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RESEARCH & POLICY

DEMYSTIFYING AI: PREPARING K-12 TEACHERS TO INTEGRATE AI TOOLS INTO THEIR PRACTICE

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MIT pK-12 Initiative

MIT RAISE Initiative
Responsible AI for Social Empowerment and Education

Contents

Foreword

Artificial intelligence is reshaping every sector of society, and education lies at the heart of this transformation. As nations prepare their youth for an increasingly digital and AI-enabled future, teachers play a pivotal role in ensuring that technology strengthens their expertise, judgment, and role as cultivators of critical and ethical thinkers. Preparing the teaching workforce to navigate and harness AI is a foundational requirement for future-ready education systems.

This WISE study, Demystifying AI: Evaluating the Effectiveness of Professional Development at Preparing K-12 Teachers for Integrating AI into their Teaching Practice, underscores a key policy recommendation: "the necessity of systemic and locally informed strategies for AI capacity building" in schools. Conducted in collaboration with MIT PK-12 Initiative and MIT RAISE and, with the participation of seven countries, including Qatar, this research provides empirical insights and highlights essential considerations to be factored into developing equitable and scalable AI capacity-building initiatives for K-12 teachers to integrate AI tools ethically and effectively into learning environments.

Qatar's participation in this study reflects our national commitment to innovation and lifelong learning as pillars of Qatar National Vision 2030. Empowering teachers with the skills and ethical awareness to leverage emerging technologies aligns directly with the Ministry of Education and Higher Education's 2024-2030 Strategy, titled "Igniting the Spark of Learning." The Strategy prioritizes personalized learning for each student and aims to empower teachers with tools and training needed to effectively use AI to improve teaching methods and meet students' needs in more personalized and impactful manners.

As Qatar accelerates its work in digital transformation and future-skills development, this research strengthens our understanding of how to design and implement national AI capacity building initiatives. We look forward to advancing research initiatives that support teachers, foster innovation, and promote ethical, inclusive, and human-centered AI adoption in education.

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Key Findings

This study led by WISE (World Innovation Summit for Education, an initiative of Qatar Foundation), in collaboration with MIT pK-12 Initiative and MIT RAISE, evaluated how short, asynchronous professional development (PD) courses prepare K–12 teachers to integrate artificial intelligence (AI) into teaching. Conducted across seven countries—Colombia, Cyprus, Ghana, Greece, Uganda, United States, and Qatar—this study examined five open-access asynchronous online AI courses with different content, pedagogy, workload, and language delivery.

Implementation and Participants

The study highlights the importance of careful strategic implementation and demonstrates the feasibility of scalable, cross-country AI PD for teachers. The teachers in this study represented diverse language, technical, and professional backgrounds. Most of the teachers in Colombia, Cyprus, Greece, United States, and Qatar had many years of experience and strong pedagogical expertise but sometimes low digital fluency. In Ghana and Uganda, teachers were generally early career, showing higher adaptability but experiencing more infrastructure challenges. All courses were offered in English, and some offered Arabic, Spanish, and Greek translations. Teachers invited to a course not offered in their first language left the program at a higher rate. Courses with official translations and recognized certifications achieved higher engagement and completion.

Course Performance and Learning Outcomes

The course offered by AI for Education showed the highest retention (~58%) and satisfaction. Day of AI had the lowest retention (~40%), possibly due to its exploratory format and inconsistent translation. PD completion certification incentives, local language, and easily accessible platforms with clear instructions were consistent motivators for participation. Across all countries, teachers reported clear gains in AI familiarity, prompt writing, and classroom application, averaging 30–50 percentage point increases post-course. Technical understanding of Machine Learning (ML) and algorithmic bias remained limited, suggesting the need for stronger conceptual foundations.

Cross-Cutting Insights and Policy Implications

Teachers favored flexibility, interactivity, multilingual access, downloadable resources, and hybrid mentor support. Data from Greece and the United States, where we ran two separate cohorts, showed that courses offered during vacation periods had slightly higher retention than courses during the school year. Across all countries, common concerns included data privacy, AI bias, and equitable access to technology. Teachers from Colombia and Uganda also requested follow-up opportunities and communities of practice for sustained engagement. Effective AI PD must be context-responsive, tiered by digital readiness, supported by localized and multilingual frameworks, and aligned with national curricular standards. Policy makers should integrate ethical guidance, certification pathways, and infrastructure investments into national digital transformation strategies. Carefully selected, timed, and organized collaboration with local, governmental, or education-related organizations greatly facilitated recruitment and implementation and is highly recommended.

Overall Insight

Brief, well-designed AI PD courses can enhance teachers' confidence and build foundational readiness for AI integration. Long-term success depends on systemic support, equity-driven implementation, and sustained professional learning ecosystems.

Executive Summary

AI technologies have rapidly catalyzed major innovations and breakthroughs in recent years, particularly in generative AI ("genAI"), poised to transform education and workforce. Approximately 60% of jobs in advanced economies are expected to be impacted by AI. This study led by WISE (Qatar Foundation), in collaboration with MIT pK-12 Initiative and MIT RAISE, evaluates the effectiveness of short PD courses in preparing K–12 teachers to integrate AI into their teaching practices. The research spans seven countries—Colombia, Cyprus, Ghana, Greece, Uganda, United States, and Qatar—and uses five online courses, each employing distinct pedagogical and delivery approaches. The findings highlight global trends, regional differences, and critical considerations for designing equitable and scalable AI capacity-building initiatives for teachers worldwide.

Study Purpose and Design

To demystify AI for K–12 education, this study examined teachers' knowledge of AI and explored how PD courses can address teachers' preconceptions, misconceptions, and attitudes regarding the use of AI in teaching and learning practice. The study also sought to determine how different course formats and pedagogical approaches influence teachers' knowledge, skills, and attitudes toward AI integration in classrooms. Using a mixed-methods design, researchers collected pre- and post-course survey data, supported by anecdotal correspondence. Teachers were randomly assigned to one of five online courses, developed by Google-RAISE, Code.org, Microsoft, AI for Education, and Day of AI.

The courses selected for this study were chosen based on a set of consistent criteria aimed at ensuring accessibility, scalability, and relevance for diverse K–12 teachers:

- online and self-paced, enabling teachers to engage with the content at their own convenience
- short, typically requiring only 2–6 hours to complete, making them manageable within busy teaching schedules
- free of charge, removing financial barriers to participation
- asynchronous, meaning they did not require real-time attendance, which supported flexibility across time zones and school calendars

Importantly, most courses offered a form of digital credential upon completion, either a certificate or digital badge, which served as a motivator and provided professional recognition. These criteria ensured that the courses were inclusive, adaptable, and suitable for evaluating AI literacy development across varied educational contexts.

Course content was also evaluated by the MIT and WISE team, finding the content appropriate for an introductory level. The research employed a randomized controlled design to ensure rigor and comparability across courses and countries, providing a unique cross-sectional view of teachers' AI literacy development across diverse contexts.

Significance of Implementation and Participant Demographics

The scale and diversity of this implementation represent a significant contribution to the emerging field of AI in education, which is still in a nascent stage. Teachers from the seven countries brought diverse language, cultural, technical, social, and professional backgrounds, enabling the study to capture variations in readiness, access, and pedagogical integration. Most teachers in Colombia, Cyprus, Greece, United States, and Qatar had over 10 years of experience (very often over 20 years), often working in public schools and demonstrating strong pedagogical expertise but sometimes low digital fluency. In contrast, early-career teachers in Ghana and Uganda showed comfort with digital tools but emphasized barriers such as connectivity and content/platform access. These demographic distinctions shed light on how years of experience, digital literacy, and local infrastructure interact to shape AI adoption trajectories, reinforcing the need for different, context-responsive PD courses. These findings echo those of Gu et al. (2025), who emphasize that national policy environments, infrastructure readiness, and cultural factors significantly influence the implementation and effectiveness of teachers' PD courses. The success of the multi-country rollout also illustrates both the feasibility and challenges of scalable, asynchronous global teacher PD and the need for local support. Rollouts took place during different periods in each country (during summer vacation or the school year), which also revealed the best timing for course effectiveness. Challenges with technological infrastructure largely affected initial engagement and retention.

Findings Across Countries

The following key themes emerged across countries:

- **Growth in AI familiarity and skills:**
  - Comfort levels with using AI tools increased by 30–50 percentage points post-course
  - Teachers in all participating countries consistently expressed enthusiasm for integrating AI responsibly
  - Familiarity with genAI tools and prompt writing increased significantly.
- **Persistent technical knowledge gaps and concerns:**
  - Limited understanding of ML and AI bias
  - Gap between conceptual and practical literacy
  - Concerns about ethical use of AI, data privacy, and student data handling
- **Teacher feedback on course improvement:**
  - Extended access to course materials
  - Improved translations
  - Subject-specific examples
- **Accessibility and engagement drivers:**
  - Local language availability increased completion rates. Teachers engaging during vacation periods showed modestly higher retention and satisfaction.
  - Anecdotal evidence also showed that offering a course completion certificate boosted initial engagement and persistence.

Findings Across Courses

Among the five courses evaluated, the one developed by AI for Education achieved the highest retention (58%) and satisfaction levels, which could be attributed to its concise, practical orientation and clear structure. Day of AI recorded the lowest retention (40%), potentially due to its self-exploratory format, the request for contextual adaptation during the course, and the inconsistent offering of translation. Despite its low retention rate, Day of AI scored higher in teachers' self-reported learning and comfort with creating teaching and learning resources with genAI. These findings align with Roshan et al. (2024), who found that while interest in AI PD is growing, retention and completion rates often remain below 30% in under-resourced contexts due to limited access to structured training and institutional support.

Their study of 200 teachers in Asia reinforces the need for accessible, context-sensitive PD. Similarly, in our study, certification availability emerged as a key motivator, with teachers favoring courses offering recognized credentials over digital badges. These findings suggest that professional recognition along with well-structured course design, clear instructions, local language options, and an easy-to-use platform are key drivers of engagement.

Implications for Teachers and Course Designers

The findings indicate that effective K–12 PD in AI requires adaptability to different professional backgrounds and contexts. Courses should offer tiered learning paths to accommodate varying levels of digital fluency and prior AI knowledge. Teachers emphasized the need for multimodal, interactive materials and extended access to open resources. Embedding mentorship, peer discussion, and communities of practice can further support reflection and sustained engagement. Recognized certification and culturally relevant examples also emerged as powerful motivators for continued participation and knowledge application. Co-development of courses with local input and careful alignment with localized curricular standards can also improve engagement. Teachers also highlighted concerns about ethical AI use, data privacy, and handling of student data. Courses should include content relevant to these concerns.

Policy and Institutional Recommendations

For policy makers, the study highlights the necessity of systemic, locally informed strategies for AI capacity-building. Ministries of Education and teacher training institutions should co-develop PD courses that align with national curricula, ensure language inclusivity, and provide equitable access to AI resources. Current levels of general digital literacy should be considered too, as such gaps still exist and should be addressed before or in parallel to developing an AI PD course. These recommendations align with findings from Gu et al. (2025), whose comparative analysis across 21 countries emphasizes that the success of AI-related PD is closely tied to national policy coherence, infrastructure readiness, and the integration of digital competence frameworks. Investment in infrastructure, including device access, low-bandwidth solutions, and open educational resources, is critical for under-resourced regions. Furthermore, leadership ranging from local school governance to national governments should develop clear ethical guidelines around data privacy, algorithmic bias, and responsible AI adoption in classrooms. Applicable policies should incorporate certification frameworks, mentorship networks, and ongoing support for teacher communities as integral components of digital transformation strategies.

Study Limitations

The study findings reflect the experience of teachers representing particular populations who voluntarily expressed interest in participating. Teachers differ in terms of years of experience, levels of digital literacy, and socioeconomic school conditions, making aforementioned findings less generalizable. If the actual representation in each country is not analogous to the one participating in this study, different approaches might be needed to more accurately reflect the current landscape and the needs of each country. A follow-up study with a more representative targeted sample in each country or region is highly recommended before planning large-scale programmatic implementations.

Conclusion

This study provides one of the first comparative analyses of AI-focused teacher PD across multiple countries. It demonstrates that brief, asynchronous online courses can improve teachers' confidence and readiness to engage with AI tools and create their own resources; eliminate preconceptions and misconceptions; and lead to a change of mindset. The diversity of teachers offers rare insight into how factors like years of experience and language shape learning outcomes. To achieve sustainable and equitable AI literacy globally, future programs must balance accessibility with depth, link ethics with practice, and embed continuous PD into broader education innovation strategies.

1. Introduction

AI technologies have rapidly catalyzed major innovations and breakthroughs in recent years, particularly in genAI, poised to transform education and the workforce. According to the International Monetary Fund, approximately 60% of jobs in advanced economies are expected to be impacted by AI, due to the high prevalence of cognitive-task-oriented roles (Cazzaniga et al., 2024). This transformation is already evident across diverse sectors, including education, where AI tools are beginning to augment and transform key activities and practices. Since the release of ChatGPT in November 2022, teachers, administrators, and policy makers have accelerated efforts to understand and regulate AI's role in K–12 education. Given this trajectory, it is therefore imperative to introduce not only AI concepts but also ethical frameworks, digital literacy, and human-centered design principles early in the education journey. Equipping teachers with the knowledge and tools to integrate AI responsibly and effectively into teaching and learning is non-negotiable for preparing future-ready learners. Preparing learners for an AI-driven world requires supporting teachers' AI literacy, helping them understand both how to teach about AI and how to use AI tools to save time, personalize learning, and design engaging lessons.

Responsible and ethical technology use is foundational to digital citizenship. As Klopfer, Reich, Ableson, and Breazeal (2024) emphasize, "Students will still need to learn how to make and create. We need students to be creators, not just consumers, especially as technology evolves rapidly." Yet UNESCO (2023) highlights that many teachers often lack the training to facilitate thoughtful discussions on AI's potential and limitations. Importantly, when teachers perceive a subject as valuable and meaningful, they are more likely to design richer, more impactful lessons (Pajares, 1992).

Klopfer et al. advocates for "considered, limited experimentation" with AI in education, emphasizing the importance of collaboration among teachers, researchers, and policy makers. To date, most K–12 teachers (66%) do not currently use AI in classrooms, although 73% anticipate doing so in the future (Diliberti et al., 2024). Research shows that while teachers recognize AI's potential to transform learning, they also express concerns about ethical implications, infrastructure limitations, and the need for PD (Aghaziarati et al., 2022; Sütçü & Sütçü, 2023). Teachers' confidence with AI and understanding of AI's relevance are strong predictors of their readiness to adopt it (Ayanwale et al., 2022; Yue, Jong, & Ng, 2024), and external support is key for successful implementation (Ravi et al., 2023).

Finally, effective integration of AI in education also requires addressing persistent misconceptions and myths. Bewersdorff et al. (2023) found that while preconceptions about AI can be easily corrected through instruction, deeper misconceptions are more persistent (Chi & Roscoe, 2002). Myths shaped by cultural beliefs further complicate public understanding and can influence how AI is perceived in educational settings (Leufer, 2020; Emmert-Streib, Yli-Harja, & Dehmer, 2020; Natale & Ballatore, 2020). Targeted teacher PD that confronts these misunderstandings is essential to improving AI literacy and fostering informed, productive engagement with AI tools in classrooms.

