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MISCONCEPTIONS OF THE SCIENCE EDUCATION FRESHMEN STUDENTS TOWARDS ASTRONOMY

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ABSTRACT

Learning astronomy poses challenges for learners, often resulting in misconceptions that hinder scientific progress and comprehension. This study is a descriptive-survey research that aimed to identify common misconceptions among Teacher Education Science freshmen students in Astronomy. The study involved 37 students from a college of teacher education in a state university in the Philippines. The researchers used an assessment test with 40 items to gather data on three different areas of astronomy: planets, stars, and asteroid, meteors, and comets. The test was validated by experts in science education and professional education. Based from the findings, it revealed that students struggle with understanding key concepts in astronomy, particularly related to planets, stars, comets, asteroids, and meteors. They have moderate misconceptions about planets and stars, but high misconceptions about comets, asteroids, and meteors. This highlights the need for targeted interventions and improved science education to address these misconceptions and improve students' understanding of astronomy.

INTRODUCTION

Astronomy, as one of the earliest scientific disciplines, revolves around the exploration of celestial bodies and the broader universe. Since ancient times, the study of astronomy has significantly contributed to our scientific understanding and global perspective (Petersen, 2019). Despite its importance, learning astronomy poses challenges for learners, often resulting in misconceptions that hinder scientific progress and comprehension.

Misconceptions within the field of astronomy have been highlighted as significant obstacles to effective scientific education (Rogayan & Albino, 2021). Correcting these misconceptions not only promotes a deeper understanding of the subject but also cultivates curiosity and a scientific mindset among students. This issue is particularly pertinent in the Philippines, where elementary science reference materials have been observed to contain errors and misconceptions (Raymundo, 2008).

Numerous studies underscore the prevalence of misconceptions among students studying astronomy. For instance, Canlas (2013) discovered that university students exhibit varied conceptions of astronomical phenomena but struggle to explain everyday occurrences, indicating substantial knowledge gaps and misconceptions in their understanding. Similarly, Serttas and Turkolu (2020) emphasized the persistence of these misconceptions. Trumper (2000) also noted that students historically harbored misconceptions and possessed limited knowledge of fundamental astronomy concepts, such as moon phases, eclipses, comet

appearances, and constellations. Consequently, learning astronomy poses considerable challenges, necessitating diverse and creative instructional approaches (Dantic, 2021).

In the context of higher education, astronomy is typically offered as a three-unit major subject course within teacher education program. This study focuses on freshmen students enrolled in such a course at a state university in Zambales, Philippines. Understanding the nature and prevalence of misconceptions among these students is vital for developing targeted interventions to enhance astronomy education and foster a more accurate understanding of the universe.

This research aims to investigate and address the misconceptions held by science education freshmen towards astronomy, recognizing the importance of accurate scientific knowledge and the challenges posed by prevalent misunderstandings within this critical field of study.

METHODS

This study is descriptive-survey research that used a assessment test as a primary data gathering tool. The study described the common misconception of Teacher Education Science freshmen students in Astronomy along three different areas – planets, stars, and asteroid, meteors, and comets. The study involved 37 freshmen science students from college of teacher education in a state university from Zambales, Philippines. Total population sampling was employed. The assessment test was validated by science education and professional education specialist. The instrument is composed of 40 in the different areas of astronomy which includes planets (15 items), stars (15 items), and asteroid, meteors, and comets (10 items). The researcher employed descriptive statistics which include mean and percent to analyze the data. The percent of misconception (MC) is analyzed using the percent analysis (Table 1).

Table 1. Interpretation of Percent Misconception

Interval	Verbal Description	Symbol
1.00 – 25.49	Low Misconception	LM
25.50 – 50.49	Moderate Misconception	MM
50.50 – 75.49	High Misconception	HM
75.50 – 100.00	Very high Misconception	VHM

Every wrong answer in the question poses a misconception. The total wrong answers in each set are divided into the total number of items (n=10) multiplied by 100. The corresponding percent was referred to the table for analysis.

RESULTS AND DISCUSSION

The study determined the common misconceptions of teacher education freshmen science students in the field of astronomy as a basis for remediation teaching. The results are shown in tables and narratives to show the level of misconceptions of the participants in comprising the three areas.

