Teaching AI in Schools

Position Paper

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Executive Summary

Artificial Intelligence (AI) is transforming everyday life. In response to the increasing pressures of its impact, governments are exploring the introduction of AI in schools. This position paper argues that, while AI awareness and AI literacy are necessary, the premature introduction of technical AI content such as machine learning models —particularly for younger children—is pedagogically unsound and may undermine more essential educational goals. It is worth emphasizing that there isn't a universally accepted notion of "AI literacy" yet. In this document, we use it broadly to mean skill sets needed to use AI tools for various tasks, while being cognizant of their limitations.

This note seeks to address two key questions: (1) Should we teach AI as part of the school curriculum? (Our answer: Yes, but with a limited focus.) (2) What should the AI curriculum in schools focus on? (Our answer: Developing the ability of students to make effective and responsible use of AI tools. We explicitly argue against teaching the technical internals of AI in school.) This note does not address questions related to the use of AI tools in classrooms -- these are addressed in a separate note.

Our recommendations are deliberately cautious. Educational research recommends that the introduction of new subjects in schools should be gradual, age-appropriate, and grounded in ethics, and that too only after adequate teacher capacity-building. Frameworks and policy initiatives in countries such as the United States, Singapore, the United Kingdom, Australia, and China emphasize responsible AI literacy rather than early technical specialization. Global guidance also stresses the importance of prerequisite skills such as literacy, numeracy, digital literacy, computational thinking, communication, and ethical reasoning. With regards to disruptive technologies such as AI, India's National Education Policy (NEP2020) is clear that the emphasis as the school level should be on raising awareness and understanding the impact that these technologies have on society:

In contrast, the policy direction set by CBSE has been more ambitious. AI has already been introduced by CBSE as a skill subject in secondary school, and their national curriculum is moving toward introducing AI from Class 3 onward. Their stated objective is to develop computational thinking, problem-solving, and an understanding of AI in daily life. However, the current curricular ambitions are not in sync with children's developmental readiness and with the implementation challenges on the ground. Concepts such as machine learning, classification, and data-driven prediction will place an additional cognitive burden on children who are still developing basic competencies in mathematics, reasoning, and language.

A key concern is that early technical introduction to AI may come at the cost of reading, logical reasoning, problem-solving ability, creativity, and a grounding in the arts, sciences, and social sciences. These cannot be bypassed in the name of technological readiness; they are precisely what will enable future citizens to use AI wisely, critically, and productively. Children do not need mastery over AI's internal mechanics in order to succeed in an AI-impacted world. They need the judgment to question outputs, the maturity to understand risks, and the intellectual depth to effectively use technology.

School-level AI adoption has practical risks too. AI tools can hallucinate, generate incorrect reasoning, and encourage cognitive offloading by supplying answers too easily. This will weaken independent thinking and reduce the sustained effort necessary for real learning. AI also disrupts conventional assessment, making it increasingly difficult to judge originality and student mastery through assignments completed outside the classroom. These concerns are especially significant for younger learners, who may anthropomorphize AI systems and trust them uncritically. This note does not offer an opinion on AI-adoption, it is instead a point of view on the teaching of AI as a subject.

Implementation evidence from Indian schools also reinforces the need for caution. Although CBSE envisions AI as a practical, project-based skill subject, schools often lack the timetable space, teacher preparation, infrastructure, and assessment clarity required to deliver it effectively. AI is frequently allotted fewer periods than recommended, taught by existing computer science or ICT teachers without sufficient specialized preparation, and assessed in inconsistent ways. As a result, it risks becoming theory-heavy, exam-led, and marks-oriented rather than meaningful and understanding-based.

The position paper therefore recommends a more cautious and developmentally appropriate path. It argues that AI should not be taught as a technical subject up to Standard 8. Instead, schools should focus on foundational learning, computational thinking, ethics in the presence of AI, and carefully monitored AI literacy. Technical depth should be introduced only at later stages and only after proper teacher preparation, curricular clarity, and pedagogical alignment.

The message is clear: the best preparation for an AI-driven future is not early technical specialization, but stronger foundations in human reasoning, subject knowledge, and ethical judgment. Education policy should therefore resist the desire to universalize technical AI instruction in schools and instead prioritize the conditions under which children can grow into capable, critical, and responsible users of AI.

Introduction

Artificial Intelligence (AI) has quickly become the defining technology of our time, disrupting work cultures across professions. A lot of routine software can now be written using AI tools. In addition, AI has already had a huge impact on diverse areas ranging from creative content to advanced scientific research. In 2024, the Nobel Prize in Chemistry was awarded to an AI solution for the protein folding problem.

