

Primary and Secondary AI Education: Preparing Children for the Future

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*“Nobody phrases it this way, but I think that artificial intelligence is almost a humanities discipline. It’s really an attempt to understand human intelligence and human cognition.”
-Sebastian Thrun*

AS A RESULT of the expedited advancement and expanded application of artificial intelligence (AI) technology, its social and economic impacts become increasingly significant. AI is often counted as one of the major technologies in the “Fourth Industrial Revolution” (Wong et al., 2020), which is reshaping the structure and demands of the future labor markets. AI literacy, alongside reading and mathematical skills, constitutes one of the core 21st century competencies (Steinbauer et al., 2021). Hence, it is essential to integrate AI education into the primary and secondary curricula.

Despite the wide recognition of the imperativeness of including AI education in the school curriculum, there are concerns from the research community about the readiness of the K-12 education systems for running AI courses. Wang and Lester (2023) argue that there is a lack of robust empirical research evidence for the development and implementation of AI curricula at the basic education level, causing issues like the unmet AI training needs of the students, unscientific teaching methods, and immature evaluation standards. While basic AI education can possibly draw on lessons from tertiary AI education, Wong et al. (2020) note that K-12 schools cannot simply borrow the AI training approaches used in higher education. Particularly, for delivering AI education in lower graders with few to no programming experiences, the teachers and schools need to explore applicable teaching methods and select appropriate instructional content.

Primary and secondary AI education is still in its infancy, facing many challenges such as a lack of explicit curriculum standards, fragmentary teaching content, disparities in teaching resource access, and shortages of AI teaching staff. To address these issues, researchers have conducted explorations from various perspectives. For instance, using the ethnographic techniques, Dai et al. (2023) focus on analyzing external factors influencing the teachers’ efforts in AI curriculum development and their reactions to these factors. The study provides valuable insights into AI curriculum development and teaching

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staff training. Levchenko et al. (2023) empirically investigated the strategies for integrating AI education into existing school curricula. They emphasized that AI classes should be designed to cater to students' needs at specific education phases and relate to other subjects such as mathematics and science education. Game-based learning, project-based learning, and instructional scaffolding are among the pedagogical approaches proven to be effective for AI training. Also, the study proposes enhancing the teachers' AI education competence through professional training.

What to Teacher and How to Teacher: Artificial Intelligence Education in Primary and Secondary Schools in this issue is a review of training objectives, curriculum content, pedagogical approaches, teaching tools in current primary and secondary AI education (Xia, 2025). Nevertheless, a pronounced limitation of the study is the absence of investigation of evaluation and assessment mechanisms for basic AI curricula. Still, the study provides valuable implications for popularizing AI education in primary and secondary schools.

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