

Use of the artificial intelligence in teaching the concept of magnetism in preschool education

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ABSTRACT

This paper presents the design, implementation, and results of a teaching intervention in a Greek kindergarten where the researcher works, highlighting the significant positive impact of artificial intelligence (AI) tools on children's learning of the concept of Magnetism. The teaching intervention was implemented as an extension of the specific thematic unit that had already been the subject of processing in kindergarten, using STEM tools and new technologies. A total of 3 activities with AI applications were implemented, with a total duration of 8 teaching hours. The methodology was based on the experiential and interdisciplinary approach and cooperative and playful learning. The role of the kindergarten teacher was helpful and supportive during the implementation of the action and its evaluation by the children. The children worked in small groups, where their group members mainly supported them in any difficulty. Children turned to the kindergarten teacher only for issues related to technical difficulties in handling the software. The educational intervention was evaluated through presentations of each group's work in plenary. At the end of the educational intervention, the children were asked what they liked and what they found difficult. The results of the present action are very encouraging, as the use of artificial intelligence tools particularly activated children's participation in the whole process and worked supportively and creatively in their mental potential.

Keywords: artificial intelligence, kindergarten, magnetism

INTRODUCTION

In our time, artificial intelligence deals with systems that display intelligent behaviors and autonomously try to achieve some goals (Smuha et al., 2021). This paper delves into a novel application of Artificial Intelligence (AI) in the field of early childhood education, specifically in teaching the concept of magnetism in a Greek kindergarten. AI has become ubiquitous in our daily lives through smart home devices or applications such as Google Maps, Siri, Google Now, Cortana, etc. It is also widely used in various fields, such as smartphones, social media platforms, search engines, and autonomous vehicles (Shuford & Islam, 2024).

A good knowledge of AI applications and computer science principles will be an essential asset for obtaining a job and, in general, for the professional careers of citizens in science and engineering.

Given the importance of AI in terms of its sustainability and effectiveness in all areas of today's and tomorrow's citizens, it is considered necessary to introduce it into education, both with the use of its tools by teachers of all teachers' grades, as well as in the form of learning tools, used

by students for the exploratory and experiential approach to knowledge. In addition, AI applications can increase students' interest (Petrescu et al., 2023) in their degree of participation in the learning process and expand or modify their knowledge based on their familiarity with new technologies.

Studies describe the use of AI in science and physics education at the primary education level (Kotsis, 2024a, 2024b). However, there are still not enough studies describing projects (design, implementation, results, conclusions) implemented in preschools, mainly education, using intelligence applications.

The work aims to assist today's primary education teacher with no or minimal experience in planning and implementing actions using AI applications. This will allow him to get ideas and, in turn, develop his actions. He will become familiar with the applications and learn to adapt his inspiration, as well as that of his students, to these applications.

Artificial intelligence can be an important tool in the didactic approach to the concept of magnetism in kindergarten, through playful applications, with the power of visualization of its tools, but also with the approach of applications, such as GPT and Ideogram (Su & Yang, 2021), as assistants in the educational process.

This work initially attempts to define AI. Then, its contribution to education is examined, and some practices implemented worldwide are presented. The methodological approach to magnetism with AI applications follows, and the results from implementing the specific action are presented.

THEORETICAL BACKGROUND

The roots of AI, but without the clarification of the term as we use it today, can already be sought in antiquity, where especially the ancient Greeks celebrated a multitude of characters in mythology that can be characterized as artificial forms of intelligence (Mayor, 2018). One such example is Talos, a robot created by the great inventor Daedalus, who roamed Crete daily and threw stones at any ships he saw approaching. Talos is a fable about a mechanical super soldier. It is no coincidence that today, the US military has a robot with the same name. Also, Daedalus invented all kinds of AI, such as moving statues, but the witch's father, Medea, created artificial soldiers that could fight unstopably (Sheikh et al., 2023).

