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Philosophical Foundations for 4C-Oriented Early Childhood Education in the Context of Artificial Intelligence

Filozoficzne podstawy edukacji wczesnoszkolnej ukierunkowanej na rozwój kompetencji 4C w kontekście sztucznej inteligencji

KEYWORDS

philosophy, 4C competences, artificial intelligence, ethics of artificial intelligence, early childhood education, communication, creativity, critical thinking, cooperation

ABSTRACT

This article discusses the philosophical foundations of early childhood education, focusing on the development of the 4C competencies – communication, collaboration, critical thinking, and creativity – as essential for preparing students to function in a world increasingly shaped by artificial intelligence. It presents a theoretical and conceptual framework, applying a methodology grounded in insights from various philosophical sub-disciplines. The research problem addresses how philosophy can provide grounding for early childhood education and support pedagogical approaches in the face of technological challenges, particularly students' over-reliance on AI. The potential of philosophy to shape children's attitudes is illustrated through practical applications in early education. When introduced in a playful and age-appropriate way, philosophy can both stimulate the development of 4C competences and raise students' awareness of the need to reinforce these skills amid advancements in artificial intelligence. The study concludes that philosophy, understood as an exercise in thinking and dialogue, can play a critical role in addressing young learners' overreliance on AI tools, which may weaken their cognitive abilities. As a method of strengthening 4C competencies, philosophy can contribute to developing rationality and a critical attitude towards technology in children, while at the same time serving as an intriguing alternative to AI systems.

SŁOWA KLUCZE

filozofia, kompetencje 4C, sztuczna inteligencja, etyka sztucznej inteligencji, edukacja wczesnoszkolna, komunikacja, kreatywność, krytyczne myślenie, współpraca

ABSTRAKT

Celem artykułu jest omówienie filozoficznych podstaw koncepcji edukacji wczesnoszkolnej opartej na rozwijaniu kompetencji 4C – komunikacji, współpracy, krytycznego myślenia i kreatywności – jako fundamentu przygotowującego ucznia do funkcjonowania w świecie zdeterminowanym przez sztuczną inteligencję. Artykuł ma charakter teoretyczno-koncepcyjny i wykorzystuje metodologię i idee wywodzące się z różnych subdyscyplin filozofii. Problematyka badawcza koncentruje się na pytaniu, w jaki sposób filozofia może dostarczać podstaw i wspomagać edukację wczesnoszkolną w obliczu wyzwań związanych z rozwojem technologii, zwłaszcza w zakresie nadmiernego polegania przez uczniów na sztucznej inteligencji. Artykuł wskazuje na potencjał filozofii jako narzędzia kształtowania postaw oraz prezentuje przykłady praktycznego zastosowania idei filozoficznych w dydaktyce wczesnoszkolnej. Rozważania pozwalają stwierdzić, że filozofia wprowadzona w zabawowy sposób, odpowiednio dostosowana do etapu rozwojowego dziecka, może stymulować budowanie kompetencji 4C, a zarazem uwrażliwiać uczniów na konieczność ich rozwijania w kontekście postępu technologii sztucznej inteligencji. Analiza prowadzi do wniosku, że filozofia traktowana jako ćwiczenie myślenia i dialogu może odegrać kluczową rolę w odniesieniu do kwestii nadmiernego polegania uczniów na narzędziach sztucznej inteligencji, które prowadzi do osłabienia kompetencji poznawczych. Natomiast wykorzystanie filozofii jako metody wzmacniania kompetencji 4C przyczynia się do kształtowania w dzieciach racjonalności i krytycznego stosunku do technologii. Filozofia staje się w ten sposób intrygującą alternatywą dla systemów sztucznej inteligencji.

Introduction

Artificial intelligence is revolutionising education systems worldwide. In this context, traditional models, characterised by the teacher's authoritarian role, rote memorisation, test-based assessments, and rigid curricula, are increasingly anachronistic and fail to address the contemporary challenges.

