



THE CANDIDATE TEACHERS' PERCEPTION ABOUT BASIC ASTRONOMY CONCEPTS

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Abstract

Learners acquire various knowledge and concepts during to their education. The most important role to enhance their knowledge and concepts is teacher. Thus, in this process entail to be teachers have adequate knowledge about their profession. The aim of this study is to detect the understanding levels of candidate teachers studying in various departments about basic astronomy concepts. These basic astronomy concepts are located in preschools' to high schools' curriculums. As a result of this, the sample of the study which carried out phenomenographic method was composed of 12 candidate teachers studying at, early childhood education, elementary teacher education, science education and physics education departments in 2009-2010 academic years. The data of the study was collected by the semi-structured interview consisting of five open-ended questions and one drawing question for each concept and two open-ended questions for the relationship between these concepts. The interviews lasted approximately 45 minutes. The obtained data showed that the candidate teachers could not submit adequate explanations for the concepts (the earth, the sun, the moon, planet, star and satellite). They could answer questions of describing the concept properties such as 'what is the Earth's shape?', but they couldn't answer questions of explaining the reasons that they have these properties like 'why the Earth has this shape?' in the interviews. The results showed that candidate teachers have not enough information about the basic astronomy concepts.

Keywords: Astronomy Concepts, Candidate Teachers, Perception.

INTRODUCTION

Nowadays, students in the process of an average 12 years of formal education from elementary school to university face with many of the concepts and topics from different fields and acquire information about them. Teachers who work at different stages are taking shape the students' acquired information that the process of teaching from the beginning of the preschool to the end of high school in accordance with the targets set by our National Education System. During this process, one of the factor to come true effective teaching as desired is teachers who take on the task of teaching students possess professional qualifications to perform this task (Erden, 2005). Teachers had content knowledge regarding to various topics become important role in the education to affect students' educational lives (Karal, 2003). Therefore, the purpose of this study is

to determine the knowledge about chosen basic astronomy concepts of preschool, elementary, science and physics teacher candidates who will serve at different stages in future.

METHOD

The study was conducted by phenomenographic method and carried out with 12 teacher candidates from the departments of early childhood education, elementary teacher education, science education and physics education at Karadeniz Technical University Fatih Faculty of Education in the academic year of 2009-2010. Data of the study were collected using semi-structured interview questions consisting of 5 open-ended questions for each term, one drawing question, and 2 open-ended questions to reveal relation between the concepts. Interviews conducted with candidates took 45 minutes approximately. The obtained data were analyzed using descriptive analysis method and presented in the form of appropriate table.

FINDINGS

In this part, answers for interview questions given by the candidates are presented in the Table 1 and also, just striking expressions with regards to concepts were included. At first, when definitions put forward by the candidates were examined, it was observed that almost all of them defined Moon as the satellite of Earth and were unable to express what kind of a celestial body Moon is. On the other hand, one candidate expressed Moon as just a spherical object. You may find below an example of definitions put forward for Moon by the candidates.

A : *What kind of a celestial body is Moon?*

K10 : *Its only difference from Earth is that it is around Earth.*

A : *Is it a planet too?*

K10 : *It's not a planet, but a satellite as it rotates around a planet. It possesses planet properties; its size for example, and there are other satellites which bears Moon's properties as well, for example Jupiter which is as large as Moon.*