2. Purpose and Objectives

This study examines teachers' knowledge of AI and explores how PD courses can address teachers' preconceptions, misconceptions, and attitudes regarding the use of AI in teaching and learning practice. The findings are intended to inform the design and implementation of K–12 teacher PD courses that promote the productive and ethical adoption of AI technologies in education.

While previous research has largely focused on debunking AI-related myths in education (Bewersdorff et al., 2023; Emmert-Streib et al., 2020) or analyzing national strategies and policy frameworks (Gu et al., 2025), this study extends the literature by empirically investigating the preconceptions and misconceptions of teachers in seven countries: Colombia, Cyprus, Ghana, Greece, Uganda, United States, and Qatar.

This study demonstrates that teachers' preconceptions and misconceptions about AI can be corrected through targeted instruction, leading to measurable shifts in teachers' attitudes and confidence. These findings align with Kurz et al. (2025), who showed that virtual PD can significantly influence teachers' perceptions of AI in the United States, and with Huynh et al. (2025), who found that PD incorporating ethical reflection and mindset development fostered deeper conceptual change. Similarly, Lademann et al. (2025) reported significant gains in AI literacy and confidence following structured online PD in Germany, while Roshan et al. (2024) highlighted the challenges of low retention in under-resourced contexts such as China. Unlike these single-country or regional studies, this study offers a rare cross-national, comparative perspective, using a randomized controlled design to evaluate multiple pedagogical approaches and delivery formats. These insights will guide the development of scalable, evidence-based resources to enhance AI literacy among teachers and support more effective integration of AI into teaching and learning.

This study also examines how PD experiences affect teachers' AI literacy, confidence, and readiness to integrate AI tools, in particular genAI, into their practice. It explores how these outcomes correlate with course design and completion rates. By comparing multiple educational resources and pedagogical approaches, the study aims to identify modalities that most effectively build teachers' conceptual understanding and practical skills.

To this end, WISE in paternship with the MIT pK-12 Initiative and MIT RAISE, invited K–12 teachers from seven countries to participate in a study on integrating AI into teaching. Teachers engaged with five short, asynchronous online courses, each representing a distinct pedagogical approach, developed to enhance teachers' understanding and application of AI in the classroom.

3. Methodology

3.1 Participants

Participants were recruited from a large, diverse sample of K–12 teachers representing different subjects, grade levels, regions, socioeconomic contexts, and school types. This diversity enabled analysis of differences in teachers' AI knowledge, preconceptions, misconceptions, and attitudes and how these factors shape the integration of AI into teaching practice. A randomized controlled design with pre- and post-course surveys (Appendix A and B) was used to evaluate learning outcomes and understand the teacher's experience. Teachers were randomly assigned to one of five courses: four structured courses and a self-guided course, which served as the control condition. This design allowed for comparison of how pedagogy, delivery, language, and timing can influence teachers' knowledge, confidence, and ability to apply AI tools in their work. The goal was to identify characteristics of effective, scalable PD for diverse teaching populations.

3.2 Course Identification and Research Instruments

The research team selected five courses that aim to introduce K–12 teachers to fundamentals about AI and strategies for teaching practices. Teachers were invited to assess the experience and effectiveness of these courses. The courses were open-source, and teachers could access them free of cost after registering on the platform. The courses employed different pedagogies and delivery modalities and varied in duration, workload, and translation options. All five courses were short and asynchronous, designed to be completed within a couple of days. Upon completion, some of the platforms offered certificates or digital credentials to recognize participation. The overview below and Table 3.1 summarize the key characteristics of each course, including pedagogical approaches. To avoid confusion due to similar course titles, this report refers to each course by the name of its hosting platform.

Generative AI for Educators (Google-RAISE)

Built by Google AI experts (Grow with Google) in collaboration with MIT RAISE, this flexible course was designed for high school and middle school teachers of any subject and requires no previous AI experience. The course is text-based with practical hands-on examples of using genAI tools in teaching. It includes topics such as AI and teaching practice, AI tools, ethical and responsible use, and strategies to integrate AI tools into teaching practice. This course is free, self-paced, and designed to be completed in 2 to 3 hours. Upon completion, participants receive a Google Ads Certification. For this study, Google offered official translation in Arabic and Spanish.

An Essential Guide to AI for Educators (AI for Education)

This AI course, developed by AI for Education, is designed to help teachers integrate AI in their classrooms, by "using ChatGPT to save time, engage students, and implement AI responsibly." It includes topics such as introduction to AI, getting started with ChatGPT, prompt engineering fundamentals, ethical implications of AI in the classroom, and strategies for introducing students to AI and ChatGPT. It is a free, hands-on course, intended to be completed in approximately two hours. After finishing the course, AI for Education provides a certificate of completion.

AI 101 Professional Learning for Educators (Code.org)

Code.org, in collaboration with the International Society for Technology in Education (ISTE), Educational Testing Service (ETS), and Khan Academy, offers a free, self-paced course for any teacher interested in AI and its transformative potential in education. The course includes five modules: Introducing AI for Educators, Understanding AI, Transforming Teaching with AI, Bringing AI to the Classroom, and Ensuring a Responsible Approach to AI. Each module has a duration of 60 minutes and includes video, text, vocabulary-matching or multiple-choice activities, and reflection prompts. Participants earn a certificate of completion for each of the five modules.

AI for Educators (Microsoft Learn)

Microsoft Learn offers this beginner-level online learning path that introduces teachers to foundational concepts in AI, including large language models (LLMs), genAI, and prompt engineering. Through four interactive modules, participants explore how to integrate AI responsibly into teaching and learning, while leveraging Microsoft's AI-powered tools such as Copilot, Image Creator, Word, PowerPoint, and Edge. The course emphasizes practical applications for lesson planning, personalization, and classroom innovation. It typically requires 4–5 hours to complete. To support a wider audience, Microsoft Learn provides AI-translated versions of this course in Arabic, Greek, and Spanish. However, these translations do not extend to all external recommended resources mentioned within the course. This free course attached digital badges to the learner's profile upon completion of each module.

What is AI? and The Brain Behind the Bot (Day of AI: Control Condition)

Day of AI is a library of free, hands-on lessons and activities that teachers can use to introduce K–12 learners to AI and how it shapes their lives. Developed by Day of AI, in collaboration with MIT RAISE researchers, the curriculum is designed for teachers with little or no background in technology. The course materials are licensed under Creative Commons (CC), allowing teachers to adapt and reuse the materials if they provide appropriate credit to the original creators. (CC licenses enable the sharing and reuse of creativity and knowledge through free legal tools. Most licenses require attribution and may include conditions such as non-commercial use or share-alike provisions.) The materials are subject-specific and designed to be flexible for use with students of diverse backgrounds and abilities. For this study, two modules were selected: *What is AI?* and *The Brain Behind the Bot*. These modules provide foundational knowledge about AI and chatbots for education, while also addressing key topics such as biases, pros and cons of AI technologies, and ethical considerations. Each module includes text, videos, a set of activities, and rubrics to support classroom implementation.

To facilitate participation and engagement, the research team developed a detailed PDF guide that included instructions for registration, platform navigation, Google Translate support, and pedagogical recommendations for engaging with this highly self-exploratory resource. Although Day of AI typically does not issue certificates, participants in this study were eligible to receive a certificate of completion for the two modules included in this study by submitting a verification form.

Pre- and post-course online surveys were developed (Appendices A and B) to examine how different AI PD courses influence teachers' preconceptions, misconceptions, and attitudes toward AI integration in education. The surveys combined multiple-choice, Likert-scale, and open-ended questions across five sections (see Table 3.2). Sections 2–5 contained identical items to allow for pre and post comparison.

Originally written in English, the surveys were translated into Arabic, Spanish, and Greek using an LLM and refined by native speakers from MIT who were not involved in the study. The pre-course survey established teachers' baseline familiarity and comfort with AI, as well as their preconceptions and misconceptions. The post-course survey measured engagement, retention, course completion, and teachers' experiences with course content, pedagogy, and technology, while assessing changes in knowledge, usage, and attitudes toward AI. A third follow-up survey, scheduled for distribution on November 15, 2025, will explore teachers' subsequent AI adoption in classroom practice and the factors that facilitate or hinder integration. Findings from the third survey will be added to this report at a later stage.

Table 3.1 Differentiating Variables per Course

Differentiating Variables per Course					
	AI for Education	**Code.org**	**Google-RAISE**	**Microsoft**	**Day of AI**
Language/s	English	English	Arabic, English, Spanish	Arabic, English, Greek, Spanish	English
Translation	–	–	Human	AI-translated	AI-translated
Duration	2 hrs	~ 5 hrs	2 hrs	~ 4.5 hrs	~ 6 hrs (flexible)
Target Audience	K-12 and higher-education teachers	K-12 and higher-education teachers	Middle & high school teachers	K-12 and higher-education teachers	K–12 teachers
Format & Pedagogy	Self-paced, mostly text	Self-paced, text & video lessons, knowledge checks	Self-paced, mostly text-based with knowledge checks	Self-paced, text-based modules with quizzes and resources	Classroom curriculum & online tools; self-exploratory format
Key Topics	Responsible AI, classroom use	AI basics, ethics, classroom integration	GenAI, prompt design, creativity	Microsoft AI tools, lesson plans, LLMs, prompt design, GenAI	AI fundamentals, ML, chatbots
Certification	Certificate of completion	Certificate of completion	Certificate of completion	Digital badges	Certification offered (for 2 modules)
Research Interest	Structured modules, concise, high applicability	Highly interactive and well-structured; supports practical engagement	Structured content with aligned knowledge checks	Strong structure, multiple resources, multilingual accessibility	Classroom-ready, activity-based; requires adaptation to local contexts

Table 3.2 Pre- and Post-Course Survey Sections

Pre- and Post-Course Survey Sections	
Pre-Course Survey Sections	**Post-Course Survey Sections**
Demographics	Experience with the course
Familiarity and use of genAI	Familiarity and use of genAI
Perceptions and Misconceptions	Perceptions and Misconceptions
Familiarity with AI and ML concepts	Familiarity with AI and ML concepts
Equity, Access & Ethical Use	Equity, Access & Ethical Use

3.3 Recruitment and Data Collection

Recruitment across the seven countries was conducted through multiple channels, including personal or professional networks, collaborations with local partner organizations, and formal partnerships with institutions affiliated with national ministries of education (see Table 3.3). Teachers were offered 3 weeks after the beginning of each cohort to complete the course. However, a pedagogical recommendation was that teachers not take over one week to complete these short courses. In Qatar, which was also the last cohort of the program, teachers were offered two weeks to complete their course.

Table 3.3: Pathways to Recruitment

Pathways to Recruitment					
Qatar	**Colombia**	**Ghana**	**Greece/Cyprus**	**Uganda**	**United States**
Ministry of Education and Higher Education, WISE	Personal and professional networking, MIT	Local partner (T-TEL), WISE	Professional networking, social media post, recruitment through "first cohort," MIT	Local partner (The North Green School), WISE	Professional networking, social media post, recruitment through "first cohort," MIT

The study began with a first cohort in Greece in June (n=104), enabling the research team to test recruitment procedures, survey instruments, and communication strategies, while also gathering preliminary teacher feedback. Recruitment materials, including a study brochure, were distributed through local professional networks. Interested teachers were invited to complete a short form (hosted on Qualtrics) indicating their interest to participate as well as their English proficiency. All subsequent communication occurred via email, including mail merge messages assigning individualized research codes for anonymity and group emails providing participation instructions. This phase yielded important insights into recruitment logistics, implementation challenges, and common technical issues across the five learning platforms hosting the five courses. A small parallel pilot was also conducted with a private school in Qatar.

One week later, the study was launched in Ghana. Recruitment occurred indirectly through a WISE local partner organization that shared 500 teacher email addresses. Although the same email process was used, mail merge messages were not reaching teachers (see Table 3.4). This issue created three main challenges: (a) a surge in email requests for research codes, (b) teachers generating their own codes that compromised accurate identification, and (c) teachers sharing unique codes with colleagues, which led to data integrity concerns and the exclusion of affected datasets.

Table 3.4: Number of Emails Sent Through Mail Merge, Including Emails with Research Codes

Number of Emails Sent via Mail Merge, Including Emails with Research Codes						
	Qatar	**Colombia**	**Ghana**	**Greece/Cyprus**	**Uganda**	**United States**
Mail merge emails sent	418	251	497	373	88	109
Emails opened	223	151	256	336	81	88
%	53%	60%	52%	90%	92%	81%

Although a second Greek round was not initially planned, high interest from teachers who missed the first phase prompted another summer implementation using an improved recruitment strategy. At this stage, substantial participation also came from Cyprus, where teachers share language and curricular similarities with Greece. Given these commonalities, the smaller Cypriot sample was merged with the Greek dataset for analysis.

Drawing on insights from the initial cohorts, the research team refined its recruitment strategy by introducing automated invitations to live "kick-off" sessions for subsequent rounds in Greece, United States, Uganda, and Qatar. Each session, supported by an instructional video, provided teachers an overview of study procedures, workload expectations, and platform navigation. Embedding the kick-off invitation link directly into the Qualtrics interest form improved communication with teachers who might otherwise miss email messages, thereby enhancing motivation and engagement. The kick-off session also allowed for clarification questions, reducing future email communication.

During the summer, the study expanded to Colombia, a second cohort in Greece, Uganda, and the first United States cohort. In September, following the beginning of the academic year, a second United States cohort and the Qatar cohort were launched. This staggered schedule allowed the team to examine whether teachers preferred PD during vacation periods, when workloads were lighter, or during the academic year, when immediate classroom application is possible.

Recruitment channels varied by country. MIT Open Learning's networks were leveraged in Colombia and the United States. WISE partner organizations supported outreach in Uganda. Collaboration between WISE and the Qatar Ministry of Education and Higher Education (MOEHE) facilitated recruitment for the Qatar cohort. Additionally, teachers from the initial cohorts were encouraged to share recruitment materials with colleagues and peers, further expanding the study's reach.

Table 3.5 Number of Participants, Engagement, Time of Deployment, and Recruitment Strategy

Number of Participants, Engagement, Time of Deployment and Recruitment							
	Qatar	Colombia	Ghana	Greece/Cyprus	Uganda	United States	Total
Expressed interest	400	241	514	276	91	109	**1631**
Submitted pre-course survey	287	124	132	208	67	57	**875**
Submitted post-course survey/ completed course	207/186	37/35	56/51	139/126	33/32	25/20	**497/450**
Cohort 1 Time of Deployment	School	School	School	School	Vacation	Vacation	
Cohort 2 Time of Deployment	School			Vacation		School	
Cohort 1 Recruitment Strategy	Mail Invitation	Mail Invitation & Video Recording	Mail Invitation	Mail Invitation	Mail invitation & Live Kick-off	Mail Invitation	
Cohort 2 Recruitment Strategy	Mail invitation & Live Kick-off			Mail invitation & Live Kick-off		Mail invitation & Live Kick-off	

3.4 Data Analysis

The data were analyzed by four researchers, native speakers of Arabic, English, Greek, and Spanish. Analysis occurred in two rounds: the first examined data by country and the second by course. Descriptive statistics were applied to multiple-choice items, while open-ended responses were analyzed through an open-coding qualitative approach. Each researcher independently reviewed responses in their native language and later participated in collaborative synthesis meetings to identify emerging themes and refine shared definitions for the final thematic codes. In addition to the primary data, the team maintained detailed metadata logs and anecdotal records, including email reach metrics, technical issues, and participant inquiries to contextualize the quantitative and qualitative findings.

