Exploring Elementary Educators' Perceptions of AI in the Context of Professional Development

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Abstract: Artificial Intelligence (AI) and its impact on education is a topic gaining attention due to the opportunities and challenges it presents for K-12 classrooms. While educators are crucial in integrating AI technology into instruction, empirical evidence documenting elementary educators' perceptions of AI and its integration in classroom instruction is scarce. This study explores elementary educators' perceptions of AI during and after participation in a professional development (PD) program which incorporated AI-focused sessions. Analyzing data from interviews, exit tickets, and group discussions, findings indicate that perceptions are shaped by factors such as the perceived usefulness of AI tools, ethical considerations, risks for younger students, and pedagogical concerns. Further, findings indicate that educators responded positively to the AI concepts and associated resources introduced in the PD. These findings offer important insights for research, practice, and policy to better support educators' AI integration into classroom instruction.

Keywords: Elementary teachers, Artificial Intelligence, AI literacy, teacher professional development

Introduction

The development of Artificial Intelligence (AI) technologies has brought attention to its implications in education, particularly the need for youth to develop skills to navigate a world increasingly shaped by AI (Lee & Perret, 2022). However, K-12 educators' AI literacy, which includes the ability to recognize opportunities and challenges associated with the integration of AI tools in classrooms, is limited (Lee & Perret, 2022). In response to this context, professional development (PD) programs have been proposed and implemented to help educators integrate AI into schools (Ayanwale et al., 2022). These programs aim to enhance educators' AI literacy by shaping their attitudes and fostering interest, enabling them to make informed decisions about integrating AI into their

instruction. Educators' attitudes towards AI can be shaped by various factors, including the availability of technology, classroom dynamics, societal perceptions of AI, and their psychological perspectives (Zhao et al., 2022).

This study reports on the findings of a study conducted with elementary school educators in a Mid-Atlantic state in the US. By collecting data during and after participation in PD that included three sessions related to AI, this study aims to understand factors that influence elementary educators' perceptions of AI and the role of a tailored PD program in shaping these perceptions. Using exit tickets, group discussions, and semi-structured interviews, the study is guided by three questions: 1) What are elementary educators' perceptions of integrating AI tools into their instruction? 2) In what ways are elementary educators' perceptions of AI shaped by their participation in a PD program that includes AI-focused sessions? and 3) What are educators' perceptions of the AI-focused PD sessions?

Theoretical background

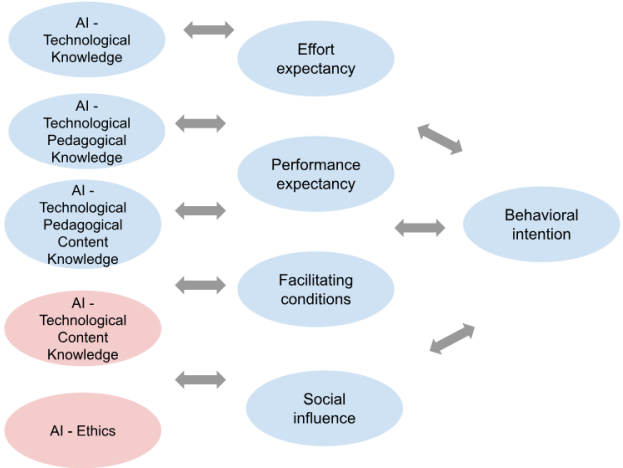
Research has demonstrated that teacher attitudes can significantly influence success in teaching (Velander et al., 2024). These attitudes, shaped by prior experiences and interactions, affect how educators learn about new concepts, how that knowledge is transferred to students, and how instruction is designed and implemented (Velander et al., 2024). This is especially relevant to the integration of technology in the classroom, as each teacher's approach may differ depending on their individual attitudes (Choi et al., 2023).

To understand how attitudes, whether positive or negative, influence the behavior that leads to technology integration, The Unified Theory of Acceptance and Use of Technology (UTAUT) has been suggested in the literature (An et al., 2023). This framework identifies four components influencing technology acceptance: a) performance expectancy, which is the perceived usefulness of the technology; b) effort expectancy, which pertains to the perceived ease of use; c) social influence, or the perceived impact of others on perceptions; and d) facilitating conditions, which represent the belief that sufficient infrastructure and resources are in place to support technology integration. However, UTAUT is a general model for technology use and may lack the specificity required for the educational field.

