

7th Class Students' Opinions on Sun, Earth and Moon System

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Abstract This study is conducted to detect the students' perceptions on Sun, Moon and Earth (SME) system and define the 7th grade students' attitudes on the subject. In the study, since it was aimed to detect and evaluate the students' perceptions on some basic astronomical concepts without changing the natural conditions, a descriptive approach was utilized. The descriptive method is effective in defining the investigated case in detail, explaining and evaluating the results in the direction of its own standard and exposing the relations between the events. The study covered a descriptive approach and a case study design was used. This pattern offers obtaining in-depth information for the purpose of work in a short time. The sample of this study consists of 100 students who are studying in a secondary school in Agri province in 2012-2013 academic year. In the study, an assessed attitude scale was also administrated to the sample. From the findings, it was found out that most of the students were far away from the scientific thinking and modeling. Some of the students interpreted the concept by drawing while some of them could not answer the questions.

Keywords Sun, Earth and Moon System, Astronomy Education, Science Education

1. Introduction

Physical sciences have come out as a result of human's efforts made towards discovering himself as a living creature and his natural environment. Physical sciences are based on generalizations reached to a great extent through observations and experiments. Science education aims at training individuals to develop scientific understandings and become science literate through teaching them the ways of how to access knowledge and use it (Yaşar et al., 1998). The students who got science education can make their life easier by using their knowledge more effectively in different stages of their future life because their vision

and level of understanding with regard to universe and rules on the run of the universe and their skill for scientific process would be developed. Deep relation between physical science and astronomy along with individuals' intensive interests towards understanding the celestial bodies have urged the researchers to find out students' perception with regard to basic astronomical concepts (Earth, Moon, formation of day and night, seasons change etc.) (Vosniadou and Brewer, 1992, 1994; Trumper, 2001, 2003, Suzuki, 2003). Basic astronomical terms are presented together with science and science and technology lectures in a spiral structure at the primary education in the new education programme. Whereas the process starting with day, night, seasons etc. subjects in science education for 3rd grade students in the old science and technology curriculum prepared by Ministry of National Education, Head Council of Education and Morality was continuing (MNE, 2006) with subjects of formation of the world, climates, meteorological incidents etc. in science and technology lecture for 8th grade students; in the new curriculum published by Ministry of National Education, Head Council of Education and Morality, science education lecture for 3rd grade students starts with the chapter entitled "lest know our world" continues with "motions of the Earth" in 4th grade, "our world, moon and the our source of life sun" in 6th grade and ends with the chapter entitled "solar system and beyond" in 7th grade (URL, 2013). In this process, students begin obtaining basic knowledge about general characteristics of celestial bodies which are visible to the naked eye at 5th grade (relevant with Sun, Earth and Moon (SEM)) and 7th grade (solar system, star, planet, meteor, satellite, comet, star cluster etc.). The students are expected to comprehend celestial bodies (Korkmaz, 2009; MEB, 2006; Turkoglu, et al., 2009). It has been observed that studies which focused on identifying students perceptions on basic astronomical terms and concepts have been intensified (Trumper, 2003, 2006).

Jones, Lynch and Reesink (1987) examined students' perceptions about Sun, Earth and Moon in terms of shape, size and movements. Researchers have identified that

students have three different solar centred models and two different geocentric models for URL system. (Nussbaum, J., 1985) and (Baxter J., 1989) conducted studies about shape of the world, sky, formation of night and day and human life in the world.

2. Method

It is well-known that it is important to make students acquire cognitive properties as well as affective properties in today's educational system (Tuan et al., 2005). It has been reported in studies that affective field skills are an important factor in making students become successful (Duit & Treagust, 2003; Tuan, et al., 2005; Dede & Yaman, 2008). For this reason, the success of the Science Education Classes Educational Curriculum, which was updated in 2013, has been based on the realization of the acquisitions in the fields of "*Knowledge*", "*Skill*", "*Perception*", and "*Science-Technology-Society-Environment (STSE)*" (MoNE, 2013). The *perception learning field* in science education classes consists of "*attitude*", "*motivation*", "*value*" and "*responsibility*" sub-learning fields (MoNE, 2013). The scope of the motivation, which is one of these sub-learning fields, consists of "*being willing to work in studies conducted on science, and participating in these studies voluntarily*" (MoNE, 2013).

