The Advocate

Volume 30
Number 2 *Fall-Winter 2025*

Article 3

December 2025

A Survey of K-12 Teachers' Perspectives on Teaching with Generative Artificial Intelligence

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Recommended Citation

Andersen, Gary and Yang, Sohyun (2025) "A Survey of K-12 Teachers' Perspectives on Teaching with Generative Artificial Intelligence," *The Advocate*: Vol. 30: No. 2.

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Abstract

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Keywords

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This research article is available in The Advocate: https://newprairiepress.org/advocate/vol30/iss2/3

A Survey of K-12 Teachers' Perspectives on Teaching with Generative Artificial Intelligence

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Abstract

This study investigated K–12 educators' perceptions of generative artificial intelligence (GenAI) in teaching and learning, examining how teachers use and evaluate GenAI tools in relation to student thinking and classroom practices. Grounded in Bloom's Taxonomy (1956) and Ritchhart's (2015) Cultures of Thinking framework, the survey of 73 teachers revealed that while most participants use GenAI for instructional design and administrative efficiency, far fewer employ it to foster higher-order cognitive processes such as application, analysis, and evaluation. Teachers reported benefits in lesson planning and differentiation but expressed concerns about accuracy, ethics, and overreliance. Findings highlighted a critical need for professional development that integrates technical proficiency with pedagogical strategies for using GenAI to promote application, critical thinking, and deeper student learning. The study underscores that GenAI's educational potential remains underrealized without intentional alignment to human-centered teaching goals.

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Introduction

As artificial intelligence (AI) becomes increasingly available in education through tools such as ChatGPT, Gemini, Blackboard, Canva, and adaptive learning platforms, educators face new opportunities and challenges in integrating technology in ways that support pedagogy, productivity, student engagement, and student thinking. Generative AI (GenAI), which refers to a subfield of AI that uses generative large language models to produce text, images, videos, audio, software code, or other forms of data (Chiu, 2023), has been a particular focus of this shift. In response, the report published by the U.S. Department of Education (2023), *AI and the Future of Teaching and Learning*, highlighted that teachers play an essential role in the use of AI for teaching and learning, considering the importance of "human-in-the-loop." This emphasis on the educator's role comes at a critical time, as GenAI is being marketed to schools and teachers with great frequency and is being embraced by teachers and other actors in the educational enterprise (Dukakis, 2025). However, the nature of GenAI integration varies widely, and its impact on student thinking remains underexplored. Therefore, examining perceptions of K-12

educators about the use of GenAI in their professional practices and how these practices relate to teacher goals for their students' thinking and learning is crucial.

Theoretical or Conceptual Framework

This study is grounded in two interrelated frameworks: (1) taxonomies of cognitive processes (Anderson & Krathwohl, 2001; Bloom, 1956) and (2) classroom cultures of thinking (Ritchhart, 2015). The first framework is Bloom's Taxonomy (1956) and its revision by Anderson and Krathwohl (2001), which provided a foundational lens for classifying student cognitive engagement—ranging from remembering and understanding to analyzing, evaluating, and creating. The survey instrument was explicitly designed to capture teacher-reported use of AI in relation to these cognitive domains, offering insight into whether AI amplifies or dampens student engagement with higher-order thinking tasks.

Complementing this is Ritchhart's (2015) Cultures of Thinking framework, which emphasized that meaningful learning emerges when classrooms prioritize intellectual engagement through routines, language, and interactions that make student thinking visible. This study explored whether AI tools are being leveraged to promote such cultures—or if they unintentionally promote passive learning, automation, or superficial engagement. The construct of "visible thinking," as outlined by Ritchhart and Perkins (2008), served as a touchstone for evaluating teachers' beliefs and classroom practices.

Emerging literature suggests that AI can function both as a cognitive scaffold and a thinking partner (Holmes et al., 2022), but also warns of risks in over-scaffolding, which may reduce cognitive demand and student agency (Luckin et al., 2016). Therefore, this study examined how educators perceive and navigate these tensions. In order to effectively analyze the complex didactical dynamics, this dual-framework approach—cognitive taxonomy and cultures of thinking— enabled a nuanced exploration of the pedagogical opportunities and ethical dilemmas posed by GenAI in education.