Other frameworks, such as Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006), specifically address technology integration in teaching. TPACK suggests that successful integration depends on content, technological, and pedagogical knowledge, as well as their intersections. Celik (2023) further adapted TPACK to better fit AI integration, proposing the i-TPACK model with an added "Ethics" dimension, highlighting the need to consider judgment and fairness when incorporating AI into education.

While the TPACK framework has been applied to study attitudes towards technology (Sun et al., 2023), its focus remains primarily on knowledge rather than on attitudes. Although related, knowledge and attitudes are distinct components (Yau et al., 2023). To bridge this gap, An et al. (2023) combined the UTAUT and TPACK frameworks, offering a more comprehensive view of how knowledge and attitudes toward technology shape the intention to integrate it into teaching. A visual representation of this framework is shown in Figure 1, with key components from An et al. (2023) highlighted in blue. For this study, we also include Technological Content Knowledge and Ethics, as proposed by Celik (2023), to capture all dimensions influencing trends in the data.

Figure 1
i-TPACK and UTAUT framework



Literature review

The I-TPACK framework has been addressed both directly and indirectly in various studies, providing empirical evidence. The literature has explored educators' perceptions of AI and their willingness to implement it across diverse global contexts. Research by Kim (2024), who cites the I-TPACK model and involved 20 Chinese teachers from various educational levels, revealed a consensus on the need to prepare students for an AI-driven future and to navigate ethical challenges, such as biases that may reinforce social inequalities. Two other studies indirectly referenced the ethics component of I-TPACK. Lin et al. (2022) found that the 18 teachers in their study emphasized teaching AI from a social responsibility perspective. Similarly, Linder and Berges (2020) examined the perspectives of 23 German teachers, revealing mixed feelings about AI, with ethical concerns—particularly regarding AI's attempts to replicate human behavior—being central to their discussions.

The literature has also addressed the UTAUT theory, including how usefulness and ease of use are core factors shaping teachers' attitudes toward AI. In South Korea, Choi et al. (2023) utilized the Technology Acceptance Model (an early version of UTAUT) in their study with teachers from various educational levels, revealing that trust in technology and perceived usefulness were key factors influencing AI acceptance and teachers' willingness to integrate it into their practices. Zhang et al. (2023) identified ease of use and the reduction of AI anxiety as critical elements for promoting AI integration based on their study with pre-service teachers.

Research has also underscored the importance of PD programs in building teachers' knowledge and positive attitudes about AI, which can facilitate its integration into the curriculum (Park et al., 2023). However, based on a meta review conducted by Tan et al. (2025), research on teacher PD focused on AI is still scarce. Nonetheless, some work is beginning to emerge. For instance, Ayanwale et al. (2022) conducted a survey of 368 teachers in Nigeria, and found that both confidence in AI and its perceived relevance are closely tied to teachers' readiness to teach it. Similarly, Nazaretsky et al. (2022) found that providing K-12 teachers in Israel with explanations about AI reduced their negative feelings and increased their trust in the technology. Furthermore, a large-scale study in China involving 3,164 teachers demonstrated that AI readiness is linked to higher levels of teaching innovation and job satisfaction (Lin & Van Brummelen, 2021).

These findings suggest that equipping educators with the appropriate tools and preparation is essential for fostering engagement and effective integration of AI into the curriculum. However, most of these studies have been conducted in various settings across the world and primarily focus on secondary or higher education, with limited attention given to elementary educators in the U.S. Elementary educators face unique challenges due to the age of their students and the impact that those early learning experiences have in students' future development (Gomez, 2016). Romano and Gibson (2006) explain that managing student behavior, addressing parental concerns, and adapting content to their students' characteristics are among the challenges elementary educators face. Given that teacher readiness and contextual factors may influence attitudes toward technology, this study addresses this gap by specifically focusing on the perceptions of elementary educators within the U.S. education system.