In this document our primary concern is the extent to which AI should be included in the school curriculum. Surveys indicate that a large number of students in middle school and high school and teachers make extensive use of AI tools. This use of AI tools has its own set of .problmes including halucinations, bias and lack of context and variety and therefore should be done with caution. However, this not is not about the use of AI tools and its benefits and harms. Instead this note presents a point of view on the teaching of AI and its internals.

This note argues that the current rush to introduce AI into school education is premature and educationally unsound. Children do need to become aware of AI, its uses, and its risks, but this is very different from making them study its technical internals before they are developmentally ready. The first duty of schooling is to build the foundations of thought: reading with understanding, reasoning clearly, solving problems independently, and exercising judgment. If these foundations are weakened, early exposure to AI will not prepare children for the future; it will leave them more dependent on tools they do not fully understand. AI may have a place in education, but only in ways that are age-appropriate, pedagogically justified, and subordinate to the larger goal of human intellectual development.

The remainder of this note is organised as follows. We first introduce the authors and their experience that informs this position. We then examine current approaches to teaching AI in schools, both globally and in India. This is followed by a detailed argument against the early introduction of AI in schools, culminating in a clear statement of our position. We conclude by presenting perspectives from individuals involved in running schools, in order to ground the discussion in practical experience and institutional realities

About the Authors

The authors of this note bring together deep and relevant experience from both academia and industry. Professors Hari Sahasrabuddhe, P. J. Narayanan, Ramanujam, Madhavan, Supratik, and Viraj have spent decades teaching Computer Science at some of India's foremost universities. Venkatesh and Vipul add to this several years of leadership and practical experience in the information technology industry. Several of the authors have served on the ACM India Council, and some have held key leadership positions as Presidents of ACM India and Chairs of the ACM India Education Committee. ACM is the world's largest educational and scientific computing society.

The authors have also played a pioneering role, through ACM, in founding CSpathshala, an initiative dedicated to bringing computational thinking to schools. CSpathshala organises the annual CTiS conference, which has become an important platform for school teachers to share ideas and classroom experience in teaching computational thinking to children in Standards III to VIII. It also conducts the Bebras India Challenge each year. Ms Sonia brings to the group the perspective of the social sector and has worked closely with school teachers and administrators for over a decade in evangelizing the vision of CSpathshala. The team further includes Mrs Abha Meghe and Mrs Malati Kalmadi, who lead the Meghe and Kalmadi groups of schools, respectively, thus bringing several years of experience in running schools.

This collective experience gives the authors both the credibility and the responsibility to speak candidly about the risks of introducing AI to school children prematurely. Their concern arises from long engagement with computing education, school systems, and the realities of how children learn. It is precisely because they understand both the promise of computing and the demands of meaningful education that they caution against exposing young learners to technical material they may not yet be ready to absorb.

AI Content in Schools

Worldover, AI education in schools is moving towards a system that lays a strong emphasis on ethics, critical thinking, and teacher capacity building.

In the United States, multiple bills introduced during 2023–24 (Artificial Intelligence Literacy Act, NSF AI Education Act, LIFT AI Act) signal a policy push to strengthen AI literacy from K–12 through higher education, with particular attention to professional development and equity for underserved communities. These acts focus primarily on using AI tools effectively and safely at the K-12 level. The bills define AI literacy as knowing how to critically evaluate AI outputs. The NSF act funds research into AI curriculum development. None of them recommend delving deep into AI internals like learning about machine learning algorithms

Internationally, governments are converging on responsible and age-appropriate AI education. Singapore has introduced AI exposure programs such as AI for Fun at the primary and secondary levels. The United Kingdom has issued national guidance on the responsible use of generative AI in schools. The focus in both cases is on educating the children on safe/responsible use of AI tools. The UK guidance recommends that teaching the internals of AI tools be restricted to specialised tracks, reserved primarily for elective secondary computer science curricula. Singapore, on the other hand, encourages its students to interact with physical *smart robots* and visual open-source AI blocks (like AI Bricks) to learn how an algorithm senses, processes data, and yields a prediction. China, through its Ministry of Education, released guidelines in 2025 that foreground AI literacy, critical thinking, human–AI collaboration, and social responsibility, alongside strict safeguards on privacy and limitations on teachers' direct dependence on AI tools. The Chinese policy is focused entirely on application of AI. They mention nothing about the internals of AI.

