



## Original Research Article

# Using Artificial Intelligence Applications in Solving Daily Life Problems in Learning Environment

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## ABSTRACT

Artificial Intelligence is the ability of logic, self-awareness, comprehension, reasoning, problem solving and creativity to be fulfilled by a computational system in a non-biological structure. The history of artificial intelligence is mostly based on the work of Alan Turing during the 2nd World War. Although the theoretical foundations were laid by Turing, the first use of the concept of artificial intelligence was brought up by another mathematician, John McCarthy, at the Dartmouth Conference held in 1956. Artificial intelligence studies have gained significant momentum since then. Today, artificial intelligence has many uses. With the introduction of Large Language Models, people can now speak with artificial intelligence applications just like talking to a human. In this direction, artificial intelligence has started to have a share in the education process. In this study, it was aimed at evaluating the solution skills of Gemini, ChatGPT and Llama applications, which are the most advanced artificial intelligence applications, also known as large language models, related to daily life problems in primary school science courses. In line with the findings obtained, the use of artificial intelligence applications in the education process is exemplified.



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## 1. Introduction

### 1.1. Intelligence and Artificial Intelligence

Although intelligence has been researched for a long time, there has yet to be a standardised definition of intelligence. Therefore, making a close rather than a precise definition is possible. According to Anderson (1992), intelligence is the intellect underlying our capacity to think, solve new problems and know about the mind and the world. According

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to the artificial intelligence researcher Fogel (1995), intelligence is a system that can produce adaptive behaviours in different environments to meet objectives. According to an anthropocentric understanding, humans have a much higher level of intelligence than all other creatures. This idea emphasises the ability of humans to communicate through spoken language and the use of technology (Artut, 2019).

Computers, a revolutionary invention of computational sciences that emerged from the combination of formal thinking, symbolic logic, and mathematical rationality, produce various solutions to the problems faced by people. Computers can also be expressed as structures with input and output and are connected to numerical operations fed with data. Today, the speed capabilities of computers in data processing are far greater than human performance. With the spread of the Internet and the emergence of the Internet of Things, data have become a concept that is constantly collected and stored. However, since more than human intelligence capacity is needed for analysing and interpreting the immense data obtained, computers have started to be preferred as practical tools. Based on millions of collected data, various inferences have begun to be received in disciplines such as data mining, data analysis, big data, and data visualisation. Artificial intelligence can be defined as a system that can learn and develop on its own based on the data obtained (Artut, 2019). This potential of artificial intelligence to revolutionize data analysis and interpretation has significant implications for the field of education, sparking a need for a deeper understanding of its applications and impact.

Artificial intelligence is a fascinating field that aims to replicate human intelligence in a nonbiological structure. It encompasses a wide range of abilities, including logic, self-awareness, comprehension, reasoning, problem-solving, and creativity. While mathematical elements such as logic, probability, and statistics are used to achieve these abilities, cognitive disciplines such as perception, interpretation, and learning are also integral to artificial intelligence. This distinction between the mathematical and cognitive aspects of artificial intelligence helps to differentiate it from human intelligence.

Artificial intelligence is not just a system that imitates the human brain but a transformative force that can fulfil specified tasks and iteratively improve itself thanks to the experience gained from the task (Oracle, 2019). Gordon (2011) explains artificial intelligence as an analytical life set that aims to imitate life. McCarthy (2007) defines artificial intelligence as the science and engineering of making human-like intelligent machines brilliant computer programs.

Although there are different definitions, the standard view can be based on two concepts: artificial intelligence, intelligent programming, and humanoid responses. Although the concept of intelligence has not yet been fully explained, it is tough to understand the phenomenon of artificial intelligence and to determine a precise line (Arslan, 2020).

### *1.2. History of Artificial Intelligence*

The history of artificial intelligence is a rich tapestry woven with the studies of Alan Turing during World War II (Kuşçu, 2015). However, the seeds of this field were sown much earlier. Automaton systems working with air pressure made by Heron of Alexandria in the 1st century A.D.; machines working with water and mechanical parts by Aljazari living in Artuklu in the 13<sup>th</sup> century are examples of these systems (Ertürk & Yayan, 2012; Topdemir, 2011). The works of Leonardo Da Vinci in the 15th century and the automatic flute of Jacques de Vaucanson in the 16th century are further examples (Barutçuoğlu, 2021). In addition, Wilhelm Shickard's mechanical calculator in the 17th century, the works of Gottfried Leibniz, who developed the binary number system at the same time, and the mechanical calculators of Charles Babbage and Ada Lovelace in the 19th century constitute essential milestones in the history of artificial intelligence (Kuşçu, 2015). Before the second quarter of the 20th century, when artificial intelligence emerged, essential studies and inventions were made. Karel Čapek mentioned robots for the first time in his 1921 theatre piece, *Rossum's Universal Robots* (Schaal, 1999). After the Second World War, the number of studies on artificial intelligence increased. Alan Turing, who attracted attention to his studies during the war years, started discussions in this field by asking, “Can machines think?” in his article *Computing Machinery and Intelligence*, published in 1950 (Kuşçu, 2015).

Although Turing laid its theoretical foundations, the first use of artificial intelligence was brought up by another mathematician, John McCarthy, at the Dartmouth Conference held in 1956. The Dartmouth Conference is the birth of a new field of science, artificial intelligence studies (Crevier, 1993). Artificial intelligence studies have gained significant momentum recently. In the period between 1950 and 1975, which is also called the golden age of artificial intelligence, considerable progress was made in the fields of algorithms, which is the reasoning form of artificial intelligence, and semantic learning, which is the learning form of artificial intelligence, that is, the language of artificial intelligence. However, although there were some pauses in the studies on artificial intelligence in the following decade because computer technology did not have the memory and processing capacity to apply the methods proposed in theory, 1980 and onwards can be defined as the new golden age of artificial intelligence studies. Since then, significant leaps have occurred in both theory and practice in artificial intelligence studies (McCorduck, 2004). Expert systems, which will enable artificial intelligence to take its current form, emerged in this period. Expert systems are models in which the knowledge of people who are experts in certain subjects is transferred, and artificial intelligence can solve problems in related fields by using specific algorithms. Thus, a revolution was experienced in the quality and form of artificial intelligence knowledge (Newquist, 1994). In particular, the 2000s was when artificial intelligence started to influence social life as a technology. In this period, artificial intelligence and “thinking” machines first appeared before the eyes of the masses. One of the most memorable events of this period was the loss of the world chess champion Garry Kasparov in a match against IBM's Deep Blue computer. Another striking example is Sophia, a robot with artificial intelligence and a physical body produced by Hanson Robotics, which started with the publication of her conversations with the engineers who created her on YouTube, her guest appearance on “The Tonight Show Starring Jimmy Fallon”, one of the most famous talk shows in the USA and being granted citizenship by Saudi Arabia (Adaş & Erbay, 2022).