The term "AI" first appeared in the 1950s as a simple theory of human intelligence exhibited by machines (Bini, 2018). Definitions of AI are often ambiguous, as they fail to keep pace with such a rapidly emerging technology (Murdick, 2020). Moreover, there is no delineated definition (Wang, 2019). One of AI's simplest and broadest definitions is the simulation or reproduction of human intelligence in machines (Ffranfield, 2020). AI is the next decade's technology because it can augment human capabilities cheaply (Schwab, 2017).

Also, AI is a concept defined as the ability of a system to correctly interpret external data, learn from it, and use this learning to achieve specific goals and tasks through flexible adaptation (Kaplan & Haenlein, 2019). Furthermore, AI has been defined as "the study of the ideas that enable electronic computers to be intelligent" (Vlachavas et al., 2020).

Due to rapid technological developments, researchers have turned their attention to using AI in education to optimize learning. AI can assist teachers in their multifaceted role, as follows (Bryant et al., 2020):

- It can perform time-consuming tasks for teachers, such as automatically assessing students, recording their scores, and designing and correcting worksheets and tests.
- It can help personalize teaching due to the data it collects during the learning process. This data can help create students' learning profiles and provide information about their strengths, weaknesses, and needs. Based on students' profiles, AI can suggest exercises to improve their weaknesses.
- It can help teachers self-evaluate, as with evaluation and monitoring functions, teachers receive detailed reports regarding their teaching style and suggestions on how to improve so that their teaching becomes more interactive and practical.
- It can provide teachers with many possible questions of the children that can be asked in the lesson. As a result, the teachers are fully prepared in the daily lesson to answer these questions, saving them valuable time.

- With the assistance of some AI tools in the educational process, teachers can guide students to discover knowledge independently while their role is complementary (Matzakos et al., 2023). This AI function is now necessary in schools due to the pressure of teaching time.

On the other hand, many universities and schools that use AI applications are attempting to explore ways to limit or ban the use of these tools in education due to their high capacity to create content and the fact that these tools are now widely available (Mao et al., 2024).

Studies on AI techniques in education have mainly focused on university students. There is not enough research regarding AI in primary education students (Kotsis, 2024c; Ponce-Toledo et al., 2017), especially in Preschool. There is, therefore, a need to carry out corresponding research aimed at younger children to conclude the assistance of AI in the educational process at these ages. This review is also beneficial, as it allows teachers to rely on them to implement corresponding teaching interventions in their classrooms and develop appropriate applications that concern their own needs and interests.

In research (Rodríguez-García et al., 2021), Learning ML was developed to provide a platform that supports teachers and students in creating practical AI projects based on machine learning techniques. This research investigated whether creating programming projects with Learning ML affects the AI knowledge of students between 10 and 16 years of age. The survey results showed that the student's knowledge of AI improved, especially among those less familiar with the subject. In addition, educators' use of the new instrument was suggested to evaluate their educational interventions. Another study conducted in Korea (Park & Kwon, 2024) aimed to develop an educational program using AI in a South Korean high school and investigate its effectiveness in technology education. The study focused on the societal impact of the latest technology, the ethics of AI, and the technological activity of problem-solving using AI. The final program was applied to the students who underwent a pre-test and a post-test. The tools used were PATT and AI. The survey results showed an increase in students' interest in and career aspirations for technology, the social impact of AI, and AI achievement, which showed the largest increase. There was no statistically significant change in interaction with AI. In addition, the technological educational value of the AI curriculum focused on solving technological problems was confirmed. A study (Akdeniz & Özdiñç, 2021), implemented in two kindergartens during the 2019-2020 school year and involving eight kindergarten teachers, was to develop an intelligent game using AI to help children of preschool age to develop concepts involving numbers, shapes, animals and colors, with the application of the intelligent game Maya. The research showed that the specific game attracted children's attention and was suitable for group activities and e-personalized education, promoting playful learning. Also, the visual and audio elements of the game were exciting and appropriate for the age of the children. Moreover, the game was user-friendly and accessible.