The OECD, in collaboration with the European Commission, has released the draft framework "Empowering Learners for the Age of AI: An AI Literacy Framework for Primary and Secondary Education" (2025). The interdisciplinary framework establishes global benchmarks for AI literacy and focuses on effective use of AI tools and making the children aware of the risks and biases of these tools. To introduce the children to the internals OECD framework recommends a focus on conceptual mapping and Computational Thinking. The recommendation is to use visual code blocks or physical, interactive smart toys.

India's Policies

India has articulated commitment to AI and Computational Thinking (CT) as foundational literacies in its National Education Policy 2020. The Ministry of Education has announced that AI will be introduced from Class 3 onwards building on earlier initiatives that introduced AI as an optional skill subject in Class 9 (2019) and expanded it to Classes 11–12 in the 2020–21 academic year.

The national curriculum, scheduled for rollout in the 2026–27 academic session, has been developed by CBSE under the guidance of an expert committee chaired by Prof. Karthik Raman (IIT Madras). The stated goal is to "develop the capacities of learners to use

computational thinking, such as logical thinking, problem solving, pattern recognition, and so on, and understand the role and use of Artificial Intelligence in daily life".

The proposed curriculum offers an age-appropriate spiral design across three stages:

- Foundational Stage (Classes 3–5): Emphasis on unplugged learning to develop computational thinking without screen dependence.
- Middle Stage (Classes 6–8): Focus on AI readiness, data literacy, and basic ethical reasoning.
- Secondary Stage (Classes 9–12): Introduction to technical depth, text-based programming, and model building.

A distinctive feature is the prescription for interdisciplinary integration with other subjects, placing AI within environmental, social, and civic contexts. This approach aligns India's policy direction with global frameworks such as the OECD AI Literacy Framework. However, the syllabus provided for the AI component for Classes 3–8 does not offer any guidelines for how such an integration may be done. The Learning Outcomes listed suggest that AI is introduced in the form of machine learning (with components such as supervised and unsupervised learning, reinforcement learning), use of datasets to learn, and predicative techniques such as regression, classification and clustering. Since the foundations required for understanding such concepts are not available to middle school students, these lessons may lead to additional information burden on students, rather than the intended integration.

Research findings and practical experiences

AI is beginning to enter K–12 education in order to future-proof children, with countries such as the United States, China, India, and Singapore developing curricula, pilot programs, and hands-on learning models. These programs typically introduce students to foundational ideas such as what AI is, how algorithms work, how machines learn from data, and how pattern recognition, automation, and decision-making systems affect everyday life. Many also include robotics, simple projects, and discussion of ethics, bias, fairness, privacy, and the social impact of AI. At the same time, global frameworks stress that AI education cannot be treated as a standalone technical add-on. As UNESCO notes, countries should first promote the "prerequisite skills" needed for AI education, including literacy, numeracy, coding and digital skills, media and information literacy, critical and creative thinking, teamwork, communication, socio-emotional skills, and AI ethics, especially where these foundations remain weak.

Research and policy experience suggest that AI should be introduced gradually and in an age-appropriate progression rather than rushed into schools as a uniform subject for all. One recommendation is to begin in the lower primary grades with not more than a few hours of experiential exposure that sparks curiosity, then in later primary years help students apply simple AI ideas in core subjects, and only at the secondary level move towards AI study. This staged approach is important because students benefit most when AI learning is

matched to their cognitive development and supported by strong foundations in computational thinking; evidence also suggests that learners with some programming background are often better able to grasp AI concepts in depth. The same gradual progress applies to schools and teachers: if AI is rolled out too quickly without careful curriculum design, teacher preparation, and facilities for project-based learning, it risks becoming shallow, overloaded, and ineffective. The stronger case, therefore, is not for rapid expansion, but for a slow, well-designed introduction of AI in schools—supported by teacher training, hands-on pedagogy, and a curriculum that delves deeper with the age and readiness of the child.

Our opinion

The significant policy push in India to introduce AI as a compulsory subject in schools, starting as early as Grade 3, is not surprising given the rapid integration of Artificial Intelligence (AI) into the global economy. While the intent to future-proof the workforce is laudable, we argue that introducing a complex AI curriculum to primary school students is premature and pedagogically unsound. The rush to make every child AI-ready contradicts the primary mission of the NEP 2020: resolving the crisis in foundational literacy and numeracy.

