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Artificial Intelligence in the Everyday Life of Younger School-Age Children

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Abstract

The integration of artificial intelligence (AI) into everyday life is rapidly increasing and significantly impacts all age groups, including younger school-age children [1, 2]. But how do children understand AI? Do they grasp this complex and abstract concept? Research shows that children often have only a vague idea of what AI is. This study, conducted in the Czech Republic, explores the influence and use of AI technologies among children aged 9 to 12. Data were collected through focus groups with 50 children, a pilot questionnaire completed by 100 pupils, and a large-scale survey distributed to 5th-grade students across Czech primary schools in May 2024, with 2,209 respondents. The research investigated whether children were familiar with the term AI, where they first heard about it, how they encounter it in their daily lives, and in which areas of human activity they believe AI is already used. It also examined their definitions and understanding of AI, common misconceptions, and whether they know how AI works, why it is used, and who creates it. Preliminary results show that 88.8% of respondents were aware of AI, with 71% citing the internet as their primary source of information. About 63.1% believe AI can make mistakes, and 76.3% consider it potentially dangerous. This work is complemented by findings from a pilot qualitative study conducted in 2025. Using focus groups and interviews with pupils, we examined questions that emerged from the quantitative findings: Why do Czech children express greater concerns about AI than children in other countries? What factors shape these concerns? What information have they received at school about how AI works, its uses, and related safety and security risks? What circumstances prompted them to become interested in this topic?

The findings contribute to shaping meaningful AI education for this age group, offering insight into their perceptions and understanding. They can support the responsible implementation of AI education and use it in primary schools.

Keywords: *artificial intelligence; younger school-age children; educational technology; cognitive development; digital divide*

1. Introduction

According to the European Union, artificial intelligence (AI) is defined as the “ability of machines to imitate human capabilities, such as reasoning, learning, planning, or creativity. Artificial intelligence enables technical systems to perceive their environment, deal with what they perceive, solve problems, and act to achieve specific goals.” [3] In the scholarly literature, a common distinction is made between narrow (weak) AI, which is designed to solve specific tasks within a limited domain, and general (strong) AI (AGI), understood as the ability to achieve across tasks a breadth of cognitive versatility and performance comparable to that of humans; generative AI is then defined separately as approaches capable of creating new content (e.g., text, images, etc.). [4,5,6]

The current generation of preschool and younger primary-school children is growing up in an environment deeply permeated by digital technologies and, from an early age, often has access to the internet and mobile devices [7,8,9,10], a trend accelerated by the COVID-19 pandemic. Children also commonly (and often inconspicuously) encounter AI in apps and on social media—for example through recommendation algorithms, filters, or AI-generated content—without necessarily understanding how these mechanisms work or how they may influence their behaviour, privacy, and safety. In the Czech context, however, larger-scale empirical studies are still lacking that would systematically describe how children perceive AI in everyday life, how they understand it, and to what extent they are able to use AI-supported digital tools safely. Many international strategic documents and scholarly studies repeatedly emphasize the need for interdisciplinary education and the systematic development of AI literacy among the general public. At the same time, they draw attention

to the long-term societal impacts of the increasingly dynamic spread of technologies built on artificial-intelligence algorithms in everyday social functioning. [11,12,13] Some countries (e.g., China, South Korea, Singapore, or the UAE) have already incorporated AI education into curricula—either as a standalone subject or by integrating it into existing courses. Others are moving more gradually: Australia does not yet mandate AI education in the national primary curriculum, but it has issued a framework for generative AI in schools (October 2023; the revision was endorsed by ministers in June 2025), while Estonia, through the KrattAI initiative, aims to develop the digital literacy of students aged 7–19 by 2030 and is progressively integrating AI and its ethical use (including work with bias) across subjects, with pilot implementation. In the Czech Republic, the topic of AI is not yet anchored in a mandatory and consistent way in everyday teaching at the primary level, even under the new curriculum. As a result, children's opportunities to encounter AI at school may vary considerably depending on a school's capacity, individual teachers' initiatives, and the information sources children access outside school.