As technological progress accelerates, learners need to acquire interdisciplinary skills to adapt to changes in today's complex world. Moreover, the growing demand for 4C skills of creativity, collaboration, communication, and critical thinking reflects awareness of labour-market shifts, where emerging professions require advanced human cooperation and flexible collaboration with AI systems. Education should, therefore, prioritise the holistic development of young learners, with a central focus on 4C competencies, while also supporting teachers in adapting their pedagogical approaches.

Another point is that technological advances in education, particularly students' overreliance on AI tools, which diminish young learners' cognitive abilities, indicate the need to lay the groundwork for reshaping education from the earliest school stages. Consequently, this study attempts to recognise and explore the philosophical foundations for a 4C-oriented early childhood education in the context of artificial intelligence.

Research Methods and Tools

One possible approach to addressing the impact of the AI revolution on education is to anchor it in philosophical principles. Practical philosophy, understood as a method of critical reflection, has the potential to equip young learners with essential human competencies.

This article introduces an interdisciplinary overview that integrates critical pedagogy, practical philosophy, and technology ethics. It presents a conceptual and theoretical framework, arguing that in an AI-dominated world, both ancient and some modern philosophical sources may provide the foundations for an early childhood education designed to equip students with 4C skills. After being adapted to the developmental stage of young learners, philosophical ideas are aligned with each of the four 4C competences, as outlined in chapter four.

The methodology is grounded in analysing philosophical methods and theoretical sources encompassing philosophy of education, ethics, aesthetics, ancient Greek philosophy, social philosophy, modern epistemology, philosophy of language, philosophy of dialogue, and hermeneutics. The study also provides examples of applying selected philosophical concepts at the level of early school education. On the whole, examining philosophical thought aims to formulate theoretical and practical proposals.

4C Competencies in Early Childhood Education

Recognised as 21st century skills, the 4Cs – creativity, collaboration, communication, and critical thinking – can be seen as meta-competencies that enable individuals to meet rapidly changing societal and technological expectations (Thornhill-Miller et al., 2023, p. 4).

An attempt to define the essential competences that prepare people to face the challenges of today's world has been made by the Organisation for Economic Co-operation and Development (OECD), which launched the Programme for International Student Assessment (PISA). OECD conceptualises a set of key competencies which comprise „the capacity of students to analyse, reason and communicate

effectively as they pose, solve and interpret problems in a variety of subject matter areas" (OECD, 2010, p. 3) and are able „to report on their own motivation to learn, beliefs about themselves and learning strategies" (OECD, 2010, p. 3).

Various organisations, including the American Management Association (2010), the Commission of the European Communities (2008), the Consortium of National Arts Education Associations (Mahlmann, 1994), and the Partnership for 21st Century Skills (2019), have developed views and recommendations on a future-oriented framework of competencies that should be taught to school students. OECD, in publication *The Definition and Selection of Key Competencies: Executive Summary,* developed the list of 21st century skills (2010, pp. 1–20) that originated the concept of the 4Cs, namely creativity, collaboration, communication, and critical thinking. Integrating these competencies from an early age aims to enable individuals to think independently, express their views in a thoughtful and intellectually responsible way, and actively shape their personal and ethical growth.

When characterising the framework of 4C competencies, significant value is placed on reflective thinking. According to OECD, reflectiveness is considered „the heart of key competencies" (OECD, 2010, p. 8) and involves "the ability to deal with change, learn from experience and think and act with a critical stance" (OECD, 2010, p. 5). Viewed broadly, the concept of the 4Cs, integrating cognitive, social, communicative, and creative competencies with reflective awareness, offers a natural foundation for the inclusion of philosophy in education.

Introducing Philosophy and Philosophical Methods in Early Childhood Education

The educational role of philosophy for young learners was emphasised by Matthew Lipman, the founder of the Philosophy for Children programme, who in the 1970s introduced an innovative curriculum designed to enhance schoolchildren's philosophical inquiry through collaborative and thought-provoking classroom discussions (Lipman, 1973).

Observations that young children spontaneously engage in philosophical thinking have also been made by Gareth Matthews. He argues that young learners act as natural philosophers capable of addressing existential problems, playing with ideas, wondering about the nature of reality, and questioning fundamental issues concerning values and human knowledge (Matthews, 1980).

