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Request for Information: Development of a 2025 National Artificial Intelligence Research and Development Strategic Plan

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Submitter Information

Organization: Institute for Advancing Computing Education

General Comment

See attached file(s)

Attachments

Response from Institute for Advancing Computing Education

INSTITUTE for ADVANCING COMPUTING EDUCATION

May 20, 2025

Networking and Information Technology Research and Development (NITRD) National Coordination Office (NCO)
National Science Foundation

Re: Request for Information on the Development of a 2025 National Artificial Intelligence (AI) Research and Development (R&D) Strategic Plan, Docket ID No. NSF-2025-OGC-0001

Dear Suzanne Plimpton and others whom it may concern:

Thank you for the opportunity to provide comments to Docket ID No. NSF-2025-OGC-0001, Request for Information on the Development of a 2025 National Artificial Intelligence (AI) Research and Development (R&D) Strategic Plan. This document is approved for public dissemination. The document contains no business-proprietary or confidential information. Document contents may be reused by the government in developing the 2025 National AI R&D Strategic Plan and associated documents without (90 FR 17836) attribution.

I am the founder and CEO of the non-profit, non-partisan Institute for Advancing Computing Education (IACE) whose mission is to advance computing, AI, and cybersecurity education through rigorous research that strengthens student success and expands opportunities for all students. Our organization has been a proponent of educating all (including PreK-12, postsecondary, and workforce learners) in established and evolving areas of computing. My background spans decades from working as a computer scientist for the federal government and industry, to teaching computer science at two postsecondary institutions and receiving tenure at both, and to shifting into education research to found IACE and lead a team of education researchers.

I am providing comments on the areas of education related to both developing and using AI to power our future on behalf of the Institute for Advancing Computing

Education. For this to happen, it is essential that more emphasis be placed on educating the current and future workforce in AI. Human-centered knowledge in these areas will be needed to grow and sustain AI in the future in ways that benefit all Americans and ensure that the American economy remains strong in the face of rapidly evolving technologies. Creating and innovating with AI will require a deep understanding of how AI works and the possibilities AI holds. As AI transforms the workforce, preparing students and the current workforce is more critical than ever. This is punctuated in a recent report on future workforce skills that highlights programming literacy, computational thinking, and algorithmic thinking as foundational skills for success in nearly every worker in every field—not just computer science[1]. Computing education, which is the underlying foundation of AI, is vital for equipping students not only for their careers but also in a world increasingly shaped by digital technologies[2].

And traditional methods of teaching CS may not fully prepare students for the AI-driven tools that are already reshaping professional software development. Over 90% of software developers now integrate AI into their workflows[3], yet high school curricula have only begun to explore how AI can be leveraged for student learning. This presents both an opportunity and a challenge: AI tools may accelerate learners' understanding of computing, but without research-backed best practices, they could also hinder novice learners[4]. Given the rapid pace of AI adoption and the scarcity of research on its effectiveness in formal and informal education[5], there is an urgent need to investigate how AI can enhance learning experiences. This also requires recognition that, although we want AI to solve many difficult and intractable problems, the reality is that AI may

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[1] McKinsey & Company. (2021). *Defining the skills citizens will need in the future world of work* (pp. 1–19). McKinsey & Company. https://hrday.nl/wp-content/uploads/2022/10/JTB.pdf

[2] Computer Science Teachers Association, Institute For Advancing Computing Education, Association For Computing Machinery, Code.org, College Board, CSforALL, & Expanding Computing Education Pathways Alliance. (2024). *Reimagining CS Pathways: High School and Beyond*. ACM. https://doi.org/10.1145/3678016

[3] Shani, I. (2023, June 13). Survey reveals AI's impact on the developer experience. *The GitHub Blog*. https://github.blog/2023-06-13-survey-reveals-ais-impact-on-the-developer-experience/

[4] Moradi Dakhel, A., Majdinasab, V., Nikanjam, A., Khomh, F., Desmarais, M. C., & Jiang, Z. M. (Jack). (2023). GitHub Copilot AI pair programmer: Asset or Liability? *Journal of Systems and Software*, *203*, 111734. https://doi.org/10.1016/j.jss.2023.111734

[5] Liu, J., & Li, S. (2024). Toward Artificial Intelligence-Human Paired Programming: A Review of the Educational Applications and Research on Artificial Intelligence Code-Generation Tools. *Journal of Educational Computing Research*, *62*(5), 1385–1415. https://doi.org/10.1177/07356331241240460

hinder the learning and growth of learners[6]–and this, too, must be studied to ensure that developers can push AI to maximize learning outcomes.

As the National Science Foundation leads the way in charting the path forward in AI, I ask that **priority and expanded consideration be given to education and education research** that will inform and shape future-leaning learning that supports the goals set forth. The NSF has a long and rich history of understanding the necessity of a broad range of experts and the pathways needed for experts to develop their expertise through education. Future innovation cannot be achieved without current and future experts. Only education, both formal and informal, can provide the tools and resources for this expertise to continue to develop and flourish.

Further, while much emphasis has been placed on moving AI into schools, little education research has been conducted to investigate the best practice approaches for learning. This is essential at this early evolutionary stage to ensure that what has been learned about education through rigorous research over the last few decades is embedded into systems, then tested for impacts.

Moving forward, I provide the following research recommendations be included in future plans:

- Research that investigates the integration of AI concepts into different subject areas (such as literacy, math, and computer science) across PreK-postsecondary education. This includes technical and vocational pathways that are available to students and can focus on problems of practice such as differentiated instruction and improving learning outcomes for all students.
- Research that investigates the development of AI literacy for the general public.
- Research that focuses on workforce training, including upskilling to include how AI can enhance the flourishing of humans while also increasing productivity.
- Research that investigates the reduction of barriers to learning about AI. This will require a focus on developing expertise among educators and ensuring that all learners are given high-quality and publicly available AI learning opportunities.

[6] Zha, H., Li, W., Wang, W., & Xiao, J. (2025). The Paradox of AI Empowerment in Primary School Physical Education: Why Technology May Hinder, Not Help, Teaching Efficiency. Behavioral Sciences, 15(2), 240.

- Research that investigates the efficacy of learning materials for the **human implications of AI**, **data privacy and security**, and **responsible AI design**.

Thank you for your consideration of these recommendations and the opportunity to put them forth in this RFI response.

Respectfully,

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