Artificial Intelligence and Education: A Metaphorical Analysis on the Perceptions of Students with Special Abilities

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To cite this article:

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Article Info	Abstract
	The main goal of this study is to reveal special talented primary school students' perceptions of artificial intelligence, one of the popular concepts of recent times, through metaphors. In this study, the phenomenological design, which is within the scope of qualitative research, was used. In this study, Türkiye Science and Art Center included special talented primary school students in the education field. The 104 special talented primary school students participating in the research were 9-14 years old. Of these students, 53 were boys and 51 were girls. The participants were in the 3th grade, 4th grade, 5th, 6th, 7th and 8th grades of primary education. Purposive sampling method was chosen in the research. When the answers from the students were examined, a total of 36 different categories emerged in line with the relevant metaphors. When these categories are examined in detail, it is seen that the concept of artificial intelligence is represented by different metaphors. According to the findings, it was determined that primary school students simulated the concept of artificial intelligence to different metaphors such as robot, smiling robot, robot vacuum cleaner. As a result, it has been revealed that special talented student generally have positive opinions about the concept of artificial intelligence.

Introduction

The concept of 'Artificial Intelligence'(AI) arouses curiosity in many people when they first hear it. Characterizing an abstract concept such as intelligence with artificial increases this curiosity. Despite the curiosity that the concept arouses, many people do not have serious knowledge about its content or the subjects it represents. The topics and components talked about around artificial intelligence are artificial neural networks, expert systems, fuzzy logic and genetic algorithms. The roots of artificial intelligence (AI) trace back to the British computer scientist Alan Turing's 1950s inquiry, "Can machines think?" (Turing, 1950). This question laid the foundation for AI, marking it as a significant outcome of technological advancement. With the advent of the Industry 4.0 era, AI research has swiftly progressed, becoming recognized as a key technology of the future. AI is continuously evolving, with new techniques, algorithms, and applications being developed regularly.

"There are three great events in history". The first of these is the formation of the universe. The second is the beginning of life. The third is the emergence of artificial intelligence. In his interview with the BBC, Edward

Fredkin, one of the MIT Computer Science laboratory managers, used the following statements: "To understand a topic like artificial intelligence, the differences and similarities between the brain and the computer must be understood". When the emergence of the concept of 'artificial intelligence' is considered historically and chronologically; (1) Prehistoric Period: "Artificial-Human" Initiative. (2) Dark Period (1965-1970): Very little progress could be achieved during this period. By developing a mechanism that thinks, computer scientists hoped to make intelligent computers by simply uploading data. As a result, there was "a period of waiting". (3) Renaissance Period (1970-1975): It was a period in which rapid developments took place. Artificial intelligence scientists have developed systems such as disease diagnosis. The foundations of today's expansions have been formed. (4) Partnership Period (1975-1980): Artificial intelligence researchers began to benefit from other branches of science such as language and psychology. (5) Entrepreneurship Period (1980-?): Artificial intelligence was taken out of laboratories and was considered with much more complex applications according to the needs of the real world. It is a period that still continues.

When the field is examined, there are many definitions of artificial intelligence; artificial intelligence (AI) is a multidisciplinary field that aims to simulate human-like intelligence capabilities of computer systems (Korkmaz, Sarıkaya & Kapukaya, 2024). Artificial intelligence (AI) is the basis for mimicking human intelligence processes through the creation and implementation of algorithms embedded in a dynamic computing environment (Ghosh & Arunachalam, 2021). With another definition; artificial intelligence (AI) is the ability of a machine or computer system to simulate and perform tasks that would normally require human intelligence, such as logical reasoning, learning, and problem solving (Morandín-Ahuermaa, 2022). As can be seen, although there are different definitions, the common view in all of them is that artificial intelligence, "intelligent programming" and "humanoid reactions" are two concepts that attract attention.

Pressey (1950), talked about "machines" that immediately show students test results, guide them to the correct answer, and support learning by providing the necessary information. Although he did not have the chance to realize his ideas other than creating complex printers under the conditions of that period, this effort was considered among the first examples of application of of artificial intelligence in education (Holmes et al., 2019). Additionally, Pressey (1950) also talked about educational management, which is one of the areas of use of artificial intelligence in education today. It was emphasized that such a machine would not only support students' learning but also reduce the burden of teachers.