From an overall perspective, integrating philosophy into the curriculum at an early stage of education undoubtedly enables students to develop reasoning skills and a critical approach to the world around them. Nevertheless, in line with James Funston's

view, pedagogy that seeks to nurture children as philosophical thinkers and engage them in dialogue should give them the freedom to develop modes of thinking that do not necessarily follow adult lines of reasoning, thereby strengthening philosophically-interesting pathways of thought (Funston, 2017, pp. 14–15).

From a philosophical perspective on education, this approach is rooted in Deweyan pragmatism, which presents the child as an active agent who learns through direct experience and exploration of the world, enriched by cooperative practices, analytical reflection, and dialogic engagement processes (Dewey, 2011).

When considering the role of philosophical approaches in conceptualising children's learning, the views of Piaget (1977), Erikson (1950), Vygotsky (1934), and Bruner (1977) cannot be overlooked. Their various theoretical frameworks outline patterns in early childhood education that integrate experiential and developmental aspects with cultural and individual purposes, while acknowledging learner diversity across different epistemological, ontological and ethical perspectives (Peters & Tesar, 2017, p. 12).

The Potential of Philosophy for a 4C-Oriented Early Childhood Education in the Context of Artificial Intelligence

The ongoing development of artificial intelligence calls for an educational framework that, from the earliest stages, enhances adaptive capacities required to meet the demands of rapidly evolving technologies.

Recent research indicates that schoolchildren increasingly rely on AI tools instead of engaging in independent reasoning (Pathan & Kanth, 2023, pp. 1711–1716). Experimental studies conducted by a team led by Nataliya Kosmyna show that students who use AI models, such as ChatGPT, demonstrate significantly less brain activity and weaker metacognitive engagement than their peers who use search engines or study by themselves (Kosmyna et al., 2025). Over time, this reliance on artificial intelligence may weaken fundamental cognitive skills such as reasoning, reflective analysis, argumentation, creativity, and evaluating the reliability of information. Young children are particularly susceptible to this problem because their judgmental abilities are still developing, making them prone to accepting results generated by artificial intelligence that are potentially incorrect (Pathan & Kanth, 2023, p. 1715).

In light of these circumstances, teachers should employ methods that enhance creativity, collaboration, communication, and critical reflection to address children's excessive reliance on AI tools. Thus, incorporating diverse philosophy-based approaches into early school didactics appears particularly beneficial.

Aesthetics in Early School Curricula to Enhance Creativity in the Context of Artificial Intelligence

Recognised as one of the key competences in the age of generative AI, creativity can be conceptualised through four fundamental factors: personal properties, cognitive processes, environmental conditions, and the nature of creative outcomes (Oppert et al., 2023, pp. 1–2). Accordingly, a creative attitude is characterised by considering different possibilities and alternative viewpoints, combined with curiosity and manifested in fluency, flexibility, the ability to make connections, find solutions, and shift perspectives (Dere, 2019, pp. 652–658; Harold, 2024, pp. 1–2). Katherine Harold concludes that „it is a mixture of curiosity and exploration which finally results in discovery" (Harold, 2024, p. 2).

Particular emphasis should be placed on the creative process in an educational setting when teaching students diverse ways of thinking. Within this context, it is essential to acknowledge young learners' natural capacity for creative thinking, which, if neglected during childhood, may prove more challenging to develop in adulthood. Furthermore, given that creativity goes beyond innate predispositions, such as personality and intelligence, and encompasses thinking styles, motivation, and knowledge (Mazeh, 2020, pp. 8–10), early childhood educators have the opportunity to integrate creative processes into classroom practice through a variety of pedagogical tools. This objective can be achieved by applying pedagogical instruments drawn from philosophical approaches to teaching children.

In a world increasingly dominated by artificial intelligence, aesthetics, among the different branches of philosophy, can significantly enhance the creative potential of the youngest learners if adjusted to students' level of understanding. To give an example, creativity can be taught by guiding learners to seek, notice, and name beauty, and to respond to it playfully in their everyday surroundings – from the colours of clothes and the shapes of plants like grass, pine cones, seed heads, or tree roots, to the architecture of the school building and even the rhythm of footsteps in the hallway. In this regard, the concept of everyday aesthetics goes beyond the realm of fine arts, encompassing how individuals perceive and appreciate *beauty* in common objects, activities and places, connecting such experiences to personal well-being and ethical awareness, and offering a compelling alternative to the colourful and playful worlds created by artificial intelligence.