When learning is explained as a behavioral change, it is known that motivation is necessary for a change in behaviors (Sevinc et al., 2011). As a matter of fact, when motivated individuals are inclined to deal with learning activities (Zimmerman, 2000); the ones that are not motivated at an adequate level are not ready for learning (Selcuk, 2000; Ulusoy, 2007). In addition, students with high motivation levels are inclined to show more effort and resolution within the classroom in intra-class activities and tasks when compared with the students with lower motivation levels (Wolters & Rosenthal, 2000, Martin, 2001). For this reason, the academic success of a student who has high motivation is also at a higher level (Senemoglu, 2007).

Student motivation is also one of the key concepts in science education (Bonney et al., 2005). It has been reported in previous studies that there would be increases in the success levels in science education when students are supported by addressing their affective fields (Butler, 2009; Guvercin et al., 2010; Sevinc et al., 2011). According to Hoang (2007), it is difficult to ensure the motivation of students in science education; however, it is necessary for an efficient science education. Tuan et al. (2005) examined the effect of science motivations of students on cognitive learning, and reported six factors that influenced the student motivation towards learning science as *self-sufficiency, active learning strategies, and the value of learning science, performance targets, success targets, and*

the motivation of the learning environment. In another study, it was reported that the participation of students in science classes stemmed from some internal and external reasons, and this situation was associated with motivation. In some students, the feeling of curiosity for scientific concepts is in the forefront and for this reason these students struggle to discover and learn (internal motivation); while some other students may act with the consideration of being at upper levels in terms of social status among their peers (external motivation) (Belo et al., 2009). In addition, it is known that the knowledge and experience of students may be used to increase their motivations in learning science. According to Butler (2009), the awareness of a student on the pollution that occur in the area where s/he lives as a result of intense transportation, and the physical and chemical changes may be the starting point in increasing the desire of the student to learn science. It has been reported that the students who are well-motivated to science classes will find the subjects that are taught in classes entertaining (internal motivation), will be interested in certain subjects (personal interest), and will form the desire to understand the subject, therefore, will participate in the class in an active manner (Cimen, 2007).

On the other hand, it has also been reported that the motivations of students in science classes are influenced by some variables like individual properties, teaching methods and techniques, learning medium and teaching curriculum (Yilmaz and Cavas, 2007; Ng et al., 2010). In the science class curriculum, which was updated in 2013, motivation was included in the curriculum for the first time as a separate learning field (MoNE, 2013). As a matter of fact, it was known that the affective dimension of science and technology teaching was not included in the curriculum at an adequate level, and the curriculum was weak on this point (Cil and Cepni, 2009). For this reason, it is a curious area how adding the motivation dimension to the Science Education curriculum influenced the motivations of secondary school students in the subjects in science classes. Although there are a great deal of studies in the literature that reveal the influence of motivation on science education (Waters and Ginns, 2000; Hynd, et al, 2000; Tuan, et al, 2005; Yilmaz and Cavas, 2007; Hoang, 2007; Dede and Yaman, 2008; Butler, 2009; Nbina, 2010; Guvercin et al., 2010; Sevinc et al., 2011), there are no studies conducted on how the updated science education curriculum influenced the motivation of secondary school students in science education. The purpose of this study is to examine the motivations of students who are studying at various levels of secondary schools in science classes.