Literature Review

Research on GenAI in education is rapidly evolving, though few studies focus explicitly on teacher practice. A recent systematic review of AI in teacher professional development (Tan et al., 2025) underscored that many studies concentrate on specialized uses in the classroom, especially conversational AI, rather than GenAI's broad roles in professional uses by educators. Additionally, a RAND report on K–12 (Diliberti et al., 2024) suggested that GenAI tools like ChatGPT are emerging as potential supports for teacher tasks such as lesson planning, grading, and differentiation—but authors cautioned that empirical evidence about impact on student learning remains limited.

In K–12 settings, more specifically, survey data revealed a slow rate of adoption; only 18 % of U.S. teachers reported using AI weekly for instructional tasks, and the most common uses include designing assessments, scaffolding instruction for learning differences, and planning lessons (Lieberman, 2024). In a broader analysis of K–12 AI integration, researchers noted that about half of teachers using AI report employing generative chatbots (e.g., ChatGPT) mostly for lesson generation and differentiation of lessons, while fewer adopt specialized AI-driven instructional systems (Lake, 2024).

Teachers' perceptions were also complex. A study (Collie et al., 2025) showed that greater support or scaffolding for GenAI correlates with higher self-efficacy and more instructional integration. However, according to U.S. national data (Lin, 2024), 25% of K–12 teachers argue that AI tools do more harm than good, 32% see mixed effects, and only 6% believe they do more good than harm. Additionally, a recent cross-sectional study in one urban district (Chen et al., 2025) found teachers express interest but also worry about workload, the reliability of AI, and ethical issues; professional learning needs emerge as a consistent theme.

Few current studies explore the use of GenAI in fostering specific genres of student thinking. Essien et al. (2024) in a study of graduate business students, found that AI text generators most readily support lower-order cognitive work—idea generation, summarizing, and basic application—while effects on higher-order critical thinking (e.g., analysis, evaluation, synthesis) were mixed and highly contingent on task design and pedagogical scaffolds. More research is needed to elucidate the impact of GenAI across a spectrum of thinking levels.

Purpose of the Study

Considering the prevalence and significance of AI in education, this study aimed to examine whether and how K-12 teachers use AI tools, such as ChatGPT or Gemini, in relation to classroom practices and student thinking, utilizing a descriptive survey design. By understanding the landscape of using GenAI in K-12 learning environments, teacher educators will get insights for course development and teaching training for educator preparation programs. Specific research questions (RQs) are as follows.

RQ1. To what extent are K-12 teachers using GenAI for teaching and learning? And what are the barriers and concerns related to using GenAI for teaching and learning?

RQ2. Do teachers use GenAI to foster student thinking? If so, how is GenAI utilized to foster student thinking?

Methods

Participants

This study included 73 K-12 educators from diverse geographic, demographic, and contextual backgrounds. Convenience sampling was employed to recruit practicing teachers from the researchers' institution, an online educator preparation program of a rural public state university in the Midwest. Course announcements in two graduate courses (i.e., Curriculum and Evaluation of PK-12 Schools, Technology in Special Education) in Fall 2025 and emails to program completers of the department were utilized to distribute surveys that were developed using Qualtrics. The survey completion rate was 88.0% (73 out of 83). Most participants were female (n = 49, 67.1%), and their average years of teaching were 6.69 (SD = 5.31). Content areas the participants were teaching included elementary education, science, English language arts, social studies/history, special education, and 12 other areas. Most participants were teaching while working on the alternative licensure programs at the master's level educator preparation programs (n = 52, 71.2%) and were teaching in rural or small towns (n = 44, 60.3%). Most participants considered their current level of competence in using AI in teaching either moderate (n = 36, 49.3%) or little (n = 28, 38.4%), and half of the participants (n = 37) received professional development about the use of AI for teaching for around 1-3 hours (little) in total. Most participants responded that they use GenAI for professional purposes a few times (n = 31, 42.5%) or regularly (n = 22, 30.1%).