In line with John Dewey's view, aesthetic experience is part of daily life and emerges from meaningful interactions with the world around us (Dewey, 1934, pp. 3–57). Within an educational framework, everyday aesthetics can encourage children to recognise and create *beauty* in their immediate settings, stimulating curiosity, openness, flexible thinking, and a sense of care for the natural environment (Marini, 2020, pp. 39–50).

In an era defined by artificial intelligence, enhancing creativity through an appreciation of *beauty* in everyday life has the potential to help young learners, growing up in a globalised, technology-driven world, develop symbolic, abstract, and imaginative thinking, while rediscovering and appreciating values grounded in the natural world.

Furthermore, encouraging children to discover various ways of identifying the creative features in objects, activities, and places, guiding them to wander through nature in order to explore *beauty* through integrated senses, and engaging them in play with colors, smells, tastes, or shapes may enhance children's sense of emotional attachment to the real world, as opposed to the intense emotions triggered by interactions with AI technologies.

Social Philosophy in Early Education to Strengthen Collaboration in the Age of Artificial Intelligence

In many areas of human life, achieving complex goals often requires collaborative efforts rather than individual endeavours. In the age of artificial intelligence, the ability to work together is becoming increasingly crucial not only within human communities but also in cooperation with AI systems.

The term *collaboration* is defined as "a type of interaction in which individuals, teams, or organisational members work together to reach a common shared goal, activity, or production" (Keyton et al., 2017, p. 93). Reflecting Laurie Lewis's perspective, a collaborative process involves interpersonal relationships with other team members while focusing on problem solving, playing, participating in discussions, making decisions, and exchanging knowledge (Lewis, 2006, pp. 219–220).

The power of collaboration in school settings lies in strengthening relationships across the wider educational community, particularly through peer interactions and dialogue between students and teachers. As Julian Kitchen, Mandi Berry and Tom Russell noted, such connections positively contribute to developing fresh perspectives, expanding knowledge, and promoting a willingness to share practices with others (Kitchen et al., 2019, pp. 93–97).

Collaborative strategies in educational practice are now implemented for students born in the midst of advanced technological developments, the impact of which on social interaction remains a matter of concern. Experimental studies conducted by a team led by Herlina Ike Oktaviani indicate that early childhood teachers need training to adjust the learning process to changes brought about by increasing virtualisation. Pre-school learners, who are now immersed in virtual reality, are likely to benefit from group collaboration aimed at achieving shared goals, provided that collaborative learning is adequately implemented (Oktaviani et al., 2023, pp. 329–337).

Collaboration, referred to as attitudes related to interdependence, cooperativeness, and view exchange, is one of the subjects addressed by social philosophy. In early childhood education, this subdiscipline of philosophy may be applied as a framework of methodological instruments and a source of philosophical narratives and ideas that facilitate understanding of the value of social interactions.

The model of collaborative learning has been examined by several philosophers of education. John Dewey in *Democracy and Education* encouraged educators to teach children collaborative engagement and the exchange of experiences in order to prepare them for life in a community (Dewey, 1916, pp. 12–47, 94–162). In contrast, Jürgen Habermas developed a communicative model of collaborative learning based on the conditions of an ideal learning situation, in which all students engage in meaningful communication with equal and unrestricted participation rights (Habermas, 1984, p. 25). Needless to say, it was Maria Montessori who recognised the power of collaboration in early childhood education, conceptualised it theoretically, and later implemented it widely in schools worldwide (Montessori, 1912).