3. Findings

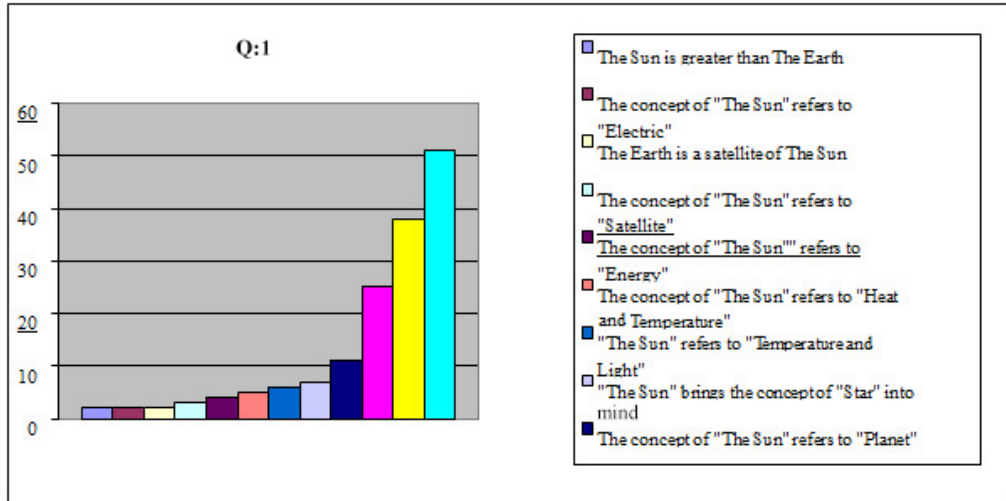
Findings of the study are dealt with two main headers as; findings obtained from the scale of students' attitudes

towards astronomy and findings obtained from semi-structured interviews.

3.1. Findings Obtained from Open-ended Questions

From the open-ended questions directed to the students, different answers are given by the students for the ones

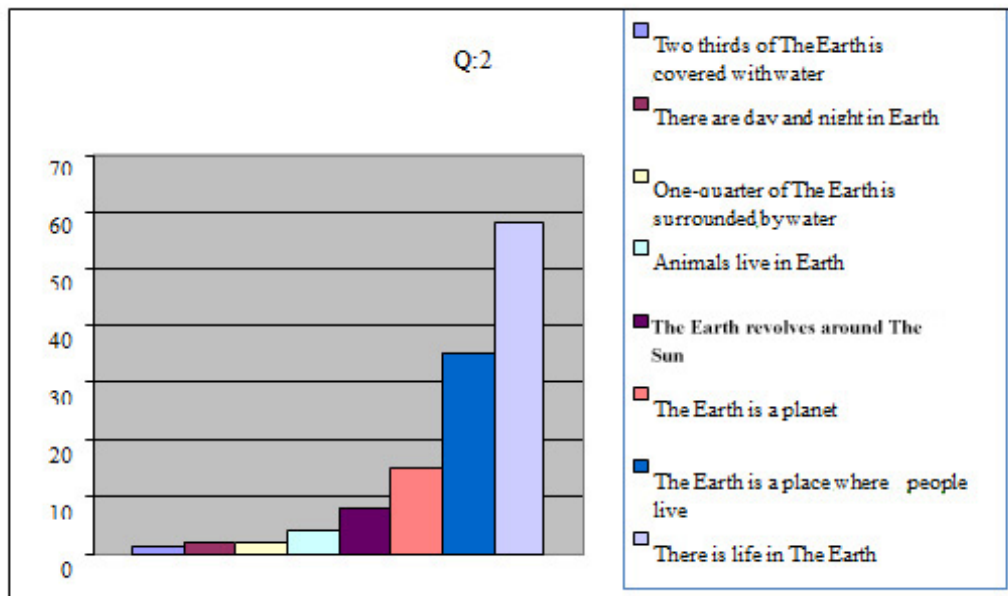
which do not include figures; while similarities in general terms are seen for those answers given to the questions which include figures. In the diagrams, frequency and percentage of student’s descriptions and drawings regarding the Sun, Earth and Moon, are calculated in line with all the questions.



