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# Epistemological perspectives of human origin: strategy to strengthen scientific skills in primary school

## Perspectivas epistemológicas del origen humano: estrategia para fortalecer las habilidades científicas en primaria

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**Abstract**
This article examines the development of scientific skills in a group of fourth-grade students through an interdisciplinary approach that integrates myth, philosophy, and science. Using a qualitative methodology and activities such as observation, group discussions, and analysis of audiovisual and written sources, the students formulated key questions about the origin of humanity, compared information, and applied the scientific method. The study highlights how the transition from mythical to philosophical and scientific thinking fosters inquiry, critical analysis, and argumentation, enhancing scientific literacy and a critical view of knowledge.

**Keywords:** mythical thinking; scientific skills; primary education; epistemes (myth, philosophy and science).

**Resumen**
Este artículo analiza el desarrollo de habilidades científicas en un grupo de estudiantes de cuarto de primaria a través de una orientación interdisciplinaria que integra mito, filosofía y ciencia. Utilizando un enfoque cualitativo y actividades como la observación, discusión grupal y análisis de fuentes audiovisuales y escritas, los estudiantes formularon preguntas clave sobre el origen de la humanidad, contrastaron información y aplicaron el método científico. El estudio resalta cómo la transición del pensamiento mítico al filosófico y científico fomenta la indagación, el análisis crítico y la argumentación, fortaleciendo la alfabetización científica y una visión crítica del conocimiento.

**Palabras clave:** pensamiento mítico; habilidades científicas; educación básica primaria; epistemes (mito, filosofía y ciencia).

## INTRODUCTION

The question of knowledge and its production has been a constant throughout human history, prompting the development of various methods for interpreting the world and establishing certainties during uncertainty. Across different cultures and periods, this quest has fostered a set of cognitive skills in humanity, including curiosity, the formulation of questions, and the establishment of hypotheses, all aimed at providing comprehensive answers. Consequently, epistemic frameworks such as myth, philosophy, and science have emerged. Despite their epistemological limitations, these frameworks continue to influence the social and cultural psyche, woven into the very fabric of human existence, particularly through a postmodern lens.

As the institution responsible for transmitting accumulated knowledge and generating new knowledge, the school has the responsibility to awaken in students the desire to learn. It must foster the development of scientific skills, understood as the ability to apply cognitive processes that underlie the acquisition and construction of knowledge. Stones (1989), Puche (2000), and

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Study conducted at Colombia.

Ordoñez (2000) agree that scientific thinking develops from an early age. This is not limited to experimental exercises in the laboratory but encompasses processes such as inference, deduction, hypothesis formulation, experimentation, and the drawing of conclusions, all of which are fundamental to the development of scientific thinking in children. In this sense, questioning stands out in the pedagogical context of this exercise as a necessary educational tool that facilitates knowledge construction. It allowed the development of mental structures in children within the didactic setting and the stimulation of reflective, autonomous, and critical processes.

As a result of a classroom exercise, fourth-grade elementary school students expressed curiosity in the origin of human life, citing questions such as: "How was humankind created?", "Who was the first woman?", and "Where can we learn about the origin of humanity?". These questions presented a pedagogical opportunity to explore narratives within three major domains: myth, philosophy, and science. This approach aims to stimulate critical thinking and foster the development of scientific skills through questioning, hypothesis formulation, and inference.

The pedagogical exercise first established a pedagogical relationship with questioning in educational contexts. Sparking interest in the topic enabled students to formulate questions based on their prior knowledge and to identify the cultural and epistemic frameworks that underpinned their answers to the question of the origin of humanity. Subsequently, didactic situations were designed to foster encounters among myth, philosophy, and science, offering teachers the opportunity to observe the emergence and evolution of scientific skills in their students.

This article aims to share a pedagogical experience conducted within the framework of the Ondas Early Childhood Project (Proyecto Ondas Primera Infancia) to develop scientific skills in fourth-grade students at the IEM Antonio Nariño, a public school in Pasto, Nariño (Colombia). This institution serves a population that faces diverse socioeconomic and family challenges, including belonging to a low socioeconomic stratum, dysfunctional families, experiencing migration, and lacking educational inclusion. It provides a setting to explore how individuals explain their origins through epistemic constructions and how these explanations can serve as a foundation for fostering scientific thinking in children.

