'What Do Children Think About AI?': Insights and Educational Implications from Primary School Students' Perceptions of AI

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Abstract

AI has great potential to transform education and daily life. However, before integrating AI into classrooms, it is crucial to first educate children on what AI is and how to use it responsibly. Effective AI education should build on children's existing perceptions, address misconceptions, and establish a solid foundation for AI literacy. This study explores primary school students' perception of AI and its relationship to their demographic characteristics and digital skills. A survey was conducted in seven local schools, with 233 students participating. The results indicate that most of them were unfamiliar with AI, and those who attempted to define or depict it often associated it with robots or digital devices. The study also found significant differences in students' AI perceptions based on factors like gender, grade, and prior digital skills training. These variables were also linked to students' awareness and understanding of AI. These findings underscore the need for targeted AI educational interventions for primary school students, leveraging their existing perceptions.

Introduction

Artificial Intelligence (AI) is now embedded into children's daily digital interactions, from streaming platforms to social media algorithms. Studies indicate that while children frequently engage with AI, many lack a clear understanding of its functions, risks, and limitations (Long, Blunt, and Magerko 2021; Ng et al. 2023). This has driven a surge in educational initiatives aimed at teaching children about AI through courses often using AI tools (Druga, Christoph, and Ko 2022; Arn and Huang 2024). In addition, AI's role in education has expanded, with AI education and tools being integrated across various subjects and proving effective in enhancing learning outcomes (Lee and Kwon 2024; Yim and Su 2024). Despite its educational potential, successfully teaching and using AI tools requires a deeper understanding of how children perceive AI and the factors influencing these perceptions, including gender, grade level, and digital skills (Druga et al. 2019; Mertala and Fagerlund 2024).

To be effective, educational interventions must be designed around students' existing perceptions, ensuring that learning aligns with their needs and experiences (Maher and Tadimalla 2024). Research has shown that well-structured educational interventions not only improve AI understanding but also influence willingness to use and learn more about it (Lee et al. 2021; Kasinidou, Kleanthous, and Otterbacher 2023; Song et al. 2023; Kasinidou et al. 2026). However, AI courses sometimes only slightly enhance children's conceptions of the technology, perhaps because they emphasize acquiring technical skills, such as programming, rather than building on students' AI awareness (Baldoni et al. 2024). Additionally, studies highlight a strong link between children's digital skills and ability to engage with AI (Yao and Wang 2024). While prior research has outlined AI courses (Long and Magerko 2020; Ng et al. 2021), few studies have focused on designing these based on children's perceptions of AI. Moreover, research on students' digital skills and AI perceptions often examines these factors in isolation rather than exploring their interplay. Few studies consider how students' characteristics (Gao et al. 2024) and digital skills (Lim 2023) collectively shape perceptions of AI. Our study expands on previous work by investigating primary school students' perceptions of AI and analyzing how their characteristics and digital skills influence their AI literacy.

Furthermore, there is a gap in research regarding students from our country, Cyprus, which, is facing challenges such as low levels of digital skills[1], and negative attitudes towards AI[2], While computer science education is introduced in 1st grade, it focuses on basic computer skills and problem-solving, with programming and advanced digital skills often pursued in after-school programs[3]. Teachers and middle school students have basic digital skills, limited AI knowledge, and they often feel they lack training for teaching AI (Kasinidou, Kleanthous, and Otterbacher 2025, 2026). This paper presents a study with primary school students in Cyprus, exploring their perceptions of AI and the relationship between their AI perceptions, characteristics and digital skills. Specifically, we address the following research questions: ***RQ1.****How do primary school students perceive AI?,* ***RQ2.*** *Are there any differences between students in terms of their perceptions of AI? and* ***RQ3.*** *How students' characteristics and digital skills affect their perceptions of AI?*

[1]https://op.europa.eu/webpub/eac/education-and-training-monitor-2023/en/country-reports/cyprus.html
[2]https://europa.eu/eurobarometer/surveys/detail/2160
[3]https://scheted.schools.ac.cy/index.php/el/