Graph 1. Answers of students to the 1st question

In Graph 1, the question is related to how the students describe the celestial bodies. In this question, the majority (22%) described the sun as a source of heat. What it features in this question is that almost all of the 100 students have given different answers. 7% of them stated that the sun had enlightened the world and had been a source of heat. 7% of them stated that sun had been a planet and only 6% of them stated that the sun had been a star. Answers of some students;

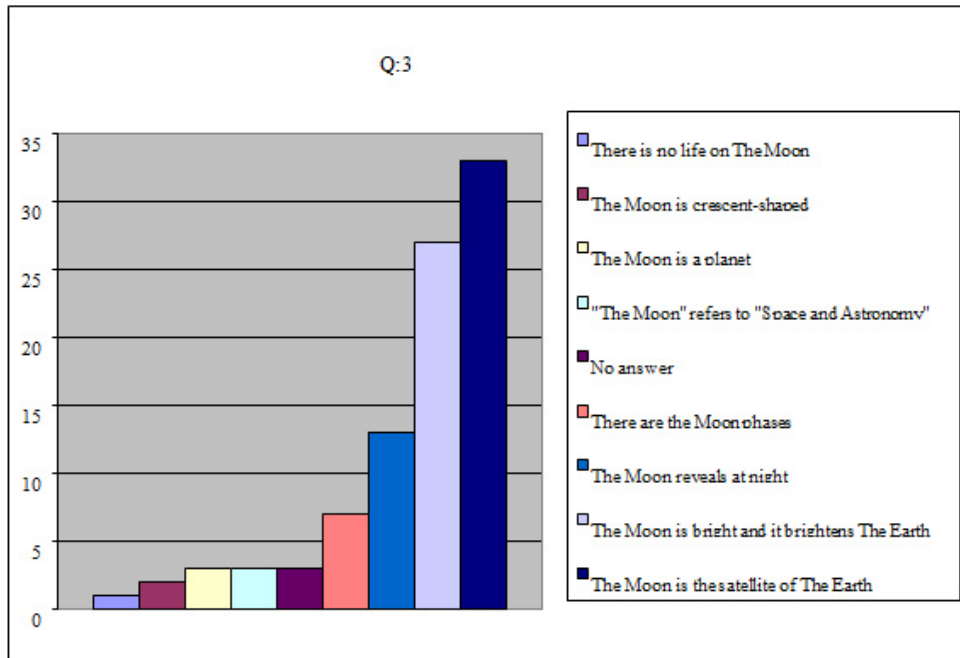
- S16, No life exists in the sun and it is very hot.
- S29, The sun is a star and very hot.
- S42, The sun is planet which enlightens and heats the world.
- S92, the sun is a star which is source of heat and light of the world.



Graph 2. Answers of students to the 2nd question

In Graph 2. the question is related to how the students describe the celestial bodies. In this question, the majority (46%) stated that people and other living creatures had lived in the world. Only 10% of the students stated there is a life in the world, 2% stated that $\frac{1}{4}$ of the world had been covered with water. Some of the students' responses to this question;

- S1, Earth is where the people live.
- S52, Earth is the only planet where the life exists.
- S57, Earth is life, oxygen and happiness
- S95, Earth is a greenish blue planet.

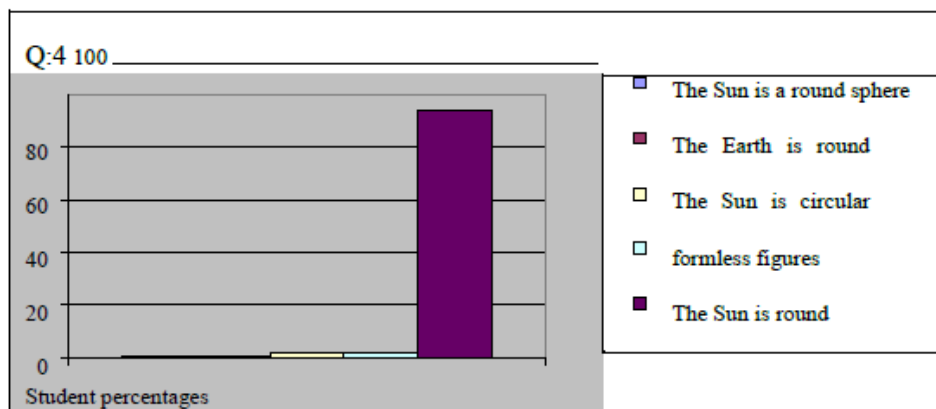


Graph 3. Answers of students to the 3rd question

In Graph 3, the question is again related to how the students describe the celestial bodies. In this question, 34% of the students states the world is satellite of Moon. 15% of students say that moon appears at night and enlightens the world. 6%, states it receives lights from the sun. 1% states it is a star enlightening the world. Again, 1% states it is a meteor which is satellite of the world.