## METHOD

The methodological approach of this research was qualitative, aimed at interpreting and describing how students developed scientific skills by responding to questions within three distinct but interrelated epistemic frameworks in the construction of knowledge. The historical-hermeneutical paradigm was adopted, supported by criteria from hermeneutics and phenomenology in the field of education. According to Van Manen (2003, p. 27), hermeneutical phenomenology is the study of the lifeworld as experienced, seeking to provide a deep understanding of lived experiences. This methodology offers insights that allow subjects a more direct contact with the world.

Three thematic scenarios were established:

- **Mythical scenario:** Narratives were introduced that explained the phenomena of the universe through the intervention of gods, regulating social and individual behavior. The creation myths of humankind used as references included the Mayan myth, the Inca myth, and the biblical account of the creation of Adam and Eve.
- **Philosophical scenario:** Philosophical reflection began with the study of nature (*physis*), in search of the essence or substance that defines existence. The postulates of the pre-Socratic philosophers, such as Thales of Miletus, Parmenides, Heraclitus, Anaxagoras, Democritus, and Socrates, were included as a reference.
- **Scientific scenario:** The central question was: "Who was the first human being?" Theories about the origin of life, including creationism, spontaneous generation, panspermia, and abiotic factors, were examined. Additionally, disciplines such as paleontology and evolutionary theory were studied.

Simple and participant observation were used to collect information. The primary instrument was the field journal, supplemented by textual and photographic records, which enabled the capture of both students' cognitive processes and interactions.

The pedagogical theoretical framework included Lev Vygotsky's (1978) sociocultural constructivism, which distinguishes between common-sense knowledge and scientific knowledge. Common-sense knowledge refers to the habitual representations of everyday life, originating in the child's personal experience. According to Vygotsky, children develop scientific skills through social interaction and cultural mediation.

Ausubel's (2000) theory of meaningful learning was used as a reference. It says that learning is a process integrating logical, cognitive, and affective aspects. Thus, the development of thinking and information-processing skills was promoted, including observing, comparing, relating, classifying, inferring, describing, and ordering. Finally, the affective aspect considered the emotional conditions of both students and the teacher, which facilitated or hindered the learning process.

The methodological design was structured in three phases: the analysis of the myth, the philosophical study, and the scientific analysis, with a focus on the category of scientific skills, specifically on formulating questions, proposing hypotheses, and making inferences. Additionally, a phenomenological approach was used to describe students' lived experiences, attending to spatiality, embodiment, temporality, and relationality.

The central category of Scientific Skills is supported by subcategories such as hypothesis and inference. It enables the collection of information and its subsequent analysis in each of the scenarios established within the phenomenological and hermeneutic frameworks through observation and written exercises documented in field journals.

The population and sample participating in the study, which is part of an urban educational institution, consisted of 18 students: 8 girls and 10 boys aged 9-11. Four of the children are not Colombian, and two children are part of an inclusion program for attention-deficit hyperactivity disorder (ADHD). Some come from vulnerable households with limited economic resources, have been displaced by migration, experienced family dysfunction, or have been abandoned, among other factors. Access to the internet, bibliographic resources at home, and libraries is very limited. The adult caregivers have multiple jobs and low levels of education, which means that their support in school activities is not the most appropriate.

## RESULTS

The students were instructed on the importance of questions in research, highlighting how they provide access to various types of knowledge. Each student was asked to formulate questions using the keywords: What?, Who?, Why?, How?, and For what purpose? Among the questions that emerged, one particularly captured everyone's interest: "Who was the first woman?" This question led to the development of related questions, such as "How was the world created?", "Does God exist?", and "How were the planets formed?". The answers to these questions varied widely, ranging from the biblical account of Adam and Eve to theories about extraterrestrial life and the idea that some mysteries may be impossible to understand. The exercise culminated in two general guiding questions that formed the foundation for defining the problem: "How did knowledge arise?" and "How can we investigate how human beings explained their origin in the universe?" These questions guided the formulation of hypotheses and marked the beginning of the research.