Table 1. Answers for interview questions given by teacher candidates

Main Themes	The Earth	f	Planet	f	The Sun	f	Star	f	The Moon	f	Satellite	f			
Description	The planet living things live on	9	Celestial body turning around the sun in a certain orbit	5	Star	6	Celestial bodies emitting light and radiating heat produced by themselves	9	Satellite of our Earth	11	Celestial bodies rotating around the planets	9			
	A planet in the Solar System	1	A spherical celestial body	2	A source of heat and light	3	Structures shine due to the light obtained from the Sun	2	A spherical body	1	Celestial bodies smaller than planets	1			
	Piece of land	1	A celestial body in the Solar System	2	A star source of heat and light	2	Smaller pieces broken off the Sun	1			A piece of rock belonging to a planet	1			
	A geoid-shaped structure consisting of lands and seas	1	A celestial body bearing criteria to be considered a planet	1	A hot structure	1					Moon	1			
			A celestial body formed by breaking off the sun	1											
		No explanation	1												
Shape	Geoid	No explanation	7	Spherical	No explanation	7	Spherical	No explanation	4	Spherical	No explanation	10			
		Centrifugal force	2		Gravitational force	3		Explosions	2		Centrifugal force	1			
		Gravitation and rotational motion	1		Based on what we have learned	2		Rotational motion	1		Based on what I have observed	1			
	Ellipse	Gravitational force	1			Gravitational force	1				No certain shape	1			
	Round	No explanation	1			For it is a planet	1	Parts of a planet	3						
								No explanation	1						
Motion	Around itself and Sun	11	Around itself and Sun	9	Moves	Gets away from the Earth in case of motion	2	Moves	Around itself	3	Around itself and Earth	5	Rotates around the planet and itself	6	
	Around itself and the galaxy	1	Around the Sun	2		Gravitational force	1		They slide	2	Around the Sun and Earth	3	Rotates around the planet	2	
			Around itself	1	Doesn't Move	No explanation	1	Doesn't Move	Around itself and inside galaxy	1	Around the Sun, Earth, and itself	2	Rotates around itself	2	
						Around itself	5		Around itself and inside star cluster	1	Around Earth	1	Rotates around the planet and star	2	
						Spiral-shaped	1		Inside galaxy	1	Around itself	1			
						Inside galaxy	1		No explanation	1					
					Around itself and inside galaxy	1	No explanation	2							
							No displacement	1							
Brightness	Shines	Reflects the light that it obtains from the Sun	5	Shines by reflecting the light that it obtains from the Sun	6	As a result of reactions	Transformation of H into He	4	They shine as a result of occurring reactions	8	Shines by reflecting the light that it obtains from the Sun	11	Reflects the light that it obtains from the Sun	10	
		Not a source of light	2		Does not shine due to its structural properties		6	H explosions		1		Shines by reflecting the light it obtains from the Sun		2	No explanation
	Does not shine	It is a planet	1			No explanation	2						No explanation	1	
		Only gets lightened	1			For it is a source of light	3								
		No explanation	1			Because of its energy	1								
	I do not know	2			Due to its structure	1									
Atmosphere	Protects against harmful rays of the Sun	9	Yes	9	No	By its energy production	3	No	For there is no life	5	No	No adequate gravitational force	4	No	7
	Ensures continuity of life	9	No	3		Related to its structure	3		For there occur reactions	2		No life	3	Yes	3
	Ensures formation of climates	3			No life	1	Yes	4			No explanation	2	No explanation	2	
					Yes	Related to its structure	1	No explanation	1			No oxygen in it	2		
						By its energy production	1					No explanation	1		
				By gravitational force	1										
				No explanation	2										
Structure	Layers	9	No explanation	5	Gases	8	No explanation	7	Rock-soil	5	Terrestrial	7			
	Lands and seas	3	Terrestrial	4	Layers	2	Gases	3	No explanation	4	No explanation	5			
	Elements	2	Terrestrial / gas	3	No explanation	2	Layers	2	Layers	3					
	Part of the Sun	1													

Another candidate listed the criteria necessary for us to consider a celestial body as a planet, and stated that we could qualify a celestial body as a planet if it fulfills those criteria. Presented below is a brief extract from that explanation which includes the criteria to be considered a planet.

A : *What are planets?*

K12 : *... First of all, a celestial body must not be a satellite of another celestial body in order to be considered it as a planet. It must follow a periodic orbit around a star. As I mentioned, it must have a mass at a certain rate to be considered as a planet. That is to say; it must have a heavy mass enough to possess that spherical shape. ..., also, it should clear off its orbit before, that means, it must be of a size large enough to pull other celestial bodies around. I mean its orbit must not be full of remains...*

When asked the questions about the shapes of these concepts, the candidates generally drew spherical shapes. It emerges that they know the Earth has a geoid shape, but a significant portion of the candidates who gives this answer are not able to explain the reason why the Earth has this shape. Expressions of the candidate with the code K11 present a good example for this situation.

A : *What is the Earth shaped like? Could you explain it?*

K11 : *It has a shape we learn since the elementary school. We call it geoid. It is shaped like flattened on the poles and bulging at the equator. Not exactly round.*

A : *Why is it shaped like that?*

K11 : *The poles are flattened as they are closer to the core. How would I know... How the land were formed during their formation... I can't precisely think of...*

When asked about the shape of the Sun, all of the candidates were able to say that The Sun has a spherical shape. However, half of the candidates were not able to present an explanation regarding the reason why it is shaped like that. Expression belonging to one of those candidates is as follows.

A : *You have drawn the shape of the Sun as round, why round?*

K9 : *I've always seen it like that, that's why I drawn it round. I've never questioned that.*

Responding to the question asking about the shape of a planet, all of the candidates provided answers in the fashion that planets are spherical, however most of the candidates were unable to explain why a planet has a shape like that. Please find below an example of explanations by a candidate who asserted what he learned as the reason.

A : *Why have you drawn the planets round?*

K3 : *That's how I saw their shapes in the book.*

The candidates who drawn pentagonal stars explained that they drawn such a shape by taking on their own observations, as well. Expressions of the candidate with code K5 was presented as an example for this situation.

A : *Why have you drawn this shape?*

K5 : *The teacher taught us like that, and also we can see its shape like this when we look at it. Just like the way, we see that the Sun is round but it is not actually like that, stars have too different structure but that's the way we see them. This is our perspective, I guess.*

He/She thinks that satellites do not have a certain shape and a part of his/her explanations are presented below.

A : *What may they have shaped like?*

K2 : *A certain shape... For example, Saturn has ring-shaped, but there are lots of rocks around it, you know. It doesn't have a certain shape. We can't say that every satellite has a certain shape.*

The answers of the question about the brightness of concepts are noteworthy. A part of the candidates, on the other hand, stated that stars shined through the light they obtained from the Sun. Explanations of the candidate with code K9 may be presented as an example for expressions of those candidates. That candidate explained the reason behind why stars shine as *'they shine by reflecting the light coming from the Sun'*.