Background

Given AI's widespread presence, research exploring how various audiences (Kasinidou, Kleanthous, and Otterbacher 2024b; Mertala and Fagerlund 2024; Bautista, Femiani, and Inclezan 2025) perceive AI has gained momentum. Studies have uncovered a range of misconceptions, myths, and inaccuracies about AI (Bewersdorff et al. 2023; Dangol et al. 2025a). One recurring misconception is the tendency to assign human-like characteristics or intelligence to AI (Kasinidou, Kleanthous, and Otterbacher 2023). Even individuals who acknowledge that AI can learn using data and algorithms have demonstrated limited understanding of how AI applications do these tasks (Bewersdorff et al. 2023; Kasinidou, Kleanthous, and Otterbacher 2024b). Children, like adults, encounter AI in various forms; thus, a growing number of studies have focused on exploring how they perceive AI, and have found mixed understandings of AI (Vandenberg and Mott 2023). Primary school students frequently associate AI with robots or digital devices (Kasinidou, Kleanthous, and Otterbacher 2024a; Walan 2024), confusing it with automation or simple programming tasks (Ottenbreit-Leftwich et al. 2023; Kim et al. 2023). Studies have highlighted misconceptions, such as anthropomorphizing AI or viewing it as possessing human-like intelligence (Mertala and Fagerlund 2024). They also view AI like voice assistants smarter than humans, reflecting an overestimation of AI's capabilities (Andries and Robertson 2023; Cai 2024). When it comes to AI applications, children mostly think of applications that they encounter daily, like search engines, Siri or Alexa (Ottenbreit-Leftwich et al. 2023).

How children perceive AI is influenced by factors such as age, gender, socioeconomic status, and cultural factors (Druga et al. 2019; Heeg and Avraamidou 2024). Younger children are more likely to perceive AI as smarter than themselves, while older students develop a nuanced perspective, sometimes seeing AI as less capable than humans (Williams, Park, and Breazeal 2019). Gender differences have been reported, with boys often displaying more confidence and enthusiasm in engaging with robotics and AI as compared to girls (Su, Yang, and Zhong 2023). Research has also shown that children from low-income families or with parents of lower educational levels often report less exposure to AI-related activities (Su, Yang, and Zhong 2023). In contrast, children in high-income schools tend to have more experience with coding and interacting with AI, which enhances their understanding of AI (Druga et al. 2019).

As argued, AI is an integral part of digital literacy; therefore, digital skills play a critical role in shaping perceptions of AI (Yang 2022). Digital skills not only determine how individuals interact with AI but also influence how they evaluate its usefulness and ease of use (Yao and Wang 2024). For instance, higher digital skills correlate with greater self-efficacy and more positive views on AI (Yao and Wang 2024; Lim 2023). Strong digital skills are positively associated with more favorable attitudes toward AI in education (Lim 2023). Similarly, teachers' digital skills are positively correlated not only with AI literacy and attitudes towards AI but also with the intentions to teach and use AI in the classroom (Kasinidou, Kleanthous, and Otterbacher 2025).

Education plays a pivotal role in shaping children's understanding of AI. Studies have shown that AI education can transform children's views, increasing their appreciation of AI and intention to continue learning about AI (Williams, Park, and Breazeal 2019; Song et al. 2023). Programs designed to teach children about AI concepts, such as machine learning and programming, have led to more nuanced and realistic perspectives (Druga and Ko 2021; Klemettilä et al. 2025). Those completing educational modules on AI showed a better understanding not only of how AI works but also of the relevance of AI to daily life (Kong, Korte, and Cheung 2023). Storytelling and participatory design activities have been particularly effective, helping children connect abstract AI concepts to real-world scenarios and fostering critical reflection about ethical and social implications (Arn and Huang 2024). AI educational tools have also been shown to impact children's perception of robots (Williams, Park, and Breazeal 2019) and enhance their knowledge of AI (Zhou, Van Brummelen, and Lin 2020).

It is evident that before integrating AI into education, it is crucial to understand how children perceive AI and how demographic factors and digital skills shape these perceptions. By understanding how they perceive AI and the factors influencing their perceptions, we can design effective educational interventions that not only improve their understanding of AI but also empower students to critically engage with AI (Kong, Korte, and Cheung 2023). This study explores the perceptions of AI among primary school students, with a particular focus on the relationship between students' characteristics and digital skills and their perception of AI. It also provides valuable insights for designing AI educational intervention that align with children's needs.

Methodology

To explore the perception of AI by primary school students, we surveyed public primary schools in Cyprus from November 2023 to April 2024. The survey targeted students in the final three grades of primary school, aged 9 to 12. Ethical approval was granted by the National Ethics Committee and the Ministry of Education. 180 public schools were invited; however, only seven agreed to participate in the survey. Parents of eligible students received a consent form and information sheet explaining the study's purpose and data management. Students were required to return the signed consent forms to participate. On survey day, the signed forms were collected, and students were taken to a classroom to complete the questionnaire. The survey was conducted face-to-face with supervision from a school teacher and one of the authors to address any questions.