### *1.3. Large Language Models*

In recent years, there has been a significant leap in the investments made in artificial intelligence worldwide. Artificial intelligence investments have become one of the largest investment areas in the world, with an annual investment volume of USD 62.2 billion. By 2027, artificial intelligence investments are expected to increase from \$62.2 billion to \$733.6 billion, with an average annual growth of 42.2% (Grand View Research, 2021). According to a report published by Stanford University, the sectors where artificial intelligence is used most intensively are the health, banking, finance, law, and service sectors (Stanford University, 2016). In the same report, artificial intelligence is expected to dominate in many areas, such as the logistics and security sectors and the military field, in 10 years, requiring minimal use of human factors (Stanford University, 2016). The use of artificial intelligence on a global scale is expected to become widespread, automation is expected to increase continuously, and it is expected that approximately 50% of the world economy, i.e., 1.2 billion employees, will be affected by automation in the foreseeable future (McKinsey, 2020). In other words, artificial intelligence is growing extremely fast in almost all social and economic areas (Adaş & Erbay, 2022).

Founded in 2015, the OpenAI research organisation developed an artificial intelligence called the GPT, which introduced the concept of a large language model into our lives. The primary purpose of OpenAI is to benefit humanity in general by developing friendly artificial intelligence. This organisation has conducted various studies in artificial intelligence fields such as machine learning, computer vision and natural language processing. The organisation's primary goal is to ensure the safe and responsible development of artificial intelligence and make the benefits of this technology accessible to everyone (Buluş & Elmas, 2024).

ChatGPT is a state-of-the-art large language model developed by OpenAI that can generate text based on the input it receives. It uses deep learning algorithms and has been trained on various internet texts to understand and respond in various languages and topics. Due to its advanced natural language processing capabilities, ChatGPT can produce highly readable and informative texts on various issues. Furthermore, its ability to understand natural language input allows it to respond to questions in a conversational style, making it an accessible and user-friendly resource for everyone (Munawar, 2023).

Goldberg (2015) defines natural language processing as a collection of techniques computers use to perform tasks such as understanding, analysing, extracting meaning, and analysing emotion and meaning. ChatGPT, a chatbot with natural language processing capability based on GPT, has become a productive artificial intelligence application that can communicate with people using natural language and provide meaningful responses (Uysal, 2024).

Following OpenAI, many large language models have come to the market. Among these are artificial intelligence large language models such as Gemini, developed by Google, Llama, developed by Meta, and Grok, developed by X. All of these applications are artificial intelligence applications that enable us to talk to computers, similar to talking to a human being, given their natural language processing skills.

#### *1.4. Artificial Intelligence in Education*

Artificial intelligence technologies have become indispensable daily, although they are often unrecognised. These technologies serve on every platform through different devices and applications. Smart home appliances, autonomous cars or smartphone applications can be examples of artificial intelligence technologies (İşler & Kılıç, 2021).

The education system is generally based on four essential components: student, teacher, curriculum, and education field. The quality of the relationship between these components increases the quality of education. The teacher is the critical variable for the most effective realisation of this process. (Aykaç, 2018). Currently, the applications developed for teachers to benefit from artificial intelligence technologies (except for a few applications) are the only methods that they can perform through computers. However, these methods are insufficient to say that artificial intelligence is actively used in education (Timms, 2016).

One of the most significant difficulties encountered in the education system is that people learn in different ways and at different rates (Saribaş & Babadağ, 2015). Although each student has various levels of learning abilities and different interests, schools try to implement uniform education. However, it can be said that some students' analytical thinking skills are more dominant, while others' creativity and literary or communicative skills are more dominant (Boydak, 2017). In this direction, artificial intelligence technologies can be used to customise the educational materials of each student according to their abilities, preferred learning style and experiences (Chopra, 2019).

Today, when artificial intelligence studies in education are examined, different applications can be seen in which not only knowledge-based but also data and logic-based artificial intelligence applications are involved in almost every field. These include personalised education or dialogue education systems, exploratory education, data mining in education, article analysis of students, intelligent agents, chatbots, education for children with special needs, child-robot interaction, assessment systems based on artificial intelligence, and automatic test creation systems (Arslan, 2020).

#### *1.5. Research Problem and Objectives*

The historical trajectory of artificial intelligence studies, which began with Turing and gained momentum through 'semantic learning' processes, has reached a new dimension today with the ability of Large Language Models (LLMs) to engage in human-like dialogue. These technologies, having evolved from algorithmic calculations (as exemplified by Deep Blue) to mimicking cognitive processes, are now positioned within education not merely as repositories of knowledge, but as learning stakeholders. However, a review of the literature reveals that while the numerical capabilities of AI tools, such as solving mathematical equations, are frequently tested, their proficiency in solving verbal and logical problems, which require context, pedagogical sensitivity, and must appeal to the cognitive level of primary school students, has not been sufficiently scrutinised.

In this context, the fundamental problem of this study is to determine the extent to which the models representing the state-of-the-art in current AI technology can generate pedagogical and accurate solutions to 'daily life problems'

within the context of primary school science. Accordingly, the aim of this research is to comparatively evaluate the responses provided by Gemini, ChatGPT, and Llama, the most powerful actors in the AI market, to scenarios within science education, and to reveal the potential of these tools as educational “tutors” or “supporters”.

## 2. Method

This study is a qualitative case study aimed at evaluating the skills of AI-based large language models (LLMs) in generating solutions for primary school-level science and daily life problems. In the research, the performance of generative artificial intelligence tools in specific educational scenarios was examined comparatively.

### 2.1. Data Collection Tools

Within the scope of the research, three main large language models were selected as the sample, considering their current natural language processing capabilities and user accessibility:

1. Gemini (Google): A model developed by Google possessing multimodal capabilities.
2. ChatGPT (OpenAI): A model based on the GPT architecture and trained on extensive datasets.
3. Llama (Meta): An open-source language model developed by Meta.

### 2.2. Prompt Design and Data Set

The research data were obtained using the "Scenario-Based Prompting" method developed by the researcher. The following criteria were observed in the design of the prompts:

- Curriculum Alignment: The problems were associated with the learning outcomes of the Primary School Science curriculum.
- Contextual Setting: In order to prevent the AI from providing merely theoretical information and to assess its pedagogical approach, the questions were not asked directly as "knowledge questions" but were contextualised as a dialogue between two friends or a real-life problem encountered.
- Problem Diversity: The prompts were prepared under five different themes: proving a scientific fact (the shape of the Earth), solving global problems (water shortage), disability and empathy (peer support for the visually impaired), health protection (hearing health), and safety (bicycle use).

### 2.3. Data Collection Process

The data were collected in January-March 2025. Each prompt was entered directly into the standard (free/basic) versions of the models using the "zero-shot" technique, without assigning any "role-playing" or providing "prior knowledge" (few-shot prompting). This method was preferred to measure the standard response quality that an average user or student would encounter. The responses generated by the models were recorded as raw data without being subjected to any editing.

#### 2.4. Data Analysis and Evaluation Criteria

The obtained data were analysed using the descriptive analysis method. The outputs of the artificial intelligence models were evaluated according to the following four basic criteria sets created within the framework of educational technologies and pedagogical content knowledge:

1. Scientific Accuracy: The consistency of the provided information with science literature.
2. Pedagogical Appropriateness: The suitability of the response to the cognitive level (language, style, and complexity) of the target audience, i.e., primary school students.
3. Concretisation and Use of Analogy: The extent to which abstract concepts (e.g., using a ball analogy instead of Euclidean geometry) could be reduced to the child's mental world.
4. Applicability to Daily Life: Whether the suggested solutions were of a practicality that the student could apply in real life, rather than being theoretical, formulaic expressions (e.g., suggesting simple behavioural changes instead of complex insulation systems).