We take these specific positions with regards to introducing AI in schools:

1. AI literacy and the use of AI tools in schools - Curriculum and pedagogy should be structured to incorporate AI tools in classrooms in carefully chosen contexts, with teachers guiding their use in specific ways.
2. Studying AI's impact on society - The school curriculum should help students understand the effects of AI on society, and help them develop a critical perspective on its role. (Preferably, integrated with other subjects.)
3. Teaching the internals of AI - The school curriculum is not an appropriate place to "look under the hood" of AI, to learn its internal structures, or to develop mastery over AI technologies.

Adoption of newer pedagogic tools to teach is always welcome, but AI tools are fundamentally different from that of a calculator or a smart board. It interferes with cognitive processes in an almost seamless manner – by supplying answers, shaping writing or proposing arguments - which can render children vulnerable to over reliance on tools. This impedes their own learning and development of foundational skills such as critical thinking and logical reasoning. It also disincentivizes persistent effort at solving problems, thereby impeding learning basic problem-solving skills, especially when (unverified) "solutions" are readily accessible with hardly any effort. Therefore, teachers need to be adequately trained on the benefits and, more importantly, the risks of using AI before deployment, or we risk "cognitive offloading", where independent problem-solving is replaced by a blind reliance on machine outputs.

Critically understanding the relationship between digital technologies and society is certainly an important educational agenda. However, this requires considerable understanding of all possible impacts of the technology and considerable maturity. This requires a deeper and

critical understanding of subjects like sociology, economics and policy studies and their interaction with technology. It is therefore easy to see that this aspect of AI in education isn't an appropriate theme for primary or secondary children.

That leaves the third approach - teaching AI in schools. The aim is to universalise AI skills, propelling India towards technological and economic leadership. However, school is too early a stage to teach AI technology. Understanding of the technology requires a level of mathematics that school children are not yet ready for and not every child needs to know the underlying technology. Technology education is complex and is universally taken up only at the tertiary level, with basic introductions at the secondary level. Even traditional apprenticeship models start at the upper primary stage. Here we present three arguments as to why school is not the right stage to introduce children to the internals of modern day AI.

The first argument is that any changes to the school curriculum should be justified in terms of how it helps in achieving the central purpose of education: to equip the child with the skills required to navigate the world and contribute meaningfully to society. This can be achieved by nurturing the child's inner resources and developing a nuanced understanding of self, society and the world which includes various AI agents. This requires a curriculum to be aligned with a child's developmental stages and grounded in pedagogical research findings. The curriculum before the introduction of AI, which includes foundations in STEM and social sciences, has been designed keeping this in mind. Any push to include AI course work will inevitably compete for curricular space with these foundations, which are essential to understand AI itself. Curtailing the content of STEM, social sciences, languages or physical education to make room for AI will be counter-productive in the long run, since AI for the benefit of society and the nation can only happen from a whole rounded understanding of the interactions of AI with these other disciplines. Children who have not yet learnt school mathematics adequately may indeed lack the cognitive prerequisites to understand AI.

The second argument is that the urgency to introduce AI in schools is driven largely by **economic anxiety**—the belief that children must master AI's internals to secure a "pole position" for our nation in a technology-driven future. This argument, though appealing at the surface, is fundamentally flawed. What is needed is the ability to use AI tools as smart assistants to improve our productivity, not necessarily delving deep into the highly complex internals of AI, some of which even leading scientists find hard to explain. Just as one needn't understand the internals of a car to drive it, children do not require a mastery of AI architecture to thrive in an AI-dominated world.

Consequently, curricula should avoid premature technical instruction in favor of waiting until secondary education to introduce **AI literacy**. This delay ensures students possess the cognitive maturity to grasp the technology's ethical and societal implications rather than merely memorizing code. Ultimately, students need a deeper grounding in their primary areas of interest—be it the arts or sciences—to effectively leverage AI and contribute productively to society. Much like an artisan who needs to master the physics of pottery to better utilize modern kilns, a deep **subject-matter expertise** is what allows for the creative use of advanced tools, regardless of whether the user understands their internal mechanics.

Another common argument is that because children will eventually need to learn AI, the earlier they start, the better. However, making it part of the compulsory school curriculum requires serious thought. This leads to our third and final argument that even undergraduate curriculum designers are debating whether AI should be a mandatory subject. It is therefore too early to make it a mandatory subject in schools.