Alongside the methodological principles of collaboration rooted in philosophical thought, teachers may draw upon social philosophers' ideas and encourage young learners to explore philosophical stories together through play-based group activities. To give an example, selected passages from Plato's *The Republic* (2021) might be adapted into a drama or short story illustrating harmonious community life and the cultivation of social virtues. Similarly, Aristotle's view of friendship (*Philia*), presented in *The Nicomachean Ethics* (2020) as an idea to enhance happiness through mutual support and cooperation, could be included in the school curriculum by introducing very young children to age-appropriate practices such as storytelling about helping friends, role-playing scenarios of sharing and kindness, or classroom projects where they cooperate to achieve a common goal. An early education programme may also benefit from incorporating insights from Jean-Jacques Rousseau's *Émile ou de l'Éducation* (1762), which portrays children as eager to interact with peers and delighted by the discovery of the world, through activities such as guided nature walks, where naturally curious young learners collect and discuss simple objects.

a) Philosophical Foundations for Early Communication Skills in the Era of Artificial Intelligence

Applying philosophical methods, stories, or concepts to achieve cooperative outcomes and build social connections from the earliest stages of education gains particular significance in light of current research indicating that interactions with artificial intelligence may contribute to social deskilling and weakened communication skills (Malfacini, 2025).

On the one hand, AI-generated messages sent on behalf of humans have the potential to facilitate interpersonal communication in terms of speed, emotional tone, and positive impression (Hohenstein et al., 2023). According to studies conducted by a team led by Desy Misnawati, "reliance on chatbots and virtual assistants can reduce essential social skills, such as empathy, listening skills, and the ability to read non-verbal expressions in face-to-face conversations" (Misnawati et al., 2025, p. 436).

First and foremost, communication skills have been cultivated in philosophy since ancient times, notably through the rhetorical techniques outlined by Aristotle in *Rhetoric* (2015) and inquiry-based dialogues employed by Socrates in Plato's *Dialogues* (1961). Integrating such philosophical frameworks into the learning environment can help children perceive language as an active, context-bound, and creative phenomenon.

Early education can help children develop empathy and respect through the way they communicate. Emmanuel Lévinas's ideas (1969), adapted to early childhood education, may inspire children to realise that every conversation is a response to *the Other*, understood as another person. This encourages them to listen attentively, care for their peers, and take responsibility for participating thoughtfully in dialogue. In this way, students learn to build relationships through conversation – a skill truly valuable nowadays and one that offers a meaningful alternative to interactions with chatbots in virtual reality.

Furthermore, adapted to early childhood education, certain insights derived from the philosophy of language may help students understand how communication functions and how meaning is conveyed. For instance, based on Wittgenstein's concept of *language games* (1958, §7, §23, §27), teachers can design activities allowing children to explore the meanings of metaphoric words and simple idiomatic phrases by playing with language. By imaginatively adapting Austin's theory of speech acts (Austin, 1962) through game-based techniques, teachers may help children recognise that utterances such as promises, requests or greetings function as real actions that establish relationships and shared understanding.

b) Enhancing Young Learners' Critical Thinking Through Philosophy in the Context of Artificial Intelligence

Critical thinking, defined as the capacity to evaluate, analyse, and synthesise information, encompasses cognitive processes such as decision-making, problem-solving, and reflective reasoning (Gerlich, 2025, p. 1), which play an essential role in 21st-century school education.

Recent social studies have shown that human reasoning and analytical abilities are influenced by interactive AI tools, which may have both positive and negative consequences for critical thinking. On the one hand, artificial intelligence algorithms

can support cognitive processes by suggesting alternative solutions, stimulating reflection and discussion, and encouraging individuals to critically examine assumptions and strive for understanding. On the other hand, plenty of researchers indicate an increasing reliance on AI tools contributing to diminished cognitive engagement and hindering the development of reasoning skills (Gerlich, 2025, pp. 1–29; Szmyd & Mitera, 2024, pp. 1022–1039).

In the educational setting, teachers are responsible for balancing these effects and achieving an appropriate equilibrium between integrating artificial intelligence and promoting critical thinking (Szmyd & Mitera, 2024, p. 1027). This aim can only be achieved by maintaining ethical principles, ensuring transparency, and exercising critical reasoning among students.

