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Investigation of Preservice Science Teachers' Comprehension of the Star, Sun, Comet and Constellation Concepts

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Abstract
The purpose of this study is to reveal preservice science teachers' perceptions related to the sun, star, comet and constellation concepts. The research was carried out by 56 preservice science teachers (4 th grade) at Kastamonu University taking astronomy course in 2014-2015 academic year. For data collection open-ended questions that required defining, drawing and association of concepts was used. Data was collected in two stages before and after relevant concepts were taught. The collected data were analyzed using different rubrics. It is seen that preservice teachers' insufficient knowledge, alternative ideas and figures away from scientific knowledge about star, sun, constellation and comet concepts that determined in pre-test showed a showed a decrease in post-test. Besides, even though there is an increase in star concept-sun, constellation and comet concept associations in post-test in comparison with pre-test, it is understood that some ideas of preservice teachers remained the same. In the light of the results, it is thought that learners are being inexperienced in astronomy, it is required to benefit from teaching materials such as three dimensional models, conceptual change texts, telescope, etc. in teaching basic astronomy concepts.
Keywords: star, sun, comet, constellation, student comprehension

1. Introduction

Observations and experiments are vital in emerging and progressing of science and the space is an enormous execution area for basic science (Tascan, 2013). Especially having features that still protect its mystery and being incredibly huge that surpass the earth of astronomy and space sciences laboratory unlike physics, chemistry, biology, etc. (Tunca, 2005) emphasizes the importance of astronomical observations. Besides, being the oldest in sciences and playing a central role in natural sciences (physics, mathematics, chemistry and earth science) (Trumper, 2006) increases astronomy's importance. In different countries, astronomy education has played a key role within the structure of science education and has been a reason for restructuring of the curriculum (Turk, 2010). STAR project that conducted in the United States or CLEA (Contemporary Laboratory Experiences in Astronomy) project executed in France are the examples to these changes. In our country's curriculum, basic astronomy concepts are taught in Life Science and Physical Science lessons at primary education, in Astronomy Elective Courses at secondary education and in Astronomy lesson in faculty of education at undergraduate level courses. In different education levels, contents regarding the concepts about this study can be seen in Table 1.

Table 1: Contents regarding star, sun, comet and constellation concepts that take part in curriculum in different levels (MNE, 2009, 2010, 2013).

Level	Content
Primary Level	It contains scientific information regarding the Earth's and Universe's properties, structure and researching, investigating and discovering the changes that occurred in the subject area of the Earth and Universe.
Secondary Level	It contains objectives for students such as providing scientific thinking skills, emphasizing and comprehending the importance of daring to recognition the universe and all its components by means of superior abilities that have despite of the fact that the earth and the human occupy very small area, understanding the basic astronomical viewpoint, gaining ability to use their knowledge against concrete events and providing to know the technological innovations related to space science.
Undergraduate Level (for Preservice Science Teachers)	Keppler laws and solar system structure include planets and its properties, satellites; galaxies in general structure of the universe, the formation of stars, red giants, neutron stars, white dwarf stars and black holes.

As it is understood in Table 1, astronomy lesson has an important place at primary and secondary level. Therefore, it is important to be taught scientific knowledge about astronomy by teachers for 3rd to 8th grades at primary level and teachers at secondary level and it is also important to create a positive attitude against astronomy (Ucar & Demircioglu, 2011). Preservice science teachers learn astronomy subjects at the last period

of curriculum in undergraduate education in Turkey and for this reason, learners are being inexperienced (naïve) in astronomy (Bektasli, 2013).

