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Greek Astromythology: intersections between mythology history and modern Astronomy Education

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This article provides a comparative assessment of the intersection between Greek Astromythology and Astronomy Education, as an interdisciplinary and intercultural contribution. The research is based on a qualitative assessment of narratives and concepts, using a brief systematic literature review to compile related academic production, with the objective of providing critical discussions on this intersection. The findings show that there is a broad diversity of themes in Astronomy that have their roots in Greek Astromythology: 174 items in total. Most stars related to Greek Astromythology, about 63%, were named in tribute to Greek culture, whereas approximately 36% of the findings correspond to elements belonging to the daily life of the Hellenic people. This shows that the Greeks' efforts to catalog various stars and think about the multiple aspects involving Astronomy resonate contemporarily and, therefore, it is imperative to contextualize the historical and cultural aspects involved in modern Astronomy science. In addition, the results identified a broad range of myths related to Astronomy, which demonstrate the significant contribution of Greek Astromythology to this science area. Hence, the use of mythology as a historical and cultural aspect of the visible constellations and planets can play a relevant contribution to scientific literacy and teaching, particularly in introductory courses of Astronomy, which are commonly developed in primary and secondary schools. Exploring this intersection at the school level can also enable the reflection, implementation, and evaluation of consistent teaching and learning indicators toward a critical education.

KEYWORDS

Greek mythology, Astronomy, physics teaching, classical philosophy, science mythology, critical pedagogy

1 Introduction

Throughout the history of science, several cultures made contributions to what is now called the science of Astronomy, including the Egyptians, Sumerians, Babylonians, Hindus, Chinese, and several indigenous cultures worldwide. However, for the scientific modeling of modern Astronomy, there is an emphasis placed on the Hellenic culture, here simply

referred to as Greece. The Ancient Greeks were the main cultural precursors of modern Western civilizations' thoughts while also having developed complex systems of knowledge involving Philosophy, Mathematics, Politics, and natural sciences more broadly, such as Astronomy and Physics (Cordón and Martinez, 2019). Some examples are: the works of Eudoxus of Cnidus (c. 390–c. 340 B.C.) in Plato's Academy, who was one of the firsts to propose a geocentric model; the works of Aristotle (Meteorology and On the Heavens—c. 350 B.C.); the work of Ptolemy (Almagest, 2nd Century c. 100–170 A.D.), in which he uses Geometry throughout the book to produce an astronomical study akin to Aristotle's conception of the World (Universe); among other examples of natural philosophers that helped shape modern Astronomy.

Philosophical thought boosted the Greeks' understanding of the physical and social world, bringing with it what the Brazilian educator Paulo Freire calls *epistemological curiosity* (Freire, 2021a,b,d, 2022a,c,d,e; Freire and Faundez, 2021; Freire and Macedo, 2023; Ferreira et al., 2024) which is the element that constitutes a critical curiosity. It provides a methodical and methodologically elaborated curiosity to transcend common sense. In the field of common sense, knowledge that is not epistemologically structured, that is part of a culture in a specific place and time, is historically delimited, given that all human action and knowledge is historical. This is because, ontologically, human beings live in particular time and space conditions, making themselves historical beings and connected to their historicity (Freire, 2021a,b,c,d, 2022a,b,c).

Moreover, religious knowledge socially constitutes one of the common elements of a given culture. The interaction between religious knowledge and science changes from one society to another, from one time to another. After the Renaissance and the Enlightenment period, for example, science and religion gradually became separated from each other, mainly due to the process of establishing a scientific methodology on a positivist basis, which often confronted some religious ways of thinking. In particular, the sciences, focusing on the object, sought criteria of objectivity (or at least intersubjectivity) as observed in experimental Physics, whereas religions, in general, remained in the sphere of subjectivity. Thus, this dual approach to existence began to obliterate, to a certain extent, the complex epistemological relationships that both maintain between themselves based on a cleavage that originated in the Cartesian-Newtonian perspective (Morin, 2016a,b,c).

On the other hand, in archaic societies, with a special focus on civilizations with a polytheistic religion, there is an intrinsic association between science and religion, although not in the modern sense of scientific terms. An example of this association is the intersection of what we now call Astronomy and Astrology in many ancient cultures. As cultural constructs, science and religion, within archaic cultures, merge in the understanding of reality, sometimes tending more toward epistemological curiosity (eventually triggering scientific thinking) and sometimes leaning toward a magical-religious[1] understanding of phenomena. In this sense, the Greeks contributed both epistemologically and religiously to the development of Astronomy. There are vast narratives available in the literature relating to Greek religion that mythically explain the emergence and occurrence of Astronomical objects and phenomena (Hesiod, 2012). Contemplation of the sky and its phenomena was part of the daily life of philosophers in antiquity, starting with the pre-Socratic philosophers,[2] and possibly other curious individuals living in Greece. It is worth noting that interactions between science and culture regarding Astronomy also occurred in several other ancient civilizations, although in different manners and in diverse contexts, such as in several parts of Asia (e.g., ancient China, India, and Mesopotamia), Africa (e.g., Egypt, Ethiopia), the Americas (e.g., Mayan, Aztec, and South America's indigenous people) and even in Europe (e.g., Nordic mythology) (Fraknoi, 2020; Sun, 2011). However, we have here focused on Greek mythology, given to its more emblematic influence in modern Astronomy science, particularly in Western culture.

In this context, several literatures stimulate the acquisition of scientific knowledge (Xavier and Flôr, 2015; Oliveira and Batista, 2021) through fantastic narratives that allude to the human appreciation of such stories, as historical beings and aware of their historicity (Freire, 2021a, 2022a,c,e).

Therefore, based on the historical-cultural and scientific-religious knowledge of the Greeks and their contribution to the development of Astronomy, which resonates in contemporary times, it is noted the importance of resuming Greek culture as a subsidy for a critical education in Astronomy, in an interdisciplinary way. There is a research gap in this regard and a lack of sufficient studies that can provide such a comparative analysis in a synthetic manner and with a pedagogical purpose. This is the main objective and original contribution of this paper, to compile data and arguments that can be used to foster the approach to Astronomy in regular courses, particularly in High Schools, considering its complex history and structure, along with other epistemological references. We believe that such an approach can contribute to the students' scientific literacy, which constitutes our main motivation in doing this research.

Astromythology is here defined as the articulation of religious/mythical beliefs with a worldview that is congenial to a scientific leaning.[3] The use of astronomical calculations and the practice of fortune-telling in antiquity are an examples of Astromythology, given the interplay of mythological constructions (the power of the stars and the description of their movements, etc.) and astronomical interests in the stars' movements. The quote below also describes this relationship.

1 Epistemological curiosity does not have the immediate consequence of science. One can have epistemological curiosity (as in Plato, for example) and not come even remotely close to scientific thinking. For this reason, we consider the idea of a less immediate epistemological transition to that of scientific formulation.