In light of these criteria, the responses were coded by the researcher as "theory-oriented" or "practice-oriented", and qualitative comparisons were made between the models.

### 3. Findings

#### 3.1. Prove Earth's Roundness

Within the scope of the research, artificial intelligence applications were first asked the problem within the scope of a conversation between two friends to prove the roundness of the Earth. The prompt entered into the applications in line with the related problem is as follows:

*A conversation takes place between two friends, Ezgi and Faruk:*

- *Ezgi: Today, I learnt that if I go straight from a certain point on the earth in the same direction, I will come back to the point where I started.*
- *Faruk: How can that be? When we go straight in a certain direction, we move away from where we are. To get back to the same point, we would have to go round in a circle.*
- *Faruk: Can you prove this to me?*

*What can Ezgi do in response to Faruk's request?*

Gemini's response to this prompt addresses the problem in two options. In the first option, it explained that the Earth is a sphere with an example on the Earth. As the second option, it exemplified the subject by using a ball analogy. Gemini's response is as follows:

*Ezgi has two options to respond to Faruk's request:*

1. *Explain the curvature of the Earth: Ezgi can explain that Earth is not flat, but a sphere. Because of this curvature, what seems like a straight line when walking on a small scale actually follows the curve of the Earth. If she keeps walking in one direction for a long enough distance (around 40,000 kilometres), she would eventually loop around the Earth and end up back at her starting point.*



2. *Use an analogy: Ezgi can use an analogy to illustrate her point. She could mention an ant walking on a ball. From the ant's perspective, it's walking in a straight line, but because the ball is curved, it eventually ends up where it started.*

*Both options address Faruk's skepticism by explaining why a straight line on a curved surface can lead back to the starting point.*

When the options presented by Gemini are analysed, it is seen that the first option does not provide a different proof than the one given in the problem. However, the ball analogy given in the second option provides an excellent proof in the context of the problem.

The same prompt was then given to ChatGPT. Unlike Gemini, ChatGPT presented five different options, but it is seen that these options are examples far from daily life. ChatGPT's response is as follows:

*Ezgi can explain to Faruk that the Earth is a sphere, and on a spherical surface, moving straight in one direction (along a great circle, which is the shortest path between two points on a sphere) will eventually bring you back to your starting point. To prove this concept to Faruk, Ezgi can take the following steps:*

1. *Explanation of Great Circles: Explain that a great circle is any circle that divides the sphere into two equal hemispheres. The Equator and the lines of longitude are examples of great circles on Earth.*
2. *Map and Globe Demonstration: Use a globe to demonstrate this concept. Trace a path along the Equator or any line of longitude with your finger, showing how moving in a straight line along these paths will eventually lead back to the starting point.*
3. *Practical Example: Give a practical example, such as an airplane travelling east or west along the Equator. If the plane continues in a straight line without changing direction, it will eventually circumnavigate the globe and return to its starting point.*
4. *Mathematical Explanation: If Faruk is interested in a more mathematical explanation, Ezgi can describe how on a flat surface (Euclidean geometry), moving straight means moving in a line indefinitely away from the starting point. However, on a curved surface like a sphere (non-Euclidean geometry), moving straight along the surface eventually loops back.*
5. *Interactive Tools: Suggest using online tools or simulations that show great circle routes, such as flight path simulators or interactive globe applications.*

*By combining these explanations and demonstrations, Ezgi can effectively prove to Faruk that moving straight in one direction on a spherical surface like Earth does indeed bring you back to your starting point.*

The ChatGPT, which provided mostly theoretical answers, indicated that the Earth sphere model could be used in only one example. However, according to Gemini's ball analogy, this option is also far from everyday life.

The same prompt was then given to Llama. Llama answered the prompt with a similar conversation example:



Ezgi can provide a proof of the concept by using basic geometry and mathematical concepts. Here's one possible way to do it:

- Ezgi: Sure, I can prove it to you! Imagine a straight line that passes through a point A on the Earth's surface. Now, let's call the point where the line intersects the Earth's surface at a distance of 10,000 km from point A, point B.
- Faruk: Okay, I see that.
- Ezgi: Now, let's draw a circle with centre point A and radius 10,000 km. The circle will intersect the line at two points, C and D.
- Faruk: That makes sense.
- Ezgi: Now, let's look at the angles formed by the line AB and the line CD. Angle A is equal to angle C, and angle B is equal to angle D.
- Faruk: Yeah, I see that.
- Ezgi: Therefore, by the inscribed angle theorem, the sum of the angles in a semicircle is equal to 180 degrees. In this case, the sum of angles A, B, C, and D is equal to 360 degrees.
- Faruk: That's true.
- Ezgi: Now, let's look at the triangle formed by points A, B, and C. It's an isosceles triangle with two equal sides, AB and BC. Therefore, the angle between these two sides is also equal, which means that angle A is equal to angle B.
- Faruk: That's a good point.
- Ezgi: Similarly, the triangle formed by points A, B, and D is also an isosceles triangle with two equal sides, AB and BD. Therefore, the angle between these two sides is also equal, which means that angle B is equal to angle D.
- Faruk: Yeah, I see that.
- Ezgi: Now, let's connect points C and D with a straight line. Since angle A is equal to angle C, and angle B is equal to angle D, this line is parallel to the line AB.
- Faruk: That makes sense.
- Ezgi: Therefore, the line CD is parallel to the line AB, and it passes through point A. This means that if we draw a circle with centre point A and radius 10,000 km, it will intersect the line AB at point C, and it will also intersect the line CD at point D.
- Faruk: Ah, I see now! That's a great proof.
- Ezgi: So, what do you think? Does this proof convince you that it's possible to go straight from a point on the Earth's surface and come back to the same point?
- Faruk: Yes, I'm convinced! That was a really good explanation. Thanks, Ezgi!

It is seen that Llama's answer is based on a purely theoretical basis. In this context, when compared to Gemini and ChatGPT's answers, this solution was the most distant solution to daily life.

Within the scope of this problem, the ball analogy given by Gemini provides a concrete example that we can convey to primary school children that the world is round and when we go straight from a certain point on the earth in the same direction, we will come back to the point where we started.