Some examples;

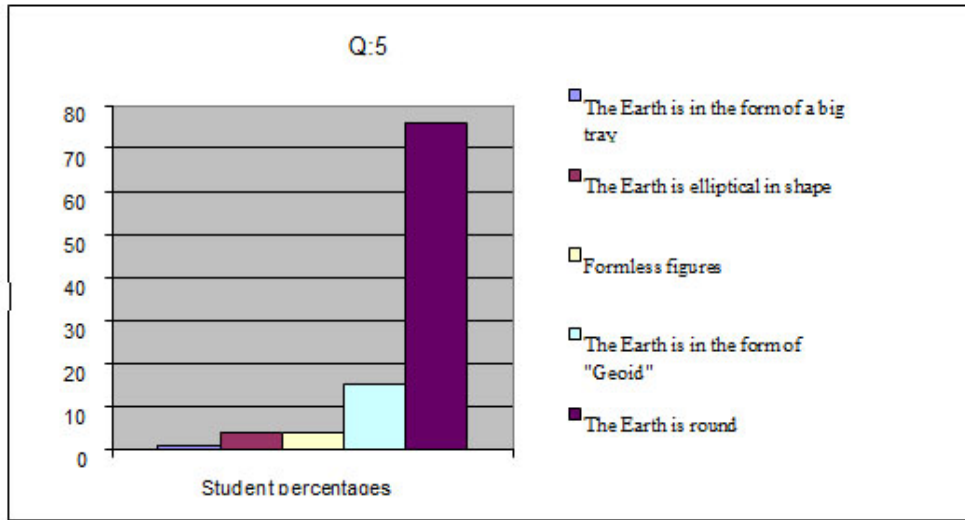
- S40, Moon is the satellite of the world. It causes high tide–low tide by the force of gravity which it applies to the World.
- S43, It is a satellite which enlightens the world with the light that it receives from the sun.
- S70, when you say Moon, flag comes to my mind.
- S90, Moon is a ball appearing at night.



Graph 4. Answers of students to the 4th question

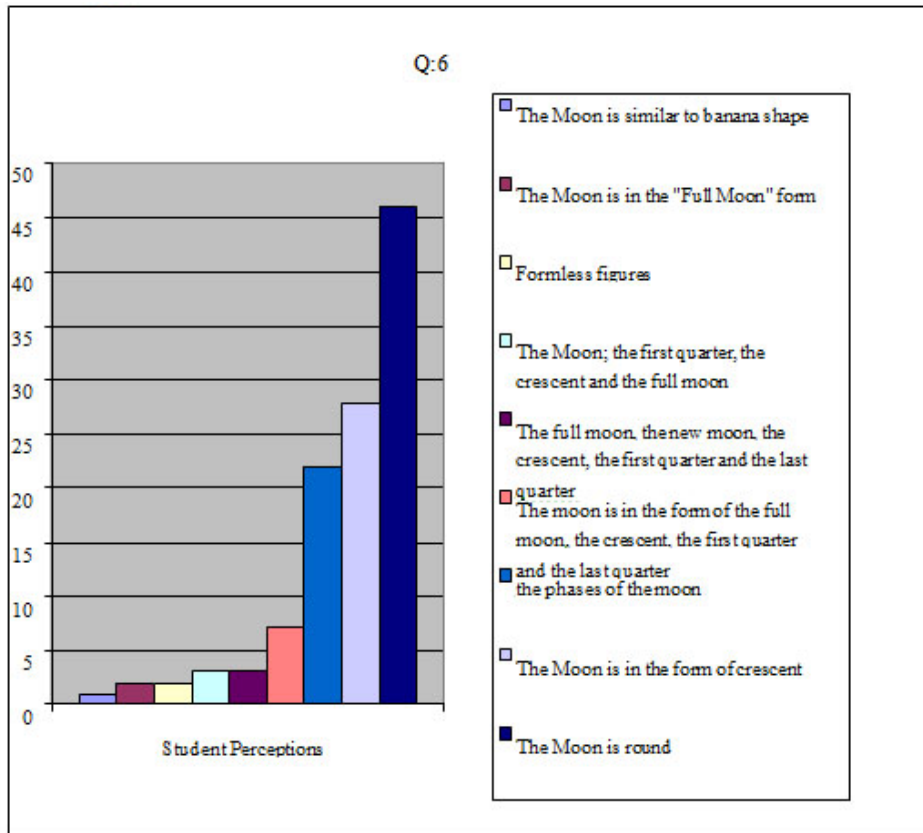
In Graph 4, the question is a visualization question, a great majority of the students seem to be of the same mind about