2 In this context, it is assumed, for example, that Thales of Miletus predicted, in the year 585 BC (at approximately forty years of age), the day and hour on which a solar eclipse would occur based on observations with the naked eye, as well as the position of the Earth and the Moon in relation to the Sun, with knowledge of astronomy and mathematical calculations. This observation has the power to establish the alluded temporal separation. Much of the mythical-religious perspective predates Greek philosophy, conceived as arising from pre-Socratic philosophers, among other influences.

3 The term "astromythology" was already used in previous literature but more focused on spiritualist perspectives (Burgoyne, 1963) or as a reference for amateur astronomers (Alexander, 2015) rather than for a scientific debate on critical pedagogy, as here proposed.

> Astronomical computation and prediction in pre-modern South Asia (an area roughly comprising modern India, Pakistan, Nepal, Bangladesh, and Sri Lanka), like their counterparts in the classical world and its European inheritors, have left detailed though incomplete imprints in the historical record since the first millennium. Founded in traditional cosmological and celestial lore and the requirements of maintaining a ritual calendar, the Indian "science of the stars" (Sanskrit jyotihśāstra) subsequently altered with the acquisition of various new scientific and social aims, as well as mathematical techniques and models. (Plofker, 2018, p. 485)

It is also important to note that, some pre-Socratics philosophers, such as Thales and others, should be included among the list of those who did science (in a broad sense), but the separation between science and mythology is less clear for most pre-Socratics, such as those from the Pythagorean school (Huffman, 2014). In the same way, Aristotle, in his book *Physics*, refers to god as the mind that thinks about itself, whereas Newton, in his *General Scholium,* appended to the *Mathematical Principles of Natural Philosophy*, refers to space and time as *sensoria dei*. Nonetheless, in general, these authors sought to distance themselves from the mythical-religious explanation. See, for example, Nietzsche's comments on the work of the Pythagoreans:

> [...] Music, in fact, is the best example of what the Pythagoreans wanted to say. Music, as such, only exists in our nerves and in our brain; outside of us or in itself (in Locke's sense), it is composed only of numerical relations regarding rhythm, regarding its quantity, tonality, and quality, depending on whether we consider the harmonic element or the rhythmic element. In the same sense, one could express the being of the universe, of which music is, at least in a certain sense, the image, exclusively with the help of numbers.

> [...] The original contribution of the Pythagoreans is, therefore, an extremely important invention: the meaning of numbers and, therefore, the possibility of an exact investigation in physics. In other systems of physics, it was always about elements and their combination. Qualities were born by combination or dissociation; now, finally, it is stated that the qualities reside in the diversity of proportions. But this intuition was still far from the exact application. He contented himself, provisionally, with fanciful analogies.

> [...] Becoming is a calculation. This is reminiscent of Leibniz's words when he said that music is *exercitu arithmeticae occultum nescientis se numerare animi* [the hidden exercise of arithmetic of the spirit that does not know how to calculate]. The Pythagoreans would have been able to say the same about the universe, but without being able to say who does the calculation. (Nietzsche, 1973, p. 62–63—free translation)

A similar observation can be found in Newton's and Kepler's works. For example, in the *Mathematical Principles of Natural Philosophy*, Newton did not use the descriptions of the *scholia* in which he cites the *sensoria dei* to substantiate his proper physical explanations. As for Kepler,[4] we have:

> So, in the middle of everything, there is the Sun. Who, in this most beautiful time of ours, could place this light in a different or better place than the one from which it can illuminate the whole equally? Not to mention the fact that, with some propriety, some call it the light of the world, others the soul, still others the ruler. Trismegistus calls her the visible God, Electra, of Sophocles, the all-seeing. And, in effect, the Sun, sitting on his royal throne, guides his family of planets that revolve around him. (Kepler, cited in Burtt, 1991, p. 44—free translation)

Thus, Astromythology is not a way of thought that should be reserved to the "ancients" alone. It is intermingled in the writings of numerous authors that formed the ground of modern science. Knowing to recognize it in the writings of these authors also can contribute to scientific literacy.

In fact, based on the doctrine of primary and secondary qualities, developed since the Renaissance, an epistemological cleavage was established (with broad methodological consequences) between the two ways of approaching the world without, however, necessarily placing them in conflict (Burtt, 1991). This movement gradually overcame the notions of ethnoscience (Dias and Janeira, 2005) and cultural science (Jafelice, 2015).

The notion of ethnoscience (ethnoastronomy, ethnobiology, ethnomathematics, etc.) presents in itself a combination between the terms "ethno", which comes from "ethnicity" and has an anthropological connotation that alludes to people and civilizations (Santos et al., 2023), and the term "science", which is related to a human construct aimed at understanding objective reality, bringing it closer to collective subjective reality (Kuhn, 2018; Freire, 2022e). Therefore, the creation and use of the term "ethnoscience" establishes a differentiation between Science and Ethnosciences, particularly in qualitative terms. This is because every science approach is historical and socially contextualized and, therefore, cultural. Thus, the Eurocentric view of cataloging sciences that deviate from such European standards is often renounced and considered inferior through this approach.

The term "cultural science" is also rejected in this context, such as, for example, "Cultural Astronomy", recurring to the same argument mentioned above. Since all science is a cultural product, it is a redundancy, an epistemological pleonasm, to consider "cultural science".[5] Aiming to review these notions about the

4 Astronomy and astrology were used similarly until c. 17th century, for instance in Kepler's times. Conversely, there was a separation between astronomy, as a subject of mathematics in liberal arts, and physics, as a subject of natural philosophy. In this sense, Kepler used religious arguments and reasoning in his findings, motivated by the conviction that the World is the corporeal image of God, while the soul is its incorporeal image (Gaspar, 1993).

5 One should not forget, here, the political dimension of the terms mentioned. If all science is cultural and has ethnic roots, the pleonasm presented does not have a relevant explanatory dimension but has it from the point of view of a political position that aims to highlight what, despite being evident, has not been considered.

relationship between culture and science, and being consistent with the purposes of this research, the term "Astromythology" is used to refer to the knowledge that intersects science and religion within the scope of certain cultures, as well as the adjective which qualifies the science or mythoscience in question by its ethnicity, people, or civilization, in this case, the Greeks.

Therefore, to accomplish the objective of this research, we catalog some narratives of Greek Astromythology to enable their use in Astronomy Education as an interdisciplinary and intercultural contribution, particularly in physics, philosophy, and geography teaching at the school level, toward a critical understanding of modern science.

2 Materials and methods

This research is of a qualitative nature, based on the literature review for cataloging some Greek narratives. It combines astronomy and mythology to incorporate discussions relevant to Astronomy Education. The emphasis on qualitative research is due to the object of study and the focus given to it, which is a synthesized epistemological discussion aimed at pedagogical reflections.[6] It was accessed the website of the International Astronomical Union (IAU) to obtain the data of the cataloged constellations, such as name, shape and belonging stars; then we searched in the Greek literature to find out which of those constellations had their respective explanations, i.e., their creation myths and description.

Indeed, considering this research within the Human Sciences and of an anthropological, historical, and cultural nature, it deals with a complex phenomenon, irreducible to numbers or statistical treatments, without losing the essence of the proposal here made (Zanella, 2011; Creswell, 2014; Dourado and Ribeiro, 2021). Thinking about the broad cataloging of a given subject and its description, qualitative research, such as through a literature review, can provide methodological support for achieving the proposed objective (Goldenberg, 2011).