### 3.2. Fresh Water Shortage Solutions

Secondly, a problem related to a water shortage that may be experienced in the near future was posed within the scope of the research. The prompt entered into the applications in line with the related problem is as follows:

*Three quarters of the world is covered with water. Despite this, we hear the news every day that we will experience a water shortage in the near future.*

*What do you think can be done to solve this problem?*

Gemini's response to this prompt includes both general and daily life solutions. Gemini's response is as follows:

*You're right, even though most of the Earth is covered in water, we face potential water shortages due to the fact that most of that water is saltwater. Here are some ways we can address this problem:*

- *Desalination: This process removes salt from seawater, making it usable for drinking and irrigation. However, desalination can be expensive and energy-intensive, so advancements in making it more efficient are crucial.*
- *Water conservation: This is a big one! Implementing practices to reduce water usage in homes, industries, and agriculture can significantly decrease the demand on freshwater resources. This can involve things like fixing leaky faucets, taking shorter showers, using watering techniques that minimise evaporation in gardens, and having industries recycle water used in their processes.*
- *Water reuse: Wastewater can be treated to a level suitable for irrigation or other non-potable uses. This can lessen the strain on freshwater resources for drinking water and critical ecological uses.*
- *Sustainable water management: This involves a holistic approach that considers water sources, usage patterns, and environmental impact. It involves practices like protecting watersheds, managing groundwater withdrawal to avoid depletion, and using drought-resistant plants in landscaping.*

*By implementing a combination of these solutions, we can work towards a future with more sustainable water use.*

The options presented here by Gemini exemplify both what organisations in general should do and what people can implement in everyday life. However, it should be noted that the solutions are mostly things that organisations can do.

The same prompt was then given to ChatGPT. ChatGPT approaches the problem from the point of view of protecting existing clean water. Accordingly, it gave a shorter answer. ChatGPT's response is as follows:

*To address the issue of future water shortages despite the Earth being covered mostly by water, a multifaceted approach can be taken:*

*1. Water Conservation:*

- Efficient Use: Implementing water-saving techniques in agriculture, industry, and households. Techniques such as drip irrigation, low-flow fixtures, and water-efficient appliances can significantly reduce water consumption.*
- Public Awareness: Educating people on the importance of water conservation and encouraging behaviours like turning off taps when not in use, fixing leaks promptly, and using water-efficient landscaping (xeriscaping).*

*2. Water Recycling and Reuse:*

- Greywater Systems: Installing systems to recycle greywater (from sinks, showers, and laundry) for non-potable uses such as irrigation and flushing toilets.*
- Wastewater Treatment: Investing in advanced wastewater treatment technologies that allow treated water to be reused for various purposes, including agriculture and industrial processes.*

*3. Desalination:*

- Technology Advancement: Developing and improving desalination technologies to make the process more energy-efficient and cost-effective. Desalination plants convert seawater into fresh water and can be a vital resource for coastal regions.*
- Renewable Energy: Utilising renewable energy sources (e.g., solar or wind power) to run desalination plants, reducing the environmental impact and cost of the process.*

*4. Protecting and Restoring Natural Water Sources:*

- Watershed Management: Implementing strategies to protect and restore watersheds, which are critical for maintaining water quality and availability. This includes reforestation, wetland restoration, and soil conservation practices.*
- Pollution Control: Reducing pollution from agricultural runoff, industrial discharges, and urban wastewater to ensure the available water sources remain clean and usable.*

*5. Efficient Water Allocation and Management:*

- Smart Infrastructure: Developing smart water management systems that use sensors and data analytics to monitor water distribution networks, detect leaks, and optimise water use.*
- Regulation and Policies: Enforcing regulations that promote sustainable water use and establishing policies that prioritise water allocation for essential uses and protect vulnerable ecosystems.*

*6. Innovative Water Harvesting:*

- Rainwater Harvesting: Encouraging and supporting the installation of rainwater harvesting systems in homes, buildings, and public spaces to collect and store rainwater for various uses.*
- Fog and Dew Collection: Exploring and investing in technologies that can collect water from fog and dew, especially in arid regions.*

7. *Agricultural Improvements:*

- *Drought-resistant Crops: Developing and planting crops that require less water and are more resilient to drought conditions.*
- *Sustainable Practices: Promoting sustainable agricultural practices such as crop rotation, no-till farming, and organic farming to maintain soil health and reduce water consumption.*

*By combining these strategies, we can create a comprehensive approach to mitigating future water shortages and ensuring a sustainable supply of fresh water for all needs.*

When the response of ChatGPT is evaluated, it is seen that education to reduce the current water use is also emphasised. However, although it provides a few examples of efficient use of water, these examples are considered to be insufficient. It is seen that the other examples it gave are very similar to Gemini.

The same prompt was then given to Llama. Llama gave a very long answer to the problem. In his answer, it put forward many options ranging from saving water to reducing the demand for water, from recycling to the problem of climate change. Llama's response is as follows:

*The paradox of water scarcity despite abundant water coverage on Earth is a complex issue with several contributing factors. To address this problem, a multifaceted approach is necessary, involving various strategies and technologies. Here are some potential solutions:*

1. *Water conservation: Encourage water conservation practices, such as reducing water waste, implementing efficient irrigation systems, and using water-saving appliances. Public awareness campaigns and education can play a significant role in promoting water-saving habits.*
2. *Water harvesting: Collect and store rainwater for non-potable uses, such as flushing toilets, washing cars, and irrigating plants. This can help reduce the demand on potable water sources.*
3. *Water treatment and recycling: Implement efficient water treatment and recycling technologies to purify wastewater and make it suitable for reuse in various applications, such as agriculture, industrial processes, and toilet flushing.*
4. *Desalination: Invest in cost-effective and energy-efficient desalination technologies to convert seawater into freshwater for drinking, agriculture, and industrial purposes.*
5. *Water-efficient agriculture: Promote water-efficient agricultural practices, such as drip irrigation, precision farming, and crop selection that requires less water. Implementing these practices can help reduce the water demand for agriculture, which currently accounts for a significant portion of the world's freshwater usage.*
6. *Water-sensitive urban design: Incorporate water-sensitive design principles into urban planning and architecture, such as green spaces, green roofs, and permeable pavements, to reduce stormwater runoff and increase water infiltration into the ground.*

7. *Water management infrastructure: Invest in water management infrastructure, such as reservoirs, canals, and water pipes, to optimise water distribution and reduce losses due to leakage or evaporation.*
8. *International cooperation: Collaborate with neighbouring countries to share water resources, establish joint water management strategies, and develop transboundary water infrastructure projects.*
9. *Climate change mitigation: Address the root cause of the problem by reducing greenhouse gas emissions to mitigate the impacts of climate change on water resources. This can help prevent droughts, sea-level rise, and other water-related challenges.*
10. *Research and development: Continuously invest in research and development to improve water technologies, such as water-saving devices, efficient water treatment methods, and advanced desalination technologies. This can help identify new, innovative solutions to address the water crisis.*

*Implementing these solutions will require a coordinated effort from governments, private sector organisations, and individuals. Adopting a circular economy approach to water management, which emphasises the efficient use and reuse of water, can help ensure a sustainable future for our planet.*

Although Llama's response is similar to Gemini and ChatGPT's, it is seen that it addresses the problem from a very wide perspective. In the answer, both the things that people can apply in their daily lives and the things that organisations need to do in the short and long term are mentioned. In this respect, Llama's response stands out in terms of raising awareness among primary school children about the measures they can take in their daily lives to protect clean water resources and what can be done organisationally in terms of the issue in general.