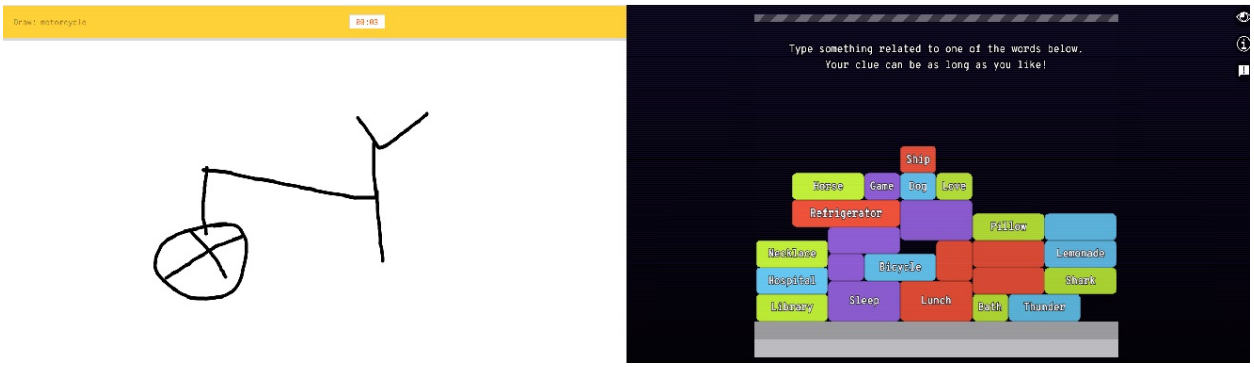
Context

This study reports on data collected in the context of a PD program involving elementary educators from a Mid-Atlantic state in the U.S. The program took place over four days in June 2024 and aimed to equip educators with content and pedagogical knowledge related to the integration of computer science (CS) into elementary content area instruction. The PD program included various CS topics, one of which was AI, based on feedback provided by educators in earlier iterations of the program. The AI part of the PD consisted of three sessions held on three consecutive days, providing educators with definitions of AI, strategies for integrating AI into classroom instruction, and tools for effective AI implementation. Each session was 45 mins long. The three sessions are described below:

1. ***Introduction to AI***. A lead member of the PD team with expertise in CS outlined the history and definition of AI, along with its implications for educators. Educators attended a talk covering concepts such as machine learning, deep learning, and generative AI. Additionally, the lead researcher demonstrated examples of how data is used to train models for AI development. The session included time for questions and discussion with the speaker.
2. ***Teaching AI to elementary students***. A member of the PD team synthesized the latest research on AI tools in education and presented tips and recommendations on how to explain AI to younger students, reviewing key concepts such as prompts, inputs, and outputs. Educators were also provided with online resources, including videos, online lessons designed to teach AI to children, guides for AI projects suitable for elementary students, and interactive

AI tools such as Semantris, Quick Draw, and AI image generators. Screenshots of Quick Draw and Semantris can be seen in Figure 2. These tools are user-friendly and designed to facilitate engaging interactions with AI in a playful manner. During the session, educators were provided with time to use each of these tools on their own, share ideas with other educators and reflect on how these tools could be incorporated in their lessons. The final part of this session included reflecting in groups of five to eight members about the challenges, opportunities, and changes associated with teaching about AI. Group members took notes of these reflections in posters, which they later shared with all participants.

Figure 2
Screenshots of Quick Draw (left) and Semantris (right)



3. ***AI as a teacher assistant***. The same member of the PD team conducted the final session that introduced ways in which AI can be used to enhance educators' instructional efforts. Specifically, the PD team member introduced concepts such as personalized learning, and examples of AI powered platforms such as Aleks that creates personalized learning paths for each student. Additionally, guidelines on how to create an effective prompt to get better outputs from generative AI tools were also presented along with educational uses of ChatGPT and MagicSchool, the latter being an AI platform specifically designed for educators. As part of the hands-on activity in this session, educators were asked to use both MagicSchool and ChatGPT to design a lesson plan. They were provided with a prompt template that they can customize with details regarding grade level, subject, topics, lesson characteristics, and student characteristics. They used this template as input in both tools. The prompt template was as follows:

> *"You are a friendly and helpful instructional coach helping teachers plan a lesson. I am a teacher and I would like you to create a lesson plan for [Grade level] students. The topic is [introduce your topic here]. This is a lesson plan to be implemented during [how many days and hours]. Include examples from different points of view, including different cultural perspectives. The learning goal of the lesson is [introduce the goal here]. My students are [add characteristics of your students here e.g. where they live, what they are interested in, ages], please adapt the lesson to them."*

At the end of the session, participants shared their thoughts and were provided with a list of digital personalized learning tools that they may want to explore in the future.