4. Findings and Interpretations

4.1 Cross-Country Analysis

Engagement and course retention varied by country (Figure 4.1 and 4.2). Initial engagement was strongest in Greece, Uganda, and Qatar, with rates ranging from 72% to 75%. In contrast, Ghana showed the lowest initial engagement at 26%, which can be attributed to logistical challenges—only 51% of participating teachers in the country received their initial code and invitation to the study via mail merge. Qatar also had a low mail merge delivery rate but, unlike Ghana, benefited from an automated invite to a live kick-off session. The automated invite and live session, introduced as a corrective measure by the research team after the Ghana experience, proved critical in ensuring teachers had the necessary information to engage in the study and for boosting initial engagement in Qatar by providing clear instructions and immediate support. Also, in Qatar the study was formally supported and offered through the Ministry of Education and Higher Education, so teachers had an additional well-informed resource in case they needed further logistical support.

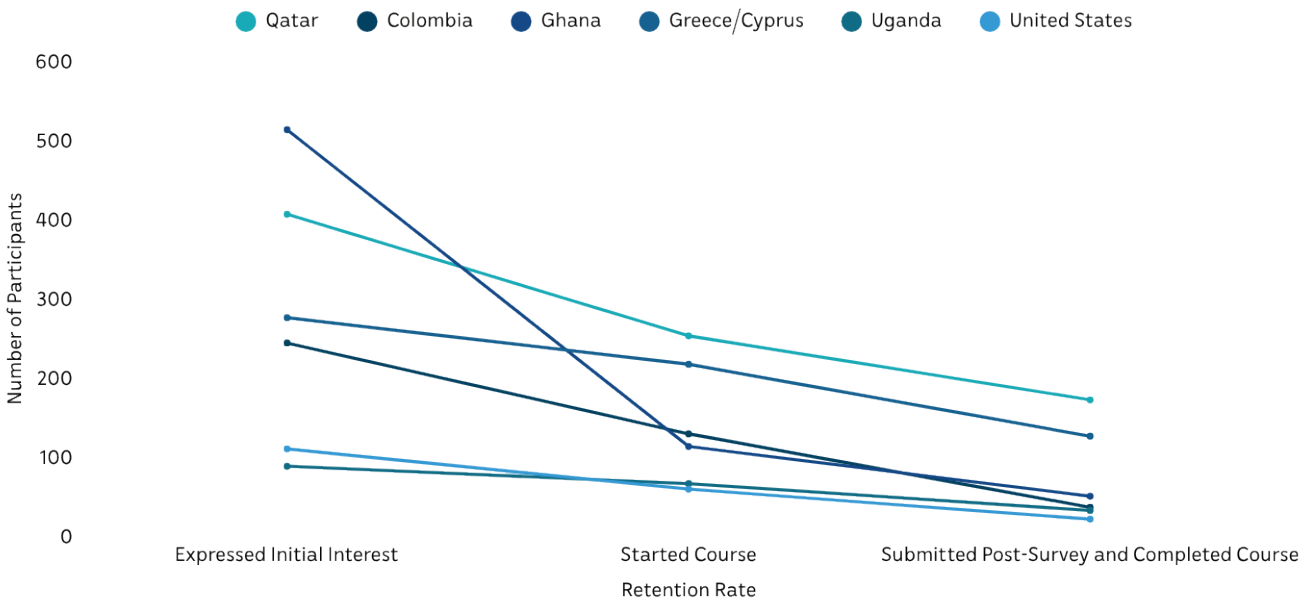

Figure 4.1: Drop-Off Curve per Country

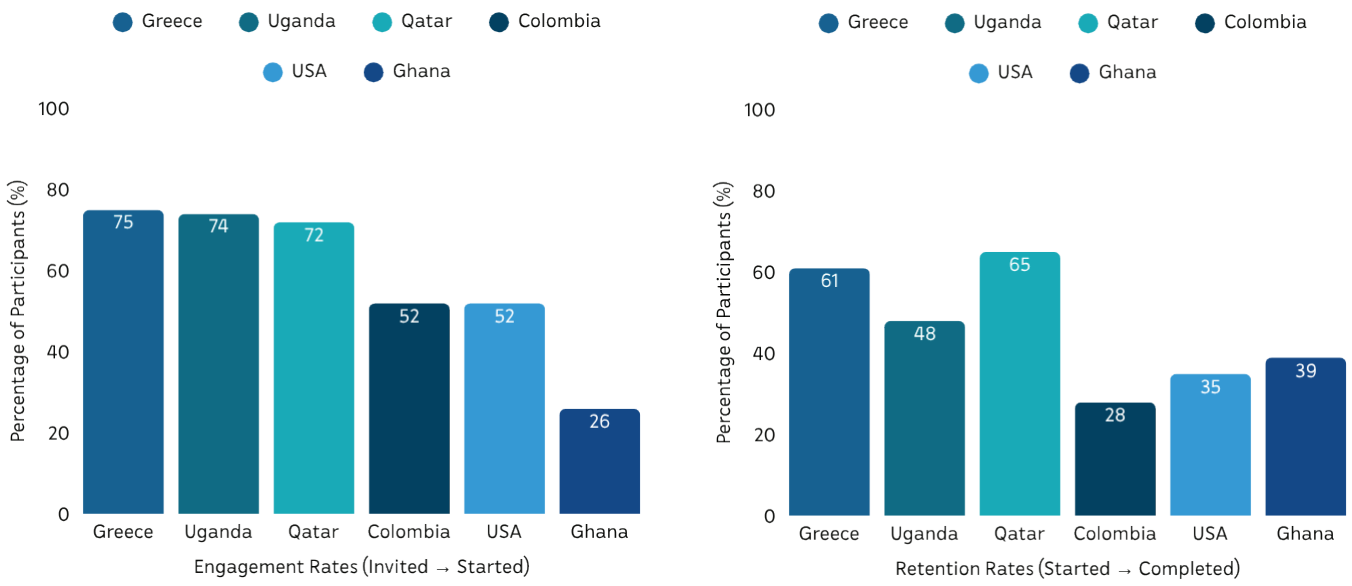

Figure 4.2: Percentage of Initial Engagement and Course Retention per Country

4.1.1 Target Audience

In countries where teachers submitted interest forms directly, the majority—except in Ghana and Uganda— had over 11 years of teaching experience, with many reporting more than 21 years. This data suggests that more experienced teachers may be particularly motivated to seek more structured PD courses, possibly due to gaps in digital skills. In contrast, teachers from Ghana and Uganda generally had fewer years of experience, possibly indicating a different culture or generational orientation toward technology in education. These demographic differences are important to consider when designing and implementing similar PD courses.

Prior experience with technology and AI also emerged as a critical factor. Teachers in the study spanned a range of expertise levels, from self-identified beginners to advanced users, reinforcing the need for different course offerings. Many teachers requested more advanced or technical courses, highlighting the importance of tailored courses for varying levels of expertise.

Of the teachers starting a course and submitting the pre-course survey, the majority were women (59%). In all countries except Ghana the majority of participating teachers were women. Analysis did not identify gender as a factor affecting engagement or course completion; however, further research should investigate whether this representation aligns with the actual gender representation in each country.

4.1.2 Language Preference and Impact

In Colombia, Greece, and Qatar, 576 teachers were asked whether they preferred to take a course in English or their native language. Teachers were then assigned randomly to courses offering their language or preference. Among those who remained engaged and submitted the post-course survey, completion rates were similar across both groups: 52% for those who took the course in their native language and 49% for those who took it in another language (Table 4.2). This data aligns with broader findings across all courses. However, among teachers who started a course but did not submit a post-course survey and left the study, 59% had been invited to complete a course in a language other than their native language. Therefore, language is a highly possible factor affecting engagement.

Table 4.2: Engagement and Retention per Language Preference

Engagement and Retention per Language Preference			
Language Preferance	**Started**	**Post-Course Survey (Submitted / Response Rate)**	**Course Completion (Reported / Completion Rate)**
Native Language	211	129 (61%)	109 (52%)
Other Language	348	208 (60%)	169 (49%)

4.1.3 Timing and Engagement

In Greece/Cyprus and the United States, two rounds of programs were offered: one during the school year and one during summer vacation. Analysis of participation patterns revealed modest but consistent differences in engagement based on timing. Among teachers who began a course during their vacation period (n = 140), 64% submitted the post-course survey and 58% reported completing the course. In comparison, those who participated during school time (n = 100) had slightly lower rates: 57% submitted the post-course survey and 51% reported completion. These findings suggest that reduced workloads during vacation may support higher engagement, although timing alone did not fully account for attrition. Of the 101 teachers who started but did not submit a post-course survey, 50 had enrolled during vacation and 43 during the school year. A small number of teachers (8) used unique codes with typos, so they remain unclassified. This distribution indicates that while participation during vacation may support engagement, other factors likely influenced retention throughout the study. Factors mentioned by teachers revealed both intrinsic and extrinsic motivation. While some teachers praised factors such as interest toward course content, platform usability, or acquiring a certification, others focused more on a desire for personal growth, a love for lifelong learning, a need to stay relevant and informed about such a fast-changing field, and a desire to participate in a research study and offer feedback that can affect national policies.

4.1.4 Remaining Considerations

After completing the courses, teachers identified *sensitive data collection* and *third-party data sharing* as their main concerns, followed by *weak security and breach* and *AI-biased decision making.* Many also expressed concerns regarding *equitable access to AI technology* as well as *how AI could support different cultural backgrounds, learning styles, or teaching practices* in an equitable way. Teachers held different views on what constitutes ethical use of AI and LLMs in the classroom but consistently emphasized the need for clear policies and for students to understand the benefits and limitations of AI tools before use.

4.2 Cross-Course Analysis

The five courses evaluated in this study employed distinct pedagogical approaches. Based on post-course survey data (Figure 4.3), AI for Education demonstrated a higher completion rate (94%) than the other courses, while Day of AI showed the lowest (83%) (Table 3.5). Teachers completing the AI for Education course mentioned that the course had easy platform navigation, took a short time to complete, provided interesting content, and was easy to understand.

When comparing initial engagement with the course—defined as the proportion of teachers who completed a pre-course survey and started their course relative to the total number initially invited after expressing interest to participate (Figure 4.4)—the Google-RAISE course showed the highest initial engagement rate (62%). While teacher feedback did not point to a single explanation for the stronger engagement with the Google-RAISE course, the research team identified three potential contributing factors:

- Language accessibility: official translations in Arabic and Spanish were offered by Google-RAISE to teachers in the study.
- Geographic distribution: the course was not available in Ghana, where email delivery issues had largely affected initial engagement and participation in the other courses.
- Credential recognition: the availability of certifications from a well-established organization appeared to be a strong incentive.

Anecdotal evidence suggests that some teachers discontinued the Microsoft course after discovering that its digital badges lacked formal recognition in their countries, while others decided not to participate after realizing the course did not lead to an MIT certificate. Frequent teacher inquiries about certification further underscores the importance of recognized credentials in driving PD engagement.

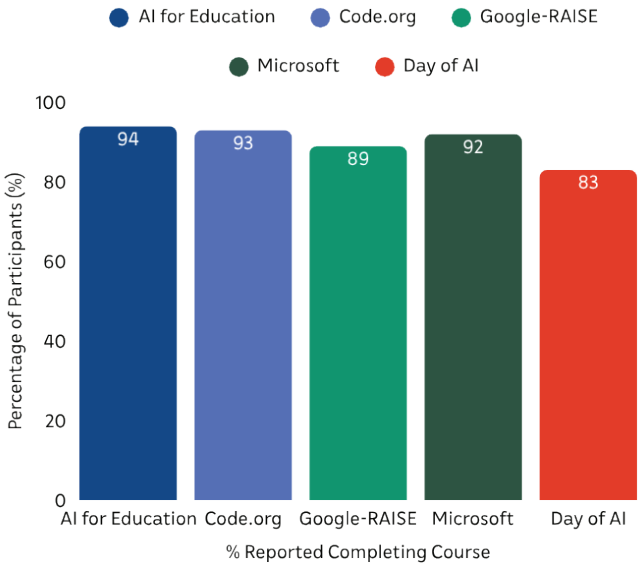

Figure 4.3: Percentage of Teachers Reporting Completing Their Course

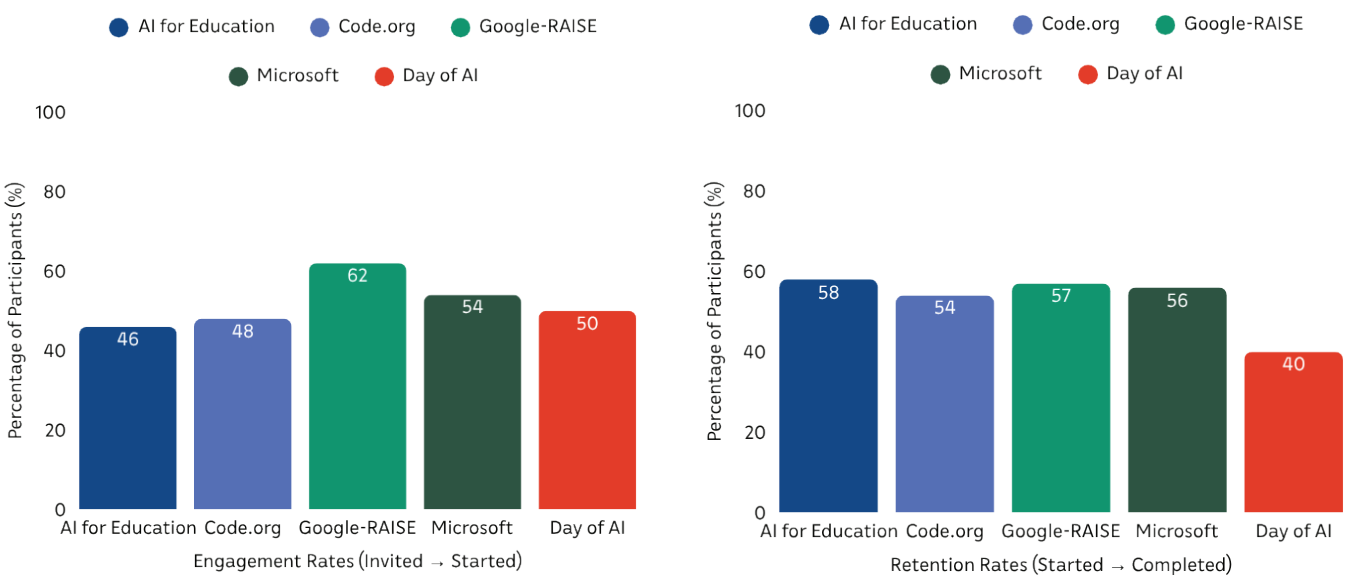

Figure 4.4: Initial Engagement per Course and Retention per Course by Course Offering

Final retention rates—defined as the proportion of teachers who reported completing the course relative to those who started—varied slightly across five of the evaluated courses (Figure 4.4). The AI for Education course showed the highest retention rate at 58%, followed closely by the Google-RAISE course at 57%. The Microsoft course had a retention rate of 56%, while the Code.org course reported 54%. Teachers frequently praised these courses for their clear structure, the useful content, accessible design, and practical orientation—common strengths noted across most offerings.