### *3.3. School Support for Blindfolded Friend*

Within the scope of the research, a third problem was posed to artificial intelligence applications about how to help a friend with temporary visual impairment at school. The prompt entered into the applications in line with the related problem is as follows:

*Imagine that a friend in the class had an operation due to a problem in his eye. Due to this surgery, his eyes need to be bandaged for 1 month. This friend wants to come to school during this period.*

*What can be done to prevent any harm to this friend while he is at school because his eyes are closed?*

Gemini's response to this prompt reveals that it evaluates the problem in terms of home, school, and general safety. However, it is seen that these different perspectives are intended to support the situation of the student at school. Gemini's response is as follows:

*Here are some things that can be done to help your friend stay safe and even participate in school while their eyes are bandaged:*

*Preparation at Home:*

- *Doctor's Note: Get a note from the doctor explaining the situation, limitations, and any specific needs your friend might have.*

- *Practice at Home:* Before coming to school, your friend can practice navigating their familiar environment blindfolded to get comfortable. This could include walking around their house, locating objects, and identifying sounds.

*Support at School:*

- *Buddy System:* Assign a trusted friend to be a 'buddy' who can guide your friend around the school, help them locate classrooms, navigate stairs, and avoid obstacles.
- *Teacher Communication:* Inform the teachers beforehand about the situation and any accommodations your friend might need. This could involve:
- *Verbal descriptions:* Teachers can describe what's written on the board or provide handouts with larger fonts or Braille.
- *Recordings:* Recordings of lectures or class discussions can be helpful for your friend to review later.
- *Seating arrangements:* A designated seat near the front of the class can ensure your friend can hear the teacher clearly.
- *Assistive Devices:* Consider using a white cane or other mobility aids to help your friend navigate the school environment.

*General Safety:*

- *Alertness:* Encourage your friend to be extra cautious and listen for voices and sounds to identify their surroundings.
- *Lunch and Breaks:* The buddy can help your friend navigate the cafeteria line and ensure they don't bump into anything during breaks.
- *Bathroom Breaks:* Assisting your friend to and from the bathroom can be helpful, especially at first.
- *Emotional Support:* Let your friend know they have your support and encourage others to be understanding and patient.

*Additional Tips:*

- *Large Print Materials:* Providing your friend with large-print textbooks or handouts can be beneficial if bandages allow some light perception.
- *Audiobooks:* Audiobooks can be a great way for your friend to access learning materials while their eyes are healing.

*By working together and implementing these suggestions, your friend can attend school safely and continue their education even with their temporary vision impairment.*

When the broad response given by Gemini is evaluated, it is seen that first of all, suggestions related to preparation for the problem at home, support activities to be carried out at school, out-of-class activities and emotional support are included. In general, the response offers a comprehensive and applicable perspective to the problem in daily life.

The same prompt was then given to ChatGPT. With ChatGPT's response, we can see that it approached the problem from a holistic perspective. Especially the emphasis on environmental arrangements and educational activities for

the teachers and friends of the child with the problem reveals ChatGPT's different aspects from Gemini. ChatGPT's response is as follows:

*To ensure the safety and well-being of a classmate with bandaged eyes while attending school, several measures can be taken:*

*1. Assign a Buddy:*

- Guidance: Pair the friend with a responsible classmate who can help navigate through the school, attend classes, and assist with daily activities.*
- Social Support: Ensure the buddy provides social support, helping the friend feel included and comfortable.*

*2. Modify Classroom Environment:*

- Seating Arrangement: Place the friend in a seat that's easily accessible and close to the door to minimize movement within the classroom.*
- Clear Pathways: Ensure that all pathways are clear of obstacles and hazards that could cause trips or falls.*

*3. Teacher and Staff Training:*

- Awareness: Inform teachers and staff about the situation and provide guidance on how to assist the friend effectively.*
- Emergency Preparedness: Ensure that all staff members are aware of how to handle emergencies involving the friend.*

*4. Accessibility Tools:*

- Audio Materials: Provide class materials in audio format or use text-to-speech software to help the friend keep up with lessons.*
- Braille or Large Print: If the friend is familiar with Braille, provide Braille materials. If partial vision is possible, use large print resources.*

*5. Safe Mobility:*

- Cane Use: Provide a white cane if the friend is comfortable using one to help detect obstacles while moving around.*
- Guide Dogs: If applicable and feasible, consider the temporary use of a guide dog to assist with mobility.*

*6. School Infrastructure Adjustments:*

- Handrails and Ramps: Install handrails and ramps where necessary to facilitate safe movement.*
- Tactile Markings: Use tactile markings or floor guides to help the friend navigate the school premises.*

*7. Breaks and Rest:*

- Designated Rest Areas: Provide a quiet and comfortable area where the friend can take breaks and rest if needed.*
- Flexible Schedule: Allow for a flexible schedule to accommodate the friend's need for rest and medical appointments.*



8. *Peer Education:*

- *Sensitivity Training: Educate classmates about the friend's condition and the importance of offering support and understanding.*
- *Encouragement of Inclusion: Promote an inclusive environment where classmates are encouraged to assist and include the friend in activities.*

9. *Regular Check-ins:*

- *Monitor Well-being: Regularly check in with the friend to ensure their physical and emotional well-being is maintained.*
- *Adjust Support: Be ready to adjust the level of support based on feedback and any changing needs.*

*By implementing these measures, the friend can safely and comfortably attend school while their eyes are bandaged, ensuring minimal disruption to their education and social life.*

The same prompt was then given to Llama. It is seen that Llama gathered the suggestions given by Gemini and ChatGPT together. Llama's response is as follows:

*There are several steps that can be taken to prevent harm to a student who has undergone eye surgery and needs to keep their eyes bandaged for a month while they are at school:*

1. *Provide a safe and supportive environment: The school can provide a safe and supportive environment for the student by ensuring that the classrooms and corridors are well-lit and free from any obstacles that the student may encounter.*
2. *Modify the student's schedule: The school can modify the student's schedule to avoid any activities that may be challenging for the student while their eyes are bandaged, such as physical education or art classes.*
3. *Assign a buddy: The school can assign a buddy to the student to help them navigate the school and assist them with any tasks that they may need help with.*
4. *Use technology: The school can use technology, such as audio descriptions or assistive technology, to help the student access information and participate in classes.*
5. *Provide alternative ways of learning: The school can provide alternative ways of learning, such as braille or audiobooks, to help the student continue their education while their eyes are bandaged.*
6. *Regular check-ups: The school can arrange for regular check-ups with the student's doctor to ensure that the student is healing properly and that any complications are addressed promptly.*
7. *Create a plan for emergencies: The school can create a plan for emergencies, such as a fire drill, and ensure that the student knows what to do in case of an emergency.*
8. *Provide support for the student's mental health: The school can provide support for the student's mental health, such as counselling, to help them cope with the challenges of having bandaged eyes.*

9. *Encourage communication: The school can encourage communication between the student, their teachers, and their classmates to ensure that everyone is aware of the student's needs and can provide the necessary support.*

10. *Provide accommodations: The school can provide accommodations, such as extra time to complete assignments or the use of a reader for exams, to help the student succeed in their studies.*

*By taking these steps, the school can help ensure that the student who has undergone eye surgery can safely attend school and continue their education while their eyes are bandaged.*

It is seen that all three artificial intelligence applications provide suggestions that can be applied to the problem in daily life. In this context, although ChatGPT's suggestions are slightly more prominent in terms of applicability, it is thought that supporting these suggestions with those of Gemini and Llama will provide a healthier result for the problem in daily life.