Participants and data collection

A total of 44 educators voluntarily attended the PD program. Consent to participate in the study was obtained from 39 individuals who will be considered as participants and will be referenced as educators. Of those, 72.7% identified as White or Caucasian, 6.1% Black or African American, 12.1% Hispanic/Latinx, and 9.1% Multiracial. Further, 91.9% identified as women, 5.4% as men, and 2.7% as non-binary. Details about their positions are presented in Table 1.

To answer the research questions, a qualitative study was conducted utilizing three data sources. First, as part of the second AI session, educators participated in breakout group discussions and took notes on posters that they presented to all attendees. These posters presented their opinions about the challenges, opportunities and ways in which AI could change teaching practices. As it was an activity within the session and did not ask for opinions about

the PD or changes in perception before and after it, these posters only helped to answer RQ1, related to perceptions of AI integration.

Table 1
Educators' positions details

Position details	**Number (%)**
Grade Level Taught	
K	40.91%
1°	45.45%
2°	47.73%
3°	93.18%
4°	86.36%
5°	88.64%
6°	72.73%
Role	
Classroom teachers	78.40%
Librarians/Media specialist	16.20%
Instructional technology coach	2.70%
Subject taught	
ELA/Reading/Literacy	69.05%
Mathematics	61.90%
Science	42.86%
Social Studies	38.10%
Technology/Computer Science	28.57%
Librarian/Media Specialist	14.29%
Gifted/TAG	9.52%
Arts	9.52%
Music	4.76%
Number of subjects taught	
One subject	33.33%
Two subjects	38.10%
Three subjects	9.52%
Four subjects	14.29%
Five subjects	4.76%

Second, after the second and third AI sessions, educators completed an exit ticket that included the following questions: 1) What did you learn from today's AI session? 2) What questions (if any) do you still have from today's AI session? 3) What activities (if any) from today's AI session do you plan to try out in your classroom? 4) What additional support could you use? A total of 35 educators responded to the exit ticket after the second session and 24 completed it after the third session. As these exit tickets provide information about willingness to implement AI, and provide insights into the outcomes of the PD, they contributed to answering the three research questions.

Third, semi-structured interviews were conducted with 20 educators at the end of the PD to gather their opinions about the program and the AI sessions specifically. All PD educators were invited to participate and an evaluation team consisting of five members conducted the interviews concurrently. Two questions asked specifically about AI: "What were your perceptions of AI before this PD?" and "How did the AI sessions of the PD shape (if at all) those perceptions?" Additional questions included "Which CS tools did you enjoy the most, and why?" and "Which PD activities did you enjoy the most?" In these questions, educators also referred to aspects of the PD related to AI. All the excerpts in which educators referenced AI were included in the analysis. Since the interviews provide insights into their perceptions of AI and the PD, they contributed to answering the three research questions.

Data analysis

Poster and interview data were transcribed, and these data, along with the survey responses, were analyzed using Dedoose, a software for qualitative data analysis. Pseudonyms were assigned to each participant to protect their personal identifiable data. In the first round, one researcher coded all the data using an inductive approach (Strauss & Corbin, 1990) to identify factors and perceptions of AI. A second researcher coded 20% of it to assess inter-coder reliability. The Cohen's Kappa for this analysis was 0.73, indicating that the coding scheme and its application are reliable.

After the initial coding, codes were grouped into broader themes based on the trends identified between them. These codes and themes were associated with the components of the i-TPACK - UTAUT model, with the purpose of answering RQ1. In this first analysis, the three sources of data (posters, exit tickets, and interviews) were used. The association of the codes and themes with the theoretical frameworks contributes to understanding the significance of the results within the broader literature and theories related to the topic.

To identify changes in AI perceptions after the PD (RQ2) and identify key insights about their overall experience (RQ3), interview and exit ticket data were also grouped into categories to capture positive and negative feelings about AI, changes in those feelings, willingness to integrate AI in instruction, and potential influences of the PD on educators' perceptions. Table 2 shows this categorization.