Since November 2022, when OpenAI made ChatGPT available—a conversational AI system based on a large language model that generates and edits natural-language text in response to user prompts—the availability of AI tools for everyday users has increased markedly, not only for developers, content creators, businesses, and public administration, but also for teachers and students. The pace of this development has been strongly reflected in the Czech educational and broader social context as well. If we focus on the age group of lower- and upper-secondary school students, for example, the large-scale Scio Research study AI Kompas 2025 [14], conducted from December 2024 to March 2025, found that 72% of Czech students reported regular use of AI in their leisure time and 69% for school purposes. The survey data show that children and adolescents obtain information about AI primarily from the internet, social media, and friends. School ranks only fourth among their sources of information about AI. However, these studies focus on students in lower-secondary education, as well as students at upper-secondary schools, grammar schools, and vocational programmes. In line with the trend described in the introduction, it is therefore desirable to also pay attention to younger primary-school children, who typically have access to the internet, use mobile devices as a matter of course, and spend a substantial part of their free time in online environments, including social networks. [15] Czech education has strengthened digital literacy by reframing informatics with an emphasis on digital competence and computational thinking, with teaching under the revised RVP implemented from 2023–24. In parallel, the comprehensive ("major") revision of the Framework Educational Programme for Basic Education (RVP ZV) is underway. [16] It responds to the rapid development of digital technologies, including AI, which increases demands on critical thinking and safe online behaviour. At the same time, data are still lacking on how primary-level pupils understand AI (including generative AI).

Therefore, this article presents a Czech study whose first part describes the current situation. The research was guided by the following questions: To what extent have pupils in the final year of primary education already encountered the concept of AI? What mental models and ideas about AI do they hold? Can they identify where and for what purposes AI is used—both in general and based on their own experience? How do they perceive the reliability of AI (i.e., whether it can make mistakes), and to what extent do they attribute risks or potential harmfulness to it—what risks they see and, where applicable, why? At the same time, we examined the extent to which children's interpretations approach what AI actually is, and whether children declare an understanding of the basic principles of how it works

2 Methodology

The research is designed as a multi-phase mixed-method study whose aim is first to descriptively map children's understanding of the concept of artificial intelligence (AI) at the end of the younger primary-school age, and then to develop a deeper understanding of which factors shape this understanding and children's relationship to AI. The mixed-methods design makes it possible to combine the strengths of a quantitative approach (an overview of the scope of the phenomenon and differences between groups) with a qualitative approach (a detailed understanding of meanings, experiences, and the reasons behind attitudes).

The subsequent qualitative component then explains and interpret the patterns identified (e.g., concerns about AI, sources of information, misconceptions, or the role of school and family). The ongoing qualitative phase builds on a quantitative survey conducted in May 2024 and aims to provide a deeper explanation and interpretation of its key findings, including potential shifts in children's knowledge and awareness in connection with the growing availability and use of generative AI tools.

This part of the research is designed as a multi-source qualitative inquiry combining group and individual techniques and focusing on the perspectives of both pupils and teachers. The target group for the initial quantitative phase comprised pupils in the 5th grade of primary school (i.e., the final year of primary education). This age group is fully literate, routinely uses digital technologies, and encounters them at school—not only in Informatics lessons but also across other educational areas. The research was conducted in the Czech Republic in the 2023/2024 school year; the main quantitative data collection took place in May 2024 and included responses from a total of 2,209 pupils.

Table 1. Research sample

Age (years)	Boys	Girls	Total
9	35 (1.6%)	48 (2.2%)	83 (3.8%)
10	344 (15.6%)	369 (16.7%)	713 (32.3%)
11	512 (23.2%)	565 (25.6%)	1077 (48.8%)
12	219 (9.9%)	117 (5.3%)	336 (15.2%)
Total	**1110 (50.2%)**	**1099 (49.8%)**	**2209 (100.0%)**

Participating schools were approached via a mass e-mail sent directly to school principals in five regions across different parts of the Czech Republic (including the capital city). These regions covered municipalities of all sizes—from small villages to a city with more than 1 million inhabitants—and schools were invited to take part in the research. Because the study involved minors, parents' informed consent for pupils' participation was obtained through cooperation with school principals and Informatics teachers, who provided organisational support and communication with legal guardians.

The research proceeded in multiple stages: first, six focus groups (6–8 children; 47 pupils in total) were conducted to verify key themes and inform item formulation, followed by questionnaire construction based on the literature, expert consultations, and piloting. Next came an online pre-test (n = 100) to verify comprehensibility and feasibility, and then the main online data collection in May 2024 (n = 2,209), during which pupils completed the questionnaire during Informatics lessons.