 The roots of artificial intelligence (AI) trace back to the British computer scientist Alan Turing's 1950s inquiry, "Can machines think?" (Turing, 1950). This question laid the foundation for AI, marking it as a significant outcome of technological advancement. With the advent of the Industry 4.0 era, AI research has swiftly progressed, becoming recognized as a key technology of the future. AI is continuously evolving, with new techniques, algorithms, and applications being developed regularly. Artificial intelligence can be defined as the use of the basic features of human intelligence, namely logical thinking and the ability to predict the future, by machines. The goal of developing artificial intelligence is to relieve people's burden by using it in areas and complex tasks that require human-like cognitive abilities (Xue & Wang, 2022). This means imitating human thinking processes by machines to solve complex problems and adapt to changing conditions (Obschonka &

Audretsch, 2020).

In traditional classroom environments, there are different learning styles and levels even among students of the same age. This is where AI offers a huge advantage. Thanks to artificial intelligence, personalized educational content can be prepared for students or educational materials can be adapted by detecting these differences in advance. Kuprenko (2020) states that individual-specific training processes can be created with AI-supported algorithm models. Additionally, AI offers early solutions for students with different learning speeds (Drigas & Ioannidou, 2012; Fahimirad & Kotamjani, 2018). Karaca & Telli (2019) also state that today, AI applications increase the quality of education in areas such as personalized training programs, individual performance tracking, creating course content and determining the teaching model.

Various AI systems are used in different educational environments. The wide opportunities offered by artificial intelligence in education have led to an increase in research in this field (Chen et al., 2020). For example, natural language processing technologies can improve language education, while intelligent teaching systems can meet individualized learning needs, especially in special education. Additionally, data mining techniques in education enable performance predictions (Su & Yang, 2022). Kharbat, Alshawabkeh & Woolsey (2021) classified AI-based technologies used in education as machine learning, artificial neural networks, natural language processing, intelligent personal assistants, deep learning, Bayesian networks and intelligent education agents.

AI applications used in education modernize traditional learning environments and help students reveal their potential. AI-based applications tailored to students' abilities and individual needs can offer students different experiences. Kupreko (2020) states that personalized education processes can be offered to individuals with AI-based algorithm models. Additionally, Fahimirad and Kotamjani (2018) emphasize that AI can help provide early solution suggestions to students with different learning speeds. Arslan (2020) states that AI systems used in the field of education can be classified as expert systems, intelligent teaching systems and dialogue-based systems. Adıguzel et al. (2023) stated that smart teaching systems, automatic evaluation systems and adaptive learning platforms have become popular in education. It is seen that the use of these technologies is becoming widespread thanks to the advantages offered by learning analytics and educational data mining. When the literature on the use of AI in the field of education is examined, it is possible to come across many studies.

Artificial intelligence tools are increasingly being used in the field of early childhood education to improve learning and development, especially among primary school students. AI education helps children understand how computers perceive, learn, decide, create and act. Artificial intelligence education can integrate knowledge from different disciplines and multiple technologies simultaneously and has great potential to enrich children's learning (Aydogdu, 2023). Children's interactions with toys or robots with artificial intelligence interfaces can develop their creativity, emotions, inquiry and literacy skills. Children's learning experiences, especially those appropriate to their age and related to their previous experiences, will support them in understanding the basic functions of artificial intelligence. In light of all this, this study aims to reveal primary school students' metaphorical perceptions of the concept of artificial intelligence. This study, which investigates students' metaphorical perceptions of the concept of artificial ıntelligence, is thought to be important in terms of

contributing to future research and primary education policy makers.

Related Research

Many studies have been conducted aiming to determine the perceptions of primary school level teachers, students or parents towards certain concepts (Altıntas & Kaya 2012; Erturk, 2017; Kalaycı, 2018; Kırmizi & Celik, 2015). However, when the studies in the literature on artificial intelligence in the field of education are examined, it is seen that they do not measure the perceptions of education stakeholders towards artificial intelligence holistically, but address different issues related to education (Santalla et al., 2020; Liang, 2020; Li & Su, 2020; Arslan, 2020; Tascı & Celebi, 2020; Pala & Ozkan, 2020; Qin, Li & Yan, 2020; Cetin & Aktas, 2021). Moreover, research conducted by Haseski (2019) and Incerti (2020) on prospective teachers and Sangapu (2019) and Aljohani (2021) on students' or teachers' opinions on artificial intelligence-based applications and artificial intelligence were identified.