### 3.4. Protecting Hearing While Studying

Within the scope of the research, a problem related to a child who studies by listening to loud music with his ears and his older sister who is concerned about his ear health was directed to artificial intelligence applications. The prompt entered into the applications in line with the related problem is as follows:

*Serdar is studying by listening to music with headphones. His older sister who comes next to him realises that the music volume is quite loud, and the sound of the music can be heard from outside. His sister warns Serdar and states that this is harmful to his ears. However, Serdar states that this is the only way he can adapt to the lesson and continues to listen to loud music. What can his sister, who is worried about Serdar's ear health, do?*

It is seen that Gemini shows a conciliatory approach with its response to this prompt. Gemini's response is as follows: *Here are some things Serdar's sister can do to address the situation:*

- *Explain the dangers: She can calmly explain the long-term consequences of loud music on hearing. Mention potential hearing loss, tinnitus (ringing in the ears), and ear fatigue.*
- *Suggest alternatives: She can suggest alternative ways for Serdar to focus while studying. This could involve:*
- *Noise-cancelling headphones: Noise-cancelling headphones can block out background noise, allowing Serdar to listen to music at a lower volume.*
- *Focus apps or white noise: Apps with ambient sounds or white noise can create a calming and focused environment without needing loud music.*
- *Compromise on volume: Encourage Serdar to download a decibel meter app to measure the music's volume. They can agree on a safe listening level that allows him to focus without damaging his ears. The World Health Organization (WHO) recommends keeping music below 85 decibels (dB) for no more than 8 hours.*

- *Offer help finding solutions: Perhaps the loud music is a way to block out distractions. The sister can help Serdar identify those distractions and find ways to minimise them, like studying in a quiet space or using earplugs to block out some noise without needing loud music.*
- *Seek professional advice: If Serdar is resistant, the sister can suggest talking to a doctor or audiologist. They can explain the risks in more detail and offer personalised advice.*
- *Lead by example: Does the sister listen to loud music herself? Being a role model and demonstrating safe listening habits can be influential.*

*By being patient, informative, and offering solutions, the sister can increase the chances of Serdar understanding the risks and making healthier choices for his hearing.*

When Gemini's response is evaluated in general, it is noteworthy that within the framework of the sister-brother relationship, the sister sets an example for her brother, informs him, and tries to find a middle way by producing alternative solutions. In this way, Gemini's response is both related to the realities of daily life and humane.

The same prompt was then given to ChatGPT. It is seen that ChatGPT's answers are similar to Gemini's. However, ChatGPT's suggestions cannot provide the humanistic quality provided by Gemini, and they appear as suggestions with a more professional approach and far from daily life. ChatGPT's response is as follows:

*If Serdar's sister is worried about his ear health due to his habit of listening to music at high volumes, she can take several steps to address the issue while also respecting his need for music to help him study:*

1. *Educate About Hearing Damage:*
  - *Informational Resources: Provide Serdar with information about the risks of listening to loud music, such as articles, videos, or pamphlets from reliable sources like health organizations or audiologists.*
  - *Personal Testimonies: Share stories or testimonials from individuals who have experienced hearing loss due to loud music to make the risks more relatable.*
2. *Suggest Volume Limits:*
  - *Safe Listening Levels: Explain that listening at a lower volume is safer. Encourage setting a volume limit on his device to prevent the music from being too loud. Generally, it is recommended to keep the volume at 60% of the maximum or lower.*
  - *Decibel Awareness: Teach Serdar about decibel levels and how sound above 85 decibels can cause hearing damage over time.*
3. *Introduce Alternatives:*
  - *Noise-Cancelling Headphones: Suggest using noise-cancelling headphones, which allow for lower volume levels while still providing an immersive listening experience by blocking out external noise.*
  - *High-Quality Headphones: Recommend high-quality headphones that deliver better sound clarity at lower volumes, reducing the need to turn up the volume.*

4. *Discuss Study Techniques:*

- *Background Music:* Propose using instrumental or classical music as background noise, which can be effective for studying and often requires lower volume levels.
- *Pomodoro Technique:* Suggest the Pomodoro Technique, where Serdar studies in intervals with breaks, allowing him to listen to music during breaks without needing to blast it during study sessions.

5. *Health Check-Up:*

- *Audiologist Visit:* Encourage Serdar to visit an audiologist for a hearing check-up. A professional can provide personalised advice and reinforce the importance of protecting his hearing.
- *Regular Monitoring:* If Serdar continues to listen to loud music, regular hearing tests can help monitor any potential damage early.

6. *Set an Example:*

- *Healthy Habits:* Lead by example by practicing healthy listening habits himself. Show Serdar that it's possible to enjoy music at safe volumes.

7. *Create a Conducive Study Environment:*

- *Quiet Study Area:* Help Serdar set up a quiet, comfortable study area that minimises the need for loud music to block out distractions.
- *Soundproofing:* If feasible, use soundproofing techniques like rugs, curtains, or foam panels to reduce external noise, making it easier for Serdar to concentrate at lower volumes.

*By combining education, practical solutions, and supportive alternatives, Serdar's sister can help him understand the importance of protecting his hearing while also accommodating his need to listen to music while studying.*

Here, the suggestions given by ChatGPT give the impression that an expert is trying to solve the problem rather than a problem-solving mechanism between two siblings who know each other very well.

The same prompt was then given to Llama. Llama's responses were again a mixture of Gemini and ChatGPT. Llama's response is as follows:

*Serdar's sister is concerned about the potential harm that loud music could cause to Serdar's ears, and she has already warned him about it. However, since Serdar insists on continuing to listen to music loudly, his sister can take a few additional steps to help protect his ears:*

1. *Offer alternative ways to study:* Serdar's sister can suggest alternative ways for him to study that don't involve listening to loud music. For example, she can offer to help him create flashcards, provide him with a quiet study space, or suggest that he use a voice recorder to record his notes.
2. *Provide ear protection:* Serdar's sister can offer to provide him with earplugs or earmuffs that can help protect his ears from the loud music. She can also suggest that he take regular breaks from listening to music to give his ears a chance to rest.

3. *Educate Serdar about hearing health: Serdar's sister can educate him about the importance of hearing health and the potential risks associated with listening to loud music. She can explain how prolonged exposure to loud noise can cause permanent hearing damage and tinnitus (ringing in the ears).*
4. *Set boundaries: Serdar's sister can set boundaries around the volume level of the music that Serdar listens to. For example, she can ask him to keep the volume low enough that it can't be heard from outside the room.*
5. *Seek professional help: If Serdar continues to refuse to listen to his sister's concerns and continues to listen to music loudly, his sister may want to consider seeking professional help from an audiologist or a hearing specialist. They can assess Serdar's hearing and provide guidance on how to protect his ears.*

*Ultimately, it's important for Serdar's sister to be supportive and understanding while also ensuring that Serdar's hearing health is protected. By working together, they can find a solution that works for both of them.*

Although Llama's solution suggestions reveal the reflection of the sister-brother relationship in daily life, it still looks at the sister from a patronising perspective. When we evaluate it in terms of daily life dynamics, we can think that such an approach would not be very useful in solving the problem.