In contrast, Day of AI had a significantly lower retention rate of 40%. This retention rate may be attributed to its self-directed, exploratory structure and its requirement that teachers actively adapt materials to their local language, contexts, and settings. Despite the research team's efforts to support participation through detailed registration and instruction guides, Day of AI generated the highest requests for technical and pedagogical assistance. Teachers reported difficulty understanding if and when they had completed the course and how to apply the knowledge gained, particularly when the cohort ran during their vacation time. The Code.org course also generated a high number of emails reporting issues with initial registration in the platform.

These anecdotal communications highlighted two persistent challenges: (a) gaps in basic digital literacy, and (b) limitations of relying solely on email instructions, as many teachers overlooked initial attached documents that offered additional guidance. Additionally, while Day of AI provides automated translations through Google tools, these exclude embedded videos and supplementary materials such as slides and activity worksheets, further limiting accessibility for non-native English speakers.

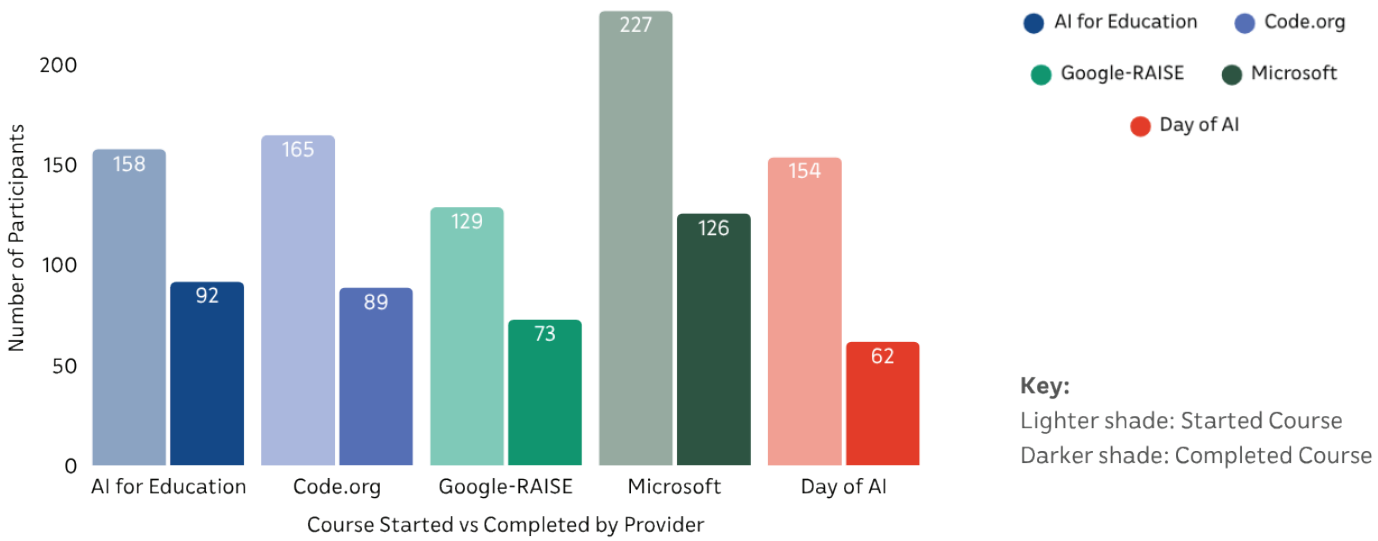

Figure 4.5: Teacher Retention Across AI PD Courses

These results suggest that while thoughtful course design and structure may influence retention, other factors such as certification, accessible language, time of offering, and clear and timely communication also play a significant role in sustaining engagement and retention in AI PD.

However, retention alone does not fully capture the impact of a course. Despite its lower retention rate, Day of AI stood out in terms of learning outcomes and teacher confidence. As shown in Figures 4.6 and 4.7, 53% of teachers who completed Day of AI reported growth in their personal learning —the highest among all courses— followed by Microsoft at 47%. Furthermore, Day of AI had a higher percentage of teachers (55%) reporting high comfort in creating teaching and learning resources using genAI. This finding aligns with the course's hands-on experiential nature and its emphasis on providing teachers with a rich number of classroom-ready activities to use as inspiration for their classes. This finding was emphasized in the analysis because teachers frequently identified *creating new and engaging educational resources and assessment tools* as key goals when asked how they plan to use AI.

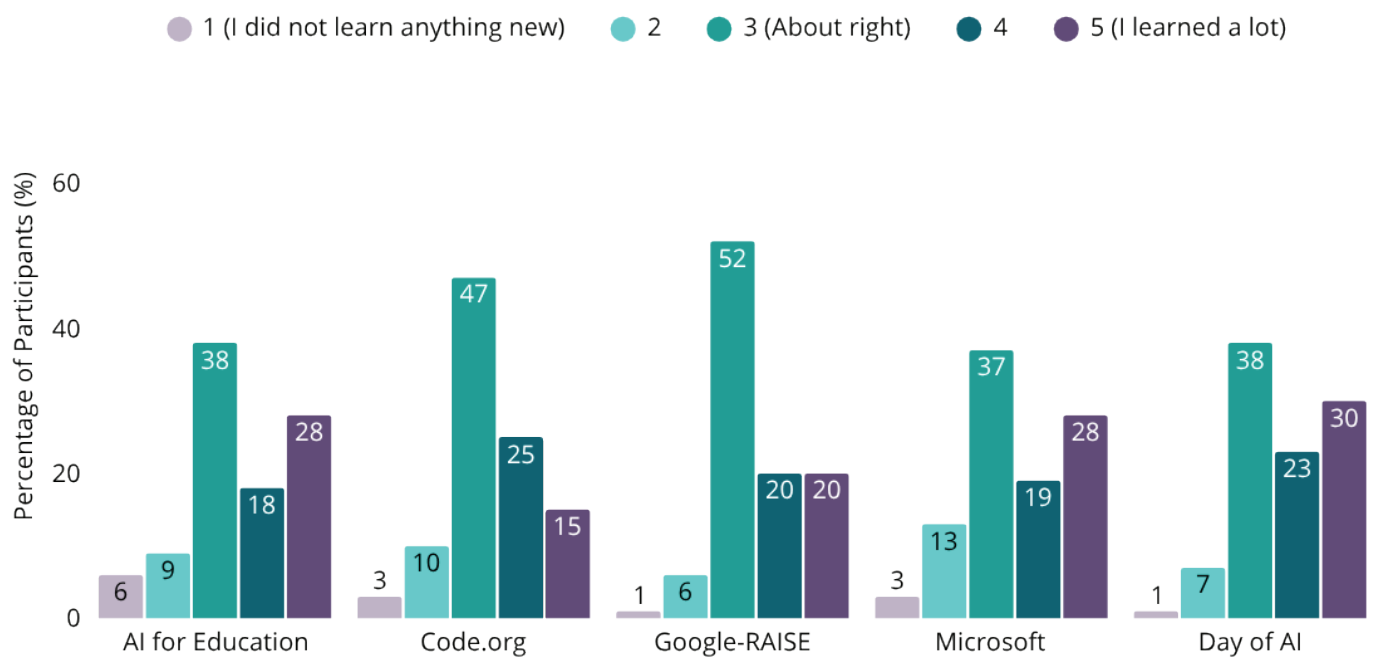

Figure 4.6: Teachers' Self-Reported Learning Gains per Course (Scale 1–5)

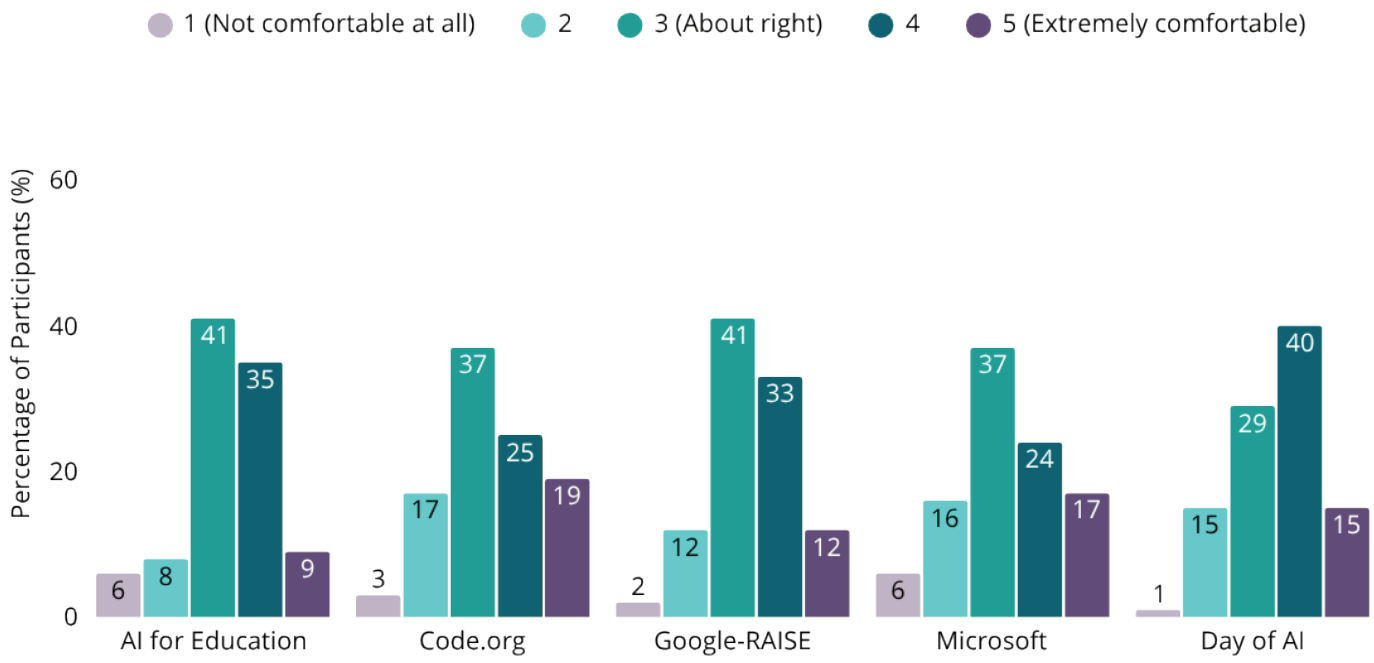

Figure 4.7: Teachers' Self-Reported Level of Comfort in Creating Educational Content with GenAI

4.3 Findings Per Country

This section presents a country-by-country analysis of teacher experiences and outcomes from participating in AI-focused PD courses. The analysis covers the following variables per country:

- demographic data, course completion rates, and self-reported learning gains
- variations in teaching experience, school type, and language preferences
- common challenges such as limited technical understanding, digital literacy gaps and infrastructure barriers
- recommendations for improving course design, accessibility, and contextual relevance

Teachers in each country reported increased familiarity with genAI, improved comfort with prompt writing, and a generally more positive perception of AI in education.

4.3.1 Colombia

Participant Profile

The sample of teachers from Colombia included a nearly even gender distribution, 50% men and 49% women, with the majority (81%) employed in public schools. The sample represented all teaching levels, with the largest groups working in high school (43%) and middle school (39%), followed by elementary school (15%) and kindergarten (4%). Though teaching experience varied, the vast majority was highly experienced: 62% had over 11 years of teaching experience and an additional 24% had 6–10.

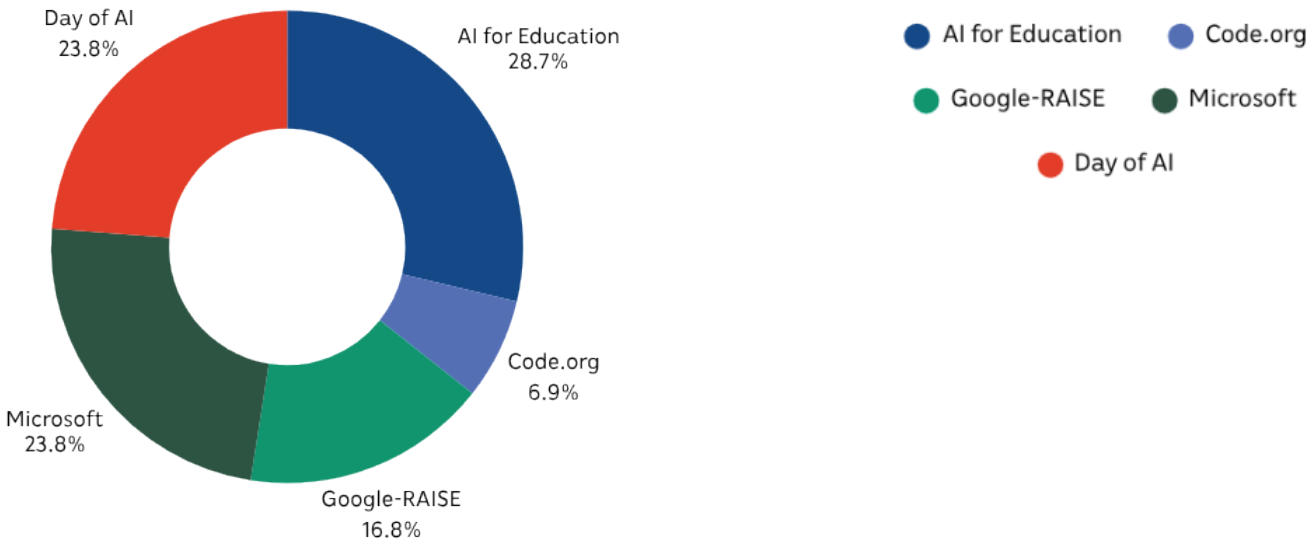

Figure 4.8: Courses Completed in Colombia

Course Completion and Perceptions

Despite a relatively low post-course survey response rate (~33%), 86% of teachers reported completing their course, and most (67%) completed their course in a language other than their native language. Over 81% of teachers expressed gains in their personal learning. The vast majority of teachers reported either maintaining their initial perception of AI or developing a more positive view of AI use in education. Teachers cited two main reasons for not completing their course: insufficient time and unclear course instructions.

Learning Gains and Challenges

Teachers reported significant improvement in their familiarity with genAI (from 31% to 67%), comfort with prompt writing (from 48% to 90%), and ability to create teaching and learning resources (from 47% to 95%). However, learning gains were lower in more technical areas. A majority remained unfamiliar or uncomfortable explaining ML concepts (from 92% to 71%), and their answers to technical knowledge check questions revealed persistent misconceptions about the topic. Knowledge checks also show that further clarity is needed to understand bias in AI.