When the literature is examined, astronomy-themed studies generally comprises of primary education level; it showed that students have dominant and different alternative ideas about basic astronomy concepts (Baloglu Ugurlu, 2005; Kucukozer, Kucukozer, Yurumezoglu & Korkusuz, 2010; Plummer, 2006; Trundle, Atwood & Christopher, 2006; Trundle & Troland, 2005). Students come to class with consistent models that they already have as a result of observations regarding physical world (Freede, 2006). For instance, the Sun is the biggest star in the universe (Baloglu Ugurlu, 2005); The comet is a star, too (Kurnaz, 2012; Bektasli, 2014); Stars are smaller than the sun (Unat, 2011). The most important task, to eliminate alternative ideas about astronomy, falls to teachers who are primarily responsible for training and education (Unsal, Gunes & Ergin, 2001). Preservice teachers who are considered as a future teacher should not have such alternative ideas. It is seen important that preservice primary school teachers both must be aware of perceptions regarding astronomy and develop appropriate curriculums (Freede, 2006). Zeilik, Schau and Mattern (1998) have examined the basic scientific and non-scientific concepts on several physics and astronomy concept in their study with university students. Before taking the class of "Introduction to Astronomy", the students have indicated that 23 % of them have adopted correct understanding regarding the Sun (sun overhead), 28 % of them have known the solar eclipse and 66 % of them have had the correct opinion regarding the stars' life/mass.

In astronomy-themed studies in literature, the number of the studies whose topic is only stars have increased in recent years, nevertheless it is quite low (Bailey, 2006; Durukan & Ultay, 2014; Ezberci Cevik & Kurnaz, 2016; Iyibil & Saglam Arslan, 2010; Kurnaz, 2012; Unat, 2011). Bailey (2006) have aimed to reveal students' perceptions about stars in his study, Durukan and Ultay (2014) have aimed to develop an appropriate course material to 5E model of constructivist learning approach about stars, implement and evaluate the materials' effectiveness, and Ezberci Cevik and Kurnaz (2016) have also examined some studies that have been done regarding stars thematically. In literature, it can be found studies such as determining preservice physics teachers' cognitive models related to star concept (Iyibil & Saglam Arslan, 2010), examining the perceptions that primary school 7th grade students have about star, comet and constellation concepts (Kurnaz, 2012) and being evaluated the pedagogical knowledge of preservice physics teachers (Unat, 2011). In this context, this study is different from other studies in terms of including both the definition, the drawing, and the association of the concepts. It is thought that the results of this study will be a guide to teachers/researchers about assesment and evaluation of astronomi course.

1.1 Research Focus

According to studies in literature presented above, it can be stated that studies regarding stars are generally involved in astronomy subject area and there is not enough study that aims at mentioned concepts. In addition to this, in literature there is no study that examines the effect of undergraduate education for these concepts on preservice science teachers' learning. In this regard, it is very important that preservice teachers' perceptions regarding these concepts and changes between training and perceptions should be found out.

The purpose of this study is to reveal preservice science teachers' comprehension related to the sun, star, comet and constellation concepts. Sub-objectives regarding primary purpose of the study are indicated below.
For preservice science teachers;

1. What are their definitions about star, sun, comet and constellation concepts?
2. What are their drawings about star, sun, comet and constellation concepts?
3. How are their associations with star, sun, comet and constellation concepts?

2. Method

In this study, one group pre-test and post-test experimental design was used in quantitative research methods. Experimental designs are studies which are used to test the relationship between variables (Büyüköztürk, Kılıc Cakmak, Akgün, Karadeniz & Demirel, 2014). In this study, independent variable is implemented to one group in one group pre-test and post-test experimental design and then, the effect of process is tested by performing measurements before and after experiment.

2.1 Sample of Research

Target population of this study is all 4th grade preservice science teachers in Kastamonu and accessible population of this study is all 4th grade preservice science teachers at Kastamonu University. Therefore, the research was carried out by 56 preservice science teachers (4th grade) at the university taking astronomy course in 2014-2015 academic year.

Astronomy courses which are taught in department of science in the faculty of education contain specific topics (see. Table 1). All students, who take the course about stars in the context of general structure of the universe, exposed to the same application, there is not any change to the context. Weekly lesson applications

that use during a term were planned in advance by researchers by making a wide literature review and it was adhered to specified content. The prepared content was implemented two hours per week in 2014-2015 academic year spring term. Lectures were taught by using slideshows, video shows (the formation of seasons, tides, the phases of the moon, etc.) the model of Sun-Earth-Moon to explain the phases of the moon and eclipse, simulation shows and question-answer method.