This approach is not methodologically neutral: it favors a synthetic view instead of an analytical one based on statistical methods. By presenting several narratives and conceptual references, the research offers a synthetic idea of the subject, that a quantitative method might not be able to inform the reader sufficiently. Although we provide some numerical references (e.g., frequency of citation of certain terms in the assessed papers), the analysis is mostly qualitative. On the other hand, future quantitative assessments that could build on this qualitative analysis are encouraged.

The bibliographical research approach becomes necessary due to the scope of the research not constituting a unitary body, that is, the information necessary to compile the assessed data is diffused in the most varied materials (Gil, 2002; Andrade, 2010). Being a study that intersects Astronomy and Greek Mythology, it is necessary to explore bibliographies seeking to disentangle the findings in a reliable way. Some of the fundamental bibliographies here assessed are the works from Brandão (2015a,b,c), Homero (1981, 2007), Franchini and Seganfredo (2013), Teixeira (2007), Horta et al. (2012), Daniels (2016), Abrão (2016a,b), and Herma (2016). This study also brings uncertainty, due to the limitation of the literature review considered in the paper.

3 Results and discussion

3.1 Astromythology

In the modern and contemporary context, based on the previous conceptualizations, Astronomy would be fitted within science, while Greek mythology would be within religion. Distinguishing the terms "myth", "mythology" and "religion", the first would be a narrative structure that seeks to explain phenomena in the world, whereas mythology and religion can be here understood as synonyms in the sense that they comprise a system of beliefs that constitutes one of the cultural identity elements of a certain population at a given historical time. This understanding goes against the authors who distinguish mythology from religion, as if anachronistically hierarchizing belief systems, so that religions worshiped in the present can receive a high status at the same time as the others become, sometimes pejoratively, mythology.

Thus, myth would be one of the constituents of mythology, of the larger system of beliefs and, therefore, of religion. Unlike legends that are epistemologically autonomous in terms of an ideological set, religion is an intricate system of relationships between narratives that present unity and cannot be dissociated from each other without referring to the whole, forming, for this very reason, a complex system (Morin, 2007). One of the elements of the superstructure, therefore, is the understanding that religion is not its only element; on the contrary, it is one that relates to the rest of the superstructure, such as language and philosophy, among others, in addition to being a correlational element with the infrastructure. That is, neither the infrastructure decisively shapes religion nor is it determined by the reality of individuals. Before that, objective and subjective reality are in constant dialectic, making religion not just an immaterial good but one that materializes in everyday life, in the same way that it influences belief systems.

Myths are narratives of a culture used to explain, through magical-religious consciousness, the phenomena of objective reality. Even though in common sense myth means something unreal, a deception, a falsehood (which is still true when faced with an epistemology of another nature[7]), when using the term mythology to refer to the belief system of a people, the intention is not to make a value judgment, but just an epistemological and conceptual agreement.

In contrast, science, in Freire's perspective, and corroborated by several science epistemologists (Kuhn, 2018; Feyerabend, 2011; Popper, 2013), can be understood as a historical-social construct

6 Although this paper provides some quantitative information, the novelty here offered is on a qualitative basis. It brings a conceptual contribution regarding the concept of "Astromythology", as a pedagogic approach to discuss modern astronomy, whilst also addressing its cultural and historical influences. This type of approach was not found in the assessed literature.

7 Consistently establishing that, in this sense, "epistemology of another nature" does not hold the prerogative of opening the objective dimension of reality.

that seeks to describe and explain phenomena through a set of ideas formulated based on the most diverse methodologies. It is also notable that these sets of ideas change historically and conflict with others of the same nature as independent systems of thought. In this sense, Astronomy is easily understood as a cultural product that aims to describe and explain celestial phenomena through epistemic-methodological systematization.

Therefore, Astromythology, as well as other mythosciences that may be cataloged, is a historical and social phenomenon and, therefore, cultural, but it is not a vague definition that is given far from any context. This means that the Hellenic society had a manifestation of Astromythology that is particular to it, not being the same as of other civilizations such as ancient China, the Romans, or the Brazilian indigenous Tupinambá, neither of the contemporary Yoruba people in Nigeria, among other examples.

Being a cultural element, Astromythology is related to the language, customs, philosophy, and worldview of the social group to which it belongs. It is in a dialectical relationship with objective reality. This means tant it is not intuitive for a culture to develop myths about celestial objects that they are not even capable of knowing exist, for example invisible with naked eye, or represent celestial gods with physical attributes that the local individuals themselves do not have, such as Greeks representing the sun god with physical characteristics of the Tupi-Guarani people, as so forth. Figure 1 illustrates the ontological relationships drawn between Culture, Mythology and Astronomy.[8]

Based on the approaches outlined so far, we now focus on Greek Astromythology, while also recognizing the existence of a vast number of astromythologies in the world and throughout history. With this, the myths of Greek Astromythology are compiled, bringing some considerations about the impact of Greek culture on Astronomy. Other cultures are not disregarded as inferior or less important, the focus on the Greeks is because of their large influence on Western civilization and modern Astronomy. Therefore, the use of Greek Astromythology as a critical contribution for Astronomy teaching in formal education is not intended to reinforce the colonialist and Eurocentric vision propagated throughout the history of the world. On the contrary, we can see that there are other possibilities for teaching based on the most diverse cultures, just as there has been and still is a gnosiological process of building knowledge that permeates the most varied manifestations of culture (Freire, 2022a; Memmi, 2023). Astromythologies from other cultures are also encouraged to be interwoven in this debate.

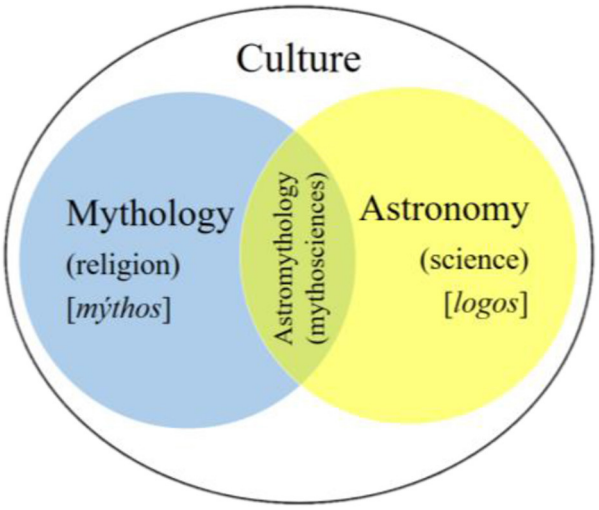

FIGURE 1
Ontological relationship between mythology and astronomy.
Source: prepared by the authors.

3.2 Greek Astromythology

Hellenic culture has a cultural richness evidenced by historians, philosophers, sociologists, and a wide range of researchers throughout history after the Classical Era,[9] among other cultures worldwide. The Greeks drew religious and epic narratives that also date back to the theme of Astronomy. These narratives include, for example, theorizations about the alternation between day and night, between the seasons, the emergence of stars, constellations, celestial bodies, and the creation of the universe, among other issues.