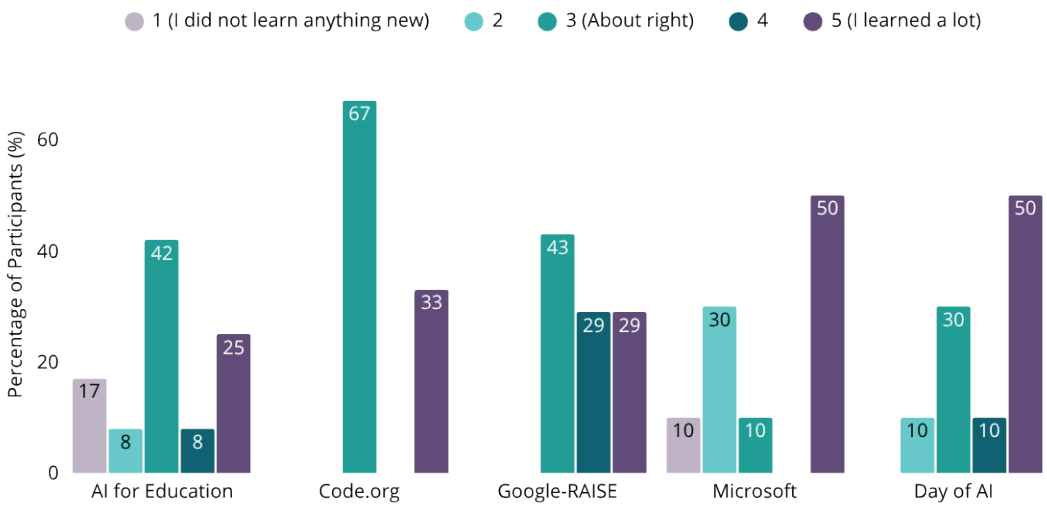

Figure 4.9: Teachers' Self-Reported Learning Gains per Course in Colombia (Scale 1–5)

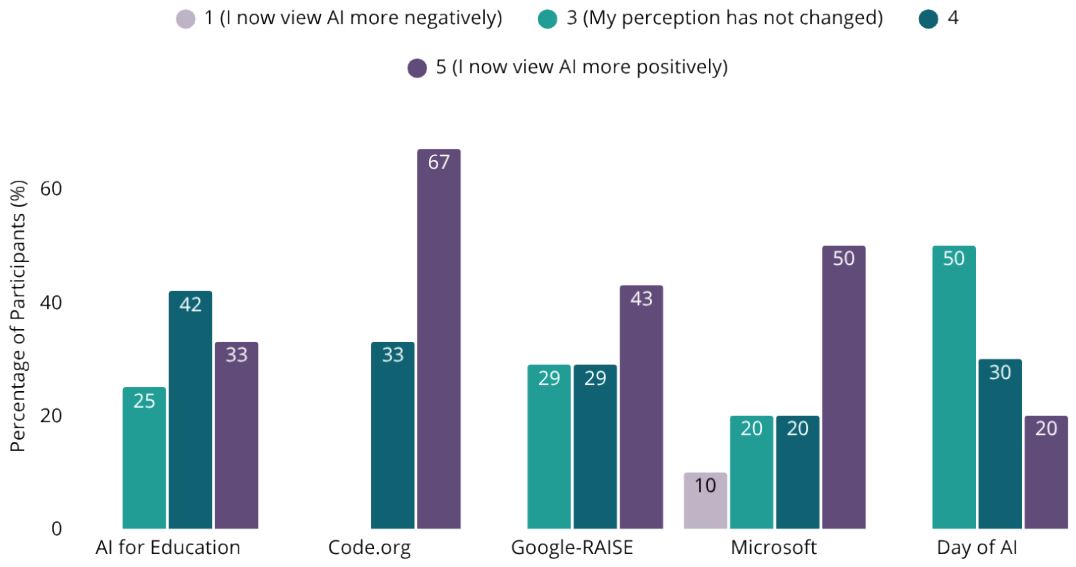

Figure 4.10: Teachers' Change in Perception About AI in Education in Colombia

Teachers' Recommendations for Future PD

Teachers recommended that future iterations of the PD maintain the same high level of content quality while expanding to include a wider range of AI tools, real-world examples, and multimodal resources such as videos and diagrams. They emphasized the importance of greater accessibility and language inclusivity, particularly requesting courses in Spanish and other languages. Teachers also recommended building a community of support through channels such as WhatsApp groups or live online sessions to foster interaction and shared experiences. In addition, teachers proposed increasing interactivity and engagement by incorporating more hands-on and diverse learning formats to accommodate different learning styles. Finally, they recommended improving course structure and clarity by offering clearer instructions and different pathways for teachers with varying levels of prior knowledge.

4.3.2 Greece/Cyprus

Participant Profile

The sample of teachers from Greece and Cyprus was predominantly female (84%), with most employed in public schools (73%). The sample represented all teaching levels, with the largest group working in elementary school (52 %) and middle school (32%), followed by high school (27%) and kindergarten (7%). Many teachers in Greece and Cyprus mentioned teaching at multiple school levels. Most of the sample was highly experienced: 43% had over 21 years of teaching experience, and an additional 31% had 11–20.

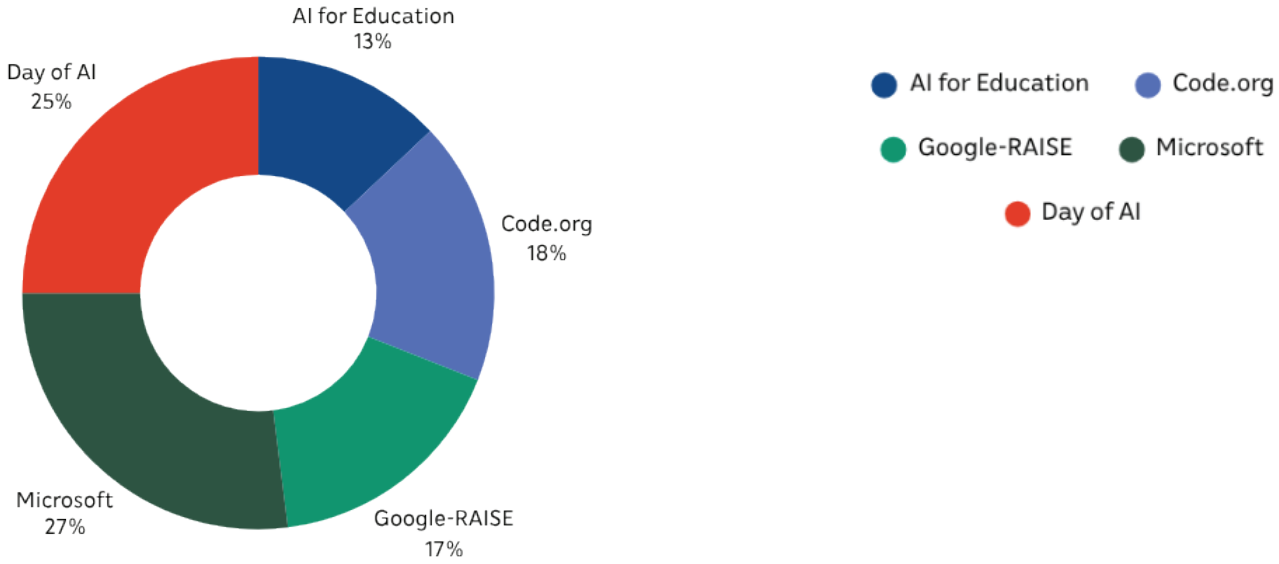

Figure 4.11: Courses Completed in Greece/Cyprus

Course Completion and Perceptions

In post-course survey responses, 91% of teachers completed their course, and most (73%) completed the course in a language other than their native language. Nearly 95% expressed gains in their personal learning (Figure 4.12). Most teachers either maintained the same perception about AI or developed a more positive view of AI use in education (Figure 4.13). A small number reported a more negative perception of AI, a shift often linked to acquiring a deeper awareness of potential harms or technological limitations. Reasons for teachers not completing their course included insufficient time, difficulty with the English language, lack of interest in course content, technical difficulties with the platform, completion of course but not the additional materials, unclear course instructions, and timing conflicts due to summer vacation.

Learning Gains and Challenges

Teachers reported notable improvement in familiarity with genAI (from 24% to 53%), comfort with prompt writing (from 51% to 84%), and ability to create teaching and learning resources (from 37% to almost 63%). However, gains were more modest when it came to more technical areas. The majority of the teachers remained unfamiliar or uncomfortable explaining ML concepts (from 93% to 81%) and their answers to the knowledge check questions about ML revealed persistent misconceptions. Understanding bias in AI also emerged as an area requiring further clarification.

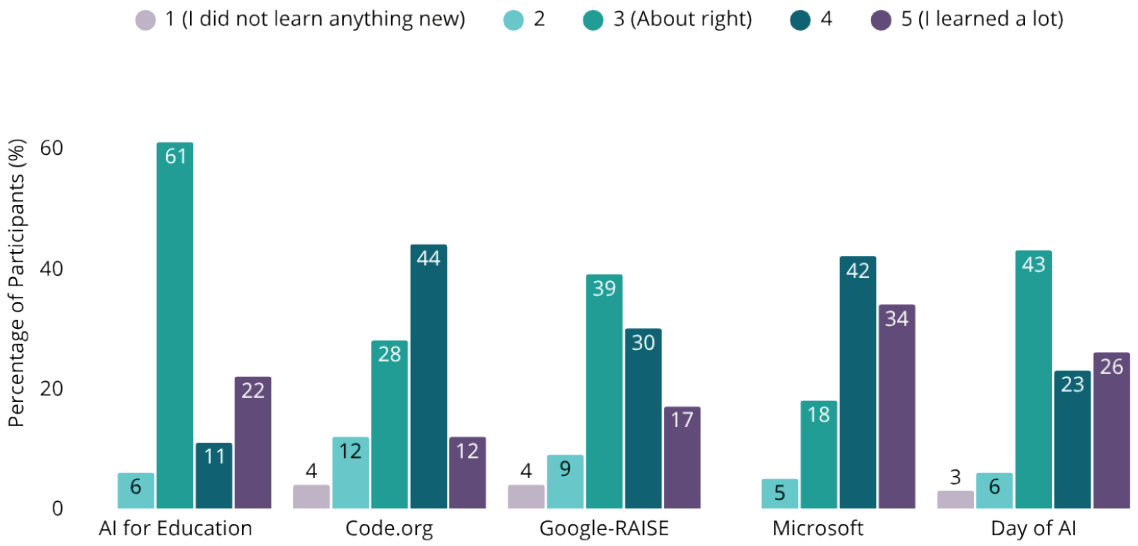

Figure 4.12: Teachers' Self-Reported Learning Gains per Course in Greece/Cyprus (Scale 1–5)

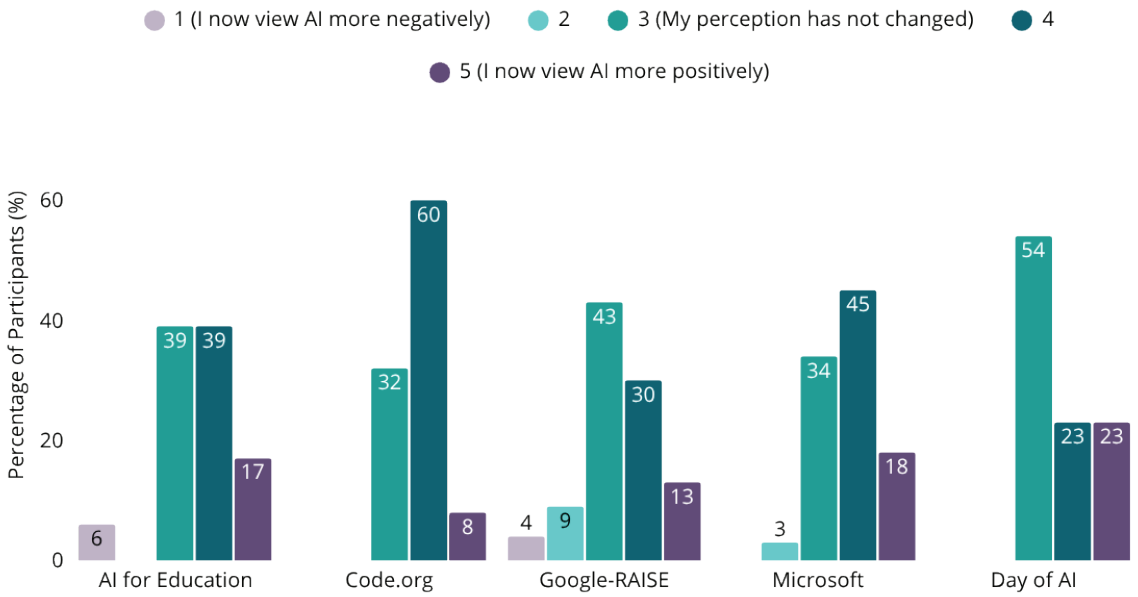

Figure 4.13: Teachers' Change in Perception About AI in Education in Greece/Cyprus

Teachers' Recommendations for Future PD

Teachers provided a range of constructive suggestions for improving the courses and PD experience, centering on language, pacing, and practical classroom applicability. Many teachers emphasized the strong need for subtitles or a fully localized version of the courses, highlighting concerns about the accuracy and clarity of machine translations. Several teachers also requested simpler language and less technical jargon, particularly to make the material more accessible to beginners and less technologically savvy learners. Regarding time and workload, teachers noted that one week (the MIT-recommended duration for course completion) was insufficient to complete the modules. Teachers recommended providing greater flexibility, extending platform access, and considering seasonal factors such as summer schedules and vacations. In terms of content and structure, teachers recommended shorter, more concise modules that align better with school contexts, are subject-specific, and include age-appropriate adaptations. Teachers also emphasized the value of practical classroom applications and progress indicators, such as navigation bars or process trackers.

In addition, teachers called for enhanced interactivity and engagement, including quizzes, games, peer-sharing opportunities, and more hands-on demonstrations of AI use in teaching practice. Some reported technical usability issues, especially on mobile devices, and requested a more intuitive, user-friendly interface. Feedback on course scope and depth revealed mixed perspectives: while some found the content overly theoretical, others proposed dividing it into introductory and advanced levels to accommodate varying backgrounds. Despite these areas for improvement, overall feedback was positive: teachers appreciated the organization, clarity, and practical value of the PD, describing it as well-structured, informative, and supportive, particularly for those new to AI in education.

4.3.3 Ghana

Participant Profile

The sample of teachers from Ghana was predominantly male (84%) and employed in public schools (99%). The sample represented two teaching levels, with the vast majority teaching in high school (96%) and a small minority in middle school (4%). Most teachers (88%) had fewer than 10 years of experience, indicating a relatively early-career sample.