Survey Instrument

The researchers developed a survey instrument based on the existing literature and utilized it for this study. Three major sections focused on the educators' use of GenAI for teaching and learning, including a section asking about participant demographics: (a) demographics, (b) the use of GenAI for teaching and learning (RQ1; Trust et al., 2023); and (c) GenAI for fostering student thinking (RQ2; Anderson & Krathwohl, 2001; Broom, 1956; Ritchhart, 2015). In the section on the use of GenAI for teaching and learning, we asked if they are using GenAI for teaching, and if so, how they are using it professionally. We also asked what perceived barriers or concerns exist for using GenAI for teaching and learning. Additionally, we asked if they allow students to use GenAI for learning. Participants responded to the items using yes/no multiple-choice and provided qualitative responses for barriers and concerns. In the last section, GenAI for fostering student thinking, we asked if they think the use of GenAI fosters student thinking, and if so, how educators are utilizing it based on Bloom's Taxonomy. Participants were asked to describe specific examples and evidence of student outcomes where applicable. If the participants do not think using GenAI fosters student thinking, they provided qualitative responses about the reasons in an open-ended question. The content validity of the survey was confirmed by two researchers with doctoral degrees in education.

Research Procedure

Researchers obtained IRB approval in August of 2025. Participants were recruited through course announcements in a master's online educator preparation program in a rural Midwestern state and via emails to recent program completers. Only the participants who provided consent to this study proceeded with the survey response. The participants could access the online survey (i.e., Qualtrics) from late August to early October 2025. There was no incentive offered for participation.

Data Analysis

For quantitative data analysis, descriptive statistics (i.e., *n*, %) were employed using SPSS to analyze multiple-response items. A qualitative analysis was also conducted, including coding and synthesizing the major themes (Braun & Clarke, 2006). The researchers first familiarized themselves with the qualitative responses and generated initial codes. After coding, we categorized the codes based on the major themes that emerged.

Findings

The Use of GenAI for Teaching and Learning

Forty-seven participants (64.4%) were using GenAI for their teaching, while 26 (35.6%) reported not using it. Teachers not using GenAI described why they are not using GenAI for teaching, including a lack of training and concerns about the accuracy of GenAI's outputs. Some also reported that their professional skills, paired with a pedagogical approach that prioritizes human connection and differentiated learning, are more effective than AI.

Teachers who are using the GenAI for teaching (n = 47) provided specific examples of their uses in the domains of (a) instructional planning and design, (b) interactive, real-time engagement of students with learning, (c) streamlining administration tasks, and (d) professional learning (see Table 1). The majority of participants were using GenAI for their instructional planning and design (n = 46), followed by interactive, real-time engagement of students with

learning (*n* = 37), streamlining administration tasks (*n* = 35), and professional learning (*n* = 29). Detailed responses are provided in Table 1. The participants utilizing GenAI for teaching noted that the major barriers or concerns related to the use of GenAI for teaching include the accuracy and reliability of AI-generated content, which requires attentive fact-checking to correct errors and biases. Also, there was a fear that over-reliance on AI would hinder critical thinking and creativity in both students and teachers, leading to *skill atrophy*. Finally, practical barriers include data privacy risks involving student information, GenAI's lack of a personalized human touch, and the need for more professional development to use these tools effectively.

Table 1

The Use of GenAI by Teachers Using GenAI for Teaching (N = 47)

Variable		*n*	%
Instructional Planning & Design (*n* = 46, 97.9%)	Generate lesson plans and learning experiences for students	35	74.5
	Generate differentiation in lesson plans	27	57.4
	Generate assessments (e.g., rubrics, quizzes, exams)	27	57.4
	Generate learning objectives	23	48.9
	Generating IEPs (Individualized Education Programs)	1	2.1
	Others (e.g., create choice boards)	1	2.1
Interactive, Real-Time Engagement of Students With Learning (*n* = 37, 78.7%)	Create interactive story & content generation (e.g., customized scenarios, narratives, or prompts)	22	46.8
	Provide language translation & support (for English Learners)	17	36.2
	Create personalized or adaptive interactive learning paths	13	27.7
	Create interactive presentations for learning	13	27.7
	Create gamified learning (e.g., adaptive learning games or simulations)	12	25.5
	Create real-time feedback tools for students	8	17.0