### Development of scientific skills

Activities were designed and distributed in four phases to observe and characterize scientific skills. Each phase was based on meaningful situations, including group dynamics, information gathering, video observation, inferential reading of short articles, and artistic expression activities. These activities enable students to develop key skills, such as formulating hypotheses through dialogue and debate and articulating knowledge about the world. Working in groups and formulating a generalized hypothesis based on conversation about the origin of humankind, as Bunge (1972) suggests, students

understand that a hypothesis must be correctly formulated to be generalized and grounded in prior knowledge.

At the beginning of the activity, teachers encouraged students to organize the value of asking questions. They guided the students in formulating their own questions and emphasized the importance of identifying reliable information sources. The teachers asked, "Where can I find information on my topic of interest?" The students offered a variety of responses, with the internet as the primary source of information, followed by books in general. The students began searching for information using the resources they had identified. They were then asked to collect and classify information, defining criteria such as whether it was a folktale, myth, or scientific text. By establishing classification criteria before collecting the information, the students could have more precise conclusions about how humans construct knowledge, the transition from myth to philosophy, and ultimately, to science.

During the process, students also viewed videos, texts, and images about creation myths, the beginnings of philosophy, the emergence of science, the theory of evolution, and other topics. This encouraged the development of reflective and analytical questions about the sources of information. Teachers stepped in to refocus the exercise when students became distracted or lacked motivation. Formulating questions helped generate hypotheses and possible conclusions, fostering the ability to infer information beyond the literal content, in line with the guidelines of Cassany, Luna and Sanz (2009), who define inference as the ability to fill gaps in text comprehension.

For each source of information, students prepared questions in advance, which helped them monitor their inferences and connect their preconceptions with the new knowledge they gained. The questions given by the teachers promoted critical thinking and integrated mythical, philosophical, and scientific perspectives. Some questions were: "What is knowledge?" "What kind of knowledge do you think is presented in this video or text?" "What do you think the video or text will narrate or explain?" "How did humankind begin to build knowledge beyond the mythical world?" "How is knowledge constructed from a philosophical viewpoint?" "What is the relationship between mythical, philosophical, and scientific knowledge?" "What are the relationships or differences between creation and evolution?" "Do you think humankind was created or evolved?". This interaction helped students understand how scientists gather data and develop explanations, as well as the provisional nature of the information that circulates (Organización para la Cooperación y el Desarrollo Económico, 2006).

**Interdisciplinary representations and analysis**

Subsequently, the students conveyed the information through various activities, including written work, graphics, and artistic representations, to express their inferences about the content of the information source they had studied. Incorporating an aesthetic perspective helped students to more easily and creatively absorb the knowledge. These activities, in accordance with Document 24 of the Ministry of Education (Colombia, 2014), enabled students to express their learning through artistic forms, thus connecting different disciplines.

According to the various subjects and the institutional literacy project, the analysis of knowledge was conducted across three scenarios, as described below:

*Mythical scenario*

Students learned what a myth is and how it is structured. They explored questions such as: "How do you think humans explained what happens in the world?" "What is a myth?" "Why did humans invent gods?" "Do you think myths still work today?" Students recorded their answers in written texts that demonstrated signs of scientific thinking by asking further questions, formulating hypotheses, and making inferences. For example, students asked: In the Christian creation myth, it says, "He created him in his own image and likeness". "What does this expression mean?" Some reflections included, "That God has the same physical characteristics as us: head, body, legs, hands, that he thinks". In the Mayan myth, it says, "So the deities decided to create human beings made of mud, but these human beings had no soul and were not good at counting the days". Students noted, "Just like God, the Mayan

gods also made them from mud, which is inert and has no life; they cannot breathe. That is why it says he made them from corn, and corn is a plant, which is a living being because it is born and grows, and because plants breathe". Later, they compared this information with internet sources and videos from three cultures, depicting the origin of humanity in the Mayan, Inca, and biblical creation stories. Finally, they compiled a synthesis in a comparison chart.

*Philosophical world*

Philosophical reflection began with the study of nature (physis) in search of the essence or substance that defines existence. The ideas of the pre-Socratic philosophers, such as Thales of Miletus, Parmenides, Heraclitus, Anaxagoras, Democritus, and Socrates, served as reference points. Students explored how, throughout history, some humans began questioning myths and seeking explanations for nature, the world, and the gods, while formulating hypotheses about the origin of life on Earth, especially humanity. Pre-Socratic philosophy was understood as a reflection on studying nature (physis), aiming to find the essence (the true nature that makes something what it is) distinguishing the real from the appearance, understanding what makes something be and continue to be, often associated with the idea of ARCHE, the origin of all that exists and of becoming: everything is change, nothing remains static; it depends on an order, a reason, the reason of logos (the dialectic of opposites that guarantees harmony).