Based on the results of the questionnaire survey to date, the qualitative phase is now underway. Implementing it through focus groups makes it possible to address the topic in greater depth. Its aim is to understand in more detail how younger primary-school children interpret AI, what shapes their interest or concerns, and which sources and experiences influence these attitudes. The focus-group discussions therefore concentrate primarily on explaining: (1) why a higher level of concern appears among Czech children compared with findings from abroad; (2) which specific factors support these concerns and attitudes; (3) what information about the functioning and use of AI children have obtained at school and which safety risks have been communicated in the school environment; (4) what led children to start engaging with the topic of AI; and (5) what ideas they hold—one year after the questionnaire survey—about possible uses of AI and how well they can illustrate these ideas with examples. In the next step, interviews will be conducted with the teachers of these pupils in order to compare the teachers' perspective with children's accounts.

These interviews will focus on whether and where teachers believe pupils encounter AI (in school vs. outside school), how children understand it and whether they are concerned about it, what teachers communicate to pupils about AI, and which methodological materials they use and how they evaluate them. The interviews will be complemented by at least two teacher focus groups (3–4 participants per group) to refine the interpretation. Pilot focus groups were conducted to verify the comprehensibility and age-appropriateness of the questions as well as the suitability of the moderation approach—namely whether children understand the questions, can respond to them spontaneously and develop the discussion, and what type of facilitation best supports their active participation and open sharing. The pilot also served to refine the research scenario (e.g., meeting length, the order of questions, and question wording)

So far, three pilot focus groups have been carried out with a total of 17 children aged 10–11 (13 ten-year-old and 4 eleven-year-olds), each with 5–6 participants; the sample included 9 girls and 8 boys. The pilot interviews took place at one rural and two urban primary schools.

2.1 Data processing and analysis (quantitative component)

To process the large set of responses, a combination of quantitative procedures and systematic coding of open-ended responses was used. Open-ended statements were first cleaned and normalized (harmonizing spelling variants, removing empty and irrelevant entries) and then coded into thematic categories based on recurring meaning patterns; for more complex statements, multiple assignments were allowed (multi-label coding). After coding, category frequencies were aggregated and compared between groups by gender and age (including the calculation of within-group proportions). Differences between groups were tested using chi-square (χ^2) tests of independence, and outputs were presented in the form of clear contingency tables.

"Knowledge/understanding of AI" in this study was operationalized as a combination of (a) declarative items capturing awareness and self-assessed understanding ("Have you ever heard the term artificial intelligence?"; "Do you have an idea how AI works?") and (b) performance/content indicators based on open-ended responses in which pupils described their associations and definition of AI in their own words ("What do you think AI is?"; "If you answered YES, try to describe your idea."). The open-ended responses were subsequently coded into thematic categories, and their frequencies were used as an indicator of the level of understanding (with multi-label assignment possible for complex statements). "Danger/concern about AI" was defined as risk perception and was measured through a closed item ("Do you think AI could be dangerous?") as well as a follow-up open-ended question eliciting specific reasons ("Why could AI be dangerous?"; analogously, "Why could AI NOT be dangerous?"). These open-ended justifications were also coded into categories of risks (e.g., cybersecurity, privacy, loss of control, etc.), which made it possible to compare what types of concerns occur across different groups of pupils. Response scales: Closed-ended items were mostly measured on a nominal three-point scale (Yes / No / I don't know); for some items, an additional option ("Maybe") appeared, and in some cases "Not stated" was treated as missing. Open-ended items were analysed through qualitative coding followed by quantification (frequencies/proportions of categories).

3 Results

Across the full research sample (N = 2,209), the vast majority of pupils reported that they had heard the term "artificial intelligence/AI" at least once (88.8%; n = 1,961), while 11.2% (n = 248) answered "no" [17]. When compared by gender, boys reported familiarity with the term AI more often than girls (boys: 90.8% "yes", n = 1,008/1,110; girls: 86.7% "yes", n = 953/1,099).

