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Student's Conceptions of Astronomy in UITM

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Abstract

The objective is to determine students' conceptual understanding on astronomy In Universiti Teknologi Mara (UITM). This study focuses on 120 university students currently enrolling in different courses and educational background in UITM. Respondents involved were students from 4 different faculties such as faculty of education, faculty of pharmacy, faculty of applied science and faculty of health science. This research used a quantitative approach to analyse the data and mainly used a set of questionnaires as the item in gathering the data. Items constructed in the questionnaire probes students' understanding in astronomy concept. Result findings found among the highest misconception percentage showed based on the analysis are: twenty-one (21) misconception about the astronomy concept are raised in the questionnaire to identify the misconception held by the student in astronomy, the moon to go around the sun in year (69.2%), the shape of the earth is geoid (77.5%), December is the longest daylight period in Australia (75.0%), the earth closer to the sun in summer (79.2%), the sun is red (82.5%), the sun is at the centre of universe (77.5%), star shine by reflected light from the sun (78.3), there is no gravity on the moon (75.0%). It is concluded that students have low level in understanding astronomy concept and the previous education level does not affect the understanding of astronomy concept. Hence, the research suggested that there shall be more research conducted to identify misconceptions in astronomy among university students across the world. In the future, comprehensive research about astronomy is hoped to help teachers and students to overcome misconceptions in astronomy education in Malaysia.

Keywords: Students' Conception, Misconception, Astronomy

Introduction

Investigation of scientific misconceptions can shed light on the processes of conceptual development and the sources of information; in particular, concepts might be influenced by individuals' intuitions, observations and experiences, or acquired from cultural sources such as formal education, parent–child conversations, or pictures in books or on screens (Nobes et. al., 2022). Percy et.al, 2006 stated astronomy has been a basic topic of education for centuries. Astronomy is a discipline that has a great number of daily implementations such as

calendars, time, finding directions, seasonal-long-term climatic changes and a dynamic science. These includes education in science, mathematics and technology. Astronomy in the classroom gives teachers the opportunity to use alternative experimental methods. It also provides many examples in terms of scientific modelling and simulations. Therefore, astronomy is an interdisciplinary field becomes more important in education. This is because astronomy increases society's awareness of science and technology. This situation is the same in both developed and developing countries.

Therefore, this study is done to investigate student's understanding towards concepts of astronomy. There will be an investigation on level understanding in different faculties, the understanding astronomy concepts between gender, previous educational level either give effect toward understanding astronomy concepts and the misconception in this study.

This study as being carried out with the following objectives:

i. To identify the level of understanding of Astronomy among students in UiTM.
ii. To determine the differences in level understanding of Astronomy between faculties in UiTM

Astronomy Conception

Concept is defined as mental representations that can be expressed in a single word (Zierbal 2004). For instance, table or chair, animal or plant and alive or dead. The meaning of concept also represents set of thought which can communicated in a sentence of several words like proposition. In the concept structure, one can induce or derive more information and knowledge. Therefore, it builds a more complex concept. Illustration of astronomy concept are eclipse dynamic, season formation, day or night cycle and evolution of stellar. These concepts are developed based on simple concept derived from physics, mathematics and other natural sciences.

The concept understanding in astronomy not only includes knowing or memorizing the logical facts (Nilsen & Angell, 2014). For instances, the number of planets, stars names or names of astronomical phenomenon. Knowledge of the concept and the capacity to utilize the knowledge completely different settings are locked under the same umbrella called, understanding astronomy conceptual.

Even though astronomy is related closely to what is happening around us, it is often considered complicated and ambiguous (Lai, 2015). The research conducted by Kiroglu (2015), he stated that most individual think of concept of astronomy as unrelated to everyday and elusive life. As a result, the concept understanding towards astronomy among teacher and students is badly affected. Teachers are lack in hold astronomy conceptual in deep make difficulties to the teacher to explain the concept to the students.

Possible Barrier in Understanding Astronomy

Teacher frequently develop naive logical conception in arrange to supply an understandable clarification to the students. The concepts created by the teachers endures unfinished in a long time period (Slater et al., 1996). This concept frequently acts as block for students to understand the concept of astronomy in depth and precisely. Moreover, an unreasonable understanding of the content encourages teachers to emphasize on memorization of confined actualities. This situation also limits their activities of pedagogical to be creative and inventive. Therefore, it causes the teacher scared to form situation where students move past the teacher's knowledge (Gess-Newsome, 2001).

As a result, creativity and innovation as the need for development and growth are missing in educating and learning astronomy within the class. In order to teacher to slip their shortcomings of understanding astronomy, make an environment where the students will not be able address teacher's power and position as the leader in the class. A conceptual lack of understanding in certain science are can lead to the low level of
teaching confidence. The teachers may frequently conclusion up dodge the subject through and through (Slater et al, 1996). This leads to Low mindfulness of the astronomical concept among students, which hence leads to low interest in astronomy. Students are not likely to appear intrigued in a subject or field which has not been covered to them appropriately.