Table 2

Data categorization for RQ2 and RQ3

Data category	Data source
Opinion before the PD	Final interview in the question "What were your perceptions of AI before this PD?"
Opinion post each AI session	Exit tickets
Opinion after PD	Final interview in the question "How did the AI sessions of the PD shape (if at all) those perceptions?"

The codes applied to each of these categories were reviewed to identify trends and possible changes of perceptions in each participant during the PD. For instance, if one educator indicated that their opinion before the PD was negative but expressed a positive opinion afterward, this would be considered a positive change in attitude.

To report trends in the data, the findings section includes three types of counts: (1) the number of times a code was applied across all the data, (2) the number of educators associated with each category, theme, or code, and (3) the number of breakout groups (posters) connected to each theme or code. To count educators, data from individual sources (exit tickets and interviews) were grouped for each educator to ensure each person was counted only once, even if the same code appeared multiple times in different data sources for that same educator. To cite a quote from an educator in the findings section, their pseudonym was used to protect their identity.

Findings

RQ1: What are elementary educators' perceptions of integrating AI tools into their instruction?

Connections with i-TPACK and UTAUT. The themes were linked to the components of the i-TPACK and UTAUT frameworks to contextualize the findings and add explanatory power to the results. This approach revealed meaningful connections between the data and the frameworks as shown in Table 3. In this inferential analysis, all five components of the i-TPACK model were present, indicating that all dimensions influence educators' perceptions of AI. In terms of UTAUT, effort expectancy (the perceived ease of use of the AI tool) was associated with one theme, while performance expectancy (the perceived usefulness of the tool) was linked to four themes, highlighting educators' strong emphasis on the utility of AI for their purposes. Social influence was associated with one theme.

Educator readiness. Educators highlighted the importance of knowledge for effectively using and integrating AI, noting that staying updated is essential as AI evolves. Dalia mentioned, *"At first, I was like, 'What is AI? I don't know what it is.' There are still concepts I don't understand. So, I'm just interested in continuing to learn more about AI and how to use it in the classroom.*" Educators also reported limited prior AI knowledge, emphasizing the need for greater exposure and the PD's relevance.

Pedagogical opportunities. Educators frequently mentioned the potential of AI to enhance student engagement and make learning enjoyable. Eliza noted, "*I wouldn't have thought of the games like that as AI.' So that kind of bridged something for me. I was like, 'Okay, well, it can be fun too."* Additionally, educators highlighted how

AI can support learning development by aiding in concept practice, critical thinking, and communication skills. They noted that AI facilitates practical learning and emphasized its potential for personalizing the learning experience for students.

Table 3
Codes, themes and associations with UTAUT and i-TPACK

i-TPACK component	UTAUT component	Themes	Codes applied	Educators	Discussion group posters
i-TK: AI Technological Knowledge	Effort Expectancy	Educators' readiness	Little previous knowledge	4	
			Educators' readiness	3	1
i-TPK - AI technological pedagogical knowledge	Performance Expectancy	Pedagogical opportunities	Fun/engaging for students	7	2
			AI to develop learning	5	2
			Practical learning		1
			Personalized learning	1	2
		Pedagogical concerns	Distraction for students	1	2
			Concern with students developing own skills	5	
			Cheating / plagiarism	7	5
	Facilitating Conditions	Age appropriate	Age appropriate	7	3
i-TCK: AI Technological Content Knowledge	Performance Expectancy	Generating content with AI	AI in the creative world	4	
			Accuracy of AI	5	6
			Lesson creation	15	
i-TPACK: AI Ethics	Social Influence	Ethics and societal impact	Ethical aspects	7	
			Fear	6	
			Unsafe	3	2
			Responsible use	10	4
			Differentiate AI vs reality	2	2
			Future of AI in society	7	
i-TPACK - Technological Pedagogical Content Knowledge	Performance Expectancy	Efficiency in teaching tasks	AI for teaching efficiency	18	5

Pedagogical concerns. Educators expressed concerns about plagiarism, cheating, and students bypassing creative engagement through AI. Ezra added, "*I think it can shortchange our students if they use it improperly by skipping the necessary steps that's needed through this whole educational process"*. Educators also felt that reliance on AI might hinder skill development, while others saw it as potentially distracting.