2.2 Instrument and Procedures

Data collection tool used in this study was prepared in three stages. In the first stage, open-ended questions were asked to preservice teachers to determine what they can write about stars, sun, comet and constellation concepts. These questions are: "What is a star?, What is a comet?, What is the sun?, What is constellation? In the second stage, preservice teachers were asked to draw figures belonging to this concepts. Finally, they have been asked a concept map that shows associations between concepts. Questions prepared by considering course content and finalized in accordance with expert opinion. It was given 20-minute period to students to write their answers and to complete their drawings and concept maps. Data was collected in two stages before and after relevant concepts were taught.

Time period between the pre-tests and post-test have to be sufficient in order to control threat of testing (Fraenkel & Wallen, 2006). Therefore, in this study duration of teaching concepts was eight weeks. So this time reduced the pre-test effect on the post-test.

2.3 Data Analysis

For the pretests and posttests, students' responses of the open-ended questions that required defining, drawing and association of concepts were entered in the SPSS files. A three-stage process was followed to analyze obtained data. In the first stage, students' responses to open-ended questions for definition were analyzed; in the second stage, the images regarding figures were analyzed. In these two analysis process, it was benefited from the rubric which was developed by Abraham, Wetsbrook and Williamson (1994) and which was used in various studies (etc. Calik, 2006; Kurnaz & Eksi, 2015). Rubric was structured for this two analysis as shown in Table 2.

Table 2. Rubric that used in identification and figure analysis

Score	**Identification Analysis**	**Figure Analysis**
[0]	Unanswered question, indifferent or uncertain / unclear responses	Unanswered question, indifferent or uncertain / unclear figures
[1]	Responses away from scientific knowledge	Figures away from scientific knowledge
[2]	Responses contain inappropriate qualifications with scientific knowledge	Figures contain inappropriate qualifications with scientific knowledge
[3]	Responses including partial scientific explanation	Partial scientific figures
[4]	Responses including completely scientific explanation	Completely scientific figures

Open-ended questions for identification and figures were analyzed by researchers in accordance with the specified categories in Table 2. In the third stage, associations/propositions that used in concept maps by students were analyzed in accordance with mentioned criteria in Table 3.

Table 3. Rubric that used in concept map analysis.

Score	Concept Map Analysis
[0]	No concept map, no association, indifferent or uncertain / unclear responses
[1]	There is an association, no proposition, not scientific
[2]	Partially associated
[3]	Scientifically associated

Data obtained for concept maps, as in the previous analysis, were analyzed separately for each student response in accordance with mentioned categories in Table 3. An example of a concept map analysis is shown below.

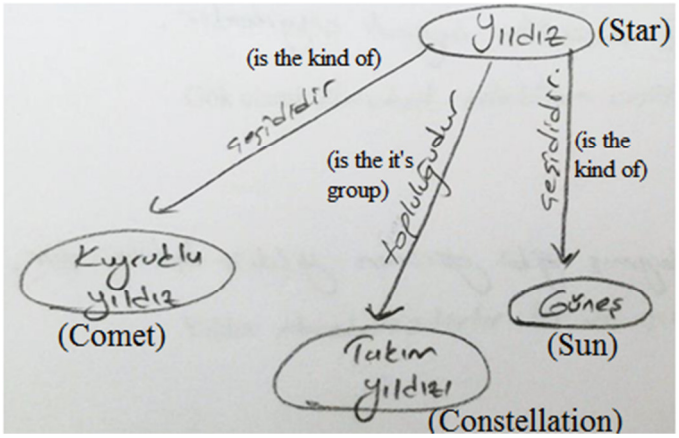


Figure 1. Concept map of O7 student (Post-test)

According to Figure 1, when associations were examined separately between star-sun, and comet-constellation, O7 coded student stated that the sun is a kind of star in star-sun match. However the sun is not a kind of star, it is an example of star. Therefore, according to rubric (see. Table 3), score should be "1". In star-constellation match, constellation is expressed as star group. When looked from the earth, it is seen star groups called as common name for their coexistence. These stars groups are called as constellations. Because student associated partially, score can be "2". Finally, in star-comet match, it is stated that comet is a kind of star. But comet is not a star. There is an association but it is not scientific so the score should be "1".