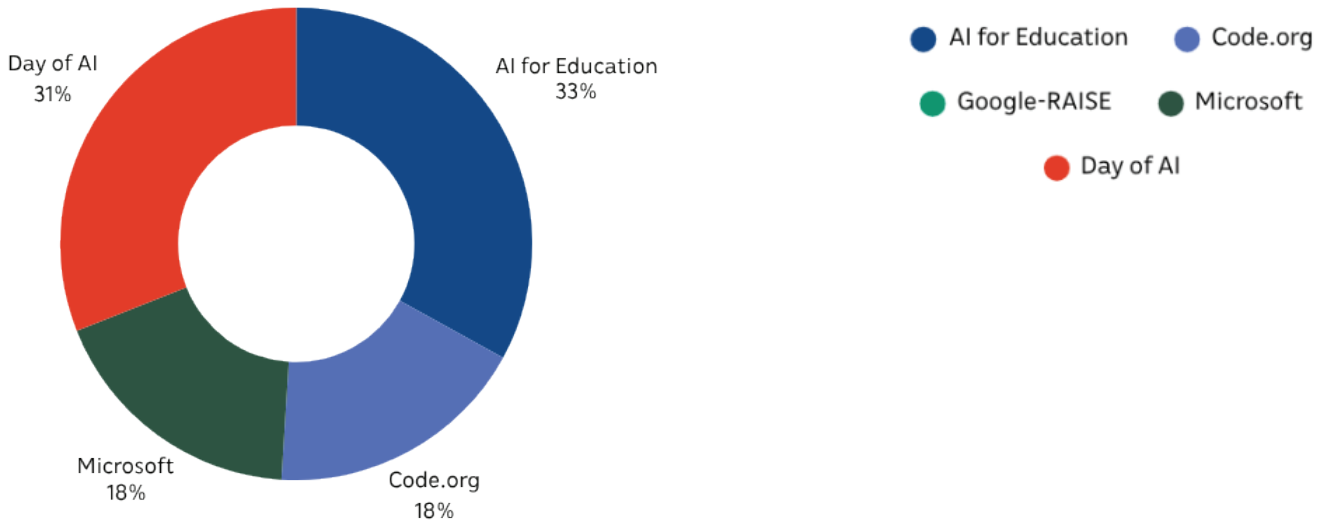

Figure 4.14: Courses Completed in Ghana

Course Completion and Perceptions

Teachers in Ghana participated in four of the five courses evaluated in this study. The Google-RAISE course was not available in their country due to a combination of regional access limitations and implementation logistics. According to post-course survey responses, 91% of teachers completed their course, and a majority (58%) completed the course in their native language. Nearly 94% expressed gains in their personal learning (Figure 4.15), and most reported either maintaining their initial perception of AI or developing a more positive view of AI use in education (Figure 4.16). Notably, no teachers reported a strongly negative perception of AI. Reasons for non-completion of their course included accessibility challenges and technical difficulties.

Learning Gains and Challenges

Teachers reported significant improvements in familiarity with genAI (from 25% to 65%), comfort with prompt writing (from 51% to 84%), and ability to create teaching and learning resources (from 52% to 76%). However, learning gains were more modest in technical areas. A majority of the teachers remained unfamiliar or uncomfortable explaining ML concepts (from 95% to 85%). This finding was reflected in persistent misconceptions identified through knowledge check questions. Although many teachers self-reported improved understanding of bias in AI, post-course survey results showed no measurable improvement in knowledge check responses related to bias.

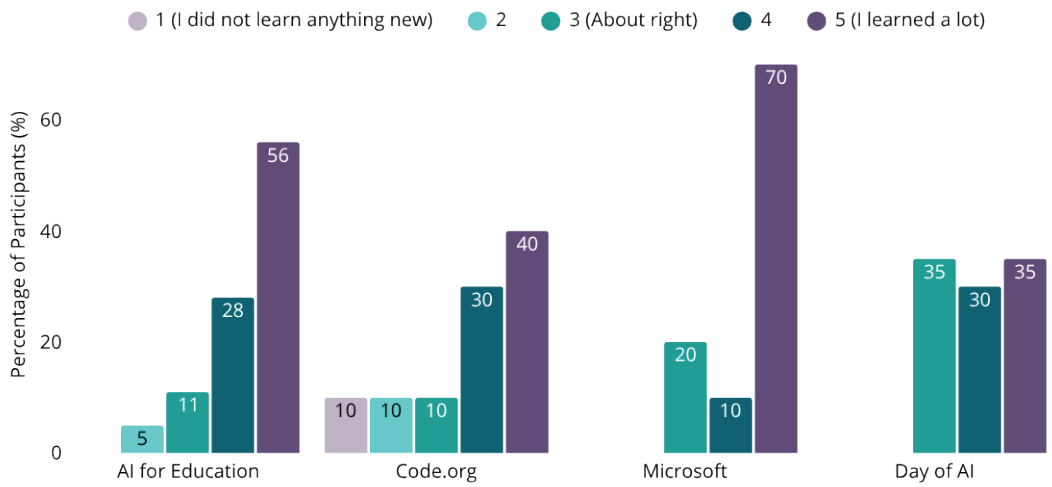

Figure 4.15 : Teachers' Self-Reported Learning Gains per Course in Ghana (Scale 1–5)

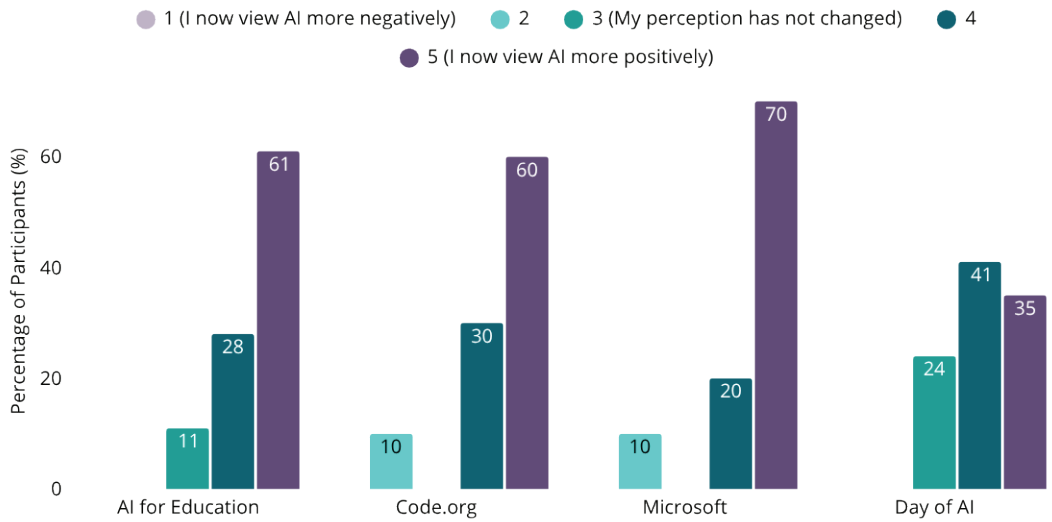

Figure 4.16: Teachers' Change in Perception About AI in Education in Ghana

Teachers' Recommendations for Future PD

Teachers offered thoughtful suggestions for improving course content and delivery. They requested more interactive, contextualized, and well-structured materials, including practical exercises, quizzes, glossaries, downloadable slides, and examples relevant to their local teaching contexts. Accessibility and inclusivity were emphasized, with calls for broader access—particularly for teachers across Africa—and simpler interfaces and more user-friendly platforms to support those with limited digital fluency. Teachers also recommended enhancing course delivery formats by offering blended learning options, such as live Q&A sessions or face-to-face components, alongside flexible, downloadable learning materials (videos, PDFs) for offline access. Regarding time and availability, teachers requested greater flexibility to complete the course and for content to remain accessible beyond the formal course period—a restriction provided by the research team rather than the course designers.

Finally, several teachers expressed a strong interest in expanding the initiative internationally, advocating for these educational resources to remain freely accessible and open to teachers worldwide, especially those in under-resourced regions who may otherwise lack opportunities for AI-focused PD.

4.3.4 Uganda

Participant Profile

The sample of teachers from Uganda included a mix of men (59%) and women (41%), with the vast majority (98%) employed in private schools. The sample represented all teaching levels, with the largest group working in high school (34%) and middle school (33%), followed by elementary school (24%) and kindergarten (40%). Many teachers in Uganda reported teaching at multiple school levels. Most teachers (86%) had fewer than 10 years of experience, indicating a relatively early-career sample.

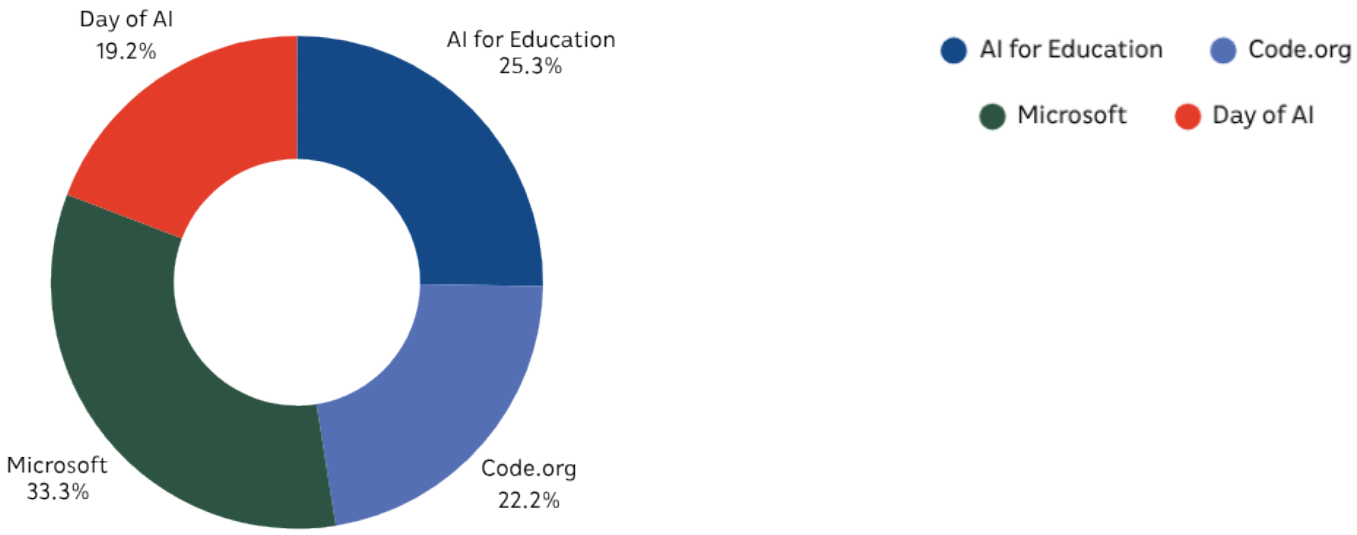

Figure 4.17: Courses Completed in Uganda

Course Completion and Perceptions

Teachers in Uganda participated in four of the five courses evaluated in the study. The Google-RAISE course was not available in their country due to a combination of regional access limitations and implementation logistics. All courses were offered in English, which is the official language of Uganda. According to post-course survey responses, 89% of teachers completed their course, and a majority (78%) completed the course in their native language (English). Nearly 91% expressed gains in their personal learning (Figure 4.18). Most reported either maintaining their initial perception of AI or developing a more positive view of AI use in education (Figure 4.19). A few teachers expressed a more cautious or negative shift in perceptions, often linked to a growing awareness of current technology limitations. Reasons for teachers' non-completion included insufficient time, excessive workload due to shortage of staff, limited internet access, and course format challenges. Some teachers also noted that the timing of the courses—during vacation periods— limited opportunities for immediate classroom application.

Learning Gains and Challenges

Teachers reported significant improvements in their familiarity with genAI (from 23% to 63%), comfort with prompt writing (from 42% to 85%), and ability to create teaching and learning resources (from 58% to 89%). However, technical understanding remained a challenge. The majority of the teachers continued to feel unfamiliar or not comfortable explaining ML concepts (from 98% to 89%), and knowledge check responses revealed persistent misconceptions. Although many teachers self-reported improved understanding of bias in AI, post-course survey results showed little change in actual comprehension, suggesting a need for more targeted instruction in this area.

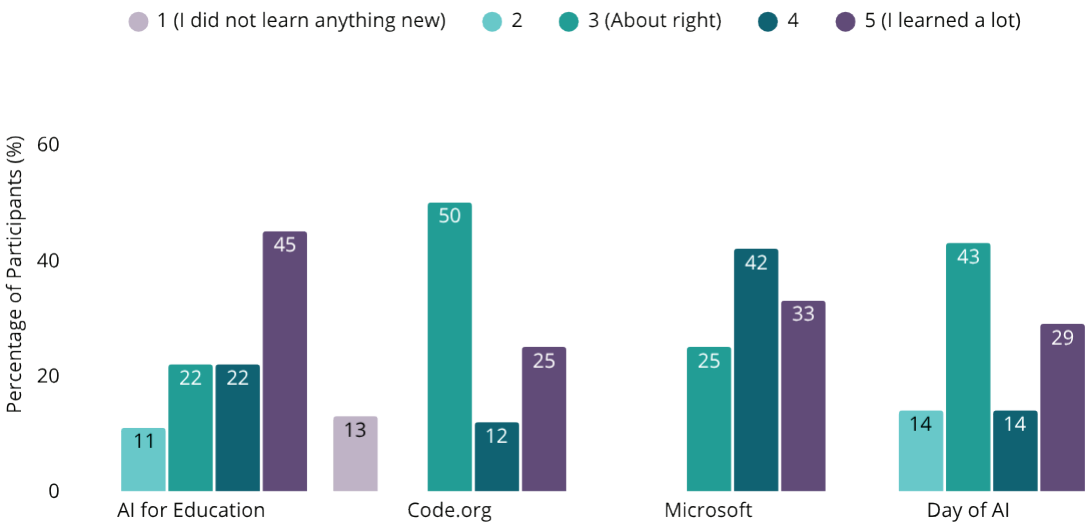

Figure 4.18: Teachers' Self-Reported Learning Gains per Course in Uganda (Scale 1–5)

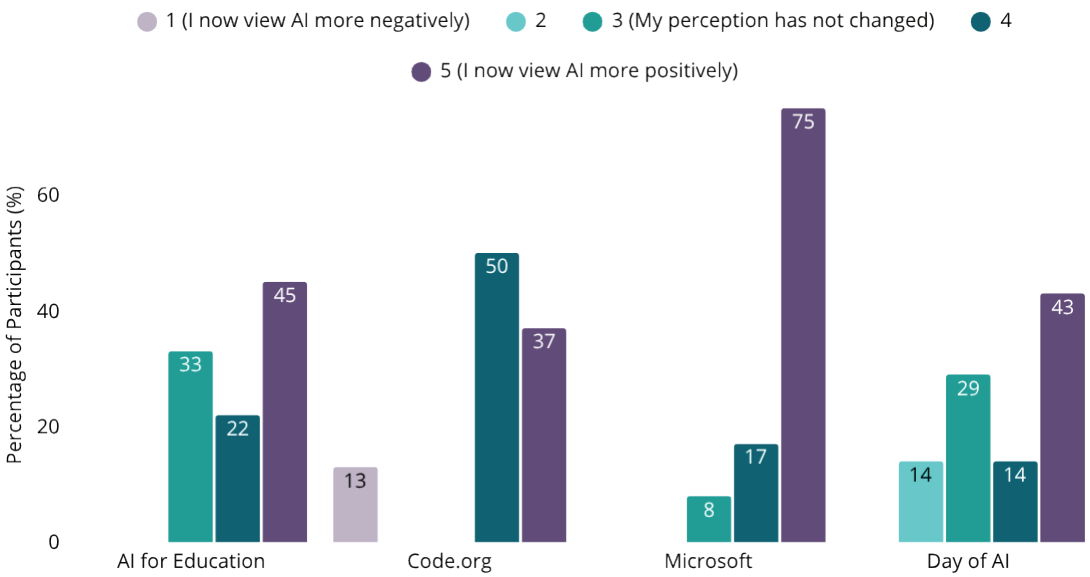

Figure 4.19: Teachers' Change in Perception About AI in Education in Uganda

Teachers' Recommendations for Future PD

Teachers provided constructive feedback on course content and format. Many requested greater depth and continuity, proposing miniseries or follow-up courses to enable deeper engagement and opportunities to revisit materials over time. Suggested pedagogical enhancements included the addition of formative assessments, live mentoring sessions, and interactive components to support sustained learning and reflection.