roundedness of the sun. 94% of the students said the sun is round. On the other hand, %6 gives different answers from each other. Out of 6 students, one, differently from the rest, said the sun has a circle shape while another student said the sun is globe.



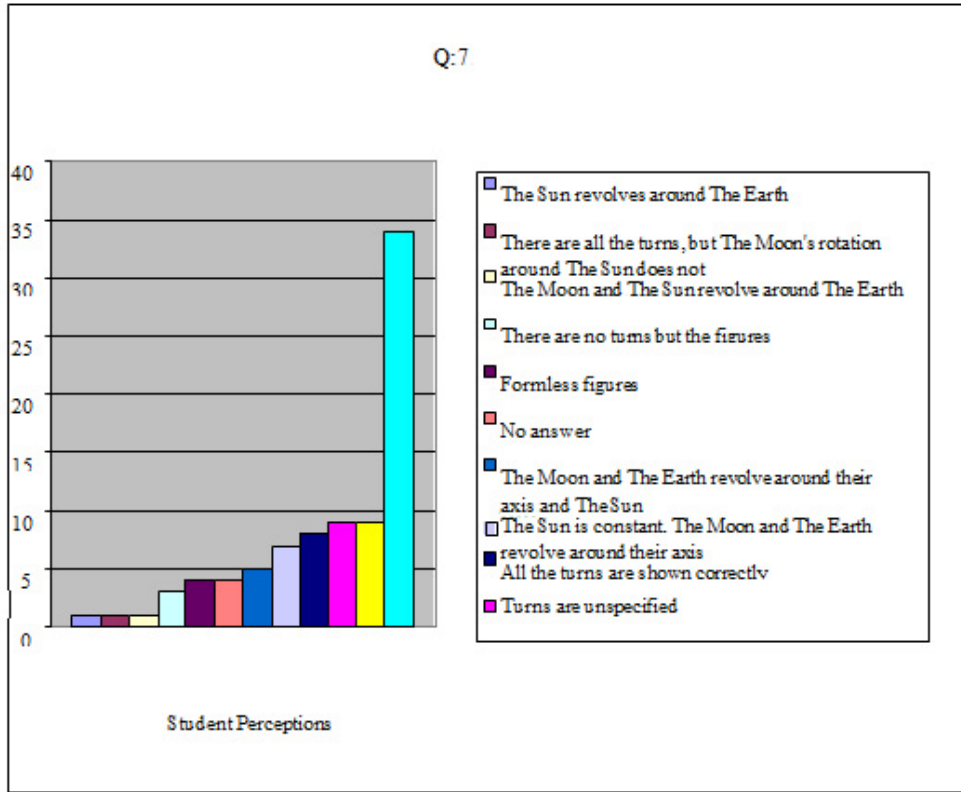
Graph 5. Answers of students to the 5th question

In Graph 5, the question is again related to visualization of celestial body. 75% of the students asserted that the world had been round. 15% of them geoid, 4% ellipses, 1% similar to egg, 1% said it is similar to round tray and the rest 4% drew shapeless figures.