### *3.5. Safe Cycling in the Garden*

Within the scope of the research, the artificial intelligence applications were finally asked a problem about a child who was uneasy due to the fast and careless cycling of other children while riding a bicycle in the garden of the apartment building where she lived. The prompt entered into the applications in line with the related problem is as follows:

*Children are riding bicycles in the garden of the apartment where Merve lives. Some of them ride their bicycles very fast and carelessly, which makes Merve very anxious while riding her own bicycle. What can Merve do about this?*

Gemini's response to this prompt has a multifaceted perspective. Gemini's response reveals both the things that the child with the problem can do on her own and what she can do with the support of an older person. Gemini's response is as follows:

*Here are a few things Merve can do about the reckless bike riding in the garden:*

*Talk to the children directly (if appropriate):*

- *If they seem old enough to understand: Merve can approach the children in a friendly way and explain that their fast and careless riding makes her nervous. She can ask them to be more mindful of others while riding in the garden.*

*Talk to a parent/guardian:*

- *Identify an adult: If Merve feels comfortable, she can find a parent or guardian supervising the children and politely explain the situation. They might not be aware of the children's riding habits and can address it directly.*

*Talk to the building management:*

- *Official route: Merve can inform the building management about the issue. They might be able to designate a specific area or time for bicycle riding in the garden or put up signs reminding everyone to ride safely and considerately.*

*Choose a safe time to ride:*

- *Alternative schedule: Merve can try riding her bike at a different time when the garden is less crowded or when the reckless riders are not present.*

*Find a different place to ride:*

- *Alternative location: If the situation doesn't improve, Merve might need to consider riding her bike in a safer location outside the apartment block, such as a park or designated bike path.*

*Additional tips:*

- *Buddy system: Merve can ask a friend or neighbour to ride their bicycles together, making them both more visible and offering a sense of security.*
- *Safety gear: Merve should always wear a helmet while riding her bike, regardless of the situation.*

*By acting, Merve can encourage a safer environment for everyone using the garden.*

When the suggestions given by Gemini are evaluated, it is seen that they are very similar to the suggestions given by ChatGPT. ChatGPT's response is as follows:

*If Merve feels nervous about riding her bicycle in the garden of her apartment block due to other children riding carelessly, she can take several steps to address the situation and ensure her safety:*

*1. Talk to the Other Children:*

- *Friendly Conversation: Merve can try talking to the other children and explaining how their fast and careless riding makes her feel nervous. Sometimes, simply communicating can lead to more mindful behaviour from others.*

*2. Set Agreed Rules:*

- *Safety Rules: Suggest establishing some common safety rules for riding bicycles in the garden, such as speed limits, designated riding areas, and taking turns. Merve can propose these rules to the other children or their parents.*

*3. Involve Parents or Guardians:*

- *Parental Guidance: Merve can speak to her parents about her concerns. They can then discuss the issue with the parents of the other children to ensure everyone is aware of the importance of riding safely.*

*4. Create a Schedule:*

- *Designated Times: Suggest having designated times for riding bikes, separating times for younger children or those who prefer to ride more cautiously from those who like to ride faster.*

5. *Seek Alternative Riding Areas:*

- *Safer Spaces:* Merve can look for other, safer places to ride her bicycle, such as nearby parks with designated bike paths or quieter streets.

6. *Safety Gear:*

- *Protective Equipment:* Ensure Merve wears appropriate safety gear, such as a helmet, knee pads, and elbow pads, to protect herself in case of an accident.

7. *Apartment Block Meeting:*

- *Community Meeting:* Merve's parents can suggest holding a meeting with other residents to discuss and establish safety guidelines for children playing and riding bicycles in the garden.

8. *Mark Safe Zones:*

- *Designated Areas:* Clearly mark out areas in the garden where it is safe to ride at different speeds. This can help create a structured environment where children know where it is safe to go fast and where they need to slow down.

9. *Supervision:*

- *Arrange for adult supervision during peak playtimes to monitor the children's behaviour and ensure they are following safety rules.*

*By taking these steps, Merve can help create a safer and more enjoyable environment for everyone riding bicycles in the garden.*

Llama, to whom the problem was directed, gave approximately the same suggestions as Gemini and ChatGPT. Llama's response is as follows:

*There are several steps that Merve can take to address the issue of children riding their bicycles carelessly in the garden of her apartment block:*

1. *Talk to the children:* Merve can approach the children and their parents and explain to them how their behaviour is making her feel. She can also remind them of the importance of safety and the need to be mindful of other people in the garden.
2. *Set boundaries:* Merve can set clear boundaries for the children, such as not allowing them to ride their bicycles in certain areas of the garden or at certain times of the day. She can also remind them to always wear helmets and follow traffic rules.
3. *Talk to the apartment management:* Merve can also talk to the management of her apartment building about the issue. They may be able to help address the problem by implementing rules or regulations for bicycle riding in the garden.
4. *Consider a bike path:* If the children are riding their bicycles in the garden because there is no designated bike path, Merve can suggest to the apartment management that they create a bike path or designated area for bicycle riding.
5. *Offer alternative activities:* Merve can also suggest alternative activities for the children, such as playing games or doing crafts, that do not involve bicycle riding.



6. *Seek support from other residents: Merve can also talk to other residents of the apartment building and ask for their support in addressing the issue. Together, they can work towards creating a safer and more enjoyable environment for everyone.*

*Overall, it's important for Merve to approach the situation calmly and respectfully, and to work towards finding a solution that works for everyone involved.*

Within the scope of this problem, each artificial intelligence application put forward approximately the same solution suggestions. However, it is seen that these solution suggestions are applicable and healthy suggestions in daily life.

### 3.6. Summary of Findings and Thematic Analysis

The qualitative data obtained from the five scenarios were synthesised to compare the pedagogical capabilities of the models. A comparative summary of the responses provided by Gemini, ChatGPT, and Llama is presented in Table 1.

Table 1. Comparative Summary of AI Models' Responses to Daily Life Scenarios

Scenario / Theme	Gemini	ChatGPT	Llama
<b>1. Roundness of Earth (Scientific Explanation)</b>	Practice-Oriented: Used a "ball and ant" analogy suitable for the child's cognitive level.	Theory-Oriented: Referred to abstract concepts like "Great Circles" and "Euclidean geometry"; academically correct but pedagogically complex.	Theory-Oriented: Provided a geometric proof using angles and theorems; completely unsuitable for the primary school level.
<b>2. Water Shortage (Global Problem Solving)</b>	Mixed Approach: Focused on both organisational (desalination) and individual solutions.	Theory-Oriented: Focused on policy and conservation but lacked sufficient concrete daily life examples.	Comprehensive: Offered the broadest perspective, ranging from individual habits to climate change awareness.
<b>3. Blindfolded Friend (Empathy &amp; Inclusion)</b>	Daily Life-Oriented: Focused on home preparation and practical school safety; offered a warm, supportive tone.	Holistic/Professional: Suggested structural changes (ramps, Braille) and staff training; adopted a formal expert tone.	Summary-Oriented: Synthesised common suggestions; practical but lacked a distinct character.
<b>4. Hearing Health (Health &amp; Communication)</b>	Conciliatory/Humane: Adopted a "sibling" role; suggested compromise and empathy. Solution-oriented (e.g., noise-cancelling headphones).	Professional/Expert: Adopted a "doctor/expert" role; focused on medical risks (decibels) and formal warnings.	Patronising: Provided correct advice but with a didactic and slightly commanding tone.
<b>5. Safe Cycling (Safety &amp; Social Rules)</b>	Action-Oriented: Suggested direct communication and practical safety measures.	Action-Oriented: Similar to Gemini; suggested rules and adult supervision.	Action-Oriented: Similar suggestions; focused on boundaries and management.