Misconception in Planets

The table show the misconceptions

Table 2. Shows the percentage of misconceptions in area of planets

Statement	Frequency of Error	% of MC	VD	Rank
1. Which planet has the most moons?	18	**48.64**	**MM**	**7.5**
2. What is the hottest planet in our solar system Mars?	20	**54.05**	HM	6
3. Which planet is the only one in our solar system with a ring system visible from Earth?	7	**18.91**	LM	13
4. What is the largest gas giant in our solar system?	4	**10.81**	LM	15
5. Which of the following planets has a retrograde rotation, meaning it spins in the opposite direction of Earth?	30	**81.08**	VHM	1.5
6. What is the primary component of the atmosphere of Venus?	11	**29.72**	MM	10.5
7. Which of the following planets is known for its Great Red Spot, a giant anticyclonic storm?	9	**24.32**	LM	12
8. Which planets that has the largest moon in our solar system?	11	**29.72**	MM	10.5
9. What is the great dark spot in Neptune?	30	**81.08**	VHM	1.5
10. Which of the following planets has the most moons compared to others?	5	**13.51**	**LM**	14
11. Which planet has the highest surface gravity in our solar system?	18	**48.64**	MM	7.5
12. Which of the following planets has water ice on its surface?	24	**64.86**	HM	4.5
13. Which planet experiences the most extreme temperature variations in our solar system?	28	**75.67**	VHM	3
14. Which of the following planets has the strongest magnetic field?	15	**40.54**	MM	9
15 Which planet has the longest revolution around the sun?	24	**64.86**	HM	4.5
Overall Mean	**23.87**	**64.50**	**MM**	

Table 2 shows the students' level of misconception in the area of planets. As gleaned from the table, students have moderate misconceptions in planets as revealed by the overall percent of the misconception of 45.77%. In particular, students have a very high misconception about which planet has retrograde motion (81.08%), the great dark spot in Neptune (81.08), and the planet that has the most extreme temperature variation (75.67). Further, there are low misconceptions in concepts about only ring planet visible on earth (18.91), largest gas giant (10.81), planet that has Great Red Spot (24.32), and planets that has most moon (13.51).

Table 3. Shows the percentage of misconceptions in area of stars

Statement	Frequency of Error	% of MC	VD	Rank
1. What is the primary fuel source for stars?	11	29.72	MM	15
2. Which star classification is the most common in the Milky Way Galaxy?	30	81.08	VHM	1.5
3. What happens to a star when it runs out of fuel in its core?	26	70.27	HM	6.5
4. What is the difference between a main sequence star and a red giant?	25	68.56	HM	8
5. How huge is the Sun's diameters in miles?	28	75.67	VHM	3.5
6. What is the most common and largest tupes of star?	24	64.86	HM	9.5
7. What is the cause of solar flares?	24	64.86	HM	9.5
8. What is the main difference between supernova and nova?	30	81.08	VHM	1.5
9. What is the closest star, aside from the sun. to Earth at a distance of 38 million kms?	27	72.97	HM	5
10. What are the main components of a star's atmosphere?	22	59.46	HM	11.5
11. Does stars fixed in its axis?	28	75.67	VHM	3.5
12. What is the name of the large, rotating disk of gas and dust surrounding a young star?	18	48.64	MM	13
13. What is the main factor that determines the luminosity of a star?	22	59.46	HM	11.5
14. What is the difference between a binary star system and a multiple star system?	17	45.94	MM	14
15. What is a stellar parallax?	26	70.27	HM	6.5
Overall Mean	**24**	**64.86**	**HM**	

Table 3 shows the students' level of misconception in the area of stars. As presented from the table, students have moderate misconceptions in stars as revealed by the overall percent of the misconception of 64.86%. In particular, students have a very high misconception about most common classification of star in milky way galaxy (81.08%), sun's diameter (75.67%), main difference between nova and supernova (81.08%), does stars fixed in its axis (75.67%). The rest are found to be of moderate misconceptions.

Table 4. Shows the percentage of misconceptions in areas of comets, asteroids and meteors

Statement	Frequency of Error	% of MC	VD	Rank
1. What is the main component of a comet's nucleus?	18	48.64	MM	5
2. What is the process by which a comet releases gas and dust as it approaches the Sun?	11	29.72	MM	9.5
3. What is the largest asteroid in the Asteroid Belt?	28	75.67	VHM	2
4. What is the composition of most asteroids?	22	59.46	HM	3.5
5. What is the main body of the comet called?	15	40.54	MM	7
6. How many tails does comets have?	17	45.94	MM	6
7. What is the phenomena where the space rock falls towards earth?	13	35.13	MM	8
8. When the first asteroid named Ceres discovered?	33	89.18	VHM	1
9. What is the role of space agencies like NASA in studying comets, asteroids, and meteors?	11	29.72	MM	9.5
10. What are the small rocky, objects that orbits the sun?	22	59.45	HM	3.5
Overall Mean	19	51.35	HM	

Table 4 shows the students' level of misconception in the areas of comets, asteroids, and meteors. As presented from the table, students have high misconceptions in comets, asteroids, and meteors as revealed by the overall percent of the misconception of 51.35%. In particular, students have a very high misconception about the largest asteroid in asteroid belt (75.67%), and discovery of asteroid Ceres (89.18), The rest are found to be of moderate misconceptions.

CONCLUSION

In conclusion, the analysis of students' misconceptions in astronomy topics reveals that they face challenges in understanding key concepts related to planets, stars, comets, asteroids, and meteors. Students exhibit moderate levels of misconception in planets and stars, with notable misconceptions in specific areas. However, in the realm of comets, asteroids, and meteors, students display notably high misconceptions. These findings highlight the need for targeted interventions and improved science education to address these misconceptions and enhance students' understanding of astronomical concepts.

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