Misconception of Students in Astronomy

Misconception is related to prior knowledge that is implanted in the logic system, but it can be the opposite of the accepted science theory (Tomita, 2008). The misconception among students can be influenced by their own observation and by the influence of people surrounding. Misconception does not only occur among students who live in village and those who have poor education but can also occur among students of higher education.

Students come to the class with numerous misconceptions approximately science in common and astronomy in specific (Neil, 2018). These belief advance from an assortment of sources all through childhood and youth. Moreover, the students' understanding might be affected for those who had taught them. This is because of the enhancing teacher knowledge is certainly well spent in student's achievement (Sadler et. al., 2013). It shows that the preparation in knowledge as a teacher to be teach is influence in terms of students' understanding.

Other than that, previous research conducted in Malaysia, most students who are the respondents of the study assume that the phenomenon of day and night is caused by the Earth orbiting the Sun (). When asked about the existence of Sun at night, they will give various answers that are logically thoughts and based on their observations. Among children, those answers were given based on their solely observation. However, among adults the answers will be based on wrongly understood Science concept. This is a big issue in Science teaching and learning because they might influence others with their misunderstood opinions.

The phases of moon occur due to the reflection of light from the Sun by the moon and due to moon orbiting the Earth. The phases are caused by the shape of the moon that is observed from the Earth changes depend on the position of moon between Earth and Sun. This phenomenon is hard to be understood by students because it is more complex compared to the occurrence of day and night. According to a study that has been done by Baxter (1989), most students who are the respondents of the study assume that this phenomenon is caused by the moon is covered by cloud. This shows another misconception towards astronomy that grows among students. Thus, this study is conducted to identify the misconception raised among the students.

Gender Differences in Science Learning

STEM concepts are very significant to generation development of collaborator, thinker and problem solver. Reinking & Martin (2018) reported although current research highlighted that the gender gap in the STEM concept, but the overall gender gap had decreasing over the generation. A field of debate concerns the use of the term gender and sex. Some authors prefer sex as a biological difference between people for example chromosomes and genitals.

Gender signifies as the differences between men and women. They are considered to arise from social or environmental influences.

On the one hand, there is a psychologist who believes that using the term "gender difference" in research comparing women and men is better. This is because it does not imply the difference or the origin of a more proactive origin (Caplan, 2005). Based on (OECD, 2006, 2008), The International Student Assessment Program (PISA), compiled by the Organization for Economic Co-operation and Development (OECD) for mathematics, natural science, and literacy, shows how strong the girls have been trapped in the past decade. They maintain their better achievement in subject's linguistic competence. They also achieve better performance compared to young men in formerly – dominated. Only in mathematics, young men's performances are higher compared to the young women, even though young women can close the gap. This may indicate a trend change in the future. Thus, in this study, it will show whether is there any significant differences between male and female students in understanding astronomy concepts.

Methodology

This study is designed to identify the conceptions of astronomy among undergraduate students at four differences of faculties in UiTM. This study utilized quantitative approach, basically consist of questionnaire given to the respondents. Quantitative method is chosen because it can help researcher to answer the research problem that had been highlighted in this study. Hence, it can be utilized to interpret the data expressively. The aim of this study is to test the level of understanding in the astronomy among the students. Hence, questionnaire is designed which based on the conceptions related to the astronomy in depth.

This study had been used stratified random sampling procedure. This procedure is used in this study because the sample is selected from a heterogenous population in order to reduce the sampling error rate. This procedure is better compared to the systematic and simple random sampling procedures. To form stratified random sampling procedure, the random selection of each sub-group in a population to be done independently. Hence, the target for this study is undergraduate students from four different faculties which is Faculty of Education, Faculty of Pharmacy, Faculty of Health Science in UiTM Puncak Alam and Faculty of Applied Science in UiTM Shah Alam.

The required sample is 120 undergraduate students at these four faculties in which they are science stream students. Subsequently, the population contains undergraduate student in Faculty of Education, Faculty of Pharmacy, Faculty of Health Science and Faculty of Applied Science. Simple random sampling procedure is used in each of the faculties, where the required sample size must reach 30 subjects for each faculty. In this procedure, the researcher should ensure that each subsample has same number of subjects.