EDUCATIONAL INTERVENTION METHODOLOGY

Children, following the implementation of an educational intervention about the magnets that had preceded, were prompted by the kindergarten teacher to learn about the possibilities offered by AI applications through the website ChatGPT (openai.com) in order to search for specific actions regarding the concept of Magnetism, as an extension - enrichment of those that had preceded, that will be chosen and implemented by the children, based on their interests and needs.

Description of Activities

The goals of the teaching interventions were, according to the The Deputy Minister of Education and Religions of the Greek Republic (2023), the following, thematic field (child and communication), thematic unit (ICT) and objectives (children):

- Design and create digital games; manage information to construct/generate digital creations such as stories with general-purpose software (AI).
- Use ICT to express themselves creatively.
- Recognize open and closed software concerning their functions and how to use them.
- Treat ICT as a tool that enhances their thinking and abilities, not only as a means of entertainment and communication.
- Appreciate and utilize the different ways of thinking programming environments offer.
- Create standard digital projects.

Materials: tambourine, objects attracted and repelled by magnets, computer, stick as a fishing rod.

AI Applications

Chat GPT is a Natural Language Processing (NLP) model developed by OpenAI that uses a large dataset to generate text responses to student queries, feedback, and prompts (Gilson et al., 2023, Figure 1).

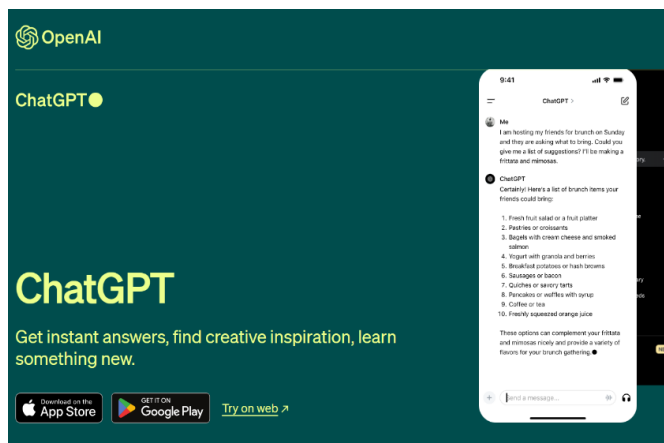


Figure 1. Chat GPT (Source: Screenshot from OpenAI website: <https://openai.com/>)

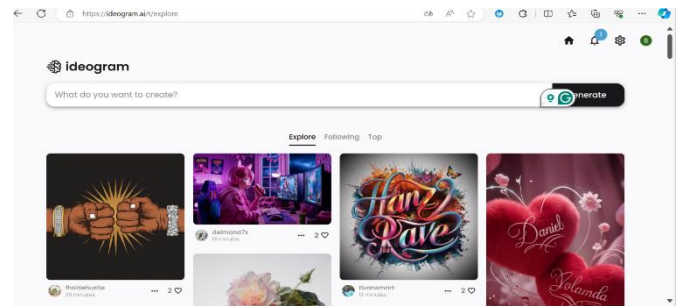


Figure 2. Ideogram (<https://ideogram.ai/t/explore>)

Ideogram (<https://ideogram.ai/t/explore>): Ideogram AI is an image generator that uses AI to create visual content. It is designed to turn text descriptions into compelling images by harnessing the power of AI to interpret and visualize ideas. The tool is commonly used by designers, marketers, content creators, and anyone who needs custom images, offering a quick and efficient way to produce graphics from text messages (Figure 2).

Pedagogical management: Children work in small groups.

Time of teaching activities: 8 teaching hours.

Summary: The kindergarten teacher asked the ChatGPT app to suggest magnetism activities in kindergarten. The application returned the following results (<https://chat.openai.com/share/69c4a509-2fc9-4ad6-bde2-849eae62990>).