### 3.7. Thematic Analysis of AI Responses

Beyond the individual scenarios, a thematic analysis of the findings reveals three critical patterns regarding the use of LLMs in primary education:

#### 3.7.1. The challenge of pedagogical concretisation

The most significant differentiator among the models was their ability to reduce abstract scientific concepts to a primary school level. While Gemini demonstrated a higher capability for "pedagogical transposition" by using

analogies (e.g., the ball example in the Earth scenario), Llama and ChatGPT often failed to exit the "encyclopaedic knowledge" mode. Specifically, Llama's attempt to prove the Earth's shape with geometric theorems highlights a risk: AI models may provide factually correct information that is pedagogically useless or confusing for a young learner without teacher intervention.

### 3.7.2. *Tone and role adoption*

In social scenarios requiring empathy (Scenario 3 and 4), the "personality" of the AI became a determining factor. Gemini tended to adopt a more relational, peer-to-peer, or supportive sibling tone, which is crucial for emotional engagement in education. In contrast, ChatGPT consistently maintained a formal, distant, and professional tone, resembling an external consultant rather than a learning companion. This suggests that for topics requiring emotional intelligence, the choice of model significantly impacts the quality of the interaction.

### 3.7.3. *Convergence in social problem solving*

Interestingly, as the problems shifted from abstract scientific facts (Earth's shape) to concrete social rules (Cycling safety), the divergence between the models decreased. All three models provided similar, applicable, and safe solutions for the cycling scenario. This indicates that current LLMs are more reliable and consistent when dealing with general social norms and safety rules than when explaining complex scientific phenomena to a specific age group.

## 4. Conclusion

Artificial intelligence large language models are currently being used in many fields, with increasing momentum from day to day. In the future, education will be an essential area of use for these artificial intelligence applications. Every day, a new artificial intelligence application is developed and used. In this relatively new field, competition is inevitable. In line with this competition, artificial intelligence applications are being created daily and customised to meet more needs. New versions of the Gemini, ChatGPT and Llama applications, which we examined in this study, are released daily. With each new version, the capabilities of the applications also increase. In addition, there are also artificial intelligence applications customised for specific purposes. For example, we come across artificial intelligence applications that create an image, compose a song, or solve mathematical equations according to the prompt you enter.

Today, while artificial intelligence applications perform specialised operations in certain areas of education, such as solving mathematical equations, they have yet to provide a specialised solution for the verbal field of education. The current applications need more contextual understanding and nuanced responses, which are required for effective verbal education. Therefore, it is crucial to evaluate the potential of existing artificial intelligence applications in the verbal field of education and provide constructive feedback to users and developers. This will help identify the limitations of these applications for practitioners and guide developers on what aspects to focus on for improvement.

In this study, three of the most popular artificial intelligence applications in the market, Gemini, ChatGPT and Llama, were evaluated in the context of the solutions they produced to daily life problems within the scope of primary school science courses. The applications were given five different daily life problems prepared by the researcher in line with the science curriculum, and solutions were expected to be proposed. When the solution suggestions provided by the artificial intelligence applications were evaluated in general, it was seen that the applications produced excellent answers to some problems. Such results are helpful in the teaching process for children. However, some application solution suggestions need to be connected to their context. The related artificial intelligence applications were not designed for this learning scenario. For this reason, their answers may be overly generalised and theoretical. It is not possible to use such answers in teaching environments for children.

Artificial intelligence applications are not static; they possess self-improvement capabilities. While practitioners can guide these applications to provide answers closer to their desired results, the applications also learn from these interactions. This adaptability underscores the immense potential of artificial intelligence applications in the verbal areas of education. With proper use and training by practitioners, these applications can be tailored to various educational scenarios, offering more accurate and context-specific solutions. This potential should inspire educators and developers to further explore the possibilities of artificial intelligence in the verbal field of education.

Using artificial intelligence applications in the verbal dimension of education, up to a certain level, can significantly enhance teaching studies. Educators can leverage various artificial intelligence applications to enrich their teaching processes without being limited to a specific application. This flexibility can lead to more engaging and effective teaching methods. Therefore, it is foreseeable that in the near future, artificial intelligence applications will become indispensable auxiliary tools in the teaching process across various education scenarios.

In this context, the findings obtained point to a critical paradigm in terms of AI-supported pedagogy: Large Language Models (LLMs) can function not only as a "knowledge engine" in education but also as a potential "pedagogical assistant." However, the results of the study prove that these tools are not "plug-and-play" solutions. particularly Gemini's ability to create analogies and Llama's comprehensive theoretical structure indicate that the teacher must assume the role of a "curator" in the classroom. In other words, the teacher should be positioned as a "knowledge designer" who organizes and verifies the AI output according to the child's cognitive level, rather than presenting it directly to the student. While AI takes on the burden of content generation, the human educator is obliged to fill the gap of contextual sensitivity and empathy.

#### *4.1. Limitations*

The results of this study should be evaluated within the framework of certain limitations. Firstly, the analyses were performed with the free/standard versions of the Gemini, ChatGPT, and Llama models available as of 2025; the pedagogical performance of paid and more advanced versions (e.g., GPT-4 or Gemini Advanced) may differ. Secondly, the "zero-shot" technique was used in the data collection process, and no teacher identity or pedagogical role was assigned to the models. The application of different "prompt engineering" techniques could alter the quality

of the responses. Finally, the study is limited to five basic scenarios within the scope of the primary school science curriculum, and the results cannot be generalized to other disciplines (social studies, mathematics, etc.).

#### 4.2. Future Directions

Future research could comparatively examine how advanced prompting techniques, such as "role-playing" or "chain-of-thought," affect the pedagogical output quality of AI to overcome the "contextual disconnection" problem revealed by this study. Furthermore, instead of solely text-based analyses, there is a need for experimental and longitudinal studies where these tools are used by teachers and students in real classroom environments, measuring their impact on learning outcomes and classroom interaction. Large-scale studies conducted with different age groups and different course contents will offer a more comprehensive roadmap for the integration of artificial intelligence in education.

#### Declaration of Competing Interest and Ethics

The author declared no conflict of interest. This research study complies with research publishing ethics. The scientific and legal responsibility for manuscripts published in OPS Journal belongs to the authors.

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