

# Astronomical Misconceptions Prevalent Among High School Students of Kerala

**RAKHY RADHAKRISHNAN**

UGC-SRF Research Scholar, School of Pedagogical Sciences, Mahatma Gandhi University, Kottayam.

**E-mail: Rakhykrish@gmail.com**

**Abstract** Astronomy is the study of celestial bodies. It is basically an observational Science and astronomical objects are always in the sky and hence everybody will get some information from their observations which may or may not be true. These incorrect information forms misconceptions. In order to find astronomical misconceptions prevalent among High school students of Kerala, Survey method was adopted. Astronomy Misconception Inventory (AMI) containing 32 items was prepared and given to a sample of 300 students studying in different high schools of Kerala. The data obtained were subjected to percentage analysis. From the study it was found that majority of the high school students of Kerala have misconceptions related to Astronomy. It is hoped that this study will orient the curriculum planners to give more importance to Astronomy in the school curriculum.

**Keywords:** Astronomy, misconceptions, Planetarium, Telescopes.

## 1. INTRODUCTION

From the time of existence of mankind itself, man has been observing the sky. Everybody perceived it in their own ways. Some were fascinated by the mysterious sky while some worshipped the astronomical objects with utmost fear. For another group, it has been an inspiration for their art forms. Some used the astronomical observations for navigation while others used it for time keeping, agriculture etc. For philosophers, the various astronomical discoveries changed their conception of the world. Thus it can be said that Astronomy had a great influence on human life from time immemorial.

Astronomy is the study of celestial bodies. This science includes information about the planet we live on -Earth- and all the neighbors in the space (Vancleave, 1995). As Astronomy is basically an observational Science and astronomical objects are always in the sky, everybody will get some information from their observations which may or may not be true. Being a matter of public interest,

Issues and Ideas  
in Education  
Vol. 1, No. 2  
September 2013  
pp. 151–159



©2013 by Chitkara  
University. All Rights  
Reserved.

astronomical phenomena are always a part of discussions in media also. Many books, poems, films were also created on the basis of certain concepts in Astronomy. Through observations, informal discussions with family members and peers, folklores, myths in the society etc., people perceive much information. This information which they gain in an informal way may be correct or incorrect. Such false belief about something is known as misconception.

Misconceptions related to Astronomy were found through various studies. Baxter (1989) found that minority of students could explain seasons in relation to the tilt of Earth's axis and revolution about the Sun. Misconceptions related to phases, eclipses and other celestial phenomena are common. Children and adults confuse the explanations of phases and eclipses by assuming that lunar phases occur when the Moon enters the Earth's shadow. Other incorrect explanations such as 'cloud covers the Moon', 'planet or the Sun casts a shadow on the Moon' have also been found among school students (Baxter, 1989; Stahly et al., 1999). Dunlop (2000) reported that 13% of the students held an incorrect eclipse view before teaching and that 12% still held that incorrect view after teaching, suggesting that misleading diagrams in textbooks and not-to-scale models of Earth, Moon and Sun used in teaching lead to difficulty in students in accepting the correct explanation of phases.

These misconceptions are prevalent among Indian children also. To Samarapungavan et.al (1996) children construct an initial understanding of the observed world on the basis of their everyday experience and by the exposition to the adult culture's theories of physical world. They reported that Indian children borrow the idea that the earth is supported by an ocean or a body of water from folk cosmology. In the study conducted by Padalkar and Ramadas (2008) on 68 class 7 students of Maharashtra on understanding of Astronomy, it was found that only 90% students knew that Sun rises in the East and 94% students knew that Sun sets in the West. Also 44% students knew that Moon is seen every night and 24% had seen the Moon in day time. 84% students knew that the shape of the Moon changes everyday. Only 45% of students were aware that Moon rises in the East and 50% of knew that Moon sets in the West.

Before teaching Astronomy, the misconceptions about it must be identified and the topics must be planned so as to minimize these. Furthermore, by minimizing misconceptions, some of the superstitions related to Astronomy can be eradicated to some extent. For all these, misconceptions prevalent among students must be identified. After reviewing the related studies, it was found that there were no studies related to finding the astronomical misconceptions prevalent among high school students of Kerala. Hence the investigator decided to conduct a study to find the astronomical misconceptions prevalent among high school students of Kerala.