Responses to the question "Where have you encountered the term artificial intelligence/AI?" were coded—given the possibility of multiple answers—into thematic categories (internet/web, school, television, social networks, YouTube/video, family, friends, games/apps, books/magazines, news/media, other, and not stated). Across the dataset, the most frequent sources were primarily online environments (internet/web and video platforms), followed by school and traditional media; some pupils also mentioned family and peers. This distribution suggests that pupils' initial exposure to AI occurs mainly outside school—through media and online environments—while school tends to function as a secondary source. It is therefore important for schools to capture these spontaneous encounters and anchor them didactically (e.g., by explaining what AI "is" and what it "is not", and how it differs from robots or general digital services). When compared by gender, both groups reported a very similar range of sources; differences typically concerned the frequency of particular channels rather than the presence/absence of specific categories.

Table 2. Where did you encounter the term artificial intelligence/AI?

Category	**Internet web**	**School teacher**	**Television radio**	**Family**	**Friends classmates**	**Not stated**
Total n (%)	1390 (62.9%)	872 (39.5%)	714 (32.3%)	463 (21.0%)	462 (20.9%)	248 (11.2%)
Category	**Books magazines**	**Other unspecified**	**YouTube video**	**Games apps**	**Social networks**	
Total n (%)	129 (5.8%)	34 (1.5%)	21 (1.0%)	12 (0.5%)	9 (0.4%)	

Open-ended responses to the question "Can you think of any words, terms, things… that are related to AI?" were coded into thematic categories based on the occurrence of key words (respondents could provide multiple associations). Across the dataset, the dominant associations were concrete artefacts

and technologies (e.g., “robot”, “computer”, “internet”, or “chatbot/ChatGPT”). Alongside these, more functional or conceptual associations also appeared (programming, algorithms, data/learning), and to a lesser extent descriptions related to “smart” devices/automation or media representations. Overall, the pattern suggests that children most often link AI to visible “carriers” (a robot, a device, or an online service), while only a smaller portion of responses reflects an understanding grounded in principles of how AI works (data, algorithms, learning).

For the question “Do you think artificial intelligence is already being used today?”, most pupils answered “yes” (88.5%), while 11.5% answered “no”. The proportion of “yes” responses was slightly higher among boys than girls (89.8% vs. 87.2%), but this difference was not statistically significant. Similarly, responses did not differ significantly across the age groups 9–12 ($\chi^2(3) = 3.128$; $p = 0.372$), although a slight increase in “yes” responses with age is visible (from 85.5% among 9-year-olds to 90.8% among 12-year-olds).

In a follow-up open-ended question in which pupils were asked to name a specific area where AI is used (only if they answered “YES” to the preceding question), a substantial share of answers was either vague (category “Other/unspecified”: 56.4%) or left blank (11.7%). Among more concretely formulated areas, pupils most often mentioned the internet/social networks/online content (9.4%) and mobile phones/apps (6.1%). Less frequently, they mentioned AI use in school/education (3.3%), in industry and robotised manufacturing (3.0%), in art and creative production (3.0%), and in healthcare/medicine (2.6%). Relatively common were also references to assistants/chatbots including ChatGPT (2.0%) and to science/research (2.0%). Overall, then, although almost all pupils state that AI is used today, for a substantial portion it is difficult to name a concrete area of application. A gender comparison suggests slightly different “contexts” in which children most often situate AI. Girls mentioned mobile phones/apps more often than boys (8.6% vs. 3.7%) and also somewhat more often cited the internet/social networks/online content (10.1% vs. 8.6%). By contrast, boys more often mentioned industry/robotisation of manufacturing (3.8% vs. 2.1%), transport/cars (1.9% vs. 1.0%), and somewhat more often ChatGPT/assistants (2.4% vs. 1.7%). The age comparison (9–12 years) indicates that the share of vague responses decreases slightly with age (roughly from 62.0% among 9-year-olds to ~55% among 11–12-year-olds).