Questionnaire in this study is adapted from TOAST (Stephanie et. al., 2018). The level of reliability and validity of the items in the questionnaire are high based on the previous research. The questionnaire of this study consists of multiple -choice questions and Likert-Scale items. The questionnaire is divided into three sections. Sections A, the demographic survey about the gender, age, faculty, previous educational level and semester/ part. Meanwhile, for section B is the Multiple-Choice Question (MCQ). This section consists of 14 questions to examine students' understanding towards astronomy. The last section is section C, there are 21 items to measure level of understanding in astronomy by using Likert-Scale. The score ranged 1 until 5 represent "Strongly Disagree", "Disagree", "Not Sure", "Agree" and

"Strongly Agree". The data collection will determine the level of understanding as well as the misconception towards astronomy towards undergraduate students' in UiTM.

Table 4
Range for Level Understanding of Astronomy Concept

Marks	Level of Conceptions
80 – 100	Excellent
60 – 79	Good
40 – 59	Moderate
20 – 39	Low
0 – 19	Very low

Findings

Section	Finding and Discussion
RQ1: What is the level of understanding of Astronomy among students in UiTM?	• The level of understanding of astronomy concept among the students in UiTM is in low level • The maximum percentage of correct response by the respondents is item 1 which is 76.7% (theory explaining the formation of universe). • The minimum percentage of correct response by the respondents is item 8 which is 15.8% (the process governing the sun). • The research conducted by Cumhur (2015) concluded that the student has difficulty in understanding astronomy concept even the basic concept in astronomy.
RQ2: Is there any significance difference between student's previous education level in understanding Astronomy concept?	• The finding from this research has revealed that there have no a significant difference of students' understanding of astronomy concept with previous studied level. • This finding corresponds to the previous research conducted by Nopiah et al (2015) that there is no correlation and significance differences between the achievement of the students in the Mathematics subject during the level of pre-university with their primary year at UKM. • It can be concluded that previous education level does not affect the student understanding at the University level.
RQ3: What is the misconception in understanding of Astronomy among students in UiTM?	• None of the respondents can get all correct for every item in both sections. • Twenty-one (21) misconception about the astronomy concept are raised in the

	questionnaire to identify the misconception held by the student in astronomy. Among the highest misconception percentage showed based on the analysis are: the moon to go around the sun in year (69.2%), the shape of he earth is geoid (77.5%), December is the longest daylight period in Australia (75.0%), the earth closer to the sun in summer (79.2%), the sun is red (82.5%), the sun is at the centre of universe (77.5%), star shine by reflected light from the sun (78.3), there is no gravity on the moon (75.0%). • This supported by research conducted by Azizah et al (2022) that overall percentage, college students experienced misconceptions of 57.34%, so that college students' misconceptions were categorized as moderate level misconceptions.
RQ4: Is there any significance difference between male and female students in understanding Astronomy concept?	• Independent samples t-test analysis results found that there is significant difference between male and female students in understanding astronomy concept. • This result of the study is supported by the research conducted by Gray and Pamela (2006) which emphasized that there is a gender gap between male and female in understanding scientific concept. • The research conducted by Soboyejo (2008) revealed that there is significant difference between gender in attitude to science among the students. • Although gender difference not directly affect the student achievement in science and mathematics, but it could be indirectly interacting with differences in attention, specific brain and system of cognitive. • Therefore, it is important for the gender issue to be emphasized in future research to investigate the significance difference between gender and knowledge understanding in science, to sure that steps and instructions are properly introduced to both genders fairly.

Source: Author

Conclusions and Recommendations

The conclusions of this study indicate that there should be the impacts to led and helpful for some people in educational field that includes

i. The secondary students know the misconception that affect their understanding in which their prior knowledge and understanding about astronomy is incorrect. Therefore, they need to apply or relate their understanding and knowledge about astronomy in daily lives. In this method, they will be alert for the further conceptual and generates the new ideas about the concepts well. This will encourage them to be actively engaged with teaching and learning in the classroom.
ii. Lecturer/teachers must play roles which are well prepared, knowledgeable with astronomy problems among students. They need to identify the best approach to improve their method of teaching that is easier for students to understand the concept of astronomy in learning. From this study also can reduce misunderstandings encountered by students on their learning as well as students can improve their understanding of the topic of light.
iii. Astronomy are one of the topics that important in Physics learning. Therefore, it should implement hands-on experience with the environment like field trip, field observation and other activities that related to the syllabus. Light is the general topic that difficult to be teaching in the class and also for those who need to learn in this part

The Recommendation for Future Research that Includes

i. To expand the general findings, researchers should undertake further studies using more varied of instruments to the respondents. It much more reliability and validity in the study. For example, the researcher can be finding out the correlations between attitude and behaviour toward understanding in Light and Optic. Therefore, add some items in the instruments.
ii. A follow-up study is needed to identify the changes preferable towards astronomy among students in UiTM. The attraction of students to the topic astronomy must be needed for further research under the topic of astronomy.
iii. Future experimental research could be investigating the cause and effect relationships between understanding of astronomy and various independent variables for secondary school students in Malaysian context.

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