In terms of course delivery, teachers recommended incorporating live sessions or chat-based support to foster community and facilitate interaction with mentors and peers. Language accessibility was also a key concern, with calls for clearer explanations, simplified English, and translations into additional languages. Teachers emphasized the need for regional customization of content to align with local curricula. They also recommended expanding topics to include early childhood education, subject-specific materials, and content anchored to regional curricular goals and assessment standards, while continuing to emphasize the need for development of critical thinking and problem-solving skills.

Finally, many teachers stressed the importance of scaling and democratizing access to AI education. They urged that future efforts aim to reach a larger, more diverse global community of teachers.

4.3.5 United States

Participant Profile

The sample of teachers from the United States included a mix of women (66%) and men (32%), while 2% preferred not to disclose their gender. Teachers were employed both in public (73%) and private schools (27%). The largest groups taught in high school (62%) and middle school (33%), followed by elementary school (27%) and kindergarten (9%). Many teachers at the United States mentioned teaching in multiple school levels. The sample was notably experience: 37% had 11–20 years of teaching experience and 34% had over 21.

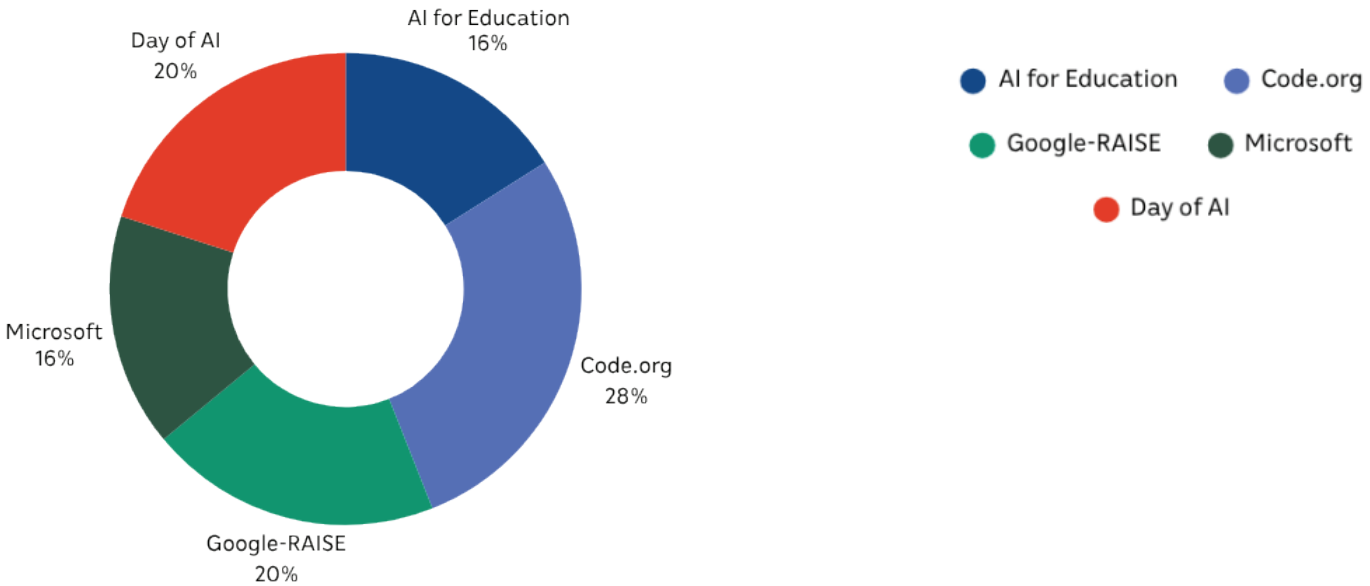

Figure 4.20: Courses Completed in United States

Course Completion and Perceptions

In post-course survey responses, 81% of teachers completed their course, and most (60%) completed the course in their native language. Approximately 80% expressed gains in their personal learning (Figure 4.21). The majority either maintained their initial perception of AI or developed a more positive view of AI use in education (Figure 4.22). A few reported a more negative view, often associated with a deeper understanding of current technology limitations. Reasons for non-completion included insufficient time, limited access to devices or internet, difficulties with the platform, and unclear course instructions.

Learning Gains and Challenges

Teachers reported notable improvements in familiarity with genAI (from 34% to 76%), comfort with prompt writing (from 61% to 84%), and ability to create teaching and learning resources (from 57% to 84%). However, technical understanding remained a challenge. While most teachers still felt unfamiliar or uncomfortable explaining ML concepts (from 90% to 79%), their responses to knowledge check questions about ML were generally accurate. Similarly, although teachers self-reported an improved understanding of bias in AI, post-course survey results indicated that further growth is needed in this area. Interestingly, teachers from the United States scored higher than teachers in other countries on most pre-course survey items related to confidence and familiarity with AI concepts. This trend likely reflects the greater availability of open AI-for-education resources in the United States, providing teachers with prior exposure to relevant materials. Likewise, given that 20% of teachers reported little or no personal learning progress, some teachers likely had engaged with similar content before the course.

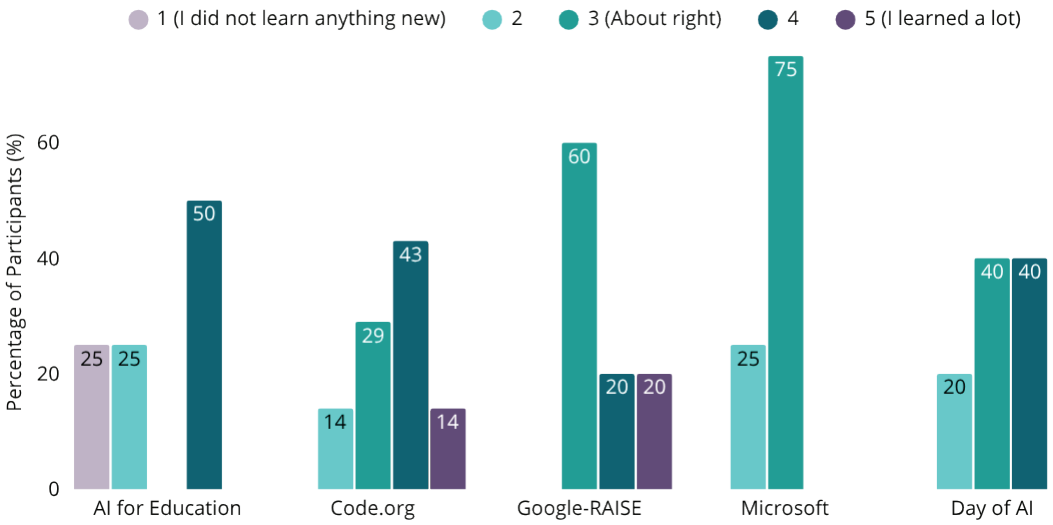

Figure 4.21 : Teachers' Self-Reported Learning Gains per Course in United States (Scale 1–5)

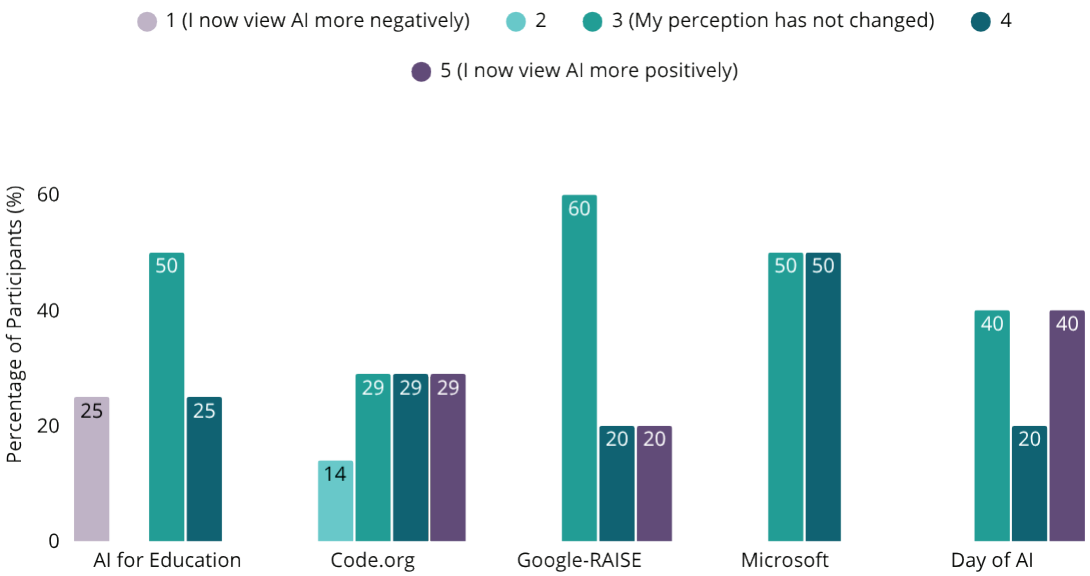

Figure 4.22: Teachers' Change in Perception About AI in Education in United States

Teachers' Recommendations for Future PD

Teachers offered several recommendations to improve the course design, relevance, and accessibility. Many suggested that future offerings be scheduled at a more suitable time in the academic calendar, noting that implementation during the beginning of the school year posed challenges due to heavy workload. Teachers emphasized the need for better alignment between course content, the subjects or grade levels they teach, and teaching conditions. They recommended that course designers consult actively with current teachers to ensure that examples and activities reflect teachers' real classroom contexts and challenges. They also proposed alternative learning activities and curated resources to replace open web searches, which may not be accessible to all students. Others requested clearer, more detailed instructions and more intuitive platform interfaces, especially for those with limited experience using AI tools. Suggestions for course design included integrating more authentic, classroom-based applications, organizing materials sequentially to reduce cognitive load, and balancing reading with interactive and hands-on components.

Teachers also advocated for their ability to select their preferred course—an option restricted by the research design, which randomly assigned teachers. They emphasized the importance of keeping programs open to all teachers and called for more explicit integration of ethical considerations, including the environmental impact and responsible use of AI technologies.

4.3.6 Qatar

Participant Profile

The sample of teachers from Qatar consisted of a mix of women (60%) and men (39%), with 1% preferring not to disclose their gender. Nearly all teachers (97%) were employed in public schools. The sample represented all educational levels, with the largest group working in high school (50%) and elementary school (26%), followed by middle school (26%) . A few teachers mentioned teaching in more than one school level. The sample was highly experienced: 54% had 11–20 years of teaching experience and 22% had over 21.

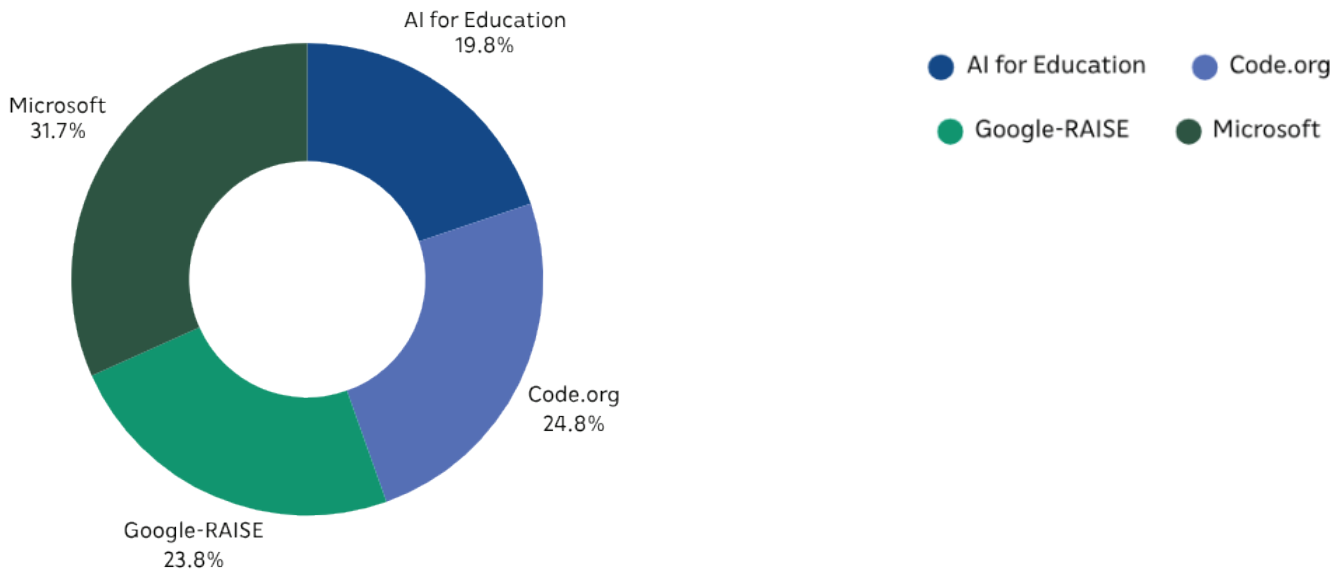

Figure 4.23: Courses Completed in Qatar

Course Completion and Perceptions

In post-course survey responses, 90% of teachers completed their course, and most (62%) completed the course in Arabic. A strong majority (86%) expressed gains in their personal learning (Figure 4.24). Most reported either maintaining their initial perception of AI or developed a more positive view of AI use in education (Figure 4.25). A few expressed negative views, often linked to a deeper awareness of current technology limitations. Reasons for non-completion included insufficient time, lack of access to devices at school, not receiving the email inviting them to the course, and personal circumstances.

Learning Gains and Challenges

Teachers reported notable improvements in familiarity with genAI (from 19% to 42%), comfort with prompt writing (from 40% to 71%), and ability to create teaching and learning resources (from 45% to 78%). However, technical understanding remained a challenge. Most teachers still felt unfamiliar or uncomfortable explaining ML concepts (from 89% to 67%), and knowledge check responses revealed persistent misconceptions. Although many teachers self-reported improved understanding of bias in AI, post-course survey results showed little change in actual comprehension, suggesting a need for more targeted instruction in this area.

