

AI in and for K-12 Informatics Education. Life after Generative AI.

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Abstract

The use and adoption of Generative AI (GenAI) has revolutionised various sectors, including computing education. However, this narrow focus comes at a cost to the wider AI in and for educational research. This working group aims to explore current trends and explore multiple sources of information to identify areas of AI research in K-12 informatics education that are being underserved but needed in the post-GenAI AI era. Our research focuses on three areas: curriculum, teacher-professional learning and policy. The denouement of this aims to identify trends and shortfalls for AI in and for K-12 informatics education. We will systematically review the current literature to identify themes and emerging trends in AI education at K-12. This will be done under two facets, curricula and teacher-professional learning. In addition, we will conduct interviews and surveys with educators and AI experts. Next, we will examine the current policy (such as the European AI Act, and European Commission guidelines on the use of AI and data in education and training as well as international counterparts). Policies are often developed by both educators and experts in the domain, thus providing a source of topics or areas that may be added to our findings. Finally, by synthesising insights from educators, AI experts, and policymakers, as well as the literature and policy, our working group seeks to highlight possible future trends and shortfalls.

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CCS Concepts

• **Computing methodologies** → **Artificial intelligence**; • **Social and professional topics** → **K-12 education**.

Keywords

AI, GenAI, Generative AI, K-12, Informatics, Curricula

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1 Background and Related Work

The research in and around generative AI and specifically large language models has exploded in recent years. This is in the most part due to the work of Open AI's GPT (General Pretrained Transformers), based on the architecture first published in 2017 [16]. An early paper on the use of Generative AI (GenAI) that first appeared in informatics education research was in 2022, based on CODEX (early programming trained GPT from Open AI) [7]. In 2023 and 2024 ITiCSE working groups followed, documenting the state-of-the-art for code generation LLMs in computing education, current opportunities and challenges related to their use, and presented actionable approaches to integrating them into computing courses and curricula [13, 14]. In parallel, the ACM/IEEE CS2023 released its new curricula and had generative AI as a curricula practices publication [2]. All of this highlights the starting point and surge of GenAI in informatics education. There has been some work on the use of GenAI in the K-12 space, for example in assessments

(in particular state examinations) [10]. However many of these publications either focus on teaching “traditional AI or ML” in the second level [8] or using tools like generative AI [12]. While this may cover some future areas, work in seeing the bigger picture of the future of AI in education is lacking.

From the authors’ point of view, one of the most foundational AI in K-12 education papers is “CT 2.0” [15]. In this paper, CT (Computational Thinking) is defined as accommodating the new ways of thinking associated with new technologies, such as Machine Learning and GenAI. There is some research emerging from the CT 2.0 area [5], however, overall it is very light at present. The authors believe that if GenAI did not take the main stage in the way that it did, these other crucial and fundamental areas of research may not be as underserved as they are currently.

2 Goals of the Proposed Work

This working group has four goals:

- (1) Conduct a systematic literature review (SLR) to identify current themes and trends in the literature on AI in and for K-12 informatics education (curriculum and teacher professional learning).
- (2) Conduct interviews and surveys with educators, AI experts and policymakers to support the first goal.
- (3) Examine current international policy and guidelines to further support the themes and trends (to identify any possible missing areas of research and practice).
- (4) Synthesise the insights identified to highlight AI K-12 informatics future trends and shortfalls that need research and practice.

3 Proposed methodology

Following on from previous working groups’ systematic literature reviews [6], the Kitchenham methodology and lessons learned from implementing it will be adopted [4]. This will be the methodology applied to identify the literature and then thematic content analysis (TCA) will be applied to identify the themes from the literature [11] as well as inter-rater reliability to investigate the rater agreement [9]. To identify emerging trends, the process adopted by Becker and Quille for SIGCSE CS1 paper trend analysis will be applied [3]. To conduct the interviews we will use semi-structured interviews [1] to identify themes and suggested future trends. Finally, a review of international policy and guidelines will be conducted, and then this will be synthesised to support or not, the trends and themes identified earlier.

4 Expected deliverables

In tradition with SIGCSE related working groups, the deliverables will be an extended abstract and working group paper. The research has three deliverables in the final working group report.

- (1) The first deliverable will be the **Systematic Literature Review**. For transparency, all of the files used in the SLR will be accessible online in a cloud folder (e.g., via OSF). This will allow any researchers to further validate the report.
- (2) The second deliverable will be a **summary of findings from interviews and surveys with educators, AI experts and policymakers**. It is expected to provide insights into the current AI usage practice in K-12 education.
- (3) The third deliverable will be a synthesis of the **main aspects from current international policy and guidelines**. This summary will be helpful for any researchers and educators interested in employing AI for K-12 education.

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