Table 3. Respondents’ answers: Specific areas where AI is used

Area of AI use (coded category)	**Internet/social networks/online content**	**Mobile phones/apps**	**School/educationí**	**Industry/robotised manufacturing**	**Art/creative production**
Total n (%)	183 (9.4%)	119 (6.1%)	65 (3.3%)	58 (3.0%)	59 (3.0%)
Area of AI use (coded category)	**Healthcare/medicine**	**Assistants/chatbots/ ChatGPT**	**Science/research**	**Search/information/ translation**	**Transport/cars**
Total n (%)	51 (2.6%)	40 (2.0%)	40 (2.0%)	32 (1.6%)	29 (1.5%)

For the item asking whether pupils think AI can make mistakes, most respondents answered “yes” (63.1%); a smaller share answered “no” (15.3%), and about one fifth chose “I don’t know” (21.6%). The comparison by age (9–12 years) did not show statistically significant differences in the distribution of responses ($\chi^2(6) = 5.371$; $p = 0.497$): the proportion of “yes” responses ranged roughly between 59.0% (age 9) and 64.6% (age 12). By contrast, gender differences were statistically significant ($\chi^2(2) = 18.760$; $p = 0.000084$). Boys answered “no” more often than girls (17.9% vs. 12.6%), whereas girls more often chose “I don’t know” (24.6% vs. 18.7%). The proportion of “yes” responses was similar in both groups (63.3% for boys vs. 62.8% for girls). Overall, children largely acknowledge that AI can be fallible; differences appear more in the degree of uncertainty and rejection of this possibility across gender groups than across ages.

For the item asking whether pupils think AI could become dangerous, the “yes” response clearly predominated: 76.3% of respondents endorsed this possibility, while 23.7% answered “no”. The option “I don’t know” virtually did not occur in the dataset (0%), suggesting that pupils tend to hold a more clear-cut view on this question. A gender comparison shows that girls rated AI as potentially dangerous somewhat more often than boys (78.5% vs. 74.1%). Overall, the results indicate that concerns about AI’s potential dangerousness are widespread among 5th-grade pupils. A detailed overview of the reasons is provided in the table below.

Table 4. How could AI be dangerous?

Category (main)	Other / vague (e.g., "robot", "because it's dangerous" without a mechanism)	Misuse by people (hacking, viruses, fraud, bullying…)	Loss of control / takeover (robots, "it will take over the world")	Privacy / identity / surveillance (personal data)	I don't know / can't say	Technical failure / damage to devices (breaks, blocks…)	Weapons / war / killing (military use, atomic bomb…)	Errors and bad advice (makes mistakes, gives wrong advice)	Job loss (replacing people)	Addiction / laziness / weakened thinking	Lies / hoaxes / disinformation	Other (≤1%) (e.g., encouraging dangerous acts, "too smart", no answer)
Total n (%)	600 (35,6%)	255 (15,1%)	216 (12,8%)	201 (11,9%)	194 (11,5)	57 (3,4%)	51 (3,0%)	37 (2,2%)	23 (1,4%)	20 (1,2%)	15 (0,9%)	16 (0,9%)

Among boys, concerns related to loss of control/takeover appeared more often (17.8% vs. 8.1%; OR girls vs. boys = 0.41; $q < 0.001$), as did concerns about AI being misused by people (e.g., hacking, viruses, fraud; 18.0% vs. 12.4%; OR = 0.65; $q = 0.004$) and scenarios involving weapons or war (4.5% vs. 1.6%; OR = 0.36; $q = 0.002$). By contrast, girls more often mentioned privacy, identity, and surveillance (15.3% vs. 8.4%; OR = 1.96; $q < 0.001$), as well as the category of other/very vague reasons (39.5% vs. 31.5%; OR = 1.42; $q = 0.002$). However, the largest group of children does not have a concrete idea of why AI might be dangerous.