You

Activities for magnetism in kindergarten

ChatGPT

Teaching kindergarten students about magnetism can be both educational and fun! Here are some hands-on activities you can try:

1. Magnetic Sorting: Provide a variety of objects, some magnetic and some non-magnetic (e.g., paper clips, coins, plastic toys, wooden blocks). Have the children use a magnet to sort the objects into magnetic and non-magnetic groups.
2. Magnetic Sensory Bin: Fill a sensory bin with materials like sand, rice, or beans and hide magnetic and non-magnetic items. Children can use a magnet wand to explore the bin and discover which items are attracted to the magnet.
3. Magnetic Fishing: Set up a pretend fishing pond by filling a large container with water and adding toy fish (some magnetic, some not). Attach a magnet to a toy fishing rod and let the children "fish" for the magnetic fish.
4. Magnetic Painting: Mix iron filings into paint and provide paper and magnets. Let the children experiment with moving the iron filings around the paper using the magnet underneath. They can create unique magnetic art pieces!

5. Exploring Magnetic Poles: Give each child a bar magnet and let them explore how the poles attract and repel each other. They can connect the opposite poles of two magnets and feel the attraction, then try connecting the same poles and feel the repulsion.

6. Making Magnetic Sculptures: Provide a variety of magnetic objects like magnetic building blocks or magnetic rods and balls. Let the children use their creativity to build sculptures and structures using magnetic pieces.

7. Magnetic Poetry: Provide a variety of words printed on magnets to create a magnetic poetry station. Let the children arrange the words to create sentences or poems on a magnetic board or cookie sheet.

8. Magnetic Races: Set up a simple racetrack using magnets, metal cars, or other objects. The children can experiment with magnets of different sizes and strengths to see which makes the objects move faster.

9. Magnetic Story Time: Read a story about magnets, such as “What Makes a Magnet?” by Franklyn M. Branley, and then discuss magnets and their properties.

10. Outdoor Magnet Hunt: Take the children on a magnet hunt outdoors. Please provide them with handheld magnets and have them explore the environment to find objects attracted to the magnet.

These educational, engaging, and interactive activities allow kindergarten students to explore the concepts of magnetism hands-on.

The kindergarten teacher translated the suggested activities into Greek and discussed with the children which they preferred to implement. The actions that the children chose from the above and that they implemented are the following:

Activity 1 I find the hidden magnetic object

Activity 2 Creating a story and illustrating it with AI applications

Activity 3 Fishing pond

Implementation of Activities

Activity 1: I find the hidden magnetic object

Children collected objects from the classroom that are attracted to magnets. With the help of the tambourine, they found the hidden magnets. When the tambourine’s intensity increased, the child had come very close to the hidden magnetic object. In contrast, when the intensity of the tambourine became low, it meant that the child was far from the magnetic object (Figure 3, Figure 4, Figure 5).

Activity 2: Creating a story and illustrating it with artificial intelligence applications

The children decided that instead of reading a story about magnets, they would create their own corresponding illustrated story with the AI application (<https://ideogram.ai/t/explore>) the children together with the



Figure 3. The objects collected by the children attracted by magnets (Source: Field study)



Figure 4. A child increases and decreases the volume with which he plays the tambourine to direct the toddlers to where the objects attracted by the magnets are hidden (Source: Field study)



Figure 5. A child who manages to find the hidden magnetic object (Source: Field study)

AI assistant (the software <https://chat.openai.com/>), which helped them further flow their story when they struggled to continue it.

The story was created using the creative writing technique. Each child continued the story from where the previous child had left it while the kindergarten teacher recorded the children's words in the AI application. Ultimately, the children saw their story come to life after making choices from the available media of the above AI applications.

Activity 2.1. Creation of a story about magnets

The story the children started about the magnets was as follows: Once upon a time, there was a thin magnet and another thick one. Then these magnets went to different objects and stuck: to irons, to pins, to metal pencil cases, to bars, to scissors, and metals. The two magnets were friends, and they hung out with each other. They all played together during the day. Then came another friend of theirs who was a little magnet.

