

# A Study of Interest in Astronomy Among University Students in Malaysia

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## Abstract

The misconception related to astronomy is fretfully rising in society. This study aims to investigate, (i) level of misconception towards astronomy among university students, (ii) significant difference in students' interest towards astronomy between male and female, (iii) significant difference between science and non-science students' level of knowledge in astronomy, (iv) significant relationship between students' faculties and misconception in astronomy, and (v) significant relationship between the educational background of the respondents' parents and their misconceptions towards astronomy. A qualitative approach was implemented using a set of questionnaires for data collection. The respondents were undergraduate students of with different courses and backgrounds from four different faculties: Faculty of Education, Faculty of Pharmacy, Faculty of Art and Design, and Faculty of Business Management. The data were analyzed using Statistical Package for the Social Science (SPSS). Findings showed that there is a significant difference in students' interest towards astronomy between male and female students, there is a significant different between level of knowledge in astronomy and students' major course, there is significant difference between students' faculties and misconception in astronomy, and there is no significant relationship between the educational background of the respondents' parents and their misconception in astronomy. This study benefits society by clarifying phenomena, distinguishing myth from reality. It aids Science teachers in addressing astronomy misconceptions and helps educators curb their spread.

**Keywords:** interest, astronomy, misconception, students

## INTRODUCTION

Misconceptions in the field of astronomy are pervasive and often resistant to change. These misconceptions encompass fundamental concepts, such as the causes of day and night, the position of the Sun in the solar system, the phases of the moon, and the shape of the Earth. These persistent misunderstandings can be attributed to individuals' tendency to rely on analogies from everyday experiences when attempting to comprehend scientific principles. Consequently, simpler concepts are more readily accepted, while complex astronomical phenomena may be met

with confusion. Research has shown that these misconceptions are prevalent not only among students but also among educators worldwide (Furnham & Hughes, 2014).

In the context of Malaysia, previous studies have revealed that a substantial number of students hold misconceptions about the occurrence of day and night, believing it to be caused by the Earth's orbit around the Sun (Plummer, 2015; Plummer, Bower, & Liben, 2016). Students offer various logically reasoned answers based on their own observations when questioned about the presence of the Sun at night. These responses are founded on personal observations

or a misunderstanding of scientific concepts. This situation poses a significant challenge to science education, as these misconceptions can potentially influence others' understanding of astronomical phenomena.

The complexity of the moon's phases, caused by the reflection of sunlight and the moon's orbit around the Earth, further adds to the challenge of dispelling misconceptions (Ali, Shrestha, Osmanaj, & Muhammed, 2021). Research indicates that many students incorrectly believe that the phases of the moon are the result of it being covered by clouds, reflecting yet another misconception among students (Kanli, 2014; Yıldız Tezer, 2022).

Beyond misconceptions related to celestial bodies, a widespread misconception in Malaysia revolves around the shape of the Earth. Despite scientific evidence supporting a spherical Earth and the force of gravity, numerous websites and social media pages propagate the belief in a flat Earth. Students involved in the study exhibit varying beliefs, ranging from a square or disk-shaped Earth to a spherical Earth with a flat North and South Pole (Öztürk & Doganay, 2013; Stocker, 2014). Some students even hold the notion that humans live on a flat surface within the Earth.

When examining differences in abilities and knowledge between males and females, it is essential to exercise caution. While there may be slight average variations in certain cognitive domains, individual differences within each gender often outweigh the average differences between genders (Schmidt, 2014). Societal and cultural factors play a significant role in shaping these variations, and it is important to acknowledge and respect diverse gender identities beyond the binary understanding (Mukti, Yuliskurniawati, Noviyanti, Mahanal, & Zubaidah, 2019). Embracing diversity and providing equal opportunities for all individuals, regardless of gender, are crucial for creating a fair and inclusive society.

In the realm of astronomy education, cultivating students' interest in the subject is of paramount importance. Learning interest in

astronomy refers to students' eagerness and curiosity towards celestial objects, the universe, and its phenomena (De Lima, De Amôres, Santos, & Martin, 2018). Developing a keen interest in astronomy among university students in Malaysia has far-reaching significance, as it fosters scientific engagement, encourages STEM education, inspires research opportunities, facilitates public outreach, and enriches cultural understanding (Toli & Kallery, 2021).

Interest in astronomy plays a pivotal role in effective university-level learning, as it drives intrinsic motivation, enhances attention and focus, deepens understanding, promotes long-term retention, encourages lifelong learning, and stimulates exploration of scientific questions (Farooque, 2020; Leberman & McDonald, 2016). Factors influencing interest include personal curiosity, early exposure to space-related content, inspirational educators and mentors, relevance and applications of astronomy, hands-on activities, a supportive learning environment, cultural and societal influences, and inclusive representation (Russo, 2015; Christensen & Knezek, 2023). By nurturing and sustaining students' fascination with the cosmos, educators can create a more engaged and diverse community, fostering a deeper appreciation and understanding of celestial phenomena and scientific advancements in the field of astronomy.