4 Discussion

The findings show that Czech pupils in younger primary-school age have a high level of awareness of AI and encounter the term mainly in online environments, while school plays a rather secondary role. Open-ended definitions suggest that children's mental models are often anthropomorphic (AI as a "robot") or device-centred (AI as a "computer"); technologically more accurate explanations (program, data, learning) appear in only a smaller share of responses. This interpretation is also confirmed by the pilot focus groups conducted roughly a year after the questionnaire survey—children often described AI as a "robot in a computer," a "smarter Google," or a "helper that saves time," and they derived their ideas primarily from interactions with apps (e.g., GPT-type chatbots). International surveys focusing on younger school-age children indicate similar patterns: children have a basic awareness of generative AI, some already use it in practice, yet the need for systematic guidance and risk work is evident. In the national Hart Research survey [18] (n = 1,510, ages 9–17), children most often define AI very concretely as a "smart computer/program," or as a "really smart robot"; they also frequently link AI directly to specific applications such as chatbots (e.g., ChatGPT), and some children report uncertainty about what AI actually means. Comparable mental models are also documented in other international studies. In a Scottish study with children aged 6–11 [19], children using smart speakers often spoke about AI "as a being" with its own will, while showing only limited understanding of data practices, privacy, and safety. Mertala and Fagerlund (2023) [20], among Finnish pupils in grades 5–6 (n = 195; ages 12–13), identified frequent misconceptions (non-technological conceptions, anthropomorphisation, AI as a "machine" without learning) and low self-ratings of knowledge. Saçan et al. (2022) [21], drawing on metaphors produced by children aged 6–10 (n = 146), showed that AI is understood either as a "living" entity (robot, human, brain) or as a "non-living" tool or an evaluated object (machine, information processor, danger). Overall, these predominantly qualitative studies suggest that children interpret AI mainly through personal experience and "human-like" interactions; without targeted instruction, they may therefore perceive AI more as an agent or an object than as a process of learning from data, which can lead both to overestimating its capabilities and to uncertainty when judging its reliability.

A salient theme in our study is risk sensitivity: a large proportion of pupils acknowledge that AI can make mistakes, and three quarters consider it potentially dangerous. At the same time, the high share of vague justifications indicates that "dangerousness" is, for many children, more of a general feeling than a precisely structured understanding of risk mechanisms. Nevertheless, relatively consistent clusters recur in their answers (misuse by people, privacy, loss of control), making these themes highly suitable for school-based interventions focused on safe use of digital tools (personal-data protection, critical evaluation of information, and misuse scenarios). In the pilot focus groups—

conducted as preparation for the qualitative phase planned for autumn 2025—children frequently mentioned their experience of communicating with GPT-type chatbots. Based on interactions in which they received answers that were sometimes inaccurate or confusing, they concluded (or reassured themselves) that AI can make mistakes. They perceived the chatbot as "a robot that pretends to be a human." For some children this experience was amusing; for others it triggered embarrassment or even anxiety. Other responses pointed to an additional possible source of children's fears about AI: experiences with videos, series, or films featuring a dangerous or "evil" AI. Their ideas thus stemmed more from media images than from factual knowledge. These repeatedly occurring responses suggest that this media-driven source of AI anxiety may be widespread among Czech children. For comparison, in a 2024 case study [22], children reflected on their attitudes after thematic lessons on AI: their views were ambivalent—on the one hand, they appreciated the benefits of AI, especially for learning and facilitating everyday tasks; on the other hand, they expressed concerns about overly rapid technological development, job losses, breaches of privacy, and potential harm to people. Most pupils already had personal experience with AI tools and agreed on the need for some form of regulation that would allow society to think through the consequences of technological progress. These insights underline the importance of including children's voices—those of future users—in debates about AI and taking them into account when designing educational approaches.

From a gender perspective, differences are statistically significant across several indicators, but typically with small effect sizes: boys more often declare understanding of how AI works and, in their concerns, more often mention "control" or misuse, whereas girls more often choose responses expressing uncertainty ("I don't know," "maybe") and, in reasons for dangerousness, place greater emphasis on privacy. These differences may reflect different levels of confidence in technical topics or different patterns of risk salience, and they may be useful when designing supportive and inclusive educational activities.

The main limitations of our analysis include the cross-sectional nature of the data and the fact that some key variables were operationalized through self-assessment and open-ended responses. For qualitative items, the resulting categorization is also to some extent dependent on the chosen coding procedure. The follow-up qualitative phase of the research will focus on refining and deepening the interpretation of these findings. A further limitation concerns sampling: the questionnaires were distributed across five regions of the Czech Republic, so the data collection did not cover the entire country. This recruitment strategy may have limited the generalizability of results. Going forward, it would be beneficial to link declared understanding to more objective indicators of AI literacy, evaluate the effects of school interventions, and broaden comparisons (e.g., across regions or educational contexts).