A summary of the main their contributions is cataloged in this study, according to each of the distinct themes that can be found in Greek Astromythology. It is important to emphasize that the myths were distinguished into two categories *a priori*. In category 1, narratives developed by the Greeks that talk about the stars or phenomena that they were aware of are defined, that is, stories that have a direct relationship with Greek everyday life. In category 2, myths coined by the Greeks are presented, but they are about stars or phenomena that they were unaware of, that is, whose nomenclature was coined later in history, as a way of paying homage to Greek culture in an Era different from that of their apogee. Therefore, category 2 is an indirect relationship with Greek culture.

It is also necessary to emphasize that the criteria for exclusion (i.e., for not cataloging some myths) include the correlation of two elements: (i) lack of knowledge of the star or phenomenon by the Hellenic people; and (ii) homage to the phenomenon or star that

8 We acknowledge that there are mythological/religious studies that do not refer to science or have a leaning toward it. More recently in history, one can find most of the scientific works without any reference to religion or historical cultural beliefs whatsoever. However, as we showed with Kepler and other authors, there is a region of shadowing between the two ways of structuring the world that constitutes the very place of Astromythology. In some sense, one might ask if there is no shadowing in contemporaneous topics in Astronomy/Astrophysics, such as the Entropic Principle (despite, possibly, it being a religious view without a god).

9 Classical antiquity (also called the classical era, classical period, or classical age), for the purpose of this paper, is considered as the period of cultural history between the 8th century BC and 5th century AD centered on the Mediterranean Sea, comprising the intertwined civilizations of ancient Greece and ancient Rome known as the Greco-Roman world.

uses Roman nomenclature. This is so because, even though Roman culture draws on elements of Greek culture, especially scientific and religious culture, if the Greeks did not know the phenomenon or star and it was honored with a Roman name, there is no type of relationship between the object of knowledge and the culture of the people in question.

Table 1 shows the myths surrounding Planetary Astronomy, that is, the composition of the Solar System, as well as the phenomena present in this field.

In general, Greek thought focused on the most varied subjects in the physical and astronomical world. In Table 1, it is also possible to note that most of the stars or phenomena were thought of, mainly through the magical-religious thought of the time. We chose to encompass several themes in a single table, as most elements are directly related to Hellenic daily life. Another caveat has to do with meteorological phenomena: the Greeks associated these events with gods often associated with the sky, with Mount Olympus (the largest Greek mountain and home of the main celestial gods). Thus, even though in contemporary times there are different sciences to deal with Astronomy and Climatology, it is necessary to include such events in the cataloging made here; otherwise, the research would present anachronistic and incomplete results.

While considering the Sun and the Moon, it is noted that the Greeks had different deities for their representation and coordination of the phenomena involving these celestial bodies. This happens for several reasons. Regarding the Moon, the Hellenes associated it with femininity, which is why only goddesses had it as an epithet. However, each of them was associated with a specific phase of the Moon and had personalities that sometimes referred to the clarity and beauty of the Moon (Titanide Phoebe),

TABLE 1 General Stars of the Solar Systems and their myths according to Hellenism.

Freq.	Astro/phenomenon	Myth(s)	Theme	Category
1	World creation	Myth of creation (primordial gods)	Solar System	1
2	Sun	The birth and life of Helios	Solar System	1
		History of Apollo as goddess of the Moon		
3	Moon	The birth of Selene	Solar System	1
		History of Artemis as goddess of the Moon		
		History of Phoebe as goddess of the Moon		
		History of Hecate as goddess of the Moon		
1	Earth (planet)	Goddess Gaia	Planets	1
2	Mercury	God Hermes	Planets	1
3	Venus	Goddess Aphrodite	Planets	1
4	Mars	Goddess Ares	Planets	1
5	Jupiter	God Zeus	Planets	1
6	Saturn	Titan Cronos	Planets	1
7	Uranus	Primordial God Uranus	Planets	2
1	Eris	Goddess Eris	Dwarf planet	2
1	The Night	Primordial Goddess Nyx	Celestial phenomena	1
2	The Day (Daytime)	Primordial Goddess Hemera	Celestial phenomena	1
3	The Dawn	Goddess Eos	Celestial phenomena	1
4	Sunset (twilight)	Hesperides	Celestial phenomena	1
5	Darkness	Primordial God Erebus	Celestial phenomena	1
6	Seasons of the year	Rape of Persephone	Celestial phenomena	1
7	Rainbow	Goddess Íris	Celestial phenomena	1
8	Rain	Nephele	Celestial phenomena	1
9	Neve	Chione (Daughter of Boreas)	Celestial phenomena	1
10	Wings	Aelous	Celestial phenomena	1
		Boreas		
		Zephyrus		
		Notus		
		Eurus		

Source: prepared by the authors.

sometimes with dark aspects of the night and magic (goddess Hecate), sometimes with the life wild, considering that in Eras, not too distant from Antiquity, the individuals hunted during the nights of the Full Moon (Artemis).

Conversely, the Sun was identified with masculinity, having as its main associated deity the god Apollo, who brings the counterpart of the dark side of the night and is also the god of truth and medicine. This denotes a clear evolutionary character that has perpetuated itself in the collective unconscious of several civilizations, associating darkness as something bad, and light (day) as something that calms and invigorates. In addition to Apollo, Helios is also on the spectrum of solar deities; however, he would be the Sun himself, the personification (humanization) of a natural component. The same occurs with the goddess Selene, who is the personification of the Moon. Still regarding solar deities, to a certain degree, the primordial goddess Hemera is referred to as the goddess of the day, but never as the goddess of the Sun, highlighting the masculine character that the star assumed for the Greeks. Therefore, it was not described for this theme, but rather for the phenomenon of day and night.

The anthropomorphic character of nature is a characteristic feature of Hellenic culture. While the Egyptians and Indians, for example, often represented their deities as animalized humans, the Greeks went in another direction. Since Greek aesthetics mostly valued human traits, nature was represented with human attributes, given that it was understood as a sacred and beautiful element. In this sense, it can be inferred that polytheistic civilizations tend to maintain a relationship with nature ideologically based on coexistence and mutual dependence, as they see themselves and the sacred in the natural, as also happens with most African and Amerindian peoples (Krenak, 2020a,b, 2022; Kopenawa and Albert, 2015, 2023).

Based on the International Astronomical Union (2018), in visible sky (naked eye), there are 88 constellations scientifically cataloged. The influence of Eurocentric sciences in the process of delimiting these data is notable since, among other cultures, the number of constellations, their format, and their location are different. This element denotes, as stated by Freire (2021a,b,c,d, 2022a,b,c,d,e), Freire and Faundez (2021), and Freire and Macedo (2023), the historical and social character that science possesses, implying its cultural dimension. There is no pure science as an element separate from culture, as well as critical aspects of racial and gender perspectives (Hooks, 2017; Gonzalez, 2020). In this sense, Astronomy (like other Eurocentric sciences) is defined as a hegemonic science.