In light of these observations, the present study aims to investigate several key aspects: (i) level of misconception towards astronomy among university students, (ii) significant difference in students' interest towards astronomy between male and female, (iii) significant difference between science and non-science students' level of knowledge in astronomy, (iv) significant relationship between students' faculties and misconception in astronomy, and (v) significant relationship between the educational background of the respondents' parents and their misconceptions towards astronomy.

By addressing these research objectives, this study endeavors to shed light on the extent of misconceptions in astronomy among university students in Malaysia and explore factors that may

influence their interest in the subject. Ultimately, the findings can inform strategies to enhance astronomy education and promote a more accurate understanding of celestial phenomena among the younger generation.

## METHOD

The study was designed using a quantitative research method to obtain numerical data for hypotheses testing. The quantitative method could be defined as the analysis of numerical data using specific statistical techniques to gather data in numerical form (Treiman, 2014; Apuke, 2017). This study measures the attitudes, practices, concerns, or interests among the respondents. The data were collected through questionnaires, which focus in-depth on the determination of students' misconceptions in astronomy.

This research focuses on the student population of UiTM Puncak Alam, Selangor, with the sample selected carefully aligned with specific research objectives aiming to address misconceptions about astronomy among students. The UiTM Puncak Alam, Selangor has diversity of faculties such as the Faculty of Education, Faculty of Business Management, Faculty of Art and Design, and Faculty of Pharmacy. This diversity in faculties ensures a broader representation of students from different academic backgrounds and interest, making it more likely that the sample reflects the overall diversity of the university student population in Malaysia. A sample of 120 respondents were both Science and non-Science majors from UiTM's designated faculties - Faculty of Education, Faculty of Business Management, Faculty of Art and Design, and Faculty of Pharmacy. To ensure unbiased representation, the researcher adopts the simple random sampling method, providing each potential participant with an equal chance of being selected as a respondent (Oribhabor & Anyanwu, 2019). By upholding principles of rigor and inclusivity, this research endeavors to shed light on prevailing misconceptions about astronomy among UiTM Puncak Alam students.

The research utilizes a structured questionnaire as the primary data collection instrument. The questionnaire was adapted and adopted from (Heale & Twycross, 2015). It was utilizing Likert-scale forms; divided into three sections: section A, section B, and section C. Section A focused on the demographic background of the respondents, including gender, faculty, and major stream. Section B explored students' understanding of astronomy, while section C assessed their knowledge through an astronomy concept survey. The grid items in Section B focus on assessing the participants' understanding of various aspects of astronomy, including basic concepts, knowledge of celestial objects, and their personal interest in the subject. The grid items in Section C focus on assessing the participants' knowledge of specific astronomy concepts.

To ensure the trustworthiness and credibility of this study on identifying misconceptions of astronomy among undergraduate students, two critical aspects, validity and reliability, have been diligently addressed. Validity refers to the accuracy of measuring perceptions in a quantitative study, and for this research, the survey is designed specifically to target astronomy misconceptions, ensuring high validity (Heale & Twycross, 2015). On the other hand, reliability pertains to the consistency of results obtained from the research instrument, which, in this case, is the questionnaire. The study employs Cronbach's Alpha in SPSS to assess the internal reliability of the instrument, with a range of 0 to 1.0. The findings indicate that the questionnaire exhibits a very strong level of reliability, strengthening the study's overall quality and validity.

To complete the study, the following process is required in order to answer the research objectives: The questionnaire were distributed to 120 students from designated faculties, namely the Faculty of Education, Faculty of Pharmacy, Faculty of Business Management, and Faculty of Art and Design at UiTM Puncak Alam, Selangor. This distribution was done through Google Form and a questionnaire booklet. Once the researcher obtains approval, the questionnaires were

randomly distributed among undergraduate students from the designated faculties. The questionnaire was structured, ensuring that no unintended questions unrelated to the research are asked. Each student is given 10 minutes to fill out the questionnaire, after which the researcher collects the completed questionnaires. The collected data is then entered into the Statistical Package for the Social Science Software (SPSS).

The pilot study for the research paper aimed to assess misconceptions of astronomy among undergraduate students at UiTM Puncak Alam, Selangor. The study utilized a quantitative research design, employing a structured questionnaire as the primary data collection instrument. To ensure the questionnaire's efficacy and relevance, a pilot sample of approximately 10-20% of the main study sample was selected, comprising 12-24 students from designated faculties. The modified questionnaire was pre-tested on this pilot sample, and participants were encouraged to provide feedback on its clarity and appropriateness. The data collection process was carefully evaluated to identify any challenges or logistical issues. Additionally, the internal reliability of the questionnaire was assessed using Cronbach's Alpha. The pilot study's findings were summarized and used to refine the questionnaire and research design for the main study. Through this process, the pilot study aimed to enhance the research's overall quality, ensuring a smooth and effective data collection process and providing robust and valid results in the main research endeavor.