The candidates were asked to establish relations between the concepts in terms of their similarities and differences. When answers received from the candidates were analyzed, it was observed that the candidates established various relations between concept pairs (Table 2).

Table 2. Relations between celestial bodies established by the teacher candidates

Opinions	f
Sun-Star	12
Earth-Planet	11
Moon-Satellite	9
Earth-Moon	8
Sun-Earth	7
Planet-Satellite	2
Star-Planet	1

All of the candidates specified that there is a relation between the Sun and star, and attempted to explain what that relation is. The candidate with code K3 briefly expressed about Sun and star's relation is *'stars reflect the Sun rays'*. The other candidates explained the same relation that *'Sun is a star'*. Some candidates who think that a relation exists between Earth and planet concepts is almost equal for number of the candidates taking part in the interview. The candidates explained as their main reason to prefer this Earth and planet relation based on the expression of *'Earth is a planet'*. The fact that Moon is a satellite underlies the relations between satellite and Moon concepts. In a similar way, for the relation between Earth and Moon, the candidates expressed some reasons like *'Moon is the satellite of the Earth (K2)'* and *'Moon rotates around the Earth (K3)'*. The relation between the Sun and the Earth appears similar to the one between the Earth and Moon. This is confirmed by candidate expressions like *'Earth rotates around the Sun (K12)'* and *'Sun is the star of the planet we live on (K10)'*. Moreover, the candidate with code K11 stated that he/she used that relation since Earth is a piece broken off the Sun. The relation between planet and satellite concepts evokes the one between Earth and Moon. *'Satellite rotates around the planet'* is an example provided for that relation by the candidate (K5). The relation between star and planet may be explained as *'each star has a planet in its own fashion'* expressed by the candidate with code K4. To summarize, it may be observed that, while correlating concepts, the candidates predicated on that a concept set an example for another concept like *'Earth is a planet'*; their interrelated motions such as *'Earth rotates around the Sun'*; or their lightening each other such as *'a star reflects Sun rays'*.

CONCLUSION

The objective of the study was to research perceptions related to basic astronomy concepts of teacher candidates who receive education at different programs. After the study, it was observed that, when it comes to basic astronomy concepts, answers of preschool and elementary teacher candidates largely contained unscientific knowledge when compared to those of science and physics teacher candidates. Nevertheless, this expression does not imply that science and physics teacher candidates provided scientific answers at very high percentages. In consideration of understanding levels the candidates predominantly accumulated by their branches, and also the fact that astronomy is a scientific branch included in science curriculum; one may tend to assert that the candidates who received education in science field would be more inclined to this subject. Thus, we considered that science and physics teacher candidates delivered more scientific explanations thanks to the advantage provided for them by their branches. In consequence, we found that the candidates do not possess knowledge at a sufficient level for basic astronomy concepts. This result bears a resemblance to the results of other studies conducted on this subject with both teacher candidates and teachers by different researchers, as well (e.g., Trumper, 2001, 2006; Ünsal et al., 2001; Frede, 2006; Küçüközer, 2007; Emrahoğlu and Öztürk, 2009).

REFERENCES

- Emrahoğlu, N. ve Öztürk, A., (2009). Fen Bilgisi Öğretmen Adaylarının Astronomi Kavramlarını Anlama Seviyelerinin ve Kavram Yanılgılarının İncelenmesi Üzerine Boylamsal Bir Araştırma, Ç.Ü. Sosyal Bilimler Enstitüsü Dergisi, 18,1, 165-180.
- Erden, M., (2005). Öğretmenlik Mesleğine Giriş, Epsilon Yayıncılık, İstanbul.
- Frede, V., (2006). Pre-Service Elementary Teacher's Conceptions About Astronomy, Advances in Space Research, 38, 2237-2246.
- Karal, I., S., (2003). Fizik Öğretmeni Adaylarının Konu Alanı Bilgi Düzeylerinin Belirlenmesi, Yüksek Lisans Tezi, K.T.Ü., Fen Bilimleri Enstitüsü, Trabzon.
- Küçüközer, H., (2007). Prospective Science Teachers' Conceptions about Astronomical Subjects, Science Educational International, 18, 2, 113-130.
- Trumper, R., (2001). A Cross- College Age Study of Science and Nonscience Students' Conceptions of Basic Astronomy Concepts in Preservice Training for High-School Teachers, Journal of Science Education and Technology, 10, 2, 189-195.
- Trumper, R., (2006). Teaching Future Teachers Basic Astronomy Concepts- Sun- Earth- Moon Relative Movements-at a Time of Reform in Science Education, Research in Science and Technological Education, 24, 1, 85-109.
- Ünsal, Y., Güneş, B. ve Ergin, İ., (2001). Yükseköğretim Öğrencilerinin Temel Astronomi Konularındaki Bilgi Düzeylerinin Tespitine Yönelik Bir Araştırma, Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi, 21, 3, 47-60.