	Create interactive experiences for (SEL) Social Emotional Learning and self-regulation (e.g., AI-driven calming tools, mood check-ins, or reflections)	7	14.9
	Create interactive multimedia content	5	10.6
Streamlining Administration Tasks (*n* = 35, 74.5%)	Draft communications (e.g., to parents, other educators, newsletters, reports)	29	61.7
	Utilize data analysis & progress monitoring of students (e.g., dashboards summarizing student data)	10	21.3
	Automate grading of objective, selected-response assessments	8	17.0
	Automate grading of constructed response assessments (e.g., essays, papers)	5	10.6
	Others (e.g, create a routine [professional development] tracker, create pacing guides)	2	4.2
Professional Learning (*n* = 29, 61.7%)	Create and use resource summarization (e.g., AI-generated summaries of research, videos, or other resources)	18	38.3
	Foster reflective practice (e.g., teacher self-reflection using AI-guided journaling)	11	23.4
	Create or use simulations (e.g., virtual scenarios for practicing classroom management, teaching, mentoring, etc.)	6	12.8
	Others (e.g., search current practices)	1	2.1

Regarding the student use of GenAI, most participants did not allow students to use GenAI for learning. Twenty-seven participants (37.0%) permitted or encouraged students to use GenAI, although 46 participants did not (63.0%). Teachers permitting or encouraging students to use GenAI allowed students to use them as a support tool for the initial stages of their work, such as brainstorming topics, generating creative ideas, or creating outlines. However, they also noted the need for fact-checking information and source verification. They also encouraged students to use GenAI to refine their writing (e.g., grammar), create visuals (e.g., images, logos), and break down complex problems, with ethical considerations.

GenAI in Fostering Student Thinking

The survey examined in more depth the respondents' reporting use of AI in their classrooms to foster student thinking. Forty-one participants (56.2%) noted that the GenAI that is currently being used in their classroom in a way that fosters and deepens student thinking. In contrast, other participants (*n* = 32, 43.8%) reported they were not using GenAI for that purpose. The responders using GenAI to foster student thinking (*n* = 41) also specified how their students are currently benefiting from it to foster and deepen their thinking (see Table 2). Teachers most often reported using GenAI to foster thinking in the domains of remembering (*n* = 27, 65.9%), understanding (*n* = 23, 56.1%), and creating (*n* = 22, 53.7%), while the lesser reported targeted domains were applying (*n* = 16, 39.0%), analyzing (*n* = 18, 43.9%), and evaluating (*n* = 15, 36.6%). Fewer teachers also reported using GenAI to explore new phenomena/ideas (*n* = 20, 48.8%) or foster collaborative thinking (*n* = 16, 39.0%).

Table 2

The Use of GenAI in Fostering Student Thinking Among Teachers Using GenAI to Foster Student Thinking (N = 41)

Category	*n*	%	Example
Remembering: Memorizing or recalling facts and basic concepts.	27	65.9	• Creating review quizzes, flashcards, and exit slips using AI tools (e.g., Quizlet, Quiziz) • Generating questions for review games (e.g., Kahoot, Gimkit) • Having students create their own study quizzes and games to test themselves or share with peers. • Using AI to find multiple definitions or deeper explanations for vocabulary words. • Interacting with AI chatbots to practice and rehearse key facts and concepts. • Creating concise summaries of readings or lessons for quick review. • Using adaptive quiz features that adjust to a student's performance.
Understanding: Explaining ideas or concepts.	23	56.1	• Getting step-by-step breakdowns of complex multi-step problems (e.g., in math). • Using AI to get feedback on their writing for clarity, word choice, and sentence structure. • Generating summaries of complex texts to identify main ideas and central themes. • Asking AI for multiple or simpler explanations of difficult concepts and vocabulary. • Using AI as an interactive dictionary or thesaurus to understand new words. • Researching different perspectives and viewpoints on a topic for projects or debates.