The students read texts about philosophers who attempted to answer the question of the origin of life, and watched several videos about the origins of philosophy. Reflections arose, such as: "How was knowledge formed?" (By observing what happens and conducting experiments); "How did humans and animals arise?" (They came from cells that joined together and gradually formed humans, animals, and plants); "Who invented philosophy?" (Those who did not believe in the gods). These activities, guided by the teacher, allowed them to learn basic terms such as philosophy, love of knowledge, logos: reason, arche, origin, relating them within an academic context, and highlighting the role of human beings.

In this way, they moved away from traditional beliefs to provide alternative answers to questions about origin and creation. Finally, they visually represented the idea of a philosopher and summarized the origin of philosophical knowledge. These questions, among others, helped them identify differences and similarities between discovery and invention and, from there, develop hypotheses about how the philosophical landscape serves as a logical precursor to what would later become science as we know it.

*Scientific world*

It was understood as the process of knowing, exploring, and observing to explain the living world, based on the idea that everything has a reason for being and that human beings seek answers and build knowledge. Here, science was seen as the result of knowledge gained that helps us understand what, how, why, and for what purpose something happens. The scientific process was demonstrated through experimental activities, such as watching the germination of bean seeds, which allowed students to document and practice the scientific method in a simple way. Additionally, they viewed videos about science and its importance for human development and progress.

It is observed that children make simple inferences because they draw on broader prior knowledge supported by other information from topics covered in natural sciences. For example, when inferring about the process Darwin followed in response to the question of the origin of humanity, from postulates such as those of Lamarck[1] and Mendel[2] and interpreting contextual clues, students discover methods that scientists use to produce knowledge and the steps of how to investigate: "Darwin had to study fossil remains, which are bones and

[1] Artigas (1999), in his 'Zoological Philosophical Work', he explains the sequence of events that give rise to the origin of man: Climate changes give rise to new needs for the species, these changes determine the use or non-use of certain organs, these organs develop or atrophy, Acquired characteristics are hereditary.

[2] According to Bravo (2007), Mendel's laws are the principles that govern genetic inheritance, that is, the process of transmitting physical and biological characteristics from parents to offspring. The characteristics or traits that are inherited are determined by two versions of a gene, called alleles. Mendel's three laws are: the Law of Uniformity, the Law of Segregation, and the Law of Independent Assortment.

skeletons, gather information from others, travel, and compare," "Lamarck observed by practicing in a laboratory with plants and writing down what happened," "Mendel discovered why we are similar to and different from one another".

In their search to answer the question of the origin of humanity, the students, guided by their teachers and after reviewing documentary and audiovisual materials, learned about the concept of paleontology. This science, which studies fossil remains through excavations, helped them understand that the scientific origin of humanity is based on the African continent. From this discovery, the students realized that the biblical story of human origins from Adam and Eve is not scientifically supported. This insight led them to explore Charles Darwin's[3] theory of evolution, which states that all living species, including humans, share a common ancestor. Learning about this theory helped the students understand the human family tree and how different species have evolved over time.

Investigating how humans have explained their origins in the universe, based on understanding how to define boundaries, helped establish a foundation of prior knowledge about what and from which references students answer questions about human origins. (Doxa) Simultaneously, creating didactic scenarios where myth, philosophy, and science (episteme) revealed the development of scientific skills in students. These skills, related to observation, hypothesis formation, and analysis, enabled students to approach complex questions from different perspectives.

Initially, students struggled to step outside their comfort zone because of prior educational experiences in which the teacher was the main source of knowledge. This showed in their limited understanding of related topics, little participation in arguments, scattered attention, difficulty asking questions, weak inferences, rushing to state hypotheses, a limited vocabulary for connecting ideas or forming opinions, and a tendency to seek the teacher's approval for any contribution. However, through motivational activities, readings, and reviewing multiple sources, their active participation and argumentative skills improved. For example: "The origin of man comes from the evolution of dinosaurs; some evolved like chickens, others evolved as mammals, and from primate mammals came Homo," and "The origin of man is the evolution from monkeys, from Homo erectus, Homo habilis, and Homo sapiens, and we see this through science".