The questionnaire used was reviewed by a primary school teacher for clarity and suitability. The survey had three sections. The first covered demographics and prior digital skills training. The second included 21 statements assessing digital skills based on the DigComp framework (R, S, and Y 2022), across five competency areas: Information and Data Literacy (IDL), Communication and Collaboration (CC), Digital Content Creation (DCC), Safety (ST), and Problem-Solving (PS). The third began with two 'Yes/No' questions asking whether they had previously heard the term

AI (henceforth: awareness) and if they knew what it was (henceforth: knowledge). They were then prompted to explain what AI is by providing their own definitions. Next, they were asked if they knew ('Yes/No') any AI applications (henceforth: AI apps) and, if so, to provide examples. Furthermore, they were encouraged to draw an example of AI. Finally, they were presented with eight images of different systems and asked to choose those depicting AI.

Analysis. All statistical analyses were performed using JASP. To address RQ1, we thematically analyzed participants' definitions of AI (Thomas 2006). Two researchers independently identified themes, allowing multiple themes per response. Discrepancies were discussed, and definitions were refined for consensus. To deepen our understanding of their AI perceptions, we analyzed their drawings using the codes that emerged from their definitions of AI (Druga, Christoph, and Ko 2022). To address RQ2, we used Mann-Whitney U and ANOVA tests to explore differences in their AI perceptions based on gender, grade level, digital skills training, AI awareness, and AI knowledge. Mann-Whitney U test was used for ordinal variables (i.e., gender, training attendance), while ANOVA compared means across grade levels. Finally, to address RQ3, we conducted a series of logistic regression analyses to predict the likelihood that students' characteristics and digital skills correlate with their perceptions of AI (i.e., awareness, knowledge and AI apps and themes that emerged in their definitions and drawings).

Participants. A total of 244 parents gave consent for their children to participate. Eleven responses were excluded, resulting in a total of 233 participants. 50.6% were girls, and 48.5% were boys, while two did not indicate their gender. In terms of age, 12.9% were 9, 34.8% were 10, 34.8% were 11 and 17.2% were 12 years old, with an average age of 10.6 years. One did not provide her age. Regarding grade, 30.9% were in the fourth grade, 27.5% were in the fifth grade, and 39.9% were in the sixth grade. Four did not specify their grades. To better understand our participants, we evaluated their digital skills using the mean and standard deviation (see Table 1); scores below 2.9 indicate low skills, 3 to 4.5 reflect intermediate skills and above 4.5 suggest high skills within the competence areas of DigComp. IDL had a mean of 3.840, CC scored 3.630, DCC was the lowest at 3.589, ST had 3.908, and PS scored 3.852. Individual item means ranged from 2.983 to 4.399, with SD values from 0.675 to 1.386. We also tested the normality of the data by examining the kurtosis and skewness of DigComp statements and the calculated means for competence areas. Overall, they perceive their digital skills as intermediate to moderately high.

Findings

Perception of AI

Definitions of AI. Most of our participants (58.1%) indicated that they had heard of AI before; however, only 41.9% reported that they knew what AI is. Their definitions of AI drew upon 13 themes, while some admitted that they did not know or chose not to provide any answer (see Table 2). **Robots** was the most common theme with responses vaguely mentioning that AI is "the robots" (participant 1 – p1, p39, p49). Others noted that *"AI is a robot that answers you back and is intelligent"* (p21) and *"does many jobs such as cooking, carrying things, etc"* (p106). Some also pointed out that *"AI is robots and things that move by themselves"* (p42), autonomously without human intervention. A few also were concerned that *"AI is a robot and knows many things and it is bad"* (p23). The second most common theme was **Digital Devices**, with most simply mentioning that *"AI is all electronic devices"* (p11) or giving examples like *"AI is electronic devices such as mobile phones, tablets, computers and various others"* (p10). A few specify that *"[AI] is the intelligence that electronic objects"* (p154) and *"know how to handle themselves and know the answer to difficult questions"* (p168). The third most common theme was **Applications** with responses noting that *"AI is an application on the mobile phone or tablet"* (p124). Some gave examples of such applications, saying that *"AI is a [...] applications like TikTok, Instagram"* (p100) or *"[...] ChatGPT and other applications"* (p135). Even those who were not sure about what AI is believed that *"it might be something in electronic form and it has to do with social media"* (p101).