## 2. OBJECTIVES OF THE STUDY

1. To prepare Astronomy Misconception Inventory on some basic concepts of Astronomy for High School students.
2. To find the astronomical misconceptions prevalent among High School Students of Kerala
3. To provide suggestions to improve Astronomy education in High Schools.

## 3. METHODOLOGY

In order to find astronomical misconceptions prevalent among High school students of Kerala, Survey method was adopted. On the basis of the personal teaching experience of the investigator and through oral classroom interaction with the students, a draft Astronomy Misconception Inventory (AMI) containing 50 items was prepared. It was given to Astronomy educators, teacher educators and other experts in the field. Based on their comments, 42 items were selected and given for item analysis. After item analysis, the final form of AMI containing 32 items was prepared. From the experts of the comments, it was clear that the developed inventory covers the selected topics related to Astronomy. This ensures the content validity of the scale. Reliability was ensured through Test retest method. The responses were found to be similar to the previous test conducted. The final form of the Astronomy Misconception Inventory was then given to a sample of 300 students studying in different high schools of Kerala selected through Random sampling technique.

153

## 4. ANALYSIS OF DATA

The data obtained were subjected to percentage analysis. The result of the analysis is given in Table 1.

**Table 1**

*Analysis of the responses of High school students regarding certain Astronomical concepts*

Sl. No	Statement	Response(%)	
		Yes	No
<b>I</b>	<b>Sun</b>		
1.	Sun rises in the East	95	5
2.	Sun sets in the West	94	16
3.	Sun emit light at night also	25	75
4.	Sun can be replaced with Moon	55	45
5.	Sun is the biggest star	75	25

6.	Sun goes under the sea at night	80	20
7.	The position of sunrise and sunset changes over the year	40	60
8.	Solar eclipse is due to the swallowing of Sun by Rahu	40	60
9.	Sun does not come overhead everyday	2	98
10.	The time of Sunrise and Sunset changes everyday	56	44
<b>II Moon</b>			
11.	Moon rises in the East	40	60
12.	Moon sets in the West	44	56
13.	Moon produces light by itself	76	24
14.	Moon is a satellite	68	32
15.	Moon can be seen at day time also	20	80
16.	From Earth all sides of the Moon can be seen	80	20
17.	The shape of the Moon changes everyday	90	10
18.	Moon revolves around the Earth	80	20
19.	The time of Moon rise and Moon set changes every day	69	31
<b>III. Earth</b>			
20.	Earth is oval in shape	86	14
21.	Earth is larger than the Sun	40	60
22.	We live on the flat middle portion of the Earth	35	65
23.	Earth is a luminescent object	26	74
24.	Earth is revolving and rotating	70	30
25.	Earth is a planet	74	26
<b>IV Star</b>			
26.	Stars really twinkle	92	8
27.	Stars are white in colour	82	18
28.	Stars are the spirit of dead persons	12	88
29.	Stars never die	62	38
30.	Stars appear in the same place in the sky every night	25	75
31.	Stars emit light by themselves	86	14
32.	Stars are present at day time also.	15	85

## 5. RESULTS

Overall results showed that astronomical misconceptions are prevalent among High school students of Kerala. The results after percentage analysis are given below.

## 5.1 SUN

By examining the response of students towards statements related to Sun, it was revealed that, 95% knew that Sun rises in the East and 94% knew that Sun sets in the West. Only 25% said that Sun emits light at night also. About 75% said that Sun is the biggest star and about 55% said that we can replace Sun with Moon. About 80% said that Sun goes under the sea at night as they have seen it directly and in picture and videos. About 40% said that the position of Sunrise and Sunset changes over the year. 40% believe that Solar eclipse is due to the swallowing of the Sun by Rahu. Only 56% know that time of sunrise and sunset changes everyday. Only 2% knew that sun does not come overhead everyday.

## 5.2 MOON

About 40% said that Moon rises in the East and 44% said that Moon sets in the West. Only 20% said that Moon can be seen at daytime also. About 68% said that Moon is a satellite and 76% said that Moon produces light by itself. About 80% said that we can see all sides of the Moon and 90% said that there will be changes in the shape of the Moonrise everyday. Only 69% was aware that time of Moon rise and Moonset changes every day. About 80% said that Moon revolves around the Earth.