Coding that made in analysis process was checked frequently by researchers, non-overlapping conditions were discussed and reliability was provided with shared assessments. All scores regarding student coding are given in annex. In findings, students' name are concealed and coded as O1, O2, O3, ..., O56. Besides, dependent t-test was applied for analyzing pre-test and post-test data.

There are some possible threats to internal validity of the results and conclusions. In this study, questions of the instrument were open-ended type, but it was used coding and scoring procedure from the literature, as you can see above. Therefore, the threat of instrument decay was eliminated. Besides, mortality threat was also controlled in this research because there was no missing participants before or after the treatment.

3. Findings

Under this heading, preservice science teachers' responses regarding definition of star, sun, comet and constellation concepts, responses for drawings and responses for associations via concept map were presented respectively. Contents in sub-headings are instantiated with responses given for relevant concepts by students.

3.1 Findings Regarding Responses Given To Open-Ended Questions by Preservice Science Teachers

Scores obtained from responses that were given by preservice teachers in pre-test and post-test regarding definition of star, sun, constellation and comet were presented in Table 4.

Table 4. Levels of preservice teachers regarding identification of celestial bodies

Celestial bodies	**[0]**		**[1]**		**[2]**		**[3]**		**[4]**	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Star	8	3	19	2	22	12	7	29	0	10
Sun	2	0	6	0	29	17	19	16	0	23
Constellation	15	4	23	9	18	16	0	9	0	18
Comet	23	5	21	13	10	14	2	16	0	8

In Table 4, when responses given by preservice teachers regarding identification of celestial bodies are examined, it is seen that they gave partial scientific responses in pre-test regarding star concept (n=29), they did not gave complete scientific responses. When it is looked at the levels of responses in post-test regarding the same concept, it is seen that there is an important increase in partial and complete scientific responses. When it is looked at the levels of pre-test responses regarding describing of the sun concept, likewise it does not contain complete scientific responses. While majority of students concentrate on expressions that contain non-scientific responses with scientific knowledge in pre-test (n=29), this concentration decreases in post-test (n=17), it is understood that there is an increase in responses involving partial and complete scientific expressions. When the levels of responses in pre-test regarding constellation concept are examined, there is no response including partial and complete scientific expression, on the contrary it is seen that majority of preservice teachers (n=23) have given responses that is away from scientific knowledge. It can be stated that there is a significant decrease in responses regarding constellation concept in post-test in these two levels, there is a significant increase in

responses involving partial (n=9) and complete scientific expression (n=18). When examined data regarding comet concept, it is not seen responses involving complete scientific expression in pre-test as similar to other concepts. It is seen that half of preservice teachers (n=23) could not answer comet concept and gave indifferent or uncertain / unclear responses. It can be understood in post-test that there is an increase in scientific and non-scientific responses, partial scientific and complete scientific response scores. Examples from preservice teachers' responses are presented in Table 5.