Idroes et al. (2023) administered a survey to students with different academic backgrounds and education levels. According to the survey results; they stated that, in general, students have a positive perception of artificial intelligence and believe that AI is useful for education. In his study, Zouhaier (2023) investigated the impact of AI on higher education, its effects on teaching and learning, assessment, ethics, required skills and future careers. It has also been stated that by assisting with grading and evaluation, educators help develop curriculum and ensure quality education. Addressing the potential role, benefits and potential challenges of Artificial Intelligence in the education sector, Lampou (2023) stated that AI systems can provide feedback on student performance and provide inclusivity for students with special needs or language barriers. Sanusi, Ayanwale & Chiu (2024) stated that AI has led to developments in many fields, including education, and emphasized that AI should be included as a course in K-12 classrooms.

Chan and Tsi (2023) have explored the potential of AI in higher education, particularly its capacity to replace or assist human teachers. As a result of the research, it was stated that although AI has become more common in education, students value and respect human teachers. As a result of the research conducted by Khaliqyar, Khaliqyar, Katebzadah & Hakimi (2024), who investigated the impact of AI on education in various academic environments; it highlights the transformative potential of AI in education regarding the various uses of the AI platform and their impact on motivation and critical thinking skills. Kumar & Raman (2022) examined student perceptions regarding the use of AI in higher education. In the results of working; it shows that students have a perception that AI can be used effectively in the teaching-learning process and academic management processes, but should not be used in exam and placement-related processes. Walan (2024), study focused on Swedish primary school students aged 11-12 and examined their cognitive and emotional perceptions of AI and their current use. As a result of the research, students' cognitive perceptions of AI, including both a machine and a concept with or without human qualities, were revealed. As a result of the research in which Alzahrani (2023), examined the attitudes and behaviors of students towards AI technologies, it was concluded that although the perceived risk negatively affects the attitudes of students, performance expectation factors and facilitating conditions It has significantly affected students' attitudes and behaviors. In his study, Sangapu (2019) investigated the perceptions

of teachers and students about the use and effectiveness of AI in the classroom. As a result of the opinions received, artificial intelligence was perceived as both a scourge and a blessing for the education system and human intelligence.

Method

In this part of the research, detailed information is given under the headings of the research model and design, study group, data collection tools, data collection, analysis of data, validity and reliability with strengths and limitations of the study.

Research Model

This research, which investigates the metaphorical representations and perceptions of special talented students regarding AI, was structured as a qualitative phenomenological study. Phenomenology emphasizes the exploration of phenomena that we recognize but do not fully comprehend in depth (Yildirim & Simsek, 2016). Phenomenology is a qualitative research method used to describe how people experience a phenomenon or concept and to express their understanding, feelings, perspectives, and perceptions (Rose, Beeby, & Parker, 1995). Phenomenology is widely used in many fields, especially in social and health sciences, philosophy, sociology, psychology and education. The choice to use metaphor analysis in this study stems from the belief that traditional data collection methods are insufficient for gathering meaningful information from primary school students. Metaphors, in addition to being linguistic instruments provide significant opportunities to comprehend human unknowns and novel situations, which is a key assumption of the constructivist approach (Moser, 2000; Parsons et al., 2004; Saban, 2008).

Metaphors are not just a figure of speech intended to embellish the language we use in daily life; their importance in human life encompasses much more than that. According to Morgan (1998), *"the use of metaphor generally means a way of thinking and a way of seeing that is useful for understanding the world."* In this respect, metaphor is a powerful mental tool that an individual can use to understand and explain a highly abstract, complex or theoretical phenomenon. As Shuell (1990) emphasizes: *"If a picture is worth 1000 words, a metaphor is worth 1000 pictures".* Because a picture merely provides a static image, whereas a metaphor provides a mental framework for thinking about a phenomenon. Metaphor is defined as a powerful mental mapping and modeling mechanism for individuals to understand and structure their own worlds and it attracts the attention of today's educators (Arslan & Bayrakcı, 2006). Metaphors can be used as powerful tools in both qualitative and quantitative research designs to understand various social processes in schools, classrooms and different educational environments.