The above children's words were entered into the AI application Open AI GPT, where it was formatted as follows (<https://chat.openai.com/share/b596bdf2-544f-459f-8834-7b39683ae881>).

Magnetic Trio's Adventures

Anonymous

Once upon a time, there was a thin magnet and another thick. Then, these magnets went to different objects and stuck to irons, pins, metal pencil cases, bars, scissors, and metals. The two magnets were friends and attached and played together during the day. Then came another friend of theirs who was a little magnet.

ChatGPT

Once upon a time, in a world where magnets roamed freely, two magnets existed: one thin and the other thick. Despite their physical differences, they were inseparable friends. They ventured out into the world, eager to explore and discover the wonders of attraction.

Their magnetic journey led them to various objects, where they showcased their extraordinary power to stick to anything made of iron, pins, metal pencil cases, bars, scissors, and an array of metals. Everywhere they went, they left a trail of fascination and wonder.

As the day unfolded, their playful adventures knew no bounds. They would race towards metallic surfaces, eagerly clinging onto each one as if it were a new challenge. Together, they reveled in the joy of their magnetic bond, drawing closer with each playful interaction.

However, their magnetic world was about to become even more vibrant with the arrival of a new friend—a little magnet eager to join their adventures. With open arms (or rather, magnetic fields), the thin and thick magnets welcomed their new companion, ready to share their experiences and explore new realms together.

From that day forward, the trio embarked on even more exciting escapades, their magnetic friendship growing stronger with each passing moment. Together, they proved that no matter the size or shape, true friendship had the power to attract and unite even the most unlikely of companions in a magnetic embrace. Thus, their adventures continued, bound by the invisible forces of friendship and attraction.

Then the children continued the story, saying

Then, the thin magnet greeted their friends and flew in a metal airplane to another country.

The kindergarten teacher translated the children's words into English and re-entered them into the app, which resulted in the following plot of the story:

Anonymous

Then, the thin magnet greeted their friends and went to another country with a metal plane.

ChatGPT

Excited by the prospect of exploring new horizons, the thin magnet bid farewell to its friends, promising to return with tales of its adventures. With a magnetic wave goodbye, it embarked on an extraordinary journey to another country, traveling aboard a metal plane.

As the plane soared through the sky, the thin magnet marveled at the breathtaking views below, its magnetic field tingling with anticipation. It watched with fascination as cities passed by like specks on the landscape, each filled with stories waiting to be discovered.

Throughout the flight, the thin magnet couldn't help but wonder at the vastness of the world and the endless possibilities ahead. Despite the distance separating it from its friends, the thin magnet knew its bond was strong enough to withstand any distance.

Finally, after a thrilling journey across the skies, the metal plane touched down in a new land, and the thin magnet stepped out onto foreign soil, ready to embark on a new chapter of its magnetic adventure. With each step, it embraced the unknown, eager to forge new friendships and create memories that would last a lifetime. Furthermore, though it may have been far from its friends, the thin magnet carried its magnetic bond wherever it went, a constant reminder that true friendship always remained close at heart no matter the distance.

The children continued their story, saying that:

The other magnets did not stop thinking about the thin magnet and built a metal airplane to get him and bring him back, along with his new friends. The kindergarten teacher inputted the children's words into the AI application, resulting in the following story plot.

Anonymous

The other magnets did not stop to think about the thin magnet and made him a metal airplane to get him and bring him back, along with his new friends.

ChatGPT

Realizing they missed their friend dearly, the thick and little magnet decided to act. Determined to reunite with the thin magnet and meet its new friends, they pooled their magnetic powers together and crafted a metal airplane with incredible speed and precision.

With every twist and turn of their magnetic fields, the metal airplane took shape, gleaming in the sunlight as a testament to their unwavering friendship and determination. Once complete, the thick and little magnets wasted no time boarding the airplane, fueled by their desire to bring their friend back home.