Table 5. Examples for the identification of celestial bodies

		Student response	Score
O20	Pre-test	Takım yıldızı : Bilmiyorum (Constellation: I don't know.)	0
	Post-test	Takımyıldız: Dünyadan bakıldığında bir arada bulunmalarından dolayı ortak adla adlandırılan yıldız topluluklarıdır. (Constellation: These are stars communities are called common name due to the coexistence seen from the wor	4
O36	Pre-test	Güneş; Dünyaya ve diğer gök cisimlerine ve yıldızlara ışık veren [illegible] cisimdir. Çok büyük bir ısıya ve enerjiye sahiptir. (Sun: It is celestial body that gives heat and light to the world, stars and other celestial bodies. It has a much greater heat and energy.)	2
	Post-test	Güneş: Çok büyük kütleye sahip, oldukça sıcak, ısı ve ışık kaynağı olan gök cismidir. Güneş sisteminde yer alır. Dünyanın yaşa kaynağıdır. Şu an anakol dönemi içerisindedir. (Sun: It is light and heat source celestial body that has a very large mass and quite hot. It is located in the Solar System. It is the World's source of life. It is in the main sequence in the current period.)	4

When looked to sample student responses in Table 5, it is seen that O20 preservice teacher took zero point because of answering as "I do not know" in pre-test regarding the definition of constellation, O20 preservice teacher took four points because of giving response involving scientific knowledge in post-test. Regarding to definition of the sun, it is understood that O36 student took two points owing to giving response involving scientific and non-scientific knowledge in pre-test, O36 student took four points owing to giving response involving scientific knowledge in post-test.

3.2 Findings Regarding Responses Given To Figure Questions by Preservice Science Teachers

Scores obtained from responses that were given by preservice teachers in pre-test and post-test regarding drawing of star, sun, constellation and comet were presented in Table 6.

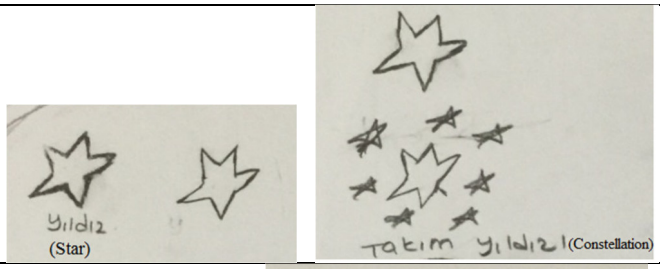
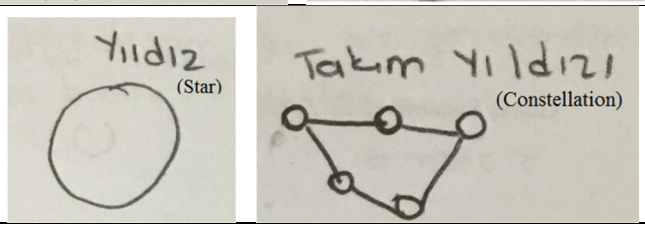
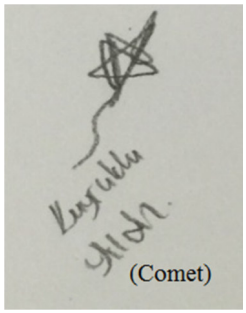
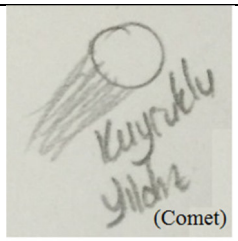
Table 6. Levels of preservice teachers regarding drawing of celestial bodies

Celestial bodies	[0]		[1]		[2]		[3]		[4]	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Star	1	3	34	7	1	1	0	0	20	45
Sun	27	23	1	3	1	1	0	0	27	29
Constellation	4	2	34	9	3	1	15	44	0	0
Comet	3	2	41	22	5	5	0	1	7	26