Metaphors can be used as a powerful "pedagogical tool" in revealing, understanding and changing the mental images that students have of certain phenomena during their education. In this context, students may be asked to produce metaphors about different concepts and phenomena that come with the digital transformation in the field of education and share them with their classmates. Students can acquire high-level learning skills by analyzing

the metaphorical images they and their friends develop and by becoming aware of the alternative conceptualizations these images offer. At the same time, new perspectives can be brought to concepts and phenomenon. In light of all this information, the purpose of this research is to reveal students' mental images of artificial intelligence, a new concept that has entered our lives with digital transformation, through metaphors. In this context, it is anticipated that determining the perceptions developed by students with special abilities regarding artificial intelligence, which is an abstract and general concept, will provide new and important information and perspectives to all stakeholders. As a result, metaphors can be used as powerful research tools in understanding, revealing and explaining students' mental images. In this context, students at different levels of education may be asked to produce metaphors for different concepts and facts related to education and share them with each other. After students analyze the metaphorical images they develop and become aware of alternative conceptualizations, they can recognize metaphorical images that bring new perspectives to different educational phenomena and events.

Study Group

In this study, Türkiye's Science and Arts Centre involved primary school students in the education field. The 104 special talented primary school students participating in the research were 9-14 years old. Of these students, 53 were boys and 51 were girls. The participants were in the 3th grade, 4th grade, 5th, 6th, 7th and 8th grades of primary education. A purposeful study group was selected in the research.

Data Collection Tool, Data Collection and Analysis of Data

Students were asked "What would happen if you compared artificial intelligence to an object or tool?" They were asked to fill out the form containing the sentence. The researcher analyzed the collected data using content analysis. The identified metaphors were coded and categorized. Quantitative descriptive analyses, including frequencies and percentages, were employed to report the findings. In this study, the content analysis method was applied to the data. Initially, the collected data were conceptualized, then the derived concepts were themed and interpreted. Additionally, F (female) and M (male) codes were used to indicate gender. This coding allows for the observation of gender differences, enabling metaphors to be evaluated based on gender when reading the comments. The reasons for examining the data with content analysis are stated as follows (Gokce, 2006; Yildirim & Simsek, 2016):

* The main purpose is to reach concepts and relationships that can explain the collected data,
* Envisages accessing common and systematic data regarding the contents,
* Bringing together essentially similar data within the framework of certain concepts and themes and organizing them in a way that the reader can understand,
* It is due to its features such as processing the data more deeply.

Research Reliability/Validity and Reliability Studies

One way to enhance the credibility of qualitative research is through the researcher's expertise in the relevant field

(Bashir et al., 2008). In this context, the researchers have both national and international publications on artificial intelligence and metaphor. To ensure the content validity of the interview questions, input was obtained from a faculty member experienced in qualitative education research. For internal validity, a strategy of sufficient participation was implemented (Merriam & Tisdell, 2015), with data collected from a total of 104 students to ensure comprehensive and satisfactory responses. The initial coding of the emerging themes was done independently by the first author, and the process was then repeated by the 5 faculty member (Assoc. Prof.) who provided input for content validity.

Three important processes were carried out to ensure the validity of the research. These:

(a) Coding the data and the data analysis process is the first step. This stage is first explained in detail (Hruschka et al., 2004),

(b) For each of the categories obtained in the research, examples are taken from the statements that are assumed to best represent these categories and are included in the findings section (Yıldırım & Simsek, 2016),

(c) The literature is scanned in detail to ensure consistency (Ratcliff, 1995).

To ensure the reliability of the research, the researchers' codes and categories related to the codes were compared to confirm whether they represented the conceptual categories in question. After the research data were coded separately by the researchers, the resulting code and category list was finalized. In the reliability calculation of the study, the formula suggested by Tawney & Gast (1984) [(Agreement) / (Agreement + Disagreement)] x 100 was used. According to Miles and Huberman (1994), reliability calculations of 70% and above are considered reliable for qualitative research. The reliability coefficient calculated in this study was found to be 91% and it was concluded that the categories determined in line with the opinions of the experts were highly consistent.

Strengths and Limitations

The strengths of using metaphor studies on AI for special talented students include helping students understand abstract concepts more easily and improving their creative thinking skills. Metaphors attract students' attention and make the learning process fun by making complex and technical topics more understandable. Additionally, metaphor studies allow students to express their feelings and thoughts and help them develop a deep understanding of the subject. However, such studies also have limitations. In particular, the subjective nature of metaphors can lead to different interpretations among students, making it difficult to obtain consistent data. Additionally, some students' abstract thinking skills may not be sufficiently developed, which may prevent the effective use of metaphors. To overcome these limitations, it is important that the study is well structured and adequate guidance is provided to students.