Help Humans and **Provide Responses** were invoked in 21 responses. In **Help Humans** responses mentioned that *"[AI] can solve our problems in our everyday life"* (p97). They explained that *"it can help with simple things, for example writing a text. But it also helps with difficult things, for example, work or building houses"* (p31). A few said that AI is *"robots that are programmed to help us by themselves without being controlled by anyone"* (p172). Responses in **Provide Responses** argued that *"AI is something on the internet that you ask it and it answers you"* (p27), *"it can answer different questions"* (p103). Some noted that it is *"robots that can answer almost everything"* (p106). Some mentioned **Digital Literacy** in their definitions, noting that AI is the knowledge about technology (p173) or that *"AI is to understand how to use the internet"* (p110) and *"know how to use a computer properly"* (p157). Some defined AI as the **Smart Assistants**, mentioning popular smart assistants such as Siri and Alexa (p28, p223, p227). They noted that AI is *"for example, Siri that responds to your commands"* (p222) or *"can turn on the lights, the oven, the electronic vacuum cleaner"* (p150). 12 referred to AI as machines or systems that are **Smart** saying that *"AI is a robot that is intelligent"* (p21) or that AI can understand them or understand what needs to be done (p114) or even *"[has] the ability to think"* (p132). A few also pointed out that *"it's very smart but not smarter than a human because the human programmed it"* (p164). Some defined AI as systems that think or act **Like Humans**, noting that *"[AI] is something that is like us and speaks and does what we do"* (p139).

The remaining themes were used in just a few responses. **Act** appeared in nine responses referring to AI as *"robots that can do different things"* (p131). Others mentioned specific examples of tasks AI can do like *"write a text [...] or building houses"* (p31) *"clean, cook"* (p114). Seven acknowledged that AI is **Developed by humans** and *"is a thing that humans created to help them"* (p142). The least commonly discussed theme was **Autonomous** with five re-

	Mis.	Med.	Mean	SD	Sk.	Kurt.		Mis.	Med.	Mean	SD	Sk.	Kurt.
IDL1	0	5.0	4.399	0.771	−1.223	1.358	ST1	6	4.0	3.780	1.335	−0.884	−0.415
IDL2	1	3.0	3.388	1.055	−0.382	−0.292	ST2	1	4.0	4.017	1.213	−1.061	0.082
IDL3	1	4.0	3.728	1.209	−0.842	−0.070	ST3	2	5.0	4.130	1.180	−1.408	1.139
IDL	0	4.0	3.840	0.689	−0.713	0.354	ST4	7	4.0	3.708	1.190	−0.726	−0.206
CC1	0	4.0	3.918	1.332	−1.020	−0.204	**ST**	1	4.0	3.908	0.872	−0.940	0.737
CC2	0	3.0	3.236	1.214	−0.375	−0.691	PS1	0	4.0	3.773	1.165	−0.784	−0.089
CC3	0	3.0	2.983	1.276	−0.018	−0.971	PS2	3	4.0	3.974	1.140	−0.946	0.012
CC4	1	4.0	3.638	1.202	−0.676	−0.413	PS3	1	4.0	3.935	1.101	−0.951	0.210
CC5	3	5.0	4.261	1.223	−1.740	1.867	PS4	3	4.0	3.730	1.064	−0.694	0.125
CC6	2	4.0	3.762	1.272	−0.773	−0.362	**PS**	0	4.0	3.852	0.825	−0.745	0.396
CC	0	3.7	3.630	0.793	−0.653	0.055	DCC1	3	4.0	3.748	1.379	−0.798	−0.649
DCC2	1	4.0	3.672	1.308	−0.733	−0.514	DCC3	1	4.0	3.806	1.196	−0.815	−0.134
DCC4	3	3.0	3.130	1.386	−0.167	−1.195	**DCC**	0	3.8	3.589	0.905	−0.495	−0.449

Table 1: Descriptive statistics for digital skills.