Many of the famous constellations cataloged today were described by the Greeks or incorporated into their culture since Classical Antiquity. This is because the Greeks were not a single people as modern Western thought often describes them. Hellas was a territory with different policies, organizations, societies, and cultures, although unity can be seen in diversity (Freire, 2021d; Freire and Faundez, 2021). Furthermore, as a civilization on the coast of the Mediterranean Sea, they had contact with other societies, such as the Phoenicians, Persians, and Egyptians, some of them started much before the Greeks. It is worth noting that the Egyptians, for example, considered Ra as the god of the Sun and had such a sophisticated knowledge of its movement in the sky that several constructions, including the pyramids and tunnels, had precise alignments with periods of solstice and equinox. Therefore, there were several cultural interactions in ancient times, which must be considered while looking at the Hellenic legacy. Table 2 shows the constellations present in Greek culture and their respective myths.[10]

In Ptolemy's *Almagest* (Ptolomeu, 1998), he cataloged 48 constellations that were present in Greek culture. However, four of the constellations apparently did not have a mythological connotation in the sense of establishing any narrative that explained their emergence or any relationship with the Hellenistic religion, at least not in the available literature that persisted over time. In contrast, the constellation Equuleus does not have a clear origin in Greek culture. It may have been defined based on a mythological interpretation, but, due to uncertainty regarding the topic, we opted to include it in the elements that are related to Greek Astromythology, apart from its imprecise origin.

An important factor to be considered in these types of historical research has to do with temporal distance and the loss of information throughout history. As much as historical documents help the knowledge of ancient cultures, much is lost over the centuries, both due to historical processes such as loss of documents, and due to intentional erasure, as often occurred during periods marked by some type of intolerance, such as the burning of the Alexandria library, the Middle Ages in general and dictatorial periods.

All the elements present in Table 2 that refer to the constellations are category 1. This means that all the constellations listed there were common to Greek culture, to their everyday life, and, hence, they were the target of mythical-religious explanations. Thus, almost all the constellations known by the Greeks were subject to interpretation, highlighting the importance that Hellenic culture gave to the most varied details of objective reality. A curious factor to be observed is that most of the myths involving the formation of constellations bring with them the relationship between gods and human beings, whether the events involve demigods and heroes, or the affective-sexual relationships between gods and mortals.

In contrast, the elements presented below in Table 3 belong to category 2, i.e., they were unknown to the Greeks during antiquity but were named based on Greek culture, with names coming from the Hellenistic religion. This lack of knowledge is explained by the fact that Table 3 presents some natural satellites of the Solar System that, with the naked eye, cannot be observed. Therefore, as there was no instrument capable of expanding human perception, it was not possible for the Greek conceptual field to fall on these bodies.

As already discussed, natural satellites (except for the Moon) were not known to the Greeks. Therefore, after their existence was confirmed much later by Galileo and modern Astronomy, a wide range of them were named after characters from Greek culture. The names chosen were not at random; most of them are related to the planet around which they orbit, in the mythological sense

10 Table 2 and its subsequent tables were prepared based on literature review rather than by conducting surveys or questionnaire. The main objective here is to provide a critical qualitative discussion, as a conceptual analysis, rather than a quantitative assessment using statistical tools.

10.3389/feduc.2025.1431336

TABLE 2 Constellations and their myths, according to Hellenism.

Freq.	Constellation	Myth(s)	Theme	Category
1	Aries	The Golden Fleece	Constellations of the Ecliptic	1
2	Taurus	The kidnapping of Europe	Constellations of the Ecliptic	1
3	Gemini	Castor and Pollux	Constellations of the Ecliptic	1
4	Cancer	The Pursuit of Hercules by Hera	Constellations of the Ecliptic	1
5	Leo	The Nemean Lion	Constellations of the Ecliptic	1
6	Virgo	Goddess Astreia	Constellations of the Ecliptic	1
7	Libra	Goddess Astreia	Constellations of the Ecliptic	1
8	Scorpius	Orion's death	Constellations of the Ecliptic	1
9	Ophiuchus	The death of Aesculapius	Constellations of the Ecliptic	1
10	Sagittarius	Centaur Chiron	Constellations of the Ecliptic	1
11	Capricornus	Aegipan	Constellations of the Ecliptic	1
		God Pan		
12	Aquarius	The kidnapping of Ganimedes	Constellations of the Ecliptic	1
13	Pisces	Aphrodite and Eros during the Attack of Typhon	Constellations of the Ecliptic	1
		Poseidon and Amphitrite		
14	Andromeda	Princess of Ethiopia	Constellations	1
15	Aquila	The eagle of Zeus	Constellations	1
16	Ara	Place of union between the gods of Olympus before the events of the Titanomachy	Constellations	1
17	Argus (divided by Lacaille in 1756 into Carina, Puppis and Vela)	Argus (the ship of the Argonauts)	Constellations	1
18	Auriga	Melissa and Amaltheia (Zeus' childhood)	Constellations	1
19	Boötes	Demeter's son	Constellations	1
		Arcade and Arcturus		
20	Canis Major	Orion's dog	Constellations	1
		Laelaps		
21	Canis Minor	Orion's dog	Constellations	1
22	Cassiopeia	Queen of Ethiopia	Constellations	1
23	Centaurus	The death of Chiron	Constellations	1
24	Cepheus	King of Ethiopia	Constellations	1
25	Ceto	Andromeda in chains	Constellations	1
26	Corona Australis	Birth of Dionysus and death of Semele	Constellations	1
27	Corona Borealis	Ariadne's Diadem	Constellations	1
28	Corvus	Apollo's raven	Constellations	1
29	Crater	Apollo's cup	Constellations	1
30	Cygnus	Birth of Helen of Troy	Constellations	1
31	Delphinus	Arion	Constellations	1
		The marriage of Poseidon		
32	Draco	Ladon and the Garden of the Hesperides	Constellations	1
		The Colchian Dragon		
33	Equuleus	uncertain	Constellations	1
34	Eridanus	River-god (from the physical world or the underworld, depending on the version)	Constellations	1

(Continued)

TABLE 2 (Continued)

Freq.	Constellation	Myth(s)	Theme	Category
35	Hercules	Death of Hercules	Constellations	1
36	Hydra	Labors of Hercules	Constellations	1
37	Lyra	Death of Orpheus	Constellations	
38	Orion	Death of Orion	Constellations	1
39	Pegasus	Myth of Bellerophon	Constellations	1
40	Perseus	Demigod hero son of Zeus	Constellations	1
41	Sagitta	Death of Zeus' Cyclops	Constellations	1
		Death of the Eagle that punished Prometheus		
		Arrow Shot by Eros to make Zeus fall in love with the young Ganymede		
42	Serpens	Myth of Aesculapius	Constellations	1
43	Ursa Major	Death of Callisto	Constellations	1
44	Ursa Minor	Death of Arcas	Constellations	1
		Nymph Ida		

Source: prepared by the authors.

of the statement. The Greeks knew the planets up to Saturn, and before the Roman conquest of Hellas, they named the planets after the names of their gods, for instance: Mercury—Hermes; Venus—Aphrodite; Earth (*Terra*, in Latin) —Gaia; Mars—Ares; Jupiter—Zeus; Saturn—Cronus. In this sense, the natural satellites that orbit Jupiter were named after characters related to Zeus in Greek mythology, most of which are the names of the god's lovers or his children.[11]

Something similar occurs with the nomenclature of other natural satellites, which are mostly named after the god related to the planet around which they revolve. While the satellites of Saturn (Cronus) are composed of names of Titans, Titanides, or older gods in the chronological line of Greek cosmogony, the satellite names of Neptune (syncretically and anachronistically, Poseidon) are marine deities. However, the satellite names of Pluto, which also syncretically and anachronistically can be identified with Hades, are chthonic deities, i.e., inhabitants of the Greek underworld and monsters that originate from this place.