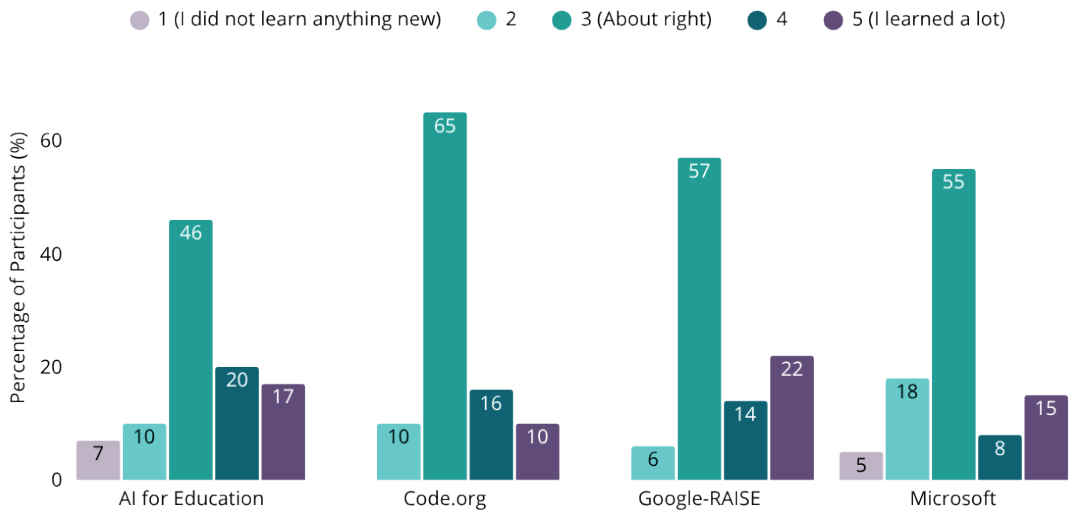

Figure 4.24: Teachers' Self-Reported Learning Gains per Course in Qatar (Scale 1–5)

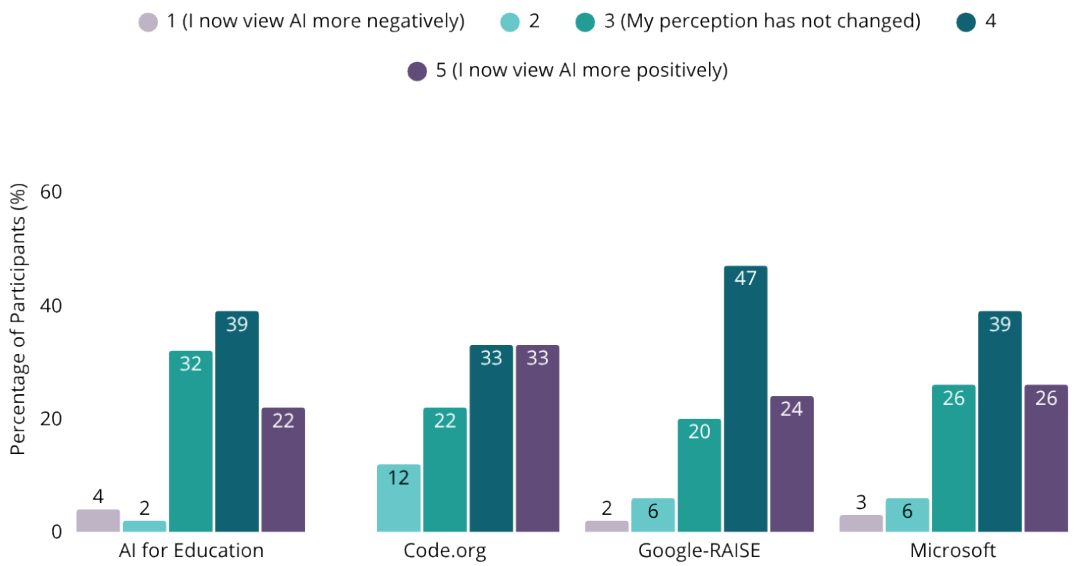

Figure 4.25: Teachers' Change in Perception About AI in Education in Qatar

Teachers' Recommendations for Future PD

Teachers consistently emphasized the need for more hands-on, practical, and subject-specific applications—particularly examples that demonstrate how AI tools can be integrated into disciplines such as mathematics and other core subjects. They recommended incorporating more interactive and multimedia elements, including videos, visuals, and live demonstrations, to enhance engagement and clarify complex concepts. Language accessibility was a recurring theme, with teachers advocating for Arabic-language videos and supporting materials to better serve multilingual teachers.

Additional recommendations focused on time and access. Teachers recommended a longer practice window to explore the tools (longer than the 2-week period offered by the research team). They also recommended including free AI resources, such as video creation platforms and open-access versions of genAI tools. Several teachers suggested a live course option with direct question-and-answer sessions to encourage dialogue and deeper learning. In terms of structure and usability, teachers called for improved lesson organization, clearer navigation between units, and concise summaries to guide progression. Finally, teachers recommended that all materials be made open and downloadable, ensuring continued access to relevant resources beyond the duration of the program.

5. Implications and Recommendations

5.1 Study Limitations

The following recommendations should be considered in light of the study's limitations. The findings reflect the experience of teachers who voluntarily expressed interest in participating and representing specific populations across diverse contexts. Teacher demographics varied significantly—teachers in Africa tended to be early-career, while those in other regions were generally more experienced. They also differed in socioeconomic school conditions, making the aforementioned findings potentially non-generalizable. If the actual representation in each country is not analogous, different approaches may be needed to better align with local realities. A follow-up study with a more representative and targeted sample is strongly recommended before scaling programmatic implementations.

5.2 Implications and Recommendations for Course Designers

Findings indicate that K–12 PD courses on AI must be contextually adaptable to teachers' professional backgrounds, technological readiness, and local working conditions. In several countries, teachers were experienced teachers with strong pedagogical expertise but sometimes lower digital fluency, as reflected in anecdotal email communications. These teachers benefit from courses that introduce technical tools gradually through guided, hands-on practice. In contrast, teachers from Ghana and Uganda were generally early-career and requested improved technological accessibility, including offline functionality, downloadable resources, and simplified digital interfaces to overcome connectivity barriers. These findings align with Roshan et al. (2024), who emphasize that in under-resourced contexts, low retention in AI PD is often linked to limited access to structured training and institutional support.
Across all settings, teachers emphasized the importance of flexibility and extended access to course materials. In this study, the time limitations were not posed by the platforms but from the research study design, while the courses are still openly available to teachers without a time limitation. Engagement was slightly higher when training occurred during vacation periods, suggesting that asynchronous learning combined with longer access windows supports sustained participation. Course designers should also consider integrating live mentorship opportunities, interactive components, and communities of practice to foster collaboration across contexts. Given the varying levels of readiness and familiarity among teachers, offering tiered courses and baseline assessments for appropriate placement could also enhance engagement and retention.

Teachers' concerns about sensitive data collection, third-party data sharing, and algorithmic bias underscore the need for stronger ethics and privacy components in AI PD courses. Course designers should include dedicated modules on data governance, emphasizing how AI tools handle user information, what constitutes ethical data use in schools, and how teachers can safeguard student privacy when adopting AI platforms. Real-world classroom scenarios should be used to help teachers critically assess the risks and benefits of different AI tools. To maximize reach and relevance, courses should be designed with language inclusivity, localized and subject-specific examples, and recognized certification. These features can transform courses from one-off learning experiences into ongoing professional ecosystems that promote reflection, collaboration, and long-term skill development.

Feedback from teachers on the two MIT-related courses, Google–RAISE and Day of AI, has already been shared with the respective course development teams. The MIT RAISE team is actively revising its educational materials, using the feedback to develop new resources and plan appropriate adaptations to better meet the diverse needs of teachers worldwide. These updates will be incorporated into future RAISE PD courses.

5.3 Implications and Recommendations for Policy Makers

For policy makers, this study underscores the importance of systemic coordination and localized implementation strategies in building teachers' AI and digital competencies. Recruitment data and teacher feedback highlight the value of collaboration with local anchor institutions—including ministries of education, universities, and teacher associations—to ensure content and pedagogical appropriateness, cultural alignment, and logistical reach. Policies should therefore prioritize co-development approaches that leverage local expertise and networks to design scalable, culturally relevant PD courses that can reach beyond the offering of AI fundamental knowledge and focus on subject-specific AI applications, while also establishing peer learning communities and capacity-building.
Years of teaching experience do not necessarily correlate with digital readiness. Governments and educational authorities should implement PD courses that account for this gap by coupling technical training with pedagogical applications, enabling less digitally literate teachers to adopt AI confidently. In under-resourced regions, policy should address technological equity by investing in infrastructure, low-bandwidth accessibility, and the production of downloadable, open materials.

Flexible scheduling is also essential. Ministries should encourage flexible scheduling, aligning PD courses with both school breaks and regular school time. While teacher preferences varied, many emphasized the need for practical application in class. To support large-scale PD implementation, policy makers should consider logistical complexity and ensure parallel access to technical and pedagogical support through expert networks as well as peer communities of practice. Smaller pilots followed by scaled-up programs can provide valuable insights into local context, needs, and capabilities, facilitating smoother future scaled-up deployments.

Finally, teachers' concerns about privacy and bias highlight the urgent need for national guidelines on ethical AI use in education. Clear regulatory frameworks should be established by policy makers. Educational technology providers should be required to disclose and easily explain how their systems store and process data, enabling teachers and schools to make informed adoption decisions. National strategies should also support formal nationally acknowledged certification, mentorship structures, and communities of practice as integral components of PD. Embedding these elements within broader digital transformation and education innovation policies will ensure sustainability and equitable AI capacity-building for all teachers.

6. Conclusion

This study led by WISE (Qatar Foundation), in collaboration with MIT pK-12 Initiative and MIT RAISE, provides one of the first comparative analyses of AI-focused teacher PD across multiple countries, having evaluated five short, asynchronous online courses as experienced by teachers in Colombia, Cyprus, Ghana, Greece, Uganda, United States, and Qatar. The findings strongly demonstrate that brief, well-designed asynchronous PD courses can significantly enhance teachers' confidence and foundational readiness for AI integration. Across all participating countries, teachers reported substantial gains—averaging 30–50 percentage point increases—in familiarity with genAI tools, prompt writing, and application in instructional design.

The intervention was successful in addressing teachers' preconceptions and misconceptions, leading to a demonstrable positive change of mindset regarding the productive use of AI in education. Furthermore, the study's diversity of teachers—ranging from public school teachers with high pedagogical expertise but low digital fluency, to early-career teachers facing infrastructure challenges—offered unique insight into how professional background and context shape AI adoption trajectories, emphasizing the critical need for context-responsive PD courses.

Despite these successes, the evaluation identified persistent challenges that must be addressed for truly equitable and sustainable AI literacy: teachers' deeper technical understanding of concepts like ML and algorithmic bias remained limited across all countries and resources. Crucially, teachers consistently expressed significant concerns regarding data privacy, third-party data sharing, weak security, and equitable access to technology. To achieve long-term success and equitable AI capacity-building globally, future policy and programs must move beyond foundational knowledge to systemic support and sustained professional learning ecosystems—ones that actively incorporate peer networks, live discussion sessions, and collaborative communities. To deepen understanding and promote meaningful classroom integration, course designers need to balance accessibility with technical depth, incorporate dedicated modules on data governance and ethics, and provide localized, culturally relevant examples with recognized certification. Policy makers must complement these efforts by investing in infrastructure (including low-bandwidth solutions), establishing clear national ethical guidelines regarding data and privacy, and integrating formal certification pathways and mentorship networks into broader digital transformation strategies.

References

Aghaziarati, A., Nejatifar, S., & Abedi, A. (2023). Artificial intelligence in education: Investigating teacher attitudes. *AI and Tech in Behavioral and Social Sciences*, *1*(1), 35–42.

Ayanwale, M. A., Sanusi, I. T., Adelana, O. P., Aruleba, K. D., & Oyelere, S. S. (2022). Teachers' readiness and intention to teach artificial intelligence in schools. *Computers and Education: Artificial Intelligence*, *3*, 100099.

Bewersdorff, A., Zhai, X., Roberts, J., & Nerdel, C. (2023). Myths, mis- and preconceptions of artificial intelligence: A review of the literature. *Computers and Education: Artificial Intelligence*, *4*, 100143.

Cazzaniga, M., Jaumotte, F., Li, L., Melina, G., Panton, A. J., Pizzinelli, C., Rockall, E., & Tavares, M. M. (2024). Gen-AI: Artificial intelligence and the future of work (IMF Staff Discussion Note SDN/2024/001). International Monetary Fund. https://www.imf.org/-/media/Files/Publications/SDN/2024/English/SDNEA2024001.ashx

Chi, M. T., & Roscoe, R. D. (2002). The processes and challenges of conceptual change. In *Reconsidering conceptual change: Issues in theory and practice* (pp. 3–27). Dordrecht: Springer Netherlands.

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

Emmert-Streib, F., Yli-Harja, O., & Dehmer, M. (2020). Artificial intelligence: A clarification of misconceptions, myths and desired status. *Frontiers in Artificial Intelligence*, *3*, 524339.

Gu, Y., He, J., Huang, W., & Sun, B. (2025). Professional development for teachers in the digital age: A comparative analysis of online training programs and policy implementation. *Behavioral Sciences, 15*(8), 1076. https://doi.org/10.3390/bs15081076

Huynh, T., Lee, M., & Patel, R. (2025). Mindset matters: The role of ethical reflection in AI professional development for teachers. *Journal of Educational Technology Research and Development, 73*(2), 145–168. https://link.springer.com/article/10.1007/s44322-025-00043-y

Klopfer, E., Reich, J., Abelson, H., & Breazeal, C. (2024). Generative AI and K-12 education: An MIT perspective. *An MIT exploration of generative AI*.

Kurz, T. L., Middleton, J. A., Yadav, A., & Wu, Y. (2025). Investigating changes in teachers' perceptions about artificial intelligence after virtual professional development. *Journal of Technology and Teacher Education, 33*(2), 123–145.

Lademann, J., Müller, S., & Richter, T. (2025). Teacher training in the age of AI: Impact on AI literacy and teachers' attitudes. *ArXiv*. Preprint. https://arxiv.org/pdf/2507.03011

Leufer, D. (2020). Why we need to bust some myths about AI. *Patterns*, *1*(7).

Natale, S., & Ballatore, A. (2020). Imagining the thinking machine: Technological myths and the rise of artificial intelligence. *Convergence*, *26*(1), 3–18.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, *62*(3), 307–332.

Ravi, P., Broski, A., Stump, G., Abelson, H., Klopfer, E., & Breazeal, C. (2023). Understanding teacher perspectives and experiences after deployment of AI literacy curriculum in middle-school classrooms. *https://arxiv.org/abs/2312.04839.*

Roshan, S., Iqbal, S. Z., & Qing, Z. (2024). Teacher training and professional development for implementing AI-based educational tools. *Journal of Asian Development Studies*, *13*(2), 1972–1987.

Sütçü, S. S., & Sütçü, E. (2023). English teachers' attitudes and opinions towards artificial intelligence. *International Journal of Research in Teacher Education (IJRTE)*, *14*(3).

UNESCO. (2024). *Global report on teachers: Addressing teacher shortages and transforming the profession*. UN.

Yue, M., Jong, M. S. Y., & Ng, D. T. K. (2024). Understanding K–12 teachers' technological pedagogical content knowledge readiness and attitudes toward artificial intelligence education. *Education and information technologies*, *29*(15), 19505–19536.

About WISE

WISE is a global education platform and think-and-do tank convening leaders to shape the future of learning. Established in 2009 by Qatar Foundation under the leadership of its Chairperson, Her Highness Sheikha Moza bint Nasser. WISE drives educational innovation through policy engagement, research, leadership development, and practitioner programs. Through our year-round activities and flagship bi-annual Summit, WISE is building the future of education through strategic local, regional, and international collaborations.

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AI Disclaimer

The authors acknowledge the use of AI tool in the writing process of this study, primarily to enhance the readability of the findings. AI-generated content was not used verbatim; instead, it was thoroughly reviewed, edited, and curated by the authors to ensure accuracy, authenticity, and integrity. Human oversight and judgment were essential in interpreting and validating the AI's contributions.

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