## 5.3 EARTH

About 86% said that Earth is oval in shape and 40% said that Earth is larger than Sun. About 35% said that we live on the flat middle portion of the Earth. Only 70% is aware that Earth is revolving and rotating. About 74% is aware that Earth is a planet and 26% believe that Earth is a luminescent object.

## 5.4 STAR

About 92% believe that stars really tinkle and 82% believe that stars are white in colour. Only 15% said that stars are present at daytime also. About 62% said that stars never die and 25% said that stars appear in the same place in the sky every night. About 12% believe that stars are the spirit of dead persons and 86% believe that stars emit light by themselves.

## 6. SUGGESTIONS TO IMPROVE ASTRONOMY EDUCATION IN HIGH SCHOOLS

In the light of the findings of the present study, the following suggestions were made to improve Astronomy education in the High schools.

1. Allocate funds to visit Planetariums and to buy Telescopes for sky watching
2. Conducts visits to Planetariums, Indian Space Research Organisation (ISRO), Thumba Equatorial Rocket Launching Station (TERLS) etc. and make arrangements to interact with the scientists there
3. Arrange facilities in Schools for sky watching during important natural phenomena like eclipses, planet transits and similar astronomical events
4. Encourage students and parents for night sky watching at home itself
5. Make necessary arrangements in the schools itself for night sky watching
6. Celebrate World Space week, Science day etc
7. Encourage students to do projects related to Astronomy in Science fairs
8. Provide funds to library for purchasing books on Astronomy
9. Use Astronomy simulation softwares for teaching Astronomy
10. Arrange video conferencing in the school with Astronomers
11. Encourage students to maintain a notice board for pasting Astronomy related news
12. Execute an Astronomy club under the supervision of Physical Science teacher
13. Astronomy is an interdisciplinary subject. Teachers of various subjects should plan collaboratively to make correlation between the subjects
14. Encourage students to conduct seminars, discussions and debates on popular Astronomical phenomena to eradicate superstitions.
15. Encourage teachers to use new technologies and innovative teaching methods for making Astronomy learning more meaningful and effective.
16. Teachers can rely on websites on Astronomy like that of ISRO, [www.kidsastronomy.com](http://www.kidsastronomy.com),  
[www.solarsystem.nasa.gov](http://www.solarsystem.nasa.gov) (Home page of NASA),  
[www.astronomy.com](http://www.astronomy.com) (Home page of Astronomy Magazine),  
[www.hps.cam.ac.uk](http://www.hps.cam.ac.uk) (Homepage of Department of History and Philosophy of Science of the University of Cambridge)  
[www.skyandtelescope.com](http://www.skyandtelescope.com) etc. for getting reliable information on Astronomy.

## CONCLUSION

From this study it can be concluded that majority of the high school students of Kerala have misconceptions related to Astronomy. It is expected that this result will be an eye opener to the curriculum planners.

In order to redeem mankind from misconceptions, superstitions, unwanted customs and rituals, education especially Science education should be made effective. More topics on Astronomy which are related to daily life like eclipses,

Star constellations, tides, planets, sun etc. must be included. It is hoped that this study will orient the curriculum planners to give more importance to Astronomy and implement innovative technologies to equip our future generation with sufficient knowledge to understand our cosmic roots and feel the beauty of this universe.