There is an advocacy of teaching the analysis of datasets, clustering and elements of machine learning to school children, justified as an effort to distinguish AI from human intelligence. It is our studied opinion that the question of how human learning and neural learning by machines differ is still poorly understood. Therefore, providing such artificial criteria to distinguish machine learning from human learning may mislead students. More critically, school children lack both the technical foundations and the mathematical maturity to understand the conceptual basis of machine learning. Rather than attempt a scientific explanation of AI unsuccessfully, it may be better to emphasise the usage aspects, especially by children.

Moreover, a major challenge to be addressed is the widely recorded observation that children using AI (as help, as companion, as adviser) tend to see AI as an all-knowing human–like companion who is available personally to them at any time, who answers any question “without judging” them. Children need to learn that AI is a machine displaying algorithmic behaviour that can at times be wrong. This is a priority for AI literacy to address.

This is not to say that AI should be excluded from the classroom entirely. Since children will inevitably interact with AI-based tools, it is vital to introduce **AI awareness and literacy** at an appropriate age. Students should be taught to recognize the associated risks and benefits, gaining exposure to these technologies within a **carefully controlled environment** that prioritizes informed use over technical mastery.

Our Position: We should immediately stop teaching internals of AI to children up to standard eight. We must not trade our children’s basic all round education for AI. The most effective preparation for a high-tech future lies in mastering fundamentals—deep reading, logical reasoning, and creative problem-solving—which form the only solid foundation upon which a true understanding of AI can stand. As AI’s impact deepens, professionals across all fields will increasingly utilize AI assistants. Consequently, our children must develop an even deeper mastery of the arts and sciences than we do today, ensuring they can effectively direct AI rather than surrendering to its capabilities.

The goal of educators must be to prepare the next generation of humans to surpass AI in their respective areas of competence. To master tools that have not yet been invented, students require robust conceptual foundations in their domains and the cognitive agility to adapt to new technologies. However, since they will inevitably use these tools, they must be educated on the appropriate application of AI and the ethical and social risks associated with it.

Implementation Challenges and Emerging Risks

CBSE introduced Artificial Intelligence as a skill subject around 2018–19, first as an optional sixth subject in Class 9 and later across Classes 8 to 12. Although it was conceived as a practical, project-based subject requiring about six periods a week, most schools are able to allot only two to four because of crowded timetables. This lack of space for AI in the timetable has meant that it is often taught in a theory-heavy manner rather than in a hands-on manner as intended.

The experience of the Meghe Group reflects these constraints. While the Group follows the CBSE AI curriculum from Grades 6 to 12, schools typically manage only three to four periods a week instead of the recommended six to seven. In practice, AI can also become effectively compulsory if most students choose it as an easy option, and in some cases it is used as a substitute subject when a student fails a core subject.

Teacher preparedness remains a major concern. In many schools, AI is taught by existing Computer Science or ICT teachers who have not been adequately prepared to teach it as a distinct subject. Although CBSE has introduced online and offline training programmes, webinars, and bootcamps, often with industry partners, these efforts remain uneven and are often too brief or insufficiently aligned with classroom needs. As a result, AI risks becoming just another marks-oriented, exam-led subject rather than a genuinely project-based one. At the same time, curriculum support remains weak: textbooks often do not keep pace with developments in the field, teacher confidence is uneven, and many educators require sustained handholding rather than one-time exposure.

Assessment and equity pose further challenges. Schools remain unclear about what counts as practical work, how much AI support in assignments is acceptable, and how originality should be judged. There is also no common school-level approach to ethics and safe use, including privacy, bias, and misuse. Unless these issues are addressed, AI as a school subject may widen the gap between better-resourced urban schools and weaker rural ones rather than bridge it. This concern is reflected in the decision of some school groups to pause rollout until a more suitable curriculum is developed. At the same time, evidence from resource-constrained settings suggests that meaningful integration is possible when teachers receive autonomy, encouragement, and sustained support. Scaling this will require inclusive, large-scale professional development, especially for rural teachers, backed by stronger public policy and institutional commitment.

Conclusion

To conclude - it is too early to introduce teaching the internal of AI engines to school children. Before doing so we need to assess the readiness of the children and teachers, else we run the risk of it becoming theory heavy leading to rote learning with very little understanding. AI literacy, as defined earlier, should be introduced albeit carefully. Children and teachers should be made aware of the risks of hallucination, off loading of learning and bias. These are hard problems and need research and experimentation before being rolled

out as a universal subject. Experience of educators on the ground implementing the CBSE curriculum too suggests the same. The curriculum is already crowded and teachers are not well prepared to introduce AI as a skill subject. The note therefore strongly recommends taking a step back and revisiting the topic after careful study.

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