The names given to the planets are also full of meaning, not just a tribute to the gods of Greek culture. Mercury, seen from Earth, is the planet whose celestial journey takes place the fastest; in fact, considering that it is the closest planet to the Sun, its translation period is the shortest among the planets (moving "stars"). Therefore, the Greeks chose to name it Hermes, as he is one of the fastest deities in Greek mythology, being sometimes associated with the god of speed, among other attributes. Hermes is regarded as the messenger of the gods and the "harvester" of souls from the dead to assist them in their passage to Hades.

Venus is the brightest object in the sky after the Sun and the Moon. Its orange glow was associated with the heat caused in men by the stunning beauty of the goddess Aphrodite, and, therefore, it was named after her. Mars, with its reddish color, caused the Greeks to associate it with Ares, the god of war who sometimes provokes conflicts to satisfy his sadistic desire for blood. Jupiter, being the largest of the planets, was associated with the supreme god of the Greek pantheon, in this case, Zeus. Finally, Saturn was the planet whose celestial journey was slower and, therefore, was named after the Titan of time, Cronus.

Uranus was discovered millennia after the sunset of ancient Greek culture, and it was named after the primordial Greek god of the sky. As a curious fact, Uranus is the only planet in the Solar System with an inclination of almost 90°, causing its rotation to be in a downward-upward direction as if pointing toward the sky. At the end of the Solar System, there are Neptune and Pluto (dwarf planet); they were not named with Greek names but through syncretism. Neptune is associated with Poseidon, receiving this name due to the color of the planet that refers to the ocean, whereas Pluto is with Hades, due to its location in the confines of the Solar system.

These historical, epistemological, and etymological relationships between contemporary Astronomy and Greek culture represent a range of narratives or even curiosities capable of enriching teaching work in Astronomy Education. It is argued here that interdisciplinarity with the interfaces "culture" and "religion" favors the acquisition of scientific knowledge in addition to enabling the cultural and historical development of students (Strapasson et al., 2022; Ferreira et al., 2023).

For this argument, we resort to the constructivist epistemology that guides studies in scientific education, supported by epistemologists such as Kuhn (2018), Feyerabend (2011), Bachelard (1996), as well as theorists in the field of psychology such as Piaget (2012), Piaget and Garcia (2011), and Vergnaud (2011).

11 In Greek mythology, Zeus had numerous extramarital relationships, even when married, having been married three times. His relationships included gods and mortals, men and women, resulting in divine offspring or heroes and demigods.

10.3389/feduc.2025.1431336

TABLE 3 Natural satellites of the solar system and the myths, according to Hellenism.

Freq.	Natural satellite	Planet of revolution	Myth	Category
1	Phoebus	Mars	God of fear, son of Ares	2
2	Deimos	Mars	God of terror, son of Ares	2
3	Io	Jupiter	Zeus' extra-marital relationship	2
4	Europa	Jupiter	Zeus' extra-marital relationship	2
5	Ganymede	Jupiter	Zeus' extra-marital relationship	2
6	Calisto	Jupiter	Zeus' extra-marital relationship	2
7	Amalthea	Jupiter	Goat or nymph responsible for breastfeeding the newborn Zeus	2
8	Himalia	Jupiter	Zeus' extra-marital relationship	2
9	Elara	Jupiter	Zeus' extra-marital relationship	2
10	Pasiphae	Jupiter	Helio's son	2
11	Sinope	Jupiter	Mortal who refused Zeus' flirtation	2
12	Carme	Jupiter	Companion of Artemis	2
13	Ananke	Jupiter	Primordial Goddess Personification of Fate	2
14	Leda	Jupiter	Zeus' extra-marital relationship	2
15	Adrastea	Jupiter	Nymph responsible for nurturing Zeus during his childhood	2
16	Metis	Jupiter	Goddess of prudence, mother of Athena, first wife of Zeus	2
17	Callirrhoe	Jupiter	Daughter of river god Achelous	2
18	Themisto	Jupiter	Athames' wife	2
19	Megaclite	Jupiter	Mortal daughter of Macareus	2
20	Taygete	Jupiter	One of the Pleiades	2
21	Caldene	Jupiter	Zeus' extra-marital relationship	2
22	Calique	Jupiter	Poseidon' extra-marital relationship	2
23	Iocasta	Jupiter	Jocasta, mother of Oedipus	2
24	Eurynome	Jupiter	Eurydome, Oceanids	2
25	Isonoe	Jupiter	Zeus' extra-marital relationship	2
26	Autonoe	Jupiter	Mortal daughter of Cadmus	2
27	Thyone	Jupiter	Semele	2
28	Eurydome	Jupiter	Eurynome (nomenclature variation)	2
29	Euanthe	Jupiter	Antaeus	2
30	Euporie	Jupiter	One of the Hours, daughters of Zeus	2
31	Orthosis	Jupiter	One of the Hours, daughters of Zeus	2
32	Sponde	Jupiter	One of the Hours, daughters of Zeus	2
33	Carpo	Jupiter	One of the Hours, daughters of Zeus	
34	Kale	Jupiter	One of the Graces, daughter of Zeus	2
35	Pasiphae	Jupiter	One of the Graces, daughter of Zeus	2
36	Hegemone	Jupiter	One of the Graces, daughter of Zeus	2
37	Mneme	Jupiter	One of the Graces, daughter of Zeus	2
38	Aoede	Jupiter	One of the Graces, daughter of Zeus	2
39	Eukelade	Jupiter	One of the Graces, daughter of Zeus	2
40	Arche	Jupiter	One of the Graces, daughter of Zeus	2

(Continued)

10.3389/feduc.2025.1431336

TABLE 3 (Continued)