Age appropriate. Educators reflected on the challenges of integrating AI with younger students. They noted that young learners may lack the ability to critically make decisions about using AI safely and appropriately. Halley noted "*Once you teach kids how to use a tool, they don't always know how to use it the right way, and because they are only, you know, 9, 10, 11-year-old kids, they don't always know what's right and what's wrong yet*".

Generating Content with AI. Educators expressed concerns about the reliability of AI-generated content, emphasizing the need to help students recognize trustworthy content. Katheleen remarked, "*I don't know if I would let ChatGPT, unless I was modeling it to a certain situation to show how AI could fail us, like with math. ChatGPT is awful with math.*" Arts educators also voiced concerns about AI creating art pieces without any input from the student. Despite the concerns and limitations expressed, educators recognized the potential for creating new and innovative lesson plans with the help of AI.

Ethics and social impact. Educators frequently reflected on values, ethics, responsibility, and safety issues surrounding AI. They expressed concerns about the ethical implications, such as data privacy, job displacement, and intellectual property. Some noted the challenge of distinguishing authentic content from AI-generated material, which could lead to misuse. Jorndyn noted, "*I was thinking that the scary part is that people can make videos or images of*

people that aren't even them. So, are we going to hold people accountable or say someone is guilty for something they didn't even do?" These undesirable uses and that uncertainty led to some educators feeling scared and considering AI to be unsafe. However, they also acknowledged the importance of responsible integration to reduce harm. Jill suggested, "*We need to include some training on AI to ensure that everyone is safe and not overusing it."*

Efficiency in tasks. Educators mentioned how AI has the potential to enhance their efficiency and reduce their workload, including generating ideas, gathering information, planning lessons, and creating rubrics. Reese shared, *"I love it for teaching. I have gotten a lot of ideas for teaching."*

RQ2: In what ways are elementary educators' perceptions of AI shaped by their participation in a PD program that includes AI-focused sessions?

Using the 20 interviews as a data source, we examined each educator's perception before and after the PD program, categorizing them as positive, negative, or mixed. A "positive" categorization applied when comments were mostly favorable toward AI, even with some mention of risks or concerns. A "negative" categorization was assigned when risks, challenges or negative opinions dominated, with minimal mention of advantages or opportunities. "Mixed" applied to educators expressing both positive and negative feelings equally. Table 4 shows that the PD helped shift 5 of the 20 educators' opinions from negative to positive. Chloe, who changed her attitude from negative to positive, noted: "*My perceptions were that it steals information… but the PD afterwards… I was like, oh, I can see how that (AI) would be really useful."*

Table 4

Changes in perceptions before and after the PD

Pre-PD AI Opinion	Post-PD AI Opinion	Number of educators	Change
Positive	Positive	9	Opinion remained positive
Negative	Positive	5	Opinion changed from negative to positive
Mixed	Mixed	4	Opinion remained mixed
Negative	Negative	2	Opinion remained negative

Although Table 4 shows that 15 educators did not experience a change in their perceptions, the qualitative data reveals nuances that indicate positive impacts. For instance, Vanessa, who expressed negative opinions both before and after the PD, said: "*It brought me a little bit closer to the side of being accepting of it…but I'm still very much so on the it scares me.*" This statement suggests a subtle shift. While explaining why she maintained a negative opinion, Vanessa emphasized the potential for harm when these tools fall into the wrong hands. She provided examples of how they can be used to steal identities, spread deceptive information, and even engage in unlawful activities, such as stealing money through online banking. Similarly, Lucy, who also retained negative feelings, said, "*I'm worried, but I'm worried with more knowledge*" indicating increased understanding. Among the reasons she gave for her unchanged perspective, she noted that this technology is still new and has a significant impact on society, leading to uncertainty about its implications. She reinforced a fear of the unknown. Educators maintaining a positive attitude also reported enhanced understanding; Reese noted, "*Yeah, I felt like it expanded my concept of what AI is and helped me see ways that it can connect to kids."* Overall, 19 of 20 educators found the AI sessions useful, gaining knowledge and resources for classroom integration.

RQ3: What are educators' perceptions of the AI-focused PD sessions?

