

World Bank. (2023). *Making teacher policy work*. World Bank. http://hdl.handle.net/10986/40579

Xiaoyu, W., Zainuddin, Z., & Hai Leng, C. (2025). Generative artificial intelligence in pedagogical practices: a systematic review of empirical studies (2022–2024). *Cogent Education*, *12*(1).

Yao, J. (2024). *The application of generative artificial intelligence in education: Potential, challenges, and strategies*. SHS Web of Conferences, 200, Article 02008.

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ČERNOCHOVÁ, M., SELCUK, H., COHEN, A., VOŠTINÁR, P., COHEN, G., YAAKOV AZARIA, A., JEŘÁBEK, T., BENEŠ, M., ŠKRINÁROVÁ, J. Generativní umělá inteligence (GenAI) ve vzdělávání od mateřské školy po střední školu z pohledu národních politik a strategií v České republice, Izraeli, Lotyšsku a na Slovensku

Vzdělávací prostředí od předškolního stupně až po střední školy (K-12) prochází změnami kvůli nastupujícímu vlivu generativní umělé inteligence (GenAI). Tyto nástroje akcelerují změny ve vzdělávání prostřednictvím personalizovaných vzdělávacích zkušeností, zefektivnění pracovních postupů učitelů a modernizace a aktualizace kurikula, v důsledku čehož dochází mezi učiteli, vzdělavateli a tvůrci politik ke zpochybňování dosud používaných vzdělávacích metod pro vzdělávání v digitálním věku. Nečekaně rychlé přijetí těchto technologií studenty, učiteli a rodiči vyvolalo naléhavou potřebu diskutovat o tom, jak by měly vzdělávací systémy K-12 reagovat. Smysluplná integrace GenAI do K-12 vyžaduje více než jen technologickou připravenost, ale také a především soudržné národní politiky, kvalitně vzdělané učitele, aplikování etických principů a spravedlivý přístup k digitální infrastruktuře. Tato studie zkoumá, jak na tyto požadavky reagují čtyři země, konkrétně Česká republika, Izrael, Lotyšsko a Slovensko. Prostřednictvím kvalitativního srovnávacího přístupu autoři článku identifikují společné směry, výzvy specifické pro jednotlivé země a nově vznikající příležitosti. Zjištění ukazují na různé úrovně připravenosti a koordinace a nabízejí praktické poznatky pro tvůrce politik, učitele a zúčastněné strany, které pracují na podpoře odpovědného a inkluzivního přijetí GenAI ve vzdělávací praxi na školách.

Klíčová slova: generativní umělá inteligence, K-12, vzdělávací politika, rámec pro AI gramotnost, kurikulum, příprava a vzdělávání učitelů