Freq.	Natural satellite	Planet of revolution	Myth	Category
41	Kallichore	Jupiter	Nymph	2
42	Cyllene	Jupiter	Naiad (river nymph)	2
43	Kore	Jupiter	Another name for the goddess Persephone, daughter of Zeus	2
44	Herse	Jupiter	Ersa, goddess daughter of Zeus	2
45	Mimas	Saturn	Titan killed by Zeus	2
46	Enceladus	Saturn	Giant brother of the Titans	2
47	Tethys	Saturn	Titanide	2
48	Dione	Saturn	Zeus' extra-marital relationship	2
49	Rhea	Saturn	Titanide of Fertility Daughter of Cronus	2
50	Titan	Saturn	Sons of de Uranus and Gaia	2
51	Hyperion	Saturn	Titan of light	2
52	Phoebe	Saturn	Titanide of the Moon	2
53	Epimetheus	Saturn	Titan who created humans and animals	2
54	Helen	Saturn	Helen of Troy (granddaughter of Cronus)	2
55	Telesto	Saturn	Oceanide (Cronus' niece)	2
56	Calypso	Saturn	Oceanide (Cronus' niece)	2
57	Atlas	Saturn	Titan of resistance	2
58	Prometheus	Saturn	Titan who stole the fire	2
59	Pandora	Saturn	First mortal woman	2
60	Pan	Saturn	God Satyr	2
61	Daphne	Saturn	Nymph	2
62	Polydeuces	Saturn	Another name for Pollux	2
63	Aegaeon	Saturn	One of the Hekatons (brothers of the Titans)	2
64	Cressida	Uranus	Trojan woman	2
65	Triton	Neptune	Marine god son of Poseidon	2
66	Nereid	Neptune	Name of the sea nymph daughters of Nereus (primordial god of the sea)	2
67	Naiad	Neptune	Freshwater nymphs	2
68	Thalassa	Neptune	Primordial Goddess of the Sea	2
69	Despina	Neptune	Goddess of winter, daughter of Poseidon	2
70	Galatea	Neptune	Sea nymph daughter of Nereus	2
71	Larissa	Neptune	Poseidon' extra-marital relationship	2
72	Proteus	Neptune	Sea god, charioteer of Poseidon	2
73	Neso	Neptune	Goddess of the islands	2
74	Kharon	Pluto	Boatman of Hades	2
75	Nix	Pluto	Primordial Goddess of the Night	2
76	Hydra	Pluto	Multi-headed serpentine monster	2
77	Cerberus	Pluto	Three-headed dog that lives in Hades	2
78	Stix	Pluto	River of the underworld	2
79	Dysnomia	Eris	Daemon (spirit) of civic disorder	2

Source: prepared by the authors.

Since scientific knowledge is historically constructed (Kuhn, 2018; Freire, 2022a; Fonseca, 2022) and acquired by subsequent generations through paradigms that structure scientific thought and practice as axioms necessary for progress, construction within the scope of the subjective reality of such concepts can only happen with the development of formal thinking (Piaget, 2012; Pozo and Crespo, 2009). In this sense, considering human cognition as a relational system (Piaget, 2012; Vergnaud, 2011), the quality of teaching resources and strategies that enable students to create meaningful connections enables more contextualized, dynamic knowledge, which goes beyond mere memoristic teaching with the purpose of application in exams.

Thus, highlighting the historicity of scientific knowledge and the valorization of non-scientific knowledge, such as cultural and religious, can be a starting point for raising awareness about the nature of science, so that history, epistemology, ontology, and conceptualization are intentionally interconnected in teacher's work (Freire, 2022a,e; Pozo and Crespo, 2009; Fonseca, 2022). As already mentioned, the possibilities involving this interdisciplinarity go beyond the limits of the nature of scientific knowledge, bringing with them relevant cultural aspects, which infer about the religion of a people, but about the etymology of scientific terms.

One of the main problems for the acquisition of scientific knowledge by schoolchildren, and even by undergraduate and postgraduate students, refers to scientific terminologies that are outside their daily lives. In this sense, the considerations presented here can be extrapolated to other fields of science, with the necessary adaptations and contexts. This is due to the inseparable relationship between science and its history; therefore, between science and Greek culture, as in fields such as Biology, Chemistry, and Astronomy, the terminologies used are mainly of Greek and Latin origins, in addition to other different cultures worldwide.

Thus, using Greek culture (among other cultural references) as one of the interdisciplinary and intercultural elements of Science Education allows students to understand the reasons that led to the choice of certain scientific terms in Western culture. Hence, cognitively, the terms can be better understood and associated with a structuring narrative. It becomes evident the conceptual field developed in the act of learning, in which the elements trace together a complex system just like objective reality (Morin, 2007). In Figure 2, the relationships discussed so far are presented. It illustrates the relationship among several concepts as a simple schematic representation of the complexity involved, rather than as a flow of information.

Still on the Greek myths, Table 4 shows the stars, exoplanets, galaxies, and nebulae that were honored with names from Greek mythology. The elements only include stars that were honored with names that refer to the mythology since all the celestial bodies mentioned are from outside the Solar System and, therefore, are difficult to catalog without the assistance of telescopes.

In summary of the previous tables, Table 5 shows the frequency and distribution of the items found in the assessed literature within each theme, making a numerical visualization and overview of the findings.

The findings made from our bibliographical research clearly pointed to a diversity of themes within Astronomy that have their roots in Greek Astromythology, resulting in 174 items in total. It is observed that most stars and phenomena (about 63%) that are related to Greek Astromythology belong to category 2, which means that they were tributes attributed to Greek culture. Approximately 36% of the assessed bodies correspond to elements belonging to the daily life of the Hellenic people. This shows that, although the Greeks cataloged several stars and thought about different aspects involving Astronomy, their impact continues to

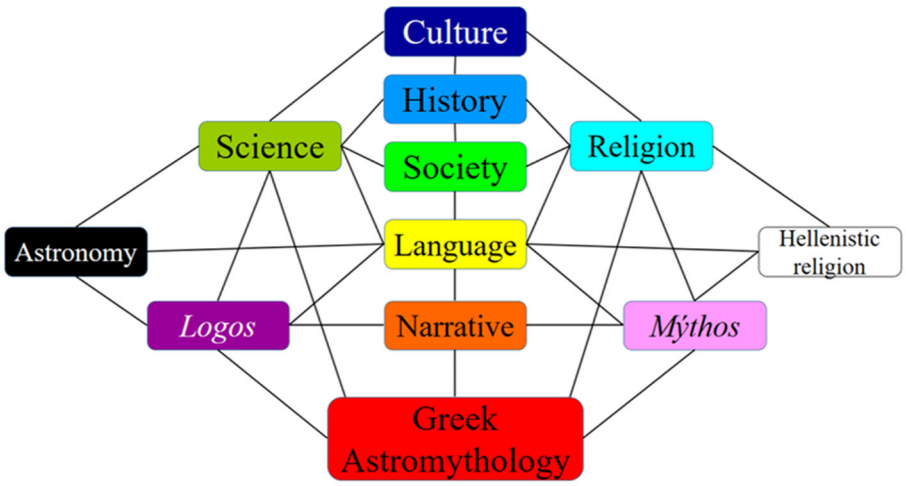

FIGURE 2
Complex interlinkages in Astronomy Education, with the use of Greek Astromythology. This is an illustrative representation. Lines indicate a dialectical and dialogic relationship, rather than flows or causality. The centralized elements are the main inducing terms that make it possible to understand the others until reaching "Astromythology". On the left side, there are elements of "Science" in its modern/contemporary conception, whereas on the right side, there are elements related to the notion of religion or myth. Source: prepared by the authors.