The data analysis procedure involved descriptive statistics analysis, independent samples t-test, and analysis of variance (ANOVA) in the SPSS.

## RESULT AND DISCUSSION

### Analysis of level of misconception towards astronomy among university students

To assess the prevalence of misconceptions in astronomy among students, a Likert-scale item was employed by the

researchers. The inclusion of response options such as "strongly disagree," "disagree," "not sure," "agree," and "strongly agree" played a crucial role in the study, enhancing the accuracy of students' perceptions regarding the concept. The response categories "strongly agree" and "agree" signify that students consider the statement to be correct, while "strongly disagree" and "disagree" indicate that students perceive the statement as incorrect. This approach contributed significantly to capturing the students' perspectives accurately.

#### (i) The earth

Item 1 aimed to assess students' fundamental knowledge of Earth, specifically its size. As the Sun is the largest object in the solar system, the statement provided is deemed false. The findings indicate that 45% (n=54) of students strongly disagree with the statement, followed by 24.2% (n=29) who simply disagree. Additionally, 19.2% (n=23) of students responded with uncertainty, selecting the "not sure" option. Thus, the majority response to the initial statement strongly disagrees with the notion that Earth is the largest object in the solar system.

Item 2 aims to gauge students' beliefs regarding the shape of the Earth, which is known to be spherical. Consequently, the given statement is false. It is observed that 58.3% (n=70) of students correctly select the response option that strongly disagrees with the statement suggesting a flat Earth. Additionally, 20% (n=24) of students' express disagreement, while 15% (n=18) are uncertain. Notably, there is a small percentage of 6.7% (n=8) of students who still hold the belief that the Earth is flat-shaped. Item 3 assessed students' knowledge of the Earth's position within the solar system. The statement provided is false, as the Sun serves as the central body of the solar system, and Earth is merely one of the planets orbiting around it. The analysis reveals that a significant majority of students, 39.2% (n=47), strongly disagreed with the erroneous statement claiming Earth as the center of the solar system. Additionally, 24.2% (n=29) of students disagreed with the statement, while 25.8% (n=31) expressed uncertainty regarding its accuracy.

The analysis of item 4, which addresses the statement claiming that Earth, is primarily composed of oxygen. However, this statement is inaccurate, as Earth's composition primarily consists of 71% nitrogen, 21% oxygen, and trace amounts of other gases. According to the data in the table below, 26.7% (n=32) of students expressed uncertainty regarding the statement, while 25% (n=30) of students agreed with it, and 20.8% strongly agreed. Item 5 presents the distribution of responses from students. The majority of students, 38.3% (n=46), disagreed with the statement, while 23.3% (n=28) strongly disagreed, suggesting that Earth and Venus are similar. Furthermore, 33.3% (n=40) of students expressed uncertainty regarding the statement, indicating that they were unsure if Earth and Venus share identical characteristics. It should be noted that Earth and Venus do exhibit several similarities, but there are also notable differences, particularly in terms of their respective environments. Thus, the provided statement is false.

Item 6 pertains to the comparison of Earth's size with that of Mars. The statement falsely claims that Earth and Mars possess the same dimensions. In reality, Mars is only half the size of Earth, rendering the statement inaccurate. Referring to The analysis reveals that a significant majority of students, 31.7% (n=38), disagreed with the statement, while 25.8% (n=31) strongly disagreed. Furthermore, 27.5% (n=33) of students expressed uncertainty regarding the validity of the statement.

Item 7 assesses students' fundamental knowledge about the size of planets in the solar system. The statement erroneously claims that all planets are the same size. In reality, each planet varies in size, with Jupiter being the largest, approximately ten times the size of Earth, and Mars being the smallest, only half the size of Earth. The majority of students, 58.3% (n=70), strongly disagree with this incorrect statement, while 21.7% (n=26) agree with it. However, there is a portion of students, 15.8% (n=19), who are uncertain about the accuracy of the statement. Item 8 evaluates students' understanding of the

factors that contribute to the occurrence of day and night. The rotation of the Earth on its axis is responsible for the alternation between day and night. The statement provided is indeed accurate. It was observed that 42.5% (n=51) of students strongly agree with the statement, while 38.3% (n=46) agree with it. Additionally, 10.8% (n=13) of students' express uncertainty regarding the validity of the statement.