As the metal airplane soared through the skies, it sliced through the clouds easily, guided by its creator's magnetic instincts. With each passing moment, the distance between them and the thin magnet grew shorter until finally, they reached the foreign land where their friend now resided.

With a magnetic landing, the airplane touched down gracefully, and the thick and little magnets rushed out, their magnetic fields buzzing with excitement. They found the thin magnet amidst a bustling crowd, surrounded by its new friends, and with joyous cries, they embraced each other in a magnetic hug.

Overjoyed to be reunited, the magnets wasted no time introducing themselves to the thin magnet's new companions. With warmth and kindness, they welcomed them into their magnetic circle, forging bonds that would last a lifetime.

Thus, united once more, the magnets embarked on a journey back home, their metal airplane soaring through the skies as they laughed and reminisced about their adventures. Together, they proved that true friendship knew no bounds, transcending distance and differences to create a magnetic connection that could never be broken.

At this point, the children wanted to complete their story about the magnets, saying:

And they lived well, and we lived better...

The kindergarten teacher, after translating their words, entered them into the AI application Open AI GPT, from which the following outcome of the story emerged:

Anonymous

And they lived well, and we better...

ChatGPT

And they lived well, their magnetic friendship more vital than ever before. Together, they continued to explore the world, spreading joy and laughter wherever they went. Their adventures were filled with excitement, from soaring through the skies in metal airplanes to discovering new lands and meeting new friends.

Back home, they shared their stories with others, inspiring them to embrace the power of friendship and unity. Their magnetic bond symbolized hope and resilience, reminding everyone that no matter their challenges, they could overcome them with their friends' support.

As time passed, their magnetic circle expanded, welcoming even more friends into their fold. They celebrated each other's successes, comforted each other in need, and cherished the moments they spent together.

Looking back on their journey, they realized that life was better when they lived with friends who stuck by each other through thick and thin. With hearts full of gratitude and magnetic fields buzzing with happiness, they lived each day to the fullest, knowing that anything was possible with their friends by their side.

Activity 2.2. Story illustration

Once upon a time, there was a thin magnet and another thick. Then, these magnets went to different objects and stuck to irons, pins, metal pencil cases, bars, scissors, and metals. The two magnets were friends and attached and played together during the day. Then came another friend of theirs who was a little magnet (**Figure 6**).

Their magnetic journey led them to various objects, where they showcased their extraordinary power to stick to anything made of iron, pins, metal pencil cases, bars, scissors, and an



Figure 6. The icon created from the ideogram (<https://ideogram.ai/api/images/direct/6qttPkcLQDO3R9mKl1ZzKg.png>)



Figure 7. The icon created from the ideogram (<https://ideogram.ai/api/images/direct/6qttPkLQDO3R9mKl1ZzKg.png>)



Figure 8. The icon created from the ideogram (<https://ideogram.ai/api/images/direct/FIcTcN40QgmFSYaZRslH3w.jpg>)

array of metals. Everywhere they went, they left a trail of fascination and wonder (**Figure 7**).

As the day unfolded, their playful adventures knew no bounds. They would race towards metallic surfaces, eagerly clinging onto each one as if it were a new challenge. Together, they reveled in the joy of their magnetic bond, drawing closer with each playful interaction.

However, their magnetic world was about to become even more vibrant with the arrival of a new friend - a little magnet, eager to join in their adventures. With open arms (or rather, magnetic fields), the thin and thick magnets welcomed their new companion, ready to share their experiences and explore new realms together (**Figure 8**).