TABLE 4 Distance astronomical bodies and their myths of reference, according to Hellenism.

Freq.	Astro	Theme	Localization	Myth	Category
1	Pollux	Stars	Gemini	Myth of Castor and Pollux	2
2	Castor	Stars	Gemini	Myth of Castor and Pollux	2
3	Pleione	Stars	Taurus (Pleiades)	Myth of the Pleiades	2
4	Taygeta	Stars	Taurus (Pleiades)	Myth of the Pleiades	2
5	Alcyone	Stars	Taurus (Pleiades)	Myth of the Pleiades	2
6	Asterope	Stars	Taurus (Pleiades)	Myth of the Pleiades	2
7	Electra	Stars	Taurus (Pleiades)	Myth of the Pleiades	2
8	Atlas	Stars	Taurus (Pleiades)	Titan	2
9	Celaeno	Stars	Taurus (Pleiades)	Myth of the Pleiades	2
10	Maia	Stars	Taurus (Pleiades)	Myth of the Pleiades	2
11	Merope	Stars	Taurus (Pleiades)	Myth of the Pleiades	2
12	Phlegethon	Stars	Virgo	River of the Underworld	2
13	Canopus	Stars	Carina	Pilot of Menelaus' ship at the siege of Troy	2
14	Antares	Stars	Scorpius	Named after the god Ares	2
15	Lerna	Stars	Hydra	The place where the Hydra monster lived	2
16	Musica	Stars	Delphinus	Myth of the Greek musician Arion	2
17	Sirius	Stars	Canis Majors	Orion's dog	2
1	Arion	Exoplanets	18 Delphini	Myth of Arion	2
2	Arkas	Exoplanets	41 Lyncis	Myth of Arcas and Calisto	2
3	Thestias	Exoplanets	Pollux	Son of Ares	2
4	Phobetor	Exoplanets	PSR B1257+12 (Lich)	God of nightmares	2
5	Iolaus	Exoplanets	HAT-P-42_(Lerna)	Hercules' nephew	2
6	Lete	Exoplanets	HD 102195_(Flegetonte)	River of oblivion	2
1	The Milky Way	Galaxies		Myth of Hercules	1
2	Andromeda Galaxy	Galaxies		Myth of Andromeda	2
3	Centaurus A	Galaxies		Greek mythological creature	2
4	Canis Majors Dwarf Galaxy	Galaxies		Relation to the origin of the constellation of the Canis Majors	2
1	Andromeda Nebula	Nebulae		Myth of Andromeda	2
2	Eagle Nebula	Nebulae		The animal symbol of Zeus	2
3	Orion Nebula	Nebulae		Myth of the giant Orion	2

Source: prepared by the authors.

resonate in contemporary times,[12] making it important to think about this science also considering its historical and cultural aspect, which refers directly to the Greeks, particularly in Western culture, among other cultures worldwide.

This importance, however, should not be understood as a centralizing aspect of research in the field of Astronomy, Astromythology, or Astronomy Education. As stated at the beginning of this article, science is, in essence, a sociocultural construct. It receives different contributions in each cultural context, as already emphasized, in the field of mythosciences. This assessment is not exhaustive, and further analyses are encouraged, looking at the perspective of other mythologies in different regions globally, for instance, the Astromythology of Brazilian indigenous people, the Aztecs and Mayans in Central America, among other examples.

4 Final considerations

Through the assessed bibliographical research, it was possible to find a range of Greek myths related to Astronomy, so-called Greek Astromythology. If critically used within the teaching and learning process, this can provide a relevant contribution to Modern Astronomy Education, particularly in school environments. The

12 Or other times, such as the beliefs in the centrality of the Sun, exposed by Kepler in a previous quote.

TABLE 5 Quantification of the described phenomena in Greek Astromythology.

Category	Theme	Frequency (quantity)	Percentage by category	Percentage of total	Total
1	Solar System	3	4.69%	1.71%	64 (100%) (36.78% of the total)
	Planets	6	9.38%	3.45%	
	Celestial phenomena	10	15.63%	5.75%	
	Constellations	44	68.75%	25.29%	
	Galaxies	1	1.56%	0.57%	
2	Planets	1	0.91%	0.57%	110 (100%) (63.22% of the total)
	Dwarf planets	1	0.91%	0.57%	
	Natural Satellites	79	71.82%	45.40%	
	Stars	17	15.45%	9.77%	
	Exoplanets	6	5.45%	3.45%	
	Galaxies	3	2.73%	1.71%	
	Nebulae	3	2.73%	1.71%	
Total	10 themes	174	–	–	174 (100%)

This table is not intended to provide a statistical relationship but to illustrate the variations of categories.
Source: prepared by the authors.

historical, social and cultural aspects, as well as the epistemological, ontological and conceptual bases will depend on the teaching intentionality. However, it is important that the relationship between mythology history and Astronomy Education follows critical pedagogy epistemologies, in which science should not be neglected but understood as a cultural construction.

The findings show that Greek Astromythology, which addressed several planets to constellations, can help scientific literacy and the teaching of planetary Astronomy, commonly developed in primary and secondary schools. At this age, between 9 and 14 years old, mythological stories can be used to understand the basic terminologies of Astronomy, in addition to representing a resource to captivate the attention of the students. Parallel references to local mythologies where the students live are also encouraged. It is evident in the results how the Greeks associated different deities with celestial phenomena, as well as the divine tasks that triggered natural processes. Something characteristic of polytheistic religions is the association between nature and its deities, making the human being a contemplator of the beauty of the Cosmos, as one of the diversities that make up unity.

We hope that this study on mythosciences may encourage other possible works from researchers critically interested in the relationships between culture, science, and religion. It is important to emphasize that the magical-religious character of the interpretations of mythosciences are not here considered as epistemologically or methodologically formulated, something necessary for science. However, epistemological curiosity can transcend common sense and develop knowledge increasingly compatible with the current notion of objectivity, which does not mean that the cultures of countless human societies cannot compose a unitary shared knowledge that integrates human narratives with a methodologically consistent science.

Finally, in addition to Greek mythology, we recommend for further research the use of comparative epistemologies for Astronomy teaching and learning at the school level, which is important to think from a local perspective in different regions worldwide, aligned with the decolonial approach. This is essential for the construction of a science that does not belittle the knowledge that comes from the mythos but also enables the reaffirmation of counter-hegemonic knowledge, whose possibilities are not limited to the reproduction of knowledge in the Global North. This study is already a step away from the delusional rationalization of contemporary science, and it is hoped that future studies based on mythosciences will also be reaffirmations of the epistemologies of the South, although not ignoring the key contributions made by the Hellenic civilization to the development of Astronomy science as here addressed. Moreover, quantitative studies based on statistical methods, for instance, using surveys with students and lecturers, may provide further evidence to the qualitative discussions here presented.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: https://www.periodicos.capes.gov.br/.

Author contributions

MF: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. MO: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. MB: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Writing –

original draft, Writing – review & editing. OS: Data curation, Formal analysis, Investigation, Supervision, Writing – review & editing. AS: Funding acquisition, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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