WestEd Perspectives

Catalyzing Generative AI's Potential to Improve K–12 Math Education

Generative Artificial Intelligence (GenAI), which creates new content by learning patterns from existing data, is rapidly shaping the future of math education. GenAI can save teachers time and help them be more responsive to their students. It can also provide students with learning opportunities that meet their unique needs.

However, successfully using GenAI in math education requires research-informed policy and professional learning.

What the Research Says About GenAI in Math Education

- **GenAI-powered tools can support differentiated instruction and quicker formative assessment.** GenAI-driven adaptive learning platforms can provide students with personalized problem sets and immediate feedback, helping them deeply engage with math concepts at their own pace. These tools can improve student achievement, particularly for those who need additional support.
- **Teachers' perceptions and preparedness influence how GenAI is adopted and used.** Many teachers recognize GenAI's potential for enhancing teaching and learning. However, they express concerns about its impact on student development of critical thinking, the mathematical accuracy of the models being used, and its alignment with their vision for math learning. Research indicates that in order to strategically and effectively leverage GenAI to improve instruction, teachers need collaborative professional development that connects GenAI to math teaching and learning.

- **There are growing concerns about data privacy and ethics.** The use of GenAI in math education raises important questions about student data privacy, academic integrity, transparency in decision-making, and potential unintended consequences of automated learning recommendations. Research underscores the importance of establishing clear policies that protect student information and ensure AI tools are used responsibly.

Actions for State and Local Policymakers

Use GenAI tools to support ambitious math teaching.

Policymakers and education leaders should evaluate GenAI-powered tools to ensure they align with research on effective math instruction. They should also make sure that teachers use these tools to provide students with opportunities to authentically solve problems, engage in sense-making discourse, and develop conceptual understanding.

Support content-focused, collaborative professional learning.

Teachers need ongoing professional learning focused on how to use GenAI tools in the teaching of math content (not just generally about GenAI tool use). This should include opportunities to learn with and from other math educators in their professional networks. Districts can generate initial teacher buy-in for GenAI by showing teachers how to use GenAI to save time and then helping them learn how to use it appropriately to enhance learning experiences for students.

Develop guidelines for responsible and transparent use of GenAI.

Develop clear guidelines on data privacy, student protections, and the role of GenAI to ensure that GenAI use ethically enhances learning. Build these guidelines iteratively with teachers and parents and communicate them clearly to all interest holders. The guidelines should be based on shared principles that school leaders, teachers, students, and parents can rely on to navigate future gray areas.

How WestEd Can Help

Our team brings expertise in math education, the learning sciences, AI and ed tech implementation, and teacher professional learning to support states, districts, and schools in making informed decisions about AI integration and supporting effective use of GenAI tools. Our services include the following:

- **evaluating GenAI-powered math learning tools** for alignment with research-based ambitious math instructional practices
- designing and delivering **professional development** to support teachers' use of GenAI tools to improve teaching and learning
- **consulting with states and districts** on the development of **GenAI policies and communications tools**

Learn more about our math work and services at WestEd.org/Math.

References

Antonenko, P., & Abramowitz, B. (2023). In-service teachers' (mis)conceptions of artificial intelligence in K–12 science education. *Journal of Research on Technology in Education*, *55*(1), 64–78. https://doi.org/10.1080/15391523.2022.2119450

Bower, M., Torrington, J., Lai, J. W. M., Petocz, P., & Alfano, M. (2024). How should we change teaching and assessment in response to increasingly powerful generative Artificial Intelligence? Outcomes of the ChatGPT teacher survey. *Education and Information Technologies*, *29*, 15403–15439. https://doi.org/10.1007/s10639-023-12405-0

Brandão, A., Pedro, L., & Zagalo, N. (2024). Teacher professional development for a future with generative artificial intelligence – An integrative literature review. *Digital Education Review*, *45*, 151–157. https://doi.org/10.1344/der.2024.45.151-157

Canonigo, A. M. (2024). Levering AI to enhance students' conceptual understanding and confidence in mathematics. *Journal of Computer Assisted Learning*, *40*(6), 3215–3229. https://doi.org/10.1111/jcal.13065

Chen, R., Lee, V. R., & G Lee, M. (2025). A cross-sectional look at teacher reactions, worries, and professional development needs related to generative AI in an urban school district. *Education and Information Technologies*. https://doi.org/10.1007/s10639-025-13350-w

Chiu, T. K. F., Moorhouse, B. L., Chai, C. S., & Ismailov, M. (2024). Teacher support and student motivation to learn with Artificial Intelligence (AI) based chatbot. *Interactive Learning Environments*, *32*(7), 3240–3256. https://doi.org/10.1080/10494820.2023.2172044

Diliberti, M. K., Schwartz, H. L., Doan, S., Shapiro, A., Rainey, L. R., & Lake, R. J. (2024). *Using artificial intelligence tools in K–12 classrooms*. RAND Corporation.

Ghimire, A., Prather, J., & Edwards, J. (2024). *Generative AI in education: A study of educators' awareness, sentiments, and influencing factors* (arXiv:2403.15586). arXiv. https://doi.org/10.48550/arXiv.2403.15586

Jia, J., Wang, T., Zhang, Y., & Wang, G. (2024). The comparison of general tips for mathematical problem solving generated by generative AI with those generated by human teachers. *Asia Pacific Journal of Education*, *44*(1), 8–28. https://doi.org/10.1080/02188791.2023.2286920

Karaman, M. R., & Göksu, İ. (2024). Are lesson plans created by ChatGPT more effective? An experimental study. *International Journal of Technology in Education*, *7*(1), 107–127. https://doi.org/10.46328/ijte.607