Figure 9. The icon created from the ideogram (https://ideogram.ai/api/images/direct/Bjju_5DFSVqVTXAEPUHPQ.jpg)

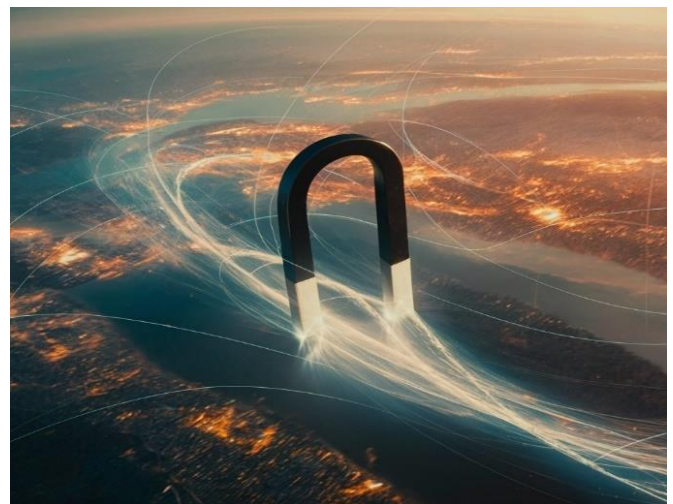


Figure 10. The icon created from the ideogram (https://ideogram.ai/api/images/direct/W42Iv6kDQ_SJcuRAJhT2gw.jpg)

From that day forward, the trio embarked on even more exciting escapades, their magnetic friendship growing stronger with each passing moment. Together, they proved that no matter the size or shape, true friendship had the power to attract and unite even the most unlikely of companions in a magnetic embrace.

Thus, their adventures continued, bound by the invisible forces of friendship and attraction.

Then the thin magnet greeted their friends and went to another country with a metal plane! (**Figure 9**).

As the plane soared through the sky, the thin magnet marveled at the breathtaking views below, its magnetic field tingling with anticipation. It watched with fascination as cities passed by like specks on the landscape, each filled with stories waiting to be discovered (**Figure 10**).



Figure 11. The icon created from the ideogram (<https://ideogram.ai/api/images/direct/s2PpGPMNTK6Lc8OB CZWdCw.jpg>)

Throughout the flight, the thin magnet couldn't help but wonder at the vastness of the world and the endless possibilities ahead. Despite the distance separating it from its friends, the thin magnet knew its bond was strong enough to withstand any distance.

Finally, after a thrilling journey across the skies, the metal plane touched down in a new land, and the thin magnet stepped out onto foreign soil, ready to embark on a new chapter of its magnetic adventure. With each step, it embraced the unknown, eager to forge new friendships and create memories that would last a lifetime. And though it may have been far from its friends, the thin magnet carried its magnetic bond with it wherever it went, a constant reminder that true friendship always remained close at heart no matter the distance (Figure 11).

The other magnets did not stop to think about the thin magnet and made him a metal airplane to get him and bring him back, along with his new friends (Figure 12).

With every twist and turn of their magnetic fields, the metal airplane took shape, gleaming in the sunlight as a testament to their unwavering friendship and determination. Once complete, the thick and little magnets wasted no time boarding the airplane, fueled by their desire to bring their friend back home.

As the metal airplane soared through the skies, it sliced through the clouds easily, guided by its creators' magnetic instincts. With each passing moment, the distance between them and the thin magnet grew shorter until finally, they reached the foreign land where their friend now resided.

With a magnetic landing, the airplane touched down gracefully, and the thick and little magnets rushed out, their magnetic fields buzzing with excitement. They found the thin magnet amidst a bustling crowd, surrounded by its new friends, and with joyous cries, they embraced each other in a magnetic hug.

Overjoyed to be reunited, the magnets wasted no time introducing themselves to the thin magnet's new companions. With warmth and kindness, they welcomed them into their



Figure 12. The icon created from the ideogram (<https://ideogram.ai/api/images/direct/CZNBZdR6RJ2QhWGF sYEpCA.jpg>)



Figure 13. The icon created from the ideogram (<https://ideogram.ai/api/images/direct/qJdQj73sRs-- CgqUu159GA.jpg>)

magnetic circle, forging bonds that would last a lifetime (Figure 13).