The use of questions as a teaching tool encouraged students to reflect on their learning process. Guiding questions, such as: "What was the path to knowledge?" "How does humankind acquire knowledge?" "Is it possible to attain absolute knowledge?" prompted curiosity and sparked classroom discussions. These discussions were essential for students to express their ideas and arguments, based on prior knowledge and their classmates' opinions, demonstrating the use of basic cognitive skills to develop argumentative and synthesis abilities.

Finally, the inquiry exercise allowed students to focus on key questions about the origin of humankind: "How was humanity created?" and "Where can we learn about the origin of humanity?" Exploring these topics through the Myth-Philosophy-Science approach provided a framework for students to seek well-founded answers and formulate hypotheses based on diverse sources of information. In other words, this exercise takes the question as the starting point for fulfilling the desire to know and the need to seek information to generate possible answers. It is important to note that the process not only fostered the development of scientific skills, such as the ability to infer and synthesize information, but also encouraged a critical and reflective attitude toward knowledge.

The learning was conveyed through group work to develop simple organizational schemes and to create final definitions of the construction and significance of knowledge, and of the origin of humanity, based on scientific and research postulates. "Knowledge is everything we know or want to know; how knowledge is produced: the use of reason, intelligence, and experience". "The origin of humankind stems from the evolution of dinosaurs; some evolved like chickens, others evolved like mammals, and from primate mammals came Homo". In building narratives, the narrative was understood as the experiences that gained meaning

[3] Darwin believed in a common ancestor from which different individuals originated. These differences developed over time and were then passed from parents to offspring. Species of living beings evolve over time, and the population of each species descends from a common ancestor.

for the students, resulting from the educational event, and expressed in each of the aesthetic and written representations created through a reflective and interpretive process.

The development of students' scientific skills began with the creation of socialization spaces where instructional tools such as advance organizers, text summaries, illustrations, analogies, questions, diagrams, and cognitive maps, among others, were used. These tools increased students' awareness of the importance of learning, not just as a process of gaining knowledge but also as a way to interact critically with the world. In agreement with the students, knowledge was defined as everything about which one knows something and/or wants to learn more, resulting from asking questions, experimenting, learning, and sharing to keep questioning. This approach is supported by recent studies showing that knowledge is not static but constantly changing, depending on historical and cultural factors and access to different sources of information (López-Vargas; Ibáñez-Ibáñez; Paéz-Hernández, 2018). Furthermore, the ability to formulate questions and seek answers is essential for developing critical and scientific thinking, elements considered key in current education (Osborne; Simon; Collins, 2003).

Therefore, the didactic scenarios created to encourage students to explore the origin of humanity led to the formation of key questions such as: Who was the first woman in the world? Who was the first human being? And how do we know that? This creates a situation of spontaneous student questioning about the topic, combined with the teacher's guidance or reformulation within a specific pedagogical framework. The topic, related to the learning goal, promotes a dialogical and critical relationship that helps teachers involve students as active participants in building knowledge through processes of understanding, analysis, reflection, and questioning.

These questions encouraged reflection on various theories, from religious ones like the biblical creation story to scientific ones such as the theory of human evolution, which proposes that humans share a common ancestor with primates (Foley; Lahr, 2020). Comparing myths, philosophy, and science helped students develop an epistemic framework to organize and support their answers more critically and thoughtfully (Lederman; Lederman, 2019).

Formulating hypotheses, searching for information from diverse sources, and comparing findings strengthen skills such as inquiry, analysis, and critical reflection. These educational practices promote scientific literacy, preparing students to actively participate in scientific and social debates with a greater understanding of natural phenomena and the ability to apply knowledge in real-world contexts (Roberts; Bybee, 2021). This is crucial not only for students to grasp scientific content but also to develop a critical perspective on the diverse forms of knowledge that coexist in contemporary society.

## CONCLUSION

Within the scope of this project, which aims to develop scientific skills, the goal was for students to understand the origins of humanity from different perspectives—myth, philosophy, and science—to encourage the formation of questions, hypotheses, and inferences—key components of scientific thinking. As several studies highlight, science education should go beyond simply transmitting concepts and should promote active student participation in constructing knowledge through inquiry and reflection (Lederman; Lederman, 2019; Osborne; Simon; Collins, 2003).