			• Receiving individualized prompts to practice and check for reading comprehension. • Analyzing AI-generated case studies to discuss and apply concepts to real-world scenarios.
Applying: Using information in a new situation.	16	39.0	• Running simulations to practice decision-making, design experiments, or solve business problems (e.g., product recalls). • Applying concepts to analyze real-world case studies. • Creating business plans, marketing campaigns, and financial projections. • Drafting plans and orders for JROTC event planning. • Adapting written work (like memos or reports) for different audiences and professional contexts. • Creating presentations to demonstrate and apply learning. • Translating quizzes, assignments, and classroom conversations for non-native English speakers.
Analyzing: Breaking down information into parts and understanding relationships.	18	43.9	• Comparing student-created work (e.g., plans, papers) against AI-generated options to analyze strengths and weaknesses. • Analyzing multiple AI responses to the same prompt to identify patterns, biases, and inconsistencies. • Evaluating AI-generated documents (e.g., business reports, case studies) for logic, feasibility, and factual errors. • Comparing a human-written paper with an AI-generated one to analyze differences in style, argumentation, and quality. • Using AI to generate plot summaries or literary analyses for students to critique and discuss. • Analyzing how rephrasing a prompt changes the AI's output and reasoning. • Investigating case studies on topics like AI ethics and intellectual property. • Using AI to help visualize and map complex systems or cause-and-effect relationships.
Evaluating: Justifying a stand or decision.	15	36.6	• Debating against an AI to test and strengthen their own arguments. • Fact-checking AI-generated responses against reliable sources to evaluate accuracy. • Getting feedback from AI on their writing (with a rubric) to guide revisions. • Critiquing the reasoning, logic, and potential bias in AI-generated arguments. • Using AI to help structure and phrase constructive feedback for their peers. • Evaluating and "grading" an AI on how well it captures their personal voice or identity.

			• Using AI simulations to role-play and evaluate ethical dilemmas from multiple perspectives.
Creating: Producing new or original work.	22	53.7	• Brainstorming initial ideas, outlines, and topics for essays, projects, and business concepts. • Generating first drafts of written content (e.g., essays, scripts, professional letters). • Creating visual content (e.g., art images, design prototypes, logos, brand package). • Drafting and strengthening professional documents (e.g., resumes, business plans, marketing materials). • Editing and refining their writing to improve its clarity, tone, and persuasiveness for a specific audience. • Using AI as a springboard to overcome creative blocks and develop their original work.
Engaging and Exploring New Phenomena or Ideas: Observing, taking in, and exploring new ideas, objects, perspectives, and processes.	20	48.8	• Creating visual and text-based writing prompts. • Taking virtual field trips to explore different cultures and historical sites. • Generating ideas and compositions for art projects. • Providing multiple, varied explanations for complex concepts (e.g., Physics). • Creating real-world, problem-based scenarios for students to solve. • Helping students understand dense academic or research papers.
Fostering Collaborative Thinking: Engaging with others to develop shared understanding and achieve collective goals.	16	39.0	• Collaboratively writing a "Choose Your Own Adventure" story. • Working in groups to solve AI-generated problems and scenarios. • Brainstorming ideas as a group and comparing them with AI suggestions. • Using AI to generate questions that guide group discussions and research. • Using AI to generate business ideas (e.g., names, logos, marketing) for teams to evaluate. • Using AI-integrated platforms (e.g., Notion) for collaborative project planning.

Thirty-two participants who were not using GenAI to foster and deepen student thinking addressed their concerns, including that AI could hinder the learning process due to the overreliance on GenAI's response, which bypasses students' critical thinking process. They also considered that students might not experience meaningful and productive struggles for building knowledge and content comprehension. Also, a lack of teacher training and being inappropriate for young learners who are still learning foundational skills was noted. They called for the resources and guidance for the effective and responsible GenAI implementation for teaching and learning.