#### **(ii) The moon**

The analysis of students' perceptions regarding the statement is pertaining to the moon. It is commonly believed that the moon shines because it generates its own light, similar to the Sun. However, this statement is incorrect, as the moon actually reflects the light of the Sun. The table reveals that a significant portion of students, specifically 40.8% (n=49), strongly disagree with the statement, while an additional 19.2% (n=23) simply disagree. Conversely, 11.7% (n=14) of students mistakenly hold a strong agreement with the statement, incorrectly believing that the moon produces its own light. Furthermore, 15% (n=18) of students expressed uncertainty regarding the validity of the statement.

Statement 10 asserts that the moon does not rotate, which is indeed a false claim. In reality, the moon does rotate on its axis, completing a full rotation every 27.3 days. A significant portion of students, specifically 26.7% (n=32), strongly disagree with the statement. However, there is a notable percentage of students, accounting for 22.5% (n=27), who express uncertainty regarding the matter. Additionally, 19.2% (n=23) of students agree with the statement. Item 11 pertains to students' understanding of the visibility of the moon. It incorrectly claims that the moon is only visible at night, whereas in reality, the moon can often be seen during the day. There are only two phases of the moon that cannot be observed during daylight: the full moon and the new moon. The full moon is visible exclusively at night, while the new moon cannot be seen from Earth. The data of 30% (n=36) of students strongly disagree with the statement, and an additional 18.3% (n=22) disagree. However, a considerable

proportion of students, amounting to 24.2% (n=29), are uncertain about the visibility of the moon during daylight. Additionally, 15.8% (n=19) of students agree that the moon can only be seen at night.

An analysis of students' responses to statement 12 claims that the moon completes a full revolution around the Earth in a single day. However, this statement is false, as it actually takes the moon 27.3 days to complete one full rotation around the Earth. The table reveals that the majority of students, 32.5% (n=39), are uncertain about the accuracy of the statement. Furthermore, 21.7% (n=26) of students strongly disagree with the statement, while 20% (n=24) agree with it. Additionally, 15% (n=18) of students agree with the statement, and a further 10.8% (n=13) strongly agree, mistakenly believing that the moon orbits the Earth in just one day. According to the analysis of item 13, exactly 33.3% (n=40) of students' express uncertainty regarding the statement, while 31.7% (n=38) agree with it. The statement claims that different countries observe different phases of the moon on the same day. However, this statement is false, as all individuals on Earth see the same phases of the moon regardless of their geographic location.

### (iii) The sun

Item 14 evaluates students' understanding of stars. The statement claims that the sun is not a star due to its lack of illumination during the night. However, this statement is false because the sun shines constantly. During the night, the Earth is positioned on the side opposite to the sun, which is why it cannot be seen. Based on the findings, 31.7% (n=38) of students strongly disagree with the statement, and an additional 19.2% (n=23) disagree. However, a notable percentage of students, 27.5%, express uncertainty regarding the accuracy of the statement. The analysis of item 15, evaluates students' understanding of the Sun's color. Although the Sun may appear orange or red, it is, in fact, white. The yellow, orange, or red hues observed by the naked eye are a result of Earth's atmosphere. The Earth's atmosphere bends the Sun's light, a phenomenon known as Rayleigh

scattering. Rayleigh scattering is also responsible for the blue appearance of the sky. Consequently, the assertion made in item 15 is inaccurate. Notably, 30% (n=36) of students expressed uncertainty, whereas 25% (n=30) agreed with the statement. Only 16.7% (n=20) strongly disagreed, while 14.2% (n=17) disagreed with the statement.

Item 16 claimed that the Sun is a burning ball of fire, which is factually incorrect. The Sun, in reality, emits light through a process of glowing rather than burning. Therefore, the statement is false. The majority of students, comprising 28.3% (n=34), agree with the statement, while 25% (n=30) strongly agree. Conversely, only 10% (n=12) of students strongly disagree, and another 10% (n=12) simply disagree with the statement. The remaining 26.7% (n=32) of students' express uncertainty regarding the accuracy of the statement.

### (iv) The planets

Item 17 assesses students' understanding of other planets. The statement suggests that spacecraft can land on the surfaces of Jupiter, Saturn, Uranus, and Neptune. While popular media often portrays spacecraft landing on various planets, this depiction is inaccurate. In reality, attempting to land a spacecraft on these gas giants would result in its destruction before reaching the surface. These planets predominantly consist of gas, and as a spacecraft approaches their cores, the pressure and temperature of the gas intensify. The majority of students, accounting for 49.2% (n=59), express uncertainty regarding the statement. Additionally, 19.2% of students strongly disagree with the statement, followed by 15.8% (n=19) who simply disagree.