This demonstrates that, for the development of scientific skills in fourth-grade elementary students, initial motivation for inquiry exercises depends on an epistemic stimulus that generates questions, either from doxa or from argumentation based on a pedagogical exercise involving understanding and analysis. Outlining three scenarios of knowledge transition (myth - philosophy - science) prompted the formulation of hypotheses and inferences, which enabled an educational approach focused on the appropriation of knowledge.

The students' conceptual synthesis demonstrated a reflective process in which they combined elements of myth, philosophy, and science to create a coherent narrative about the origin of humanity. This type of learning, which integrates different perspectives, is essential for developing

scientific and critical thinking and has been widely supported by educational literature that advocates for a multidisciplinary and reflective approach to science teaching (Foley; Lahr, 2020).

The use of narratives and aesthetic representations as part of the learning process also contributed to knowledge acquisition, a key aspect of contemporary science education that advocates integrating creativity and artistic expression into the teaching of scientific content (Duschl, 2019). The students' artwork and oral narratives demonstrated not only their understanding of the concepts covered but also their ability to interpret them and give them personal meaning, reinforcing the idea that meaningful learning occurs when students can connect knowledge to their own context and experiences. Thus, the exercise demonstrated how an interdisciplinary approach, inquiry, and creativity can be powerful tools for developing students' scientific skills, preparing them to face the challenges of the knowledge society.

As a result of the research project on the origin of humanity, which this article is based on, students were able to develop an interest in learning about the connection between myth, philosophy, and science. This is due to their ability to inquire and ask questions, which, as Harlen (2015) argues, are the starting points for developing scientific skills. Throughout the activities, students not only explored sources of information but also successfully applied that knowledge to new situations, as Duschl (2019) argues, thereby fostering their critical and epistemological thinking.

The students' socioeconomic backgrounds initially limited their knowledge. However, once the barriers to accessing resources were overcome with teacher support, the students were able to grasp the content. This aligns with Foley and Lahr (2020), who argue that human curiosity and the desire to learn more about the past are fundamental drivers of knowledge construction. Similarly, the importance of collaborative work and dialogue was evident in the group activities, reinforcing Osborne, Simon and Collins (2003) idea that social interaction fosters the understanding and construction of scientific knowledge.

Once an interest in knowledge was sparked, and by leveraging their curiosity about a topic of interest, classroom activities were designed to develop scientific skills through observation and interaction with the environment, information gathering and discussion with others, and ultimately, the conceptualization and epistemic or opinion-based theorization of a phenomenon — in this case, the construction of knowledge about the origin of humanity. The children involved approached the investigation of humanity's origins by first describing what they already knew, discovering that this knowledge can be organized, argued, systematized, and compared, thereby constructing valid understanding of the world they live in.

Also, as a result of this experience, the importance of questioning in acquiring knowledge was established. Questions such as how, where, who, when, what it is, how it happens, and what the difference is, as well as inquiry and hypothesis formulation using multiple sources, allowed students to develop skills in observation and inference, grounded in the principles of scientific inquiry. Lederman and Lederman (2019) state that this approach is crucial for students to understand the nature of scientific knowledge. Furthermore, the use of creative media such as graphic and narrative representations fostered scientific communication, highlighting the importance of visual representation in learning, as noted by López-Vargas, Ibáñez-Ibáñez and Paéz-Hernández (2018).

The integration of words and concepts such as origin, logos, arche, philosophy, and knowledge into students' vocabulary demonstrates that learning is not an isolated process but rather a continuous, cumulative one. Each new phase of knowledge builds upon the previous one, reflecting Duschl's (2019) assertion about the cumulative and contextual nature of scientific learning. This also reinforces the idea that knowledge is dynamic and evolves, a process that continues as new questions and research are conducted.

Generally, because of its significant contribution to the pedagogical experience of teachers involved in the inquiry process as guides, it can be said that this particular experience redefines teaching and learning methods in many ways. It emphasizes the educational event driven by questions and the relationship between doxa and episteme as a way to stimulate inquiry. This approach allows a specific theme to be integrated into the curriculum under the pretense of sparking in students a desire to learn beyond the traditional goal of passing.

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