Discussion and Implications

This research sheds light on how teachers who embrace GenAI incorporate it into their teaching and foster student thinking, as well as the barriers teachers perceive in incorporating it into their teaching. Findings indicated that most teachers reported using generative AI in their teaching, with a sizable minority not engaging with the technology at all. Among teachers who are GenAI users, it is most often applied to lesson planning and instructional design, including generating full lesson plans, creating differentiated lessons, and developing assessments such as rubrics and quizzes, showing similar uses of AI by educators with the study of Lieberman (2024). Regarding integrating AI for teaching, Holmes et al. (2022) noted that when thoughtfully integrated, AI may foster creativity, support differentiated learning, or even act as a thinking partner. This study also found gaps in the types of student thinking that teachers address with their students when using GenAI. Most teachers reported no when asked whether AI fostered specific cognitive categories of student thinking. Of those who said yes, the most often reported categories were remembering, understanding, and creating, while less often reported were engaging/exploring new ideas and phenomena, fostering collaborative thinking, applying, analyzing, and evaluating. This finding aligned with the study of Essien et al. (2024), which found that students often use AI for lower-level cognitive tasks. An interesting finding is that the types of thinking reported with the fewest frequency (collaborative thinking, applying, and evaluating) are also those uniquely human endeavors that may be the path forward to useful ways of interacting with GenAI.

Teachers described both enthusiasm and skepticism. Some praised AI for its ability to streamline repetitive tasks and support differentiation: "*I have built out courses by putting standards into AI and then creating a pacing guide, unit plans, lesson plans, and texts.*" Others, however, highlighted concerns about accuracy and overreliance, noting that AI content often required extensive correction: "*I was not impressed with it, and I feel like I can do a better job in a shorter amount of time.*" Ethical worries also surfaced, with teachers questioning the intellectual property foundations of AI outputs. These concerns align with the finding that more than 40% of teachers do not permit student use of AI in their classrooms. Many teachers expressed doubts about the potential negative impacts of AI on students' critical thinking, which aligned with the previous literature (Luckin et al., 2016) noted the potential issue that AI may reduce cognitive demand or over-scaffold student responses, thereby inhibiting critical or original thought. Teachers also reported a lack of training about the use of AI, ethical and environmental concerns, and some expressed that they did not see a need for its use, considering their higher effectiveness as teachers with pedagogical knowledge and skills.

Taken together, the data suggested that teachers are currently leveraging AI primarily for efficiency—reducing the burden of administrative and planning tasks—while hesitating to integrate it into higher-order student thinking and learning. The findings highlight the need for professional development that emphasizes *both technical skills and pedagogical* strategies for integrating AI in ways that promote deeper learning (UNESCO, 2023). Without such support, AI risks being confined to peripheral administrative functions rather than transforming classroom practice meaningfully. Structured professional learning could provide educators with models, examples, and safeguards for using AI responsibly to promote creativity, application, critical thinking, and ethical reasoning. Also, school and district leaders should clarify policies around the ethical and appropriate use of GenAI. More straightforward guidelines and shared norms could help build trust. At the same time, districts should address issues of equity and access, as

some teachers have cited a lack of devices, connectivity, or resources as barriers to meaningful student engagement with AI. Without equitable infrastructure, AI may widen rather than close opportunity gaps.

These results carry implications for future research. Teachers' reports of GenAI improving efficiency but not yet enhancing deep learning raise questions about what conditions, tools, or pedagogical approaches could unlock the transformative potential of AI to foster the critical higher-order thinking skills of application, analysis, and evaluation, as well as foster engagement with new phenomena and collaborative thinking. Longitudinal studies of classrooms that integrate AI in inquiry, collaboration, and problem-solving could shed light on best practices. Researchers should also investigate student perspectives and learning data, since this study captured only teacher voices.

Conclusion

This study highlights the importance of equipping teachers not only with the technical skills to use AI but also with the pedagogical frameworks to guide its responsible integration. This approach is supported by a recently announced framework (Basham et al., 2025) addressing the need for AI in education to be human-centered, strategic, equitable, and supported by professional development. By aligning GenAI tools with pedagogical frameworks (e.g., Anderson & Krathwohl, 2001; Bloom, 1956), educators can better determine how AI supports or detracts from their instructional goals. Ultimately, whether AI serves as a catalyst for deeper student learning or remains a tool of convenience will depend on the professional learning, policies, educator preparation programs, and research that shape its adoption in schools.

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