Theme	**Description [AI is ...]**	**Def**	**Dr**
Robots (RB)	The robots	50	77
Digital Devices (DD)	Digital devices like phones, TVs, vacuums etc.	29	58
Applications (AP)	Applications like Facebook, ChatGPT, Instagram etc.	22	31
Help Humans (HH)	Systems that make people's life easier	21	–
Provide Responses (PR)	Systems that can provide the answer to given question	21	18
Digital Literacy (DL)	Being able to use digital devices like computers	16	2
Smart Assistants (SA)	Systems that follow our commands and communicate (e.g., Siri)	15	13
Smart (SM)	Systems that act smart	12	–
Like Humans (LH)	Systems that think and/or act like humans	11	–
Act (AC)	Systems that act and can do specific tasks	9	–
Developed by Humans (DH)	Systems developed/programmed by humans	7	–
Autonomous (AU)	Systems that work autonomously without the need of human intervention	5	–
Other	[falls outside of the established themes]	20	17
Do not Know	Participants noted that they do not know what AI is	68	30
No answer	Participants did not provide an answer	12	15

Table 2: Themes that emerged from participants' definitions of AI and drawings.

sponses discussing that *"AI is when a digital object thinks by itself"* (p121) or *"robots that work by themselves"* (p51). 20 responses fell under the catch-all **Other** theme, which included thoughtful responses that do not mention the other themes (such as *"AI is the technology we will use in the future and it will be more advanced than now"* (p207). Some expressed negative emotions saying that *"AI [...] is developing into terrorism"* (p61) or that *"AI controls you in what you do, what to wear and much more"* (p181). 68 participants stated that they **Did not know** what AI. Finally, 12 participants did not provide any answer to the question.

Drawing AI. Participants' drawings aligned with the themes identified in their definitions, adding further depth to how they perceive AI. Many participants drew **Robots** mostly as humanoid figures, indicating a common perception of AI as **Human Like** machines. For **Digital Devices**, they frequently illustrated devices like phones, laptops or smartwatches, and even a few robotic vacuums. Drawings in **Applications** theme depicted logos of popular platforms such as TikTok, Instagram, and YouTube, associating AI with social media and content-driven applications. Within **Smart Assistants**, they tried to draw virtual assistants like Siri and Alexa often trying to show them talking. In **Provide Responses**, drawings depicted ChatGPT or dialogues where

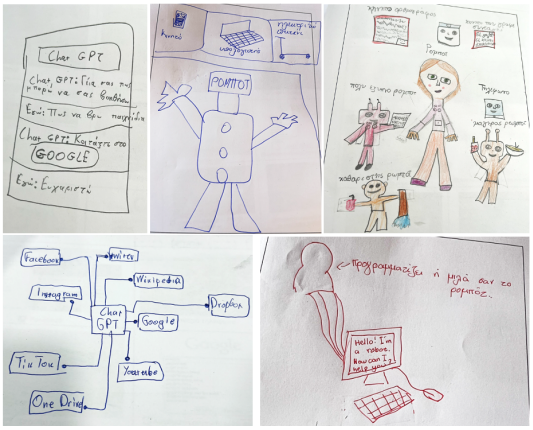

Figure 1: Participants' drawings depicting AI.

AI systems answering to questions. For **Digital Literacy**, drawings showed children using computers, with notes indicating that they *"know how to do it well"*. Examples of the drawings of our participants can be found in Fig. 1.

AI applications. Only 48.93% reported knowing examples of AI apps. When trying to provide specific exam-

ples, 42 participants mentioned chatbots, with 24 of them specifically mentioning ChatGPT. Social media platforms, such as TikTok, were noted by 33 respondents, followed by search engines (29 responses), voice assistants (21 responses), robots (20 responses), and digital devices (20 responses). YouTube was mentioned by 15 participants, while 11 gave examples of "other" applications such as "Fortnite" (p94), "Word, and PowerPoint" (p53). Notably, 66 expressed that they "Do not Know" while 42 did not provide any answer. When participants were presented with the eight images that represent various systems and asked to select all images that depict AI, the vast majority selected the image of a robot (199). A popular choice was also the image of a Chatbot (i.e., ChatGPT) (172). 168 selected the image of a robotic vacuum. Some also associated AI with TikTok (115) and/or Facebook (109) by selecting those images. 87 selected the image illustrating parking with indications of available spaces as an example of AI. Lastly, a few (42) associated the image of a landline phone with AI. Four selected all eight images, while 21 selected all images except the one depicting the landline phone. 28 selected only the images representing devices (i.e., Robot, Robotic vacuum, and Landline phone) while 87 selected all images depicting applications (i.e., Chatbot, TikTok, Facebook, Google).

Difference in AI perceptions

Gender: Mann-Whitney U test results showed no significant gender differences in awareness and knowledge of AI, or familiarity with AI apps. However, gender differences emerged in how participants defined AI. Boys (15.93%) were more likely to associate AI with systems that provide responses (W=7559.5, p¡.001) compared to girls (2.61%). In contrast, girls (10.43%) were more likely to define AI in terms of digital literacy (W = 6225.0, p = 0.048), compared to 3.54% of boys. No significant gender differences were found in the remaining themes. However, differences were observed in their drawings: girls (31.36%) were more likely to depict AI as digital devices (W=5756.5, p=.016), compared to boys (17.70%), while boys (17.70%) were more likely to depict AI as applications (W=7282.0, p=.038), compared to girls (8.47%).