Thus, united once more, the magnets embarked on a journey back home, their metal airplane soaring through the skies as they laughed and reminisced about their adventures. Together, they proved that true friendship knew no bounds, transcending distance and differences to create a magnetic connection that could never be broken.

And they lived well, and we better...

Together, they continued to explore the world, spreading joy and laughter wherever they went. Their adventures were filled with excitement, from soaring through the skies in metal airplanes to discovering new lands and meeting new friends.

Back home, they shared their stories with others, inspiring them to embrace the power of friendship and unity. Their magnetic bond symbolized hope and resilience, reminding



Figure 14. The icon created from the ideogram (https://ideogram.ai/api/images/direct/SRV AZ61OQJGKlfrRK m_HaA.jpg)



Figure 15. A child happy that he managed to “fish” a pair of scissors! (Source: Please indicate source here)

everyone that no matter their challenges, they could overcome them with their friends’ support.

As time passed, their magnetic circle expanded, welcoming even more friends into their fold. They celebrated each other’s successes, comforted each other in need, and cherished the moments they spent together.

Looking back on their journey, they realized that life was better when they lived with friends who stuck by each other through thick and thin. With hearts full of gratitude and magnetic fields buzzing with happiness, they lived each day to the fullest, knowing that anything was possible with their friends by their side (Figure 14).

Activity 3: Fishing pond

The children made a lake with magnetic and non-magnetic objects. They fished for the magnetic objects with a makeshift stick, string, and magnet (Figure 15).

RESULTS

The results of this teaching intervention are summarized as follows:

- The student’s interest and enthusiasm in participating in the educational process increased. Especially with the CHATGPT AI implementation, they found interacting with it “magical” and were amazed that they could co-author a story. It further explored their interest in the follow-up version of the story given by CHATGPT and prompted them to think and express more original versions themselves. The same happens with the Ideogram application, with which the story about magnets was illustrated, where the children saw their words transformed into original images, which they had not thought to render if they were asked to illustrate it themselves with their drawings.
- The transition to using AI tools was smooth and effortless for the children, as the educational intervention contained tangible and familiar materials, magnetic objects, etc., thus mobilizing the experiential and playful learning that are the main pillars of preschool education. The children felt autonomous and creative as they worked in groups. The kindergarten teacher’s role was purely supportive and mainly related to technical difficulties they encountered using the applications.
- The children chose the activities they will implement from those proposed by CHATGPT, depending on their interests and the materials available at the kindergarten, which they collected themselves. They were surprised by the speed with which the application of AI gave answers and the originality of some of these answers, which initially related to recording activities for teaching magnetism in kindergarten. They saw the app as a means of enriching the educational process. At this point, the kindergarten teacher told them that she uses the app to enrich her ideas about teaching concepts in kindergarten.

DISCUSSION, LIMITATIONS & FURTHER RESEARCH

The results of the present research cannot be generalized, as the sample of children who participated in it was small, and the activities were few. However, the results of the research are indicative of the way in which artificial intelligence can affect both their participation in the educational process and their acquisition in an experiential way of correct representations regarding the concept of magnetism.

Suggestions for future research could be to approach the concept of magnetism with the use of further AI tools, as well as to investigate how artificial intelligence helps these children further understand this concept when they move on to the next school level, primary school.

CONCLUSION

AI can offer students and teachers many possibilities in action planning, implementation, evaluation, knowledge

feedback, and personalized learning. The introduction of AI applications must start in preschool education, familiarizing young children with them and maximizing their cognitive and mental potential. Researching AI applications related to the age group is imperative to enrich the literature with contrasting practices. This will form the basis for the evolution of existing applications and the creation of new, more efficient, and enriched ones. Special consideration must be given to using these applications to implement actions where the student's creativity and originality will be involved to avoid providing ready-made knowledge.

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Declaration of interest: The authors declare that they have no competing interests.

Availability of data and materials: All data generated or analyzed during this study are available for sharing when appropriate request is directed to corresponding author.

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