Graph 6. Answers of students to the 6th question

In Graph 6, the question is a question of visualization of celestial body. Majority of the students (46%) think that the moon is round. 29% of them stated that the moon had had crescent shape.



Graph 7. Answers of students to the 7th question

In Graph 7, the question is related to specification of the celestial bodies and visualization of their situation with respect to each other. In this visualization question, it has been seen that most of the students avoided from drawing but 8% of the students showed the Sun, Earth and Moon system ant their rotations exactly. 34% of the students stated that the moon, earth and sun turn around their own axis. Again, it is noticeable that 7% of the students stated that the sun is stationary, but the moon and the earth revolve around their own axis.

3.2. Findings Obtained from the Attitude Scale

Table 1. Attitude scale frequency and rate distribution

Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Q.1 %13	%11	%41	%10	%25
Q.2 %39	%31	%17	%8	%5
Q.3 %14	%7	%21	%32	%26
Q.4 %12	%9	%33	%13	%33
Q.5 %25	%23	%32	%6	%14
Q.6 %16	%13	%17	%25	% 29
Q.7 %53	%21	%11	%6	%9
Q.8 %9	%8	%18	%15	%50
Q.9 %11	%12	%20	%21	%36
Q.10 %18	%11	%18	%20	%33
Q.11 %43	%22	%19	%5	%11
Q.12 %16	%17	%27	%16	%24
Q.13 %34	%25	%19	%9	%13
Q.14 %48	%24	%13	%8	%7
Q.15 %11	%5	%8	%22	%54

Examining Table 1, according to the results of scale attitude of the students, due to their thinking, it is observed that 41% of them are undecided with regard to understanding astronomical concepts. Looking at how they relate astronomical concepts to daily life, 32% of them expressed their disaccord. Vast majority of the students remained undecided with regard to how analytical thinking could be used. 50% of the students stated that they had seen astronomy useful for their professional life while 53% expressed that they had loved astronomy. Majority of the students (33%) stated that that had had difficulties in understanding astronomical concepts. As for “I make plenty of mistakes in explaining astronomical concepts”, majority of the students (27%) remained undecided, while 24% of them expressed their disaccord. 34% of the students stated that there had been many concepts in astronomy science that require memorizing. %48 of them expressed that they could learn astronomy science. 54% of them pointed out that astronomy had been important.

4. Result and Discussion

This study is conducted for the purpose of identifying both perceptions of students regarding Sun, Earth, Moon and SEM system and how they interpret astronomical concepts by means of the astronomy attitude scale which was developed by Zeilik et al (1999). As a result of the findings obtained, it is observed that majority of the students do not use scientific data and they interpret concepts by their own way. A similar study was conducted on the concepts of star, comet and star cluster by (Kurnaz, 2012). In this study, it is emphasized that students have insufficient knowledge with regard to interpretation of the concepts and their failure might stem from the effect of daily language, textbooks and many other similar reasons. Findings from another research show that there is a significant difference between students' opinions and the scientific identifications of some basic astronomical concepts (Kalkan, Kiroglu 2007). The reasons for misconception of the students and their lack of sufficient level of knowledge can be attributed to, as in the case in this study of which the sampling is composed of students from 7th grade, lack of sufficient guidance to be provided by the teachers, disuse of proper materials or schools' not being provided with necessary materials, disuse of terms equivalent to the student's level, insufficient textbooks and so on.

Different samplings and similar studies conducted on the subject suggest that use of new teaching methods and techniques and realization of technology aided applications in transferring and learning of the basic astronomical concepts could be more permanent and efficient in teaching of astronomical concepts. In order to avoid situations like these it is necessary to teach students the basic astronomical concepts in an efficient and clear way. These

problems would be minimized only if the teachers give students subject related projects-homework by using necessary materials, assessing the homework through graded rubric, benefit from concept maps, diagnostic tree, table of componential analysis and take the students to observation houses so that they can examine the issues in situ.

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