Grade: ANOVA test showed significant differences in participants' awareness of AI (F=3.242, p=.041), knowledge of AI (F=3.825, p=.023), and familiarity with AI apps (F=3.636, p=.028), with those in higher grades demonstrating greater awareness. Specifically, AI awareness, knowledge, and AI app familiarity were highest among 6th graders (76.34%, 55.91%, and 58.06%), compared to 4th graders (61.11%, 36.11%, 40.28%) and 5th graders (64.06%, 43.7%, 45.31%). Significant differences were found in their definitions of AI, particularly among those who reported not knowing what AI is (F=3.992, p=.020). 4th graders (41.67%) were more likely to state that they did not know what AI is compared to those in the 5th (23.44%) and 6th (23.66%) grades. No other significant differences were found in their definitions of AI. Significant differences were also found in the drawing of AI with 5th (37.50%) and 6th (37.63%) graders being more likely to depict AI as robots (F=3.685, p=.027) than 4th graders (22.22%). Also, 4th (29.17%) and 6th (30.11%) graders were more likely to draw digital devices (F=3.728, p=.026) than those in 5th (12.50%) grade. On the other hand, 4th (23.61%) graders were more likely to draw applications (F=5.474, p=.005) than the 5th (6.25%) and 6th (9.68%) graders.

Digital Skills Training: Mann-Whitney U tests revealed that those who attended digital skills training were more likely to have heard of AI (W=5116.5, p=.011) and to be familiar with AI apps (W=5699.0, p=.028). However, no significant differences were found in their knowledge of AI. Significant differences were observed in their definitions of AI, with those attending training (18.68%) being more likely to associate AI with digital devices (W=5504.0, p=.033) than those who did not (8.96%). No other significant differences were found in the definitions and drawings.

Students' characteristics and AI perception

Logistic regression analyses were conducted to examine the relationship of gender, grade, digital skills training, and digital skills on students' awareness and knowledge of AI and AI apps. For AI awareness, the model was statistically significant (see Table 3(a)), explaining between 9% (McFadden R^2) and 15% (Nagelkerke R^2) of the variance. IDL was the only significant predictor, with an odds ratio of 1.898, indicating a positive relationship. The model for knowledge of AI was also significant, accounting for 8.7% (McFadden R^2) to 15.2% (Nagelkerke R^2) of the variance. IDL was again a significant predictor, with an odds ratio of 2.497, suggesting that higher levels of IDL increase the likelihood of knowing what AI is. Finally, the model exploring knowledge of AI apps was also significant, explaining between 16.2% (McFadden R^2) and 26.8% (Nagelkerke R^2) of the variance. Both IDL and ST were significant predictors, but with odds ratios below 1, indicating a negative relationship.

To better understand the relationship between gender, grade, digital skills training, and digital skills on perceptions of AI, we used logistic regression models to predict the likelihood of participants mentioning specific themes in their definitions and drawings. None of the regression models were statistically significant in predicting the themes discussed in participants' definitions. However, three logistic regression models were statistically significant in predicting themes in participants' drawings. The first model was statistically significant in predicting the drawing of AI depicted as robots (see Table 3(b)). Among the predictors, being in the 5th grade (odds ratio=2.673) and CC (odds ratio=0.562) were significant factors, suggesting a positive relationship between 5th graders depicting AI as robots and a negative relationship between CC. The second model predicted the likelihood of participants drawing digital devices when representing AI. Gender (odds ratio=2.135) and being in the 5th grade (odds ratio=0.345) were significant predictors, indicating a positive relationship between girls and drawings of digital devices while being in the 5th grade showed a negative relationship. The third model was significant in predicting whether participants drew applications, such as social media logos, to represent AI. Gender (odds ratio=0.246)