Item 18 serves to assess students' knowledge regarding the ring of Saturn. Saturn stands as the sole planet in our solar system encompassed by a distinctive ring system. However, the statement in Item 18 asserting that the rings of Saturn are solid disks is inaccurate. In actuality, the rings consist of numerous pieces of ice, ranging in size from small pecks to substantial structures resembling houses. These ice fragments orbit the planet and remain in proximity

due to the gravitational forces at play. It is apparent that the majority of students, comprising 46.7% (n=56), express uncertainty regarding the statement. Additionally, 17.5% (n=21) of students agree with the statement, while only 15.8% (n=19) strongly disagree and 18.3% (n=22) disagree with it. Item 19 is dedicated to examining Pluto, which is often regarded as the farthest and final object within the solar system. However, this statement is erroneous as Pluto resides within a region known as the Kuiper Belt. The Kuiper Belt consists of icy objects and extends outward from the orbit of Neptune. It could be observed that 27.5% (n=33) of students strongly agree with the statement, while an additional 26.7% (n=32) agree. Conversely, 23.3% (n=28) of students' express uncertainty regarding the accuracy of the statement.

Item 20 asserts that the planets in the solar system are evenly spaced between the Sun and Neptune, which is an inaccurate statement. In reality, the eight planets in the solar system exhibit a distinct pattern of spacing. The inner planets, including Mercury, Venus, Earth, and Mars, are closer to each other in proximity compared to the outer planets, namely Jupiter, Saturn, Uranus, and Neptune, which are more widely spaced. Therefore, the distance between the Sun and Neptune is not uniformly distributed. Based on the evident that a majority of students, accounting for 54.2% (n=65), express uncertainty regarding the statement. Furthermore, 19.2% (n=23) of students disagree with the statement, followed by 15% (n=18) of students who strongly disagree. Regarding item 21, it serves to assess students' comprehension of the solar system. The statement in question suggests that the solar system solely comprises the Sun and eight planets. However, the reality is that the solar system encompasses various components, including moons, asteroids, comets, as well as scattered gas and dust. It was shown that 39.2% (n=47) of students' express uncertainty regarding the statement. Additionally, 20.8% (n=25) of students disagree with the statement, while 15.8% (n=19) strongly disagree. On the other hand, 18.3% (n=22) of students agree with the statement.

### **(v) The comets**

Item 22 aims to assess students' understanding of the composition of comets. The statement posits that the composition of comets is identical to that of asteroids. However, asteroids primarily consist of rock with some ice, whereas comets are predominantly composed of ice with some rock. It was apparent that 47.5% (n=57) of students' express uncertainty regarding the statement. Conversely, 26.7% (n=32) of students agree with the statement. Item 23 evaluates students' understanding of the shape of comets. The statement suggests that comets always possess tails; however, this is an incorrect assertion. Comets do not consistently exhibit tails, but instead, they develop a shell-like cloud known as a coma. It was shown that 49.2% (n=59) of students' express uncertainty regarding the presence of tails in comets. Additionally, 20% (n=24) of students agree with the statement. Conversely, only 16.7% (n=20) of students disagree, while a smaller percentage of 9.2% (n=11) strongly disagree.

Item 24 serves to evaluate students' knowledge regarding the origin of comets. The statement suggests that comets originate from regions beyond the solar system. However, this statement is incorrect. Comets actually originate from within the solar system, not from outside of it. It was apparent that a majority of students, accounting for 50.8% (n=61), express uncertainty regarding the origin of comets. Furthermore, 19.2% (n=23) of students agree with the statement. On the other hand, only 16.7% (n=20) of students disagree, and a mere 3.3% (n=4) of students strongly disagree with the statement.

### **(vi) The meteors**

Item 25 aims to assess students' comprehension of meteors. The statement proposes that meteors are falling stars, but this is not accurate. In reality, meteors refer to the luminous flashes of light visible in the night sky. These brilliant flashes occur due to the presence of meteoroids, which are small, solid objects that traverse space and enter Earth's atmosphere.

Exactly 35.8% (n=43) of students agree with the statement, while 30.8% (n=37) express uncertainty regarding its accuracy. The analysis of item 26 discusses the nature of meteors. The statement claims that meteors are solid objects; however, this is inaccurate. In reality, meteors are not solid objects but rather luminous streaks of light that become visible when they enter Earth's atmosphere. Based on the analysis, a majority of students, comprising 42.5% (n=51), agree with the statement, while an additional 14.2% (n=17) strongly agree. However, 32.5% (n=29) of students' express uncertainty, and 10% (n=12) do not agree with the statement.

#### **(vii) The asteroids**

Item 27 is designed to assess students' understanding of asteroids. The statement claims that asteroids are situated in close proximity to one another. However, this statement is false as asteroids are generally separated by approximately 1 million miles. A majority of students, accounting for 59.2% (n=71), express uncertainty regarding the distance between asteroids. Additionally, 20.8% (n=25) of students disagree with the statement, while 16.7% (n=20) of students agree with it.