Findings and Discussion

In this section, the metaphors stated by special talented students regarding the concept of AI are presented by evaluating these metaphors under the relevant categories and arranging the explanations given to the relevant

metaphors. When Table 1 is examined; it is seen that the students produced a total of 36 types of metaphors for the concept of artificial intelligence and expressed 104 opinions about it. The metaphors that students mentioned most about the concept of artificial intelligence in the first five concepts are; "*Robot/İnformation Robotic/ Robot Vacuum Cleaner*", "*Computer*", "*Human/ Knowledgeable Human*", "*Smart Phone/Tablet*", "*Human Brain*" etc. are listed as follows. It was determined that a total of 23 metaphors were repeated 10 times to 2 times, while a total of 13 metaphors were expressed once. Additionally, when the table is examined, it is noted that as well as positive metaphors for the concept of AI, a few negative metaphors were developed by the students. These negative metaphors are "*War/Digital War*", "*Disaster*", "*Weapon*" and *"Slave"*.

Table 1. Metaphors Developed by Students for the Concept of AI

Metaphors Order	Metaphor Name	f	Metaphors Orders	Metaphor Name	f
1	Robot/information robotic/ robot vacuum cleaner	10	19	Tools/Robotic Tools/Electronic Tools	3
2	Computer	8	20	Future	2
3	Human/ Knowledgeable Human	6	21	Employee/Worker	2
4	Smart phone/Tablet	5	22	Teleportation	2
5	Human Brain	5	23	Chef/Guide	2
6	Mind/Artificial Mind/Metal Mind	5	24	War/Digital War	1
7	Machine/Intelligent machine	4	25	Cyber/Cyber space	1
8	Book/Talking Book	4	26	Child/Smart Child	1
9	Sea/Sea of Knowledge	4	27	Intelligent Animal	1
10	Digitality	4	28	Training Dog	1
11	AI communication	4	29	Artificial Rain	1
12	Android	3	30	Remote Control	1
13	Friend/Talking Friend/Virtual Friend	3	31	Cheerful Teacher	1
14	Eyewear	3	32	Flashlight	1
15	Thinking/ Thought System	3	33	Disaster	1
16	Toy/Control Toy	3	34	Weapon	1
17	Coding/ Robotic Coding Coding set	3	35	Voyager	1
18	Internet Technologies	3	36	Slave	1

Below, examples of some of the metaphors in these categories are given with explanations from the participants.

• E (9): *I liken artificial intelligence to a robot vacuum cleaner; because I can access the information I*

want with a single command.

• K (11): I liken artificial intelligence to a computer; because it collects information and reflects it on the screen.

• E (13): I liken artificial intelligence to the brain; because it imitates the human brain.

• K (25): I liken artificial intelligence to the talking friends; I can spend time with it when I can't hang out my friends.

• E (30): I liken artificial intelligence to the future; Because we don't know what will happen.

• E (34): I liken artificial intelligence to war; because it will take possession of our world.

• K (41): I liken artificial intelligence to cheerful teacher; I think it won't get angry at us if we make a mistake.

• K (50): I liken artificial intelligence to training dog; just as the dog does everything it is told, the AI robot also implements the commands we write.

• E (54): I liken artificial intelligence to slave; because it is a slave to those people, have to do what we say.

The website https://wordart.com/create was used to create the word cloud figure following (see Figure 1). Thus, with the word cloud method, common and important words written by survey respondents in open-ended answers were highlighted.

Figure 1. Word Cloud of the Metaphors Stated by Special Talented Students regarding the Concept of AI

Artificial Intelligence is the ability of a computer or computer-controlled robot to perform tasks typically associated with intelligent beings. In this research, it was aimed to determine the metaphors developed by students regarding the concept of AI. In this study, Türkiye's Science and Arts Centre involved primary school students in the education field. The 104 special talented primary school students participating in the research were 9-14 years old. Of these students, 53 were boys and 51 were girls. The participants were in the 3th grade, 4th grade, 5th, 6th,