	Intercept	Gender	Grade	Training	IDL	CC	DCC	ST	PS
a)Awareness of AI, knowledge of AI and AI apps									
Awareness (X^2=24.967, df=209, p=.003)									
Coef.	-2.527*	(F) -0.110	(5th) -0.033 (6th) 0.044	(Y) 0.590	0.641*	0.225	-0.191	0.410	-0.272
Odds ratio					1.898				
Knowledge (X^2=26.370, df=209, p=.002)									
Coef.	-4.792***	(F) - 0.061	(5th) 0.138 (6th) 0.078	(Y) -0.053	0.915***	0.009	-0.034	0.222	0.065
Odds ratio					2.497				
AI apps (X^2=49.134, df=209, p>.001)									
Coef.	7.053***	(F) 0.115	(5th) 0.130 (6th) 0.417	(Y) -0.404	-0.624*	-0.211	-0.039	-0.522	-0.426*
Odds ratio					0.536				0.653
(b) Themes in drawing of AI									
Robot (X^2=14.368, df=212, p=.045)									
Coef.	-2.203*	(F) 0.388	(5th) 0.983* (6th) 0.762	(Y) 0.193	0.410	-0.577*	0.318	–	–
Odds ratio			2.673			0.562			
Digital Devices (X^2=16.077, df=218, p=.041)									
Coef.	-2.120	(F) 0.759*	(5th) -1.063* (6th) -0.109	–	0.174	0.396	-0.159	0.165	-0.351
Odds ratio		2.135	0.345						
Applications (X^2=23.484, df=209, p=.005)									
Coef.	0.019	(F) -1.404**	(5th) -1.875** (6th) -0.999	(Y) -0.463	-0.490	0.403	-0.053	-0.214	0.252
Odds ratio		0.246	0.153						

* p<.05, ** p<.01, *** p<.001

Table 3: Logistic regression models for (a) awareness of AI, knowledge of AI and AI apps and (b)themes in the drawings of AI

and being in the 5th grade (odds ratio=0.153) were significant predictors, both showing a negative relationship. This suggests that girls and 5th graders were less likely to depict AI as applications compared to other groups.

Discussion

Perception of AI. Our study revealed different perceptions of AI among primary school students, with a majority indicating that they did not know what AI is. Among those who attempted to define or draw AI, most associated AI with robots, which is consistent with previous research findings that underscore this prevalent misconception (Kim et al. 2023; Kasinidou, Kleanthous, and Otterbacher 2024a). Some linked AI to digital devices such as smartphones, watches or laptops, reflecting a common association of AI with technology and digital devices (Mertala and Fagerlund 2024). Others thought of AI as applications such as social networks and smart assistance, which was not surprising, since studies showed that students often associate AI with applications they use (Heeg and Avraamidou 2024; Ottenbreit-Leftwich et al. 2023). This finding builds on prior research, suggesting that children's perceptions of AI are shaped by their firsthand experiences (Ottenbreit-Leftwich et al. 2023; Mertala, Fagerlund, and Calderon 2022). Interestingly, some demonstrated a nuanced understanding of AI, acknowledging its capability of assisting humans in tasks such as writing text and essays, answering questions, or helping with household chores (Ottenbreit-Leftwich et al. 2023). Furthermore, our findings show that most of our participants were unaware of AI applications. They mostly mentioned ChatGPT reflecting findings from previous studies, highlight the ChatGPT hype (Kasinidou, Kleanthous, and Otterbacher 2024a). Like in their definitions, participants often referred to applications they likely encountered in their daily lives, such as social media platforms and voice assistants, echoing results of previous studies (Ottenbreit-Leftwich et al. 2023). Our findings contribute to previous work (Vandenberg and Mott 2023) highlighting the varied and often limited understanding of AI among primary school students, underscoring the importance of considering their perceptions when designing AI educational interventions.

Differences in perception of AI and its relationship with students' characteristics. Our study offers insights into the relationship between primary school students' characteristics, digital skills, and AI perceptions. The lack of gender differences in AI awareness and knowledge suggests a general absence of formal AI education in Cyprus, leaving both groups equally uninformed (Kasinidou, Kleanthous, and Otterbacher 2024a). However, boys were more likely to associate AI with responsive applications, while females linked it to digital devices and literacy, reflecting gender differences (Gao et al. 2024). Consistent with (Williams, Park, and Breazeal 2019; Dangol et al. 2025b), we found that higher-grade students showed greater AI awareness and knowledge, likely due to more cognitive development or increased