In early childhood education, critical thinking may be introduced by simplifying insights rooted in diverse philosophical subdisciplines into playful, age-appropriate activities. A thought-provoking starting point for inspiring children to explore ideas through dialogue may be the philosophical statement *I know that I know nothing* expressed by Socrates, who, as Katarzyna Szmyd and Ewelina Mitera observed, "is considered the father of critical thinking" (Szmyd & Mitera, 2024, p. 1025). Taken this way, teachers can introduce young learners to Socratic dialogues, engaging them in questioning, listening, and formulating answers, thereby supporting the development of early reasoning and open-mindedness.

For instance, René Descartes's philosophy, adapted to early childhood education and introduced through playful techniques, may inspire young learners to question his fundamental insight*: cogito, ergo sum* (1960). In this context, children might question simple everyday assumptions while playing with stacking cubes. Scepticism towards unverified claims, such as deepfakes, potentially generated by AI, could also be enhanced by exploring Descartes's doubts. Furthermore, inspired by playfully adjusted Immanuel Kant's insights (1999), students can be encouraged to reflect on the limits of the human mind compared to AI information processing. With reference to Kant's concept of the limits of cognition, children could identify examples of how they use their senses – sight, hearing, taste, smell, and touch – in everyday life and then do analogous experiments to test the sensory capacities of AI tools.

Against the background of increasing cognitive offloading caused by the overuse of AI systems, philosophical hermeneutics has the potential to develop critical thinking skills in early childhood education. Hans-Georg Gadamer's *fusion of horizons* that emerges in contextual, culturally and historically situated dialogue (Gadamer, 1989) can be introduced to very young learners through activities such as listening to stories from different cultures, relating narratives to their life experiences, role-playing everyday situations like sharing toys, or discussing how characters in a tale might feel. Gadamer's method, which guides children to see and compare various viewpoints in

familiar situations and encourages openness to diverse perspectives rather than rigid answers, seems highly valuable under today's circumstances, where excessive reliance on information delivered quickly and effortlessly by AI systems has been observed.

Results of the Conceptual Analysis

As artificial intelligence becomes increasingly influential, strengthening 4C competences in early education has the potential to prepare children for living in an uncertain future world. Addressing young learners' overdependence on AI tools, this study is focused on philosophical concepts, sources, and methodological principles that could help establish new pedagogical foundations and values applicable in early childhood education.

In light of students' declining concentration skills due to overexposure to technological devices, as well as their tendency to prioritise access to information over its comprehension, it becomes necessary to abandon the stereotypical perception of philosophy as merely abstract narratives lacking clear or practical relevance to reality. Instead, early childhood education can draw pedagogical value from practical philosophy grounded in various subdisciplines and methodologies, including the philosophy of education, ethics, aesthetics, ancient Greek philosophy, social philosophy, modern epistemology, the philosophy of language, the philosophy of dialogue, and philosophical hermeneutics.

Furthermore, philosophical approaches that encourage reflection are inherently linked to developing 4C competences such as creativity, collaboration, communication, and critical thinking. In practical application, philosophical reasoning may be introduced through role-playing, dialogues, adapted games, and other activities that engage children in questioning, listening, responding, doubting, and reasoning, all anchored in their real-life experiences.

Finally, this study reveals that, paradoxically, the rapid development of artificial intelligence leads to human-centric approaches and prompts a shift towards educational frameworks that prioritise skills such as creativity, collaboration, communication, and critical thinking. These transformative changes in education reflect a growing awareness and a revival of the Renaissance vision of humans as versatile individuals equipped with a wide range of competencies.

Conclusion

In summary, exercising philosophical thinking at the level of early school education can contribute to developing 21st century skills in children. Given the increasing overreliance on AI tools, philosophy, when introduced in an age-appropriate way, has the potential to encourage reflection in young learners. Philosophical concepts and methods adapted to their developmental stage can play a critical role in stimulating intellectual engagement and a desire to know. Inspired by philosophical ideas, children may learn through games, role-playing scenarios, or other fun activities to think independently and act according to reasoned principles.

In a nutshell, philosophy as a method aimed at strengthening 4C competencies – creativity, collaboration, communication, and critical thinking – can contribute to developing rationality and a critical attitude towards technology in children. Moreover, adjusted to children's learning style and emotional needs, philosophy can stimulate curiosity and offer an intriguing alternative to AI algorithms that deliver information quickly and effortlessly.

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