#### **(viii) The stars**

Item 28 aims to assess students' understanding of stars. The statement in question pertains to the relationship between stars and the solar system. However, this statement is incorrect, as the sun is the sole star within the solar system, while all other stars and galaxies exist outside of it. It was shown that 35% (n=42) of students agree with the statement, while 32.5% (n=39) of students' express uncertainty regarding its accuracy. Item 29 is designed to evaluate students' understanding of star formation. The statement proposes that stars are generated from fragments of other stars or planets, which is incorrect. It was notable that a majority of students, comprising 55.8% (n=67), express uncertainty regarding the process of star formation. Furthermore, 15.8% (n=19) of students agree with

the statement that stars originate from fragments of other stars or planets. However, it is crucial to note that this statement is false. The percentage of students who disagree with the statement is slightly lower, indicating that some students are uncertain or may have different perspectives on the topic.

Item 30 aims to discuss the characteristics of stars. The statement asserts that all stars appear identical, which is an inaccurate claim. In reality, stars exhibit a wide range of variations in terms of color, temperature, mass, age, and brightness. Based on the data analysis, 30.8% (n=37) of students agree with the false statement, while 22.5% (n=27) strongly disagree with it. However, a significant portion of students, accounting for 30% (n=36), express uncertainty regarding whether stars are truly similar or not. The analysis of item 31 examines students' understanding of the lifespan of stars. The statement suggests that stars live forever, but this is incorrect as stars will eventually cease to exist. In fact, the shortest lifespan of a star is approximately 50 million years. Reviewing the data from the analysis, it is observed that 36.7% (n=44) of students' express uncertainty regarding the statement. Moreover, a significant portion of students, with 25.8% (n=31) strongly disagreeing, and 23.3% (n=28) disagreeing, reject the notion that stars have an everlasting lifespan.

Item 32 examines the topic of star locations. The statement posits that stars within a constellation are situated close to each other. However, this statement is false since the stars in a constellation may appear close, but they are not physically near one another. In reality, the stars within a constellation are composed of the brightest ones within a specific region, which gives the impression of proximity. Referring to the data analysis, it was evident that a majority of students, comprising 44.2% (n=53), express uncertainty regarding the accuracy of the statement. Furthermore, 23.3% (n=28) of students disagree with the statement, while 15% (n=18) strongly disagree with it.



### (ix) The galaxies

Item 33 aims to assess students' understanding of galaxies. The statement suggests that galaxies are static and do not undergo any changes over time, which is an inaccurate portrayal. In reality, galaxies are dynamic and undergo significant transformations over millions of years. Analyzing the data, it was apparent that a considerable portion of students, comprising 39.2% (n=47), express uncertainty regarding the statement. Moreover, 25.8% (n=31) of students disagree with the statement, while 14.2% (n=17) strongly disagree with the false claim. The analysis of item 34 assesses students' awareness regarding current scientific studies. The statement under examination asserts that scientists have discovered life on Mars, but this claim is incorrect. To date, there is no definitive evidence of life having been found on Mars. As depicted in Table 4.5.34, a significant portion of students, specifically 39.2% (n=47), expressed uncertainty about the statement, while 27.5% (n=33) of students agreed with the notion that scientists have indeed discovered life on Mars.

According to Item 35, it was claimed that scientists possess the ability to determine the age of the Earth. A considerable proportion of students, specifically 38.3% (n=46), agree with this statement, and an additional 14.2% (n=17) of students strongly agree. On the other hand, 35.8% (n=43) of students' express uncertainty regarding the veracity of the statement. It is important to note that this statement is indeed accurate, as scientists have successfully calculated the age of the Earth to be approximately 4.6 billion years old. The misconception in astronomy was determined using Likert-scale items questionnaire (section c). The totals of 35 items were related to the misconceptions of astronomy. All items were false statements which the terms of "strongly disagree" as indicator of correct answer, meanwhile "strongly agree" as indicator of wrong answer. There was an exception for item C8 and item C35 which were true statements. Therefore, the answer would be vice versa.

The findings indicated that students have a high level of misconception in astronomy. The

highest percentage of correct answer was obtained for both viz., Earth was flat-shaped (58.3%), and all planets were the same size as Earth (58.3%). The analysis of percentage showed that: meteors were solid object (0.8%), comets came from region outside of solar system (3.3%), and comets were composed of the same material as asteroid (5%). Therefore, it showed that the level of students' misconception towards astronomy was relatively low among students in UiTM. One of the most well-known misconceptions among science teachers the Earth was closer to the Sun in summer. The finding of study done by Cox et al. (2016) (Cox, Steegen, & De Cock, 2016) summarized that the sources of misconceptions among students and teachers were caused by the misleading figures which widely used in textbooks.