technology exposure. Older students were also more likely to depict AI as robots, suggesting a deeper understanding, whereas younger students often represented AI as digital devices or everyday applications, a pattern seen in studies on perceptions of technological agents (Nguyen 2022). These findings reinforce the role of age and grade in shaping children's AI perceptions (Gao et al. 2024). Students who attended digital skills training were more likely to have heard of AI and be aware of AI apps, often linking AI to digital devices. While this suggests some exposure to AI, we expected greater differences, as prior research highlights the role of training in fostering AI understanding (Druga and Ko 2021). The lack of significant improvement in AI comprehension suggests these programs may not effectively promote AI literacy, highlighting the need for building training based on prior knowledge and existing perceptions. Digital skills, and demographics significantly correlated with AI awareness and knowledge. IDL emerged as key, reinforcing the link between digital and AI literacy. As in (Lim 2023), our findings support the idea that digital skills are essential for AI literacy (Long and Magerko 2020). These factors also strongly influenced how students visually represented AI, aligning with prior research on how personal traits and digital skills shape AI perceptions (Kasinidou, Kleanthous, and Otterbacher 2025; Yao and Wang 2024; Lim 2023).

Recommendations for designing AI educational intervention for primary school students

Our findings highlight the need for AI educational interventions that consider students' characteristics and AI perceptions. AI education should cater students' diverse understandings of AI. Based on our findings, we propose five recommendations for developing educational interventions that promote AI literacy to primary school students.

1. *Bridging misconceptions, building a comprehensive understanding.* AI educational interventions should account students' diverse and often limited perceptions of AI. Effective interventions should address common misconceptions with clear explanations of what AI is and is not (Long and Magerko 2020) using real-world examples to illustrate its broader applications. Interactive, hands-on experiences that allow students to engage with AI systems can help them develop a deeper understanding while fostering critical thinking about AI's societal impact and ethical implications.

2. *Connecting daily applications to AI.* AI educational interventions should build on students' existing knowledge, which is often shaped by their personal experiences with AI apps. Starting with familiar applications and connecting them with societal impact helps bridge everyday experiences with formal AI concepts (Ottenbreit-Leftwich et al. 2023; Morales-Navarro et al. 2025). Hands-on interactions with simple AI apps can deepen understanding. Encouraging critical discussions on how they work and generate outcomes fosters analytical thinking. Once students grasp these basics, introducing AI in unfamiliar contexts, like healthcare, can broaden awareness of AI's societal impact.

3. *Interventions for all genders.* To effectively promote AI literacy, educational interventions must consider gender differences in students' perceptions and interactions with AI. Interventions should include a variety of examples that appeal to diverse interests, such as AI in gaming, robotics, and smart devices for boys, and AI in education and social media for girls. Group activities can also foster mixed-gender discussions, allowing students to learn from each other's experiences and deepen their understanding of AI.

4. *Grade-appropriate interventions.* AI educational interventions should be designed to be both age- and grade-appropriate, taking into account students' cognitive and developmental stages (Touretzky et al. 2019). Younger students should focus on foundational AI concepts and simple interactions, gradually increasing in complexity as students advance through grades. Older students can incorporate more challenging tasks, enabling deeper exploration of AI concepts, ethics, and real-world applications. This approach ensures that interventions support students' understanding at each educational level.

AI educational interventions should be integrated into digital skills training, and vice versa, to enhance both AI literacy and overall digital skills. While digital skills training increases AI exposure, it does not always deepen understanding. This gap can be bridged by embedding AI projects, such as building chatbots or training simple models, into activities of the digital skills training, like coding, robotics workshops, or app design. Conversely, AI educational interventions can incorporate digital skills activities such as programming, problem-solving, and critical thinking by having students code basic AI functions, evaluate their performance, and reflect on ethical issues. This approach strengthens both AI literacy and essential digital skills.

Limitations. Several limitations should be noted. First, while we collected participants' ages, we focused on grade-level differences, not age variations, though age could influence perceptions. Second, despite that a researcher and a teacher were present during the survey, some students may have misunderstood questions without seeking clarification, potentially affecting data accuracy. Lastly, self-reported digital skills may be biased, as students might have overestimated their abilities, leading to inflated assessments.

Conclusion

Our study explores the perceptions of AI among primary school students in Cyprus, revealing a significant lack in the understanding of AI. Many students hold common misconceptions, associating AI with robots, digital devices, or applications. Additionally, our study provides valuable insights into the relationship between students' characteristics such as gender, grade level, and digital skills training and skills, and their perception of AI. The findings highlight the importance of developing comprehensive educational interventions and integrating them into school curricula and digital skills training to address misconceptions and promote a deeper understanding of AI. We propose five recommendations for designing AI educational interventions for teaching AI to primary school students. Educational interventions should aim to improve students' perceptions of AI and empower the effective use of AI while considering students' characteristics and digital skills.

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