7th and 8th grades of primary education. A purposeful study group was selected in the research. While collecting data, each participant was asked to fill out form containing open-ended items regarding the concept of artificial intelligence. The data obtained from the students were later analysed using the content analysis technique. When the relevant metaphors were examined, a total of 36 different categories were revealed. Within the framework of this purpose, the results obtained from the research are as follows:

Robot, information robot, robot vacuum cleaner categories were found to be the categories containing the most metaphors. These metaphorical perception results are similar to the repeated metaphors in word clouds prepared for AI in the literature. The metaphors that students mentioned most about the concept of artificial intelligence in the first five concepts are; *"Robot/Information Robotic/ Robot Vacuum Cleaner", "Computer", "Human/ Knowledgeable Human", "Smart Phone/Tablet", "Human Brain"* etc. are listed as follows. It was determined that a total of 23 metaphors were repeated 10 times to 2 times, while a total of 13 metaphors were expressed once. Additionally, when the table is examined, it is noted that as well as positive metaphors for the concept of AI, a few negative metaphors were developed by the students. These negative metaphors are *"War/Digital War", "Disaster", "Weapon"* and *"Slave"*. When the details of negative metaphors are examined;

> *E (34): "I liken artificial intelligence to war; because it will take possession of our world".*
> *K (29): "I think artificial intelligence is a disaster tool for the future; even now our voices are being imitated and used for fraud. This situation is worrying".*
> *K (64): "Artificial intelligence is a powerful weapon for countries; no more war, countries will attack each other with AI technologies, whoever is strong will rule".*
> *E (54): "I liken artificial intelligence to slave; because it is a slave to those people, have to do what we say".*

When we examine negative metaphorical sentences above; the factors that are shown as the most important disadvantages of artificial intelligence today have not escaped the attention of students. "Privacy violations", "human becoming lazy" and "deepfake problem" are among them. Similar studies in the literature are examined; Aktas (2021), developed a metaphor study for the concept of artificial intelligence based on the opinions of administrators and teachers. In the research conducted with the phenomenology design, a semi-structured interview form was used as a data collection tool. 53 metaphors were produced by managers, the most produced metaphors were "robot, computer, child and assistant". 108 metaphors were produced by teachers and the most produced metaphors were found to be "robot, computer, child, machine and artificial human". Maas (2023), conducted a literature review on AI metaphors and why they are important for policy. The research presents a non-exhaustive survey of 55 analogies for AI technology and some of their policy implications. It discusses the risks of utilizing unreflexively analogies in AI law and regulation in this study.

Conclusion

The main goal of this study is to reveal special talented primary school students' perceptions of artificial intelligence, one of the popular concepts of recent times, through metaphors. In this study, the phenomenological

design, which is within the scope of qualitative research, was used. In this study, Türkiye Science and Art Center included special talented primary school students in the education field. The 104 special talented primary school students participating in the research were 9-14 years old. Of these students, 53 were boys and 51 were girls. The participants were in the 3th grade, 4th grade, 5th, 6th, 7th and 8th grades of primary education. When the answers from the students were examined, a total of 36 different categories emerged in line with the relevant metaphors. When these categories are examined in detail, it is seen that the concept of artificial intelligence is represented by different metaphors. The purpose of this research is to reveal the mental images of students regarding artificial intelligence, a new concept that has entered our lives with digital transformation, through metaphors.

Providing children with age- and development-appropriate education about artificial intelligence, machine learning and robotics from early childhood is very important in supporting cognitive development (problem solving, creative thinking) and other developmental areas. It has been found that a significant portion of children learn about artificial intelligence from media tools. In this respect, it is very important to introduce children to the concept of artificial intelligence appropriately and correctly from an early age and to raise awareness of parents about artificial intelligence.

Recommendations

The recommendations are as follows;
• In order to examine students' perceptions of AI in more detail through metaphors, further studies can be conducted using different demographic variables of students.
• Based on the negative metaphors obtained in the research, educational institutions should be made aware of the relevant issues and improvement efforts should be made by recommending new policies and practices in this regard.
• With the development of technology, new tools appear in our lives every day. Driverless cars, drones, assistive robots, robot vacuum cleaners, home appliances that can be operated remotely via voice command or mobile phone applications, etc. vehicles/tools are among them. In line with these developments, it is very important to provide age and development-appropriate education to children in artificial intelligence, machine learning and robotics, starting from early childhood, in terms of supporting other areas of development, especially cognitive development (problem solving, creative thinking).

Acknowledgements

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