5 Conclusion

This study shows that 5th-grade pupils in the Czech Republic have extensive exposure to the concept of artificial intelligence and perceive AI as an ordinary part of today's world; however, their understanding often remains superficial and grounded in specific artefacts and experiences. Children most frequently associate AI with a "robot," a "smart computer," or tools such as ChatGPT, and their descriptions of how AI works are dominated by a functional logic of "I give a task → AI answers," or by the idea of searching for information on the internet. Mechanistic explanations (learning from data, algorithms) appear only marginally, and even among pupils who declare that they "know how AI works," a substantial share cannot articulate their idea clearly (as reflected in the proportion of vague or empty responses). Alongside this, a marked ambivalence in attitudes emerges: AI is viewed as useful, especially for school tasks and information searching, but it is also associated with fallibility and high levels of concern—many pupils consider AI potentially dangerous, and open-ended justifications include both realistic risks (security, privacy) and narratives taken from fiction (the idea of "taking control").

The contribution of the study lies in the fact that, using a large sample of Czech pupils, it links in detail three levels: (a) the extent of exposure and the sources from which children obtain information about AI, (b) the quality of their mental models (definitions, associations, ideas about how AI works and where it "resides"), and (c) attitudes and concerns, including open-ended justifications. The results thus extend the existing literature on children's understanding of AI by showing how, alongside high declared knowledge, device-centred and anthropomorphic interpretations persist, and how concerns are not merely "immature fear" but often build on children's general experiences of online environments (e.g., hacking, misuse of data). Differences by gender and age further suggest that, for some children, increasing age changes more the style of expression and level of certainty than the

"correctness" of understanding itself—an important point for interpreting self-report questionnaire items.

From a practical perspective, the findings indicate the need to begin developing AI literacy already in primary education: not merely as "introducing tools," but as the targeted building of comprehensible mental models (what AI is and is not, where it "runs," why it can make mistakes), strengthening critical verification of outputs, and teaching the basics of data and safety literacy (privacy, accounts, manipulation, scams). For school practice, it appears key to connect instruction with concrete situations children mention (school, searching, social networks) while also creating space to work with anxieties so that these are framed in terms of realistic risks and preventive strategies. For education-policy and curriculum makers, the results support the need for systematic integration of AI topics into education, including methodological support for teachers. For technology designers, it is important that children often understand AI through the interface and a "sense of agency"—transparent explanations of functions, warnings about limitations, and age-appropriate safety features can help reduce misconceptions as well as excessive fears.

The results of our study should be read with these limitations in mind: some findings are based on self-assessment and open-ended responses, which may be influenced by children's language development and varying willingness to answer; in open-ended items, there is also a share of vague or empty responses. This is why the qualitative research phase already mentioned will follow. It will combine the questionnaire survey with a deeper qualitative probe (focus groups) and examine how mental models and concerns change over time, after a school intervention, or with different types of experience using AI tools. Subsequently, focus groups and interviews with teachers will be conducted to compare teachers' perspectives with pupils' accounts and to complement the interpretation of findings.

Overall, the study clearly shows that children come into contact with AI early, form their own—often insufficiently grounded—ideas about it, and at the same time perceive substantial risks; it is precisely this combination that makes AI literacy an urgent topic for education as well as for responsible technology development. However, instructional materials should be designed consistently regarding the age-related and cognitive specificities of younger primary-school children: their cognition is more visual, concrete, and situational, and they learn primarily through examples drawn from everyday experience, play, stories, and hands-on activities. It follows that education about AI should build on comprehensible situations from everyday life (e.g., video recommendations, voice assistants, filters in photo apps), work with simple models of "how it might work," and at the same time sensitively open topics of fallibility, reliability, and safety in ways that match children's understanding of causes and consequences. [23,24] An inspiring example of good practice is provided by the Jů and Pí teaching materials, designed precisely for this age group and developing understanding in an accessible and playful form, as well as the AI Curriculum [25] created by the Czech non-profit organization AI dětem, for which it received the prestigious AI Award 2025. For pupils to be educated about AI in a truly age-appropriate way, it is essential to educate teachers first and foremost. Teachers need to understand the basic principles and limitations of AI so that they can translate the topic into children's language, choose suitable examples, correct common child conceptions (e.g., anthropomorphizing AI), and at the same time provide a safe framework for discussing both risks and benefits. The conclusions of this research can help teachers better anticipate which questions children actually grapple with, and which explanations are understandable to them, and thus prepare them for the specific topics that need to be introduced to children sensitively and with sound pedagogy

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