### Analysis of significant difference in students' interest towards astronomy between male and female

To investigate the disparity in misconceptions about astronomy between male and female students, an independent sample t-test was employed as the analytical tool to address the research question. The study participants comprised 23.3% (n=28) males (M=3.0119, SD=1.06374) and 76.7% (n=72) females (M=2.5290, SD=.81523). The research question was examined through the application of an independent samples t-test. Overall, the outcomes indicate a notable distinction in students' interest in astronomy between males and females. The table reveals a t-value of 2.213 and a corresponding p-value of 0.033. Based on the requirement for null hypothesis rejection, which necessitates a p-value less than 0.5, it can be concluded that a significant difference exists in students' interest in astronomy between male and female students, as the obtained p-value (0.033) falls below the specified threshold. Specifically, the average interest level in astronomy among male students (M=3.6964, SD=0.60766) significantly differs from that of female students (M=3.6946, SD=0.52985).

The mean of students' interest in astronomy was obtained from item 7, item 8, and

item 10 in questionnaire (section b). From the descriptive analysis table, it showed that male students ( $M=3.0119$ ) have higher interest in astronomy than that of the female students ( $M=2.5290$ ). The research question was analyzed using independent samples t-test – there is a significant difference in students' interest towards astronomy between male and female students where the  $p=0.033<0.05$ . The finding of this research question was supported by previous study. According to the previous study, there was a significant difference in gender among the sample of 1299 of 6<sup>th</sup> to 12<sup>th</sup> grade students where the female students were highly anxious about science – lead to reducing of motivation and enjoyment in learning science compared to male students (Chittum & Jones, 2017; Maloney, Sattizahn, & Beilock, 2014; Sofiani, Maulida, Fadhillah, & Sihite, 2017). Another study that was done by (Duran & Dökme, 2016; Nadile et al., 2021) the findings ( $n = 437$ ) of sixth grade students showed that there was a significant difference among gender in science experiences, approaches, and awareness of science course.

### **Analysis of significant difference between science and non-science students' in level of knowledge in astronomy**

The student cohort in this study comprises individuals from two distinct academic backgrounds: science and non-science streams. The Science stream students account for 51.7% ( $n=62$ ) of the sample, with a mean interest level in astronomy of  $M=3.1935$  and a standard deviation of  $SD=0.62677$ . On the other hand, the non-Science stream students make up 48.3% ( $n=58$ ) of the sample, with a mean interest level in astronomy of  $M=2.9286$  and a standard deviation of  $SD=0.58091$ . The utilization of these two different backgrounds aims to examine whether the chosen academic stream has any influence on students' knowledge levels in astronomy. To assess the presence of a significant difference between the two major groups, an independent sample t-test was employed, enabling a

comparison of means between the two independent groups.

The findings indicate a significant difference in the level of knowledge in astronomy between science and non-science students. The calculated t-value is 2.397, with a corresponding p-value of 0.018. Consequently, the obtained p-value ( $p=0.018$ ) is smaller than the significance level of 0.05, leading to the rejection of the null hypothesis for this research question. In other words, there is a statistically significant difference observed between the average level of knowledge in astronomy among science students ( $M=3.7694$ ,  $SD=0.55415$ ) and non-science students ( $M=3.6155$ ,  $SD=0.53107$ ). The level of knowledge in astronomy was determined by the mean of item 1, item 2, item 3, item 4, item 5, item 6, and item 9 in questionnaire (section b). The results of independent samples t-test showed that there was a significant different between level of knowledge in astronomy and students' major course; science and non-science where the  $p=0.018 (<0.05)$ .

Research by (Metzger, Dingel, & Brown, 2023) supported that the science major students (43.7%) had performed significantly better than non-Science students (34.5%) where the t-value is 6.30 and  $p=.0001 (<0.05)$ . This was due to 31% of science major students had previous knowledge about astronomy compared to only 6% of non-science students who had previous knowledge of astronomy (Aretz, Borowski, & Schmeling, 2016; Buxner, Impey, Romine, & Nieberding, 2018; Leo-Winkler, Mario, Canalizo, & Wilson, 2016).

### **Analysis of significant difference between students' faculties and misconception in astronomy**

The mean and standard deviation of students' level of knowledge across various faculties, including the Faculty of Education ( $M=2.8609$ ,  $SD=0.45563$ ), Faculty of Pharmacy ( $M=2.6067$ ,  $SD=0.37723$ ), Faculty of Art and Design ( $M=2.9257$ ,  $SD=0.48352$ ), and Faculty of Business Management ( $M=3.0000$ ,  $SD=0.40998$ ). To assess the presence of a significant difference in students' level of knowledge among these

faculties (Faculty of Education, Faculty of Pharmacy, Faculty of Art and Design, and Faculty of Business Management), a one-way ANOVA, specifically an F-test.

The results of a one-way ANOVA indicate a significant difference between respondents' faculties and their misconceptions in astronomy, as evidenced by the F-value of 4.129 with degrees of freedom (3,116) and a  $p$ -value of 0.008, which is less than the predetermined significance level of 0.05. However, in order to identify the specific locations of the significant differences, further examination of the results using the Least Significant Difference (LSD) multiple comparison method is required.