Code applications provided insights into the benefits of the PD for educators. Table 5 lists the codes with the highest applications in the data categories "Opinion post session" and "Opinion post PD". The findings show a significant count for "AI for teaching efficiency," "New tools to implement," and "Willingness to implement" in both categories. These counts suggest that the AI sessions positively impacted educators by providing practical tools and ideas they are eager to implement, influencing their perceptions and intentions regarding AI integration.

A total of 36 educators submitted at least one exit ticket, which included the question, "What activities (if any) from today's AI session do you plan to try out in your classroom?" This allowed easy identification of those willing to incorporate AI into their lessons. In total, 35 educators expressed a willingness to integrate these tools. Emma noted *"I really liked the semantics by Google. I think that could be a great short center in an ELA block to help build vocabulary."*

Table 5
Data categories and code counts

Data category	Code	Code count	Data source
Opinion post session	AI for teaching efficiency	18	Exit tickets
Opinion post session	New AI tools to implement	11	Exit tickets
Opinion post session	Willingness to implement Ai in classroom	53	Exit tickets
Opinion post PD	Willingness to implement Ai in classroom	10	Interviews
Opinion post PD	AI for teaching efficiency	7	Interviews
Opinion post PD	Session of AI was helpful or beneficial	32	Interviews

Discussion and conclusion

The findings suggest that elementary educators' perceptions of AI are shaped by both its perceived opportunities—such as enhancing pedagogical strategies, creating new content, and personalizing instruction—and its challenges, including concerns about students' critical thinking development, safety, and ethics. Dimensions from the i-TPACK framework, such as technological pedagogical knowledge and ethics, frequently emerged in their responses. These perceptions may be strongly influenced by educators' work with younger students.

Educators also placed significant importance on AI's performance expectancy, reflecting their belief in its potential to enhance their work. This emphasis on performance expectancy aligns with the findings of An et al. (2023) in their study of Chinese teachers at all educational levels, suggesting that this may be a broader trend among educators.

Additionally, data indicate that the three AI focused PD sessions contributed positively to educators' perceptions, increased their knowledge of AI, and influenced their behavioral intention—defined by the UTAUT model as the willingness to integrate technology into the classroom. Out of 39 educators, 38 indicated they would use at least one of the AI tools presented during the PD. These results highlight that a PD program offering accessible AI explanations and providing age-appropriate resources (such as lessons and tools) can positively influence elementary educators' perceptions and integration of AI. These findings, as mentioned by Park et al. (2023), justify the pertinence of PD programs to integrate AI in the curriculum.

Based on the findings, several content areas and strategies can be incorporated into PD to address educators' perspectives, needs, and concerns. These include: (a) providing more technical explanations of how AI is created and implemented, as this helps educators assess the functionality of AI tools and make informed decisions about their adoption (e.g. pedagogical opportunities, age appropriate), as indicated by the findings of RQ1; (b) incorporating hands-on, age-appropriate activities to help educators connect their theoretical understanding of AI with authentic, practical classroom applications, a strategy shown to be effective in RQ2 and RQ3, where exit ticket responses revealed that teachers were enthusiastic about implementing the introduced tools in their teaching; (c) offering guidance on ethical and safety considerations, such as protecting data privacy and implementing additional safeguards for younger students, which emerged as a key theme in RQ1; (d) providing resources for ongoing AI integration, as this is particularly important for teachers—especially those with negative perceptions—who expressed anxiety about the unknown, with the PD demonstrating that offering guidance and tools enhances teacher readiness; and (e) offering methods for evaluating the impact of AI integration on teaching and learning, ensuring that its use aligns with safety, ethical appropriateness, and instructional effectiveness—three factors that teachers in RQ1 identified as critical.

One limitation of this study is that educators volunteered to participate in the PD, indicating that they likely held relatively positive attitudes towards computing, which was the central focus of this work. In turn, this may have fostered a favorable perception of AI during the PD, even among those who were initially more skeptical. Further research is needed to explore the impact of such initiatives on educators who have less familiarity and interest towards computing.

This study offers practical guidance for PD providers, policymakers, and education officials on better supporting and preparing educators for the era of AI by providing a concrete example of how to implement PD with an AI focus. It also provides valuable insights for technology developers on designing features that facilitate classroom implementation, including elements that minimize risks for children, thereby enabling safe interaction with AI while promoting skill development and knowledge acquisition.

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