## REFERENCES

- Baxter, J. (1989). Children's understanding of familiar Astronomical events. *International Journal of Science Education*, 11(5), 502-513. <http://dx.doi.org/10.1080/0950069890110503>
- Dunlop, J. (2000). How children observe the universe. *Publications of the Astronomical Society of Australia*, 17, 194-206 <http://dx.doi.org/10.1071/AS00194>
- Padalkar, S. & Ramadas, J. (2008). Indian students understanding of astronomy. In electronic proceedings of the conference of Asian science education-CASE 2008, Kaohsiung, Taiwan.
- Samarapungavan, A., Vosniadou, S., Brewer, W.F. (1996). Mental models of the Earth, Sun, and Moon. Indian children's cosmologies. *Cognitive development*, 11, 491-521. [http://dx.doi.org/10.1016/S0885-2014\(96\)90015-5](http://dx.doi.org/10.1016/S0885-2014(96)90015-5)
- Stahly, L., Krockover, G., & Shepardson, D. (1999). Third grade student's ideas about the lunar phase. *Journal of Research in Science Teaching*, 36(2), 159-177. [http://dx.doi.org/10.1002/\(SICI\)1098-2736\(199902\)36:2<159::AID-TEA4>3.0.CO;2-Y](http://dx.doi.org/10.1002/(SICI)1098-2736(199902)36:2<159::AID-TEA4>3.0.CO;2-Y)
- Vancleave, J.P. (1995). *Astronomy for every kid-101 easy experiments that really work*. Delhi: Pustak Mahal.

## APPENDIX 1

### Astronomy Misconception Inventory- Answer Key with Hints

1	Sun rises in the East	True
2	Sun sets in the West	True
3	Sun emit light at night also	True
4	Sun can be replaced with Moon	False <sup>1</sup>
5	Sun is the biggest star	False <sup>2</sup>
6	Sun goes under the sea at night	False <sup>3</sup>
7	The position of sunrise and sunset changes over the year	True
8	Solar eclipse is due to the swallowing of Sun by Rahu	False <sup>4</sup>
9	Sun does not come overhead everyday	True
10	The time of Sunrise and Sunset changes everyday	True
<b>Moon</b>		
11	Moon rises in the East	True
12	Moon sets in the West	True
13	Moon produces light by itself	False <sup>5</sup>

---

Radhakrishnan, R.

14	Moon is a satellite	True <sup>6</sup>
15	Moon can be seen at day time also	True <sup>7</sup>
16	From Earth all sides of the Moon can be seen	False <sup>8</sup>
17	The shape of the Moon changes everyday	True
18	Moon revolves around the Earth	True
19	The time of Moon rise and Moon set changes every day	True
<b>Earth</b>		
20	Earth is oval in shape	True
21	Earth is larger than the Sun	False <sup>9</sup>
22	We live on the flat middle portion of the Earth	False
23	Earth is a luminescent object	False
24	Earth is revolving and rotating	True
25	Earth is a planet	True
<b>Star</b>		
26	Stars really twinkle	False <sup>10</sup>
27	Stars are white in colour	False <sup>11</sup>
28	Stars are the spirit of dead persons	False <sup>12</sup>
29	Stars never die	False <sup>13</sup>
30	Stars appear in the same place in the sky every night	False <sup>14</sup>
31	Stars emit light by themselves	True
32	Stars are present at day time also.	True

---

158

<sup>1</sup>Sun cannot be replaced with Moon. Sun emits light and is the source of energy on Earth. Moon only reflects the light of Sun falling on it.

<sup>2</sup>Sun is not the biggest star. There are other stars bigger than Sun. It is due to the long distance from earth such that people on earth perceive it as big.

<sup>3</sup>Sun does not go under the sea at night. Due to the movement of earth it appears to go under sea.

<sup>4</sup>Solar eclipse is not due to the swallowing of Sun by Rahu. It is a misconception being formed from the epics.

<sup>5</sup>Moon reflects the light of Sun

<sup>6</sup>Moon is the only natural satellite of Earth

<sup>7</sup>Moon is present at day time also. But it is not visible due to the intense Sunlight.

<sup>8</sup>As the Period of rotation and revolution of Moon is same, people on earth can see only one side of Moon.



---

<sup>9</sup>Sun is very big compared to earth

<sup>10</sup>The light from the stars reach earth after crossing various layers of atmosphere of varying density. Due to this, it appears to twinkle.

<sup>11</sup>Stars have different colours according to its temperature.

<sup>12</sup>Stars are clusters of gases, dust, cloud etc formed due to the gravitation which finally results in the formation of energy in the form of light, heat etc due to nuclear fusion.

<sup>13</sup>When the energy production in star ceases, it is said to be dead.

<sup>14</sup>Due to the rotation of earth the position of stars appear to change everyday.

Astronomical  
Misconceptions  
Prevalent Among  
High School  
Student of Kerala