The LSD comparisons have identified three mean scores that exhibit significant differences. Specifically, the mean score of the Business Management Faculty ( $M=3.0000$ ) was significantly higher than that of the Art and Design Faculty ( $M=2.9257$ ), and the mean score of the Art and Design Faculty was significantly higher than that of the Education Faculty ( $M=2.8609$ ). Based on the Analysis of Variance (ANOVA), the finding showed that there was a significant difference between students' faculty and students' misconceptions in astronomy where the  $p = 0.008$  ( $<0.05$ ). The mean of students from Faculty of Art and Design and Faculty of Business Management was slightly higher than the mean of students from Faculty of Education and Faculty of Pharmacy. It showed that the level of misconception of these two faculties; Faculty of Art and Design and Faculty of Business Management, were higher than that of the two faculties.

### **Analysis of significant difference between educational background of the respondents' parents and their misconceptions towards astronomy**

Students were requested to indicate their parents' educational background with the objective of investigating any potential significant difference between parents' educational background and students' misconceptions towards astronomy. The responses included seven options: PMR, SPM,

Diploma, Degree, Master, PhD, and none. It is worth noting that those who selected "none" reported that their parents' highest educational background was UPSR. To examine the presence of a significant difference between students' parents' educational background and their interest in astronomy, an ANOVA test was conducted. This analysis aimed to determine any potential variations across different educational backgrounds of students.

The findings indicate that there is no significant difference observed between the educational background of respondents' parents and the students' misconceptions towards astronomy. The results of the analysis reveal an  $F$ -value of 0.757, with degrees of freedom (6,113), and a corresponding  $p$ -value of 0.605, which is greater than the predetermined significance level of 0.05. Therefore, based on these results, it can be concluded that there is no statistically significant difference between respondents' parents' educational background and students' misconceptions towards astronomy.

Another noteworthy finding suggests that there is no significant difference between the educational background of respondents' parents and students' misconceptions towards astronomy. The students' level of misconception towards astronomy was assessed through Section C of the questionnaire employed. The analysis conducted using ANOVA revealed a  $p$ -value of 0.605, which exceeds the predetermined significance level of 0.05. Thus, it can be inferred that parents' educational background does not exert a significant influence on students' misconceptions towards astronomy. This finding aligns with previous research conducted by (Meira da Silva, Teixeira de Araújo, & Voelzke, 2014), which supports the notion that parents' educational level has minimal impact on the prevalence of misconceptions held by students. Sadler's study indicates that the education level of the mother contributes only 1% of variance in the regression model, while the father's education level does not exhibit statistical significance at  $p=0.05$ . This implies that even if the father possesses a higher level of education, it does not significantly

influence the students. Possible explanations for these findings include the transmission of misconceptions from parents to students and the difficulty parents may encounter in effectively imparting scientific concepts to their children.

Furthermore, in a study conducted by (Makewa, Role, & Otewa, 2012), it was found that the correlation coefficient between the mother's education level and child performance was 0.228, with a corresponding  $p$ -value of 0.000. Similarly, the correlation coefficient between the father's education level and child performance was 0.275, with a  $p$ -value of 0.000. These results indicate a significant correlation between parents' level of education and their child's academic performance. Consequently, it can be concluded that students whose parents possess higher levels of education are more likely to achieve better learning outcomes (Makewa, Role, & Otewa, 2012). Moreover, the research conducted by (MAMAT, 2015) supports these findings, highlighting the significant correlation between parents' educational level and students' academic performance in both Malaysia and Korea. This correlation can be attributed to parents who have a heightened awareness of the importance of education and strive to ensure their children emulate them and excel in their respective fields.

## CONCLUSION

In conclusion, the study showed that there was a significant difference in students' interest towards astronomy between male and female students, whereby, the male students have higher interest in astronomy than that of the female students. Besides, there was a significant difference between level of knowledge in astronomy and students' major course. The average levels of knowledge in astronomy among science students were higher than that of the non-science students. There was significant difference between students' faculties and misconception in astronomy. The level of misconception of the non-science students from Faculty of Art and Design and Faculty of Business Management, were higher than that of

the science students from Faculty of Education, and Faculty of Pharmacy. Lastly, there was no significant relationship between the educational background of the respondents' parents and their misconception in astronomy. The parents' educational background do not exert a significant influence on students' misconceptions towards astronomy. In short, the data analysis revealed low astronomy knowledge and high misconceptions among UiTM Puncak Alam students. Without proper intervention, these misconceptions could worsen. A limited coverage of astronomy knowledge in the Science syllabus highlights the need for a separate subject, ideally starting in primary education. This subject would teach simple and accurate celestial phenomena to cultivate a better understanding from an early age.

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