When Table 6 is examined, pre-test does not contain partial scientific figures for drawing star shape. It is understood that the majority of preservice teachers (n=34) drew figures away from scientific knowledge. Similarly, the post-test does not contain partial scientific figures, moreover there is a significant decrease (n=7) in figure drawing that is away from scientific knowledge. On the contrary, it is seen that there is a significant increase in complete scientific figure drawings (n=45) and most of preservice teachers gave correct responses. When looked at the levels of pre-test responses regarding drawing of the sun figure, it is seen that preservice teachers drew either completely scientific (n=27) or unanswered/indifferent/unclear figures (n=27), it is not seen partial scientific figures. Similarly, it can be stated in post-test that there is not partial scientific figures, there is an increase in complete scientific figure drawings (n=29). Besides this, it is seen that preservice teachers used unanswered/indifferent/unclear figures regarding the sun in post-test again (n=23). When looked at pre-test data

of preservice teachers regarding constellation drawing, it is understood that majority of them draw figures away from scientific knowledge. It can be stated that while there are not complete scientific figures in pre-test and post-test, most of students (n=44) used partial scientific figures in post-test. When examined pre-test levels of drawings regarding comet concept, it is seen that majority of preservice teachers drew figures away from scientific knowledge. While it cannot find partial scientific figures regarding comet in pre-test, it is quite low in post-test, either (n=1). It is understood that there is a decrease in drawings away from scientific knowledge in post-test, there is an increase in complete scientific figure drawings. Examples from preservice teachers' drawings are presented in Table 7.

Table 7. Examples for the drawing of celestial bodies

		Student response	Score
O54	Pre-test		1-1
	Post-test		4-3
O14	Pre-test		1
	Post-test		4

When examined Table 7, O54 preservice teacher took one point because of giving response involving non-scientific knowledge in pre-test regarding star figure and similarly took one point for constellation. It is seen in post-test that O54 preservice teacher took four points because of drawing scientific figure regarding star and was considered as partial scientific (three points) because of not showing three-dimensional plane for constellation. It is understood that O14 preservice teacher took one point because of drawing figure away from scientific knowledge regarding comet and took four points because of drawing scientific figure in post-test.

3.3 Findings Regarding Responses Given To Associate Questions by Preservice Science Teachers

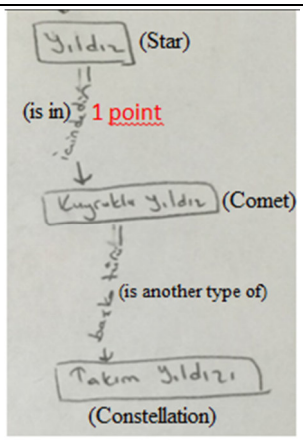
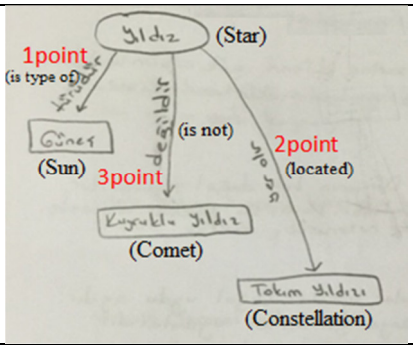
In this study, since star concept is basic concept, it is looked at star-focused associations at this stage. The scores of preservice teachers' responses obtained from pre-test and post-test for associations between star, sun, comet and constellation concepts can be seen in Table 8.

Table 8. Levels of preservice teachers regarding association of celestial bodies

Celestial bodies	[0]		[1]		[2]		[3]	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Star-Sun	43	32	10	13	0	2	3	9
Star- Constellation	25	29	22	17	9	7	0	3
Star-Comet	24	32	32	18	0	1	0	5

As seen in Table 8, it is ascertained that majority of preservice teachers (n=43) gave uncertain / unclear responses in pre-test regarding no association between star-sun, there are ten preservice teachers who associated but not offered a proposition or presented non-scientific proposition and there are three preservice teacher who associated scientifically. Similarly, in post-test, most of preservice teachers (n=33) stated that there is no association between star-sun, besides that there is an increase in the number of teachers who establish partial or scientific connection. When looked at association between star and constellation, in pre-test, either concept map was not specified, it was made uncertain proposition (n=25) or it was associated/ not offered a proposition or made non-scientific proposition (n=22). Besides, while there are 9 preservice teachers who establish partial connection, there is no scientific association. In post-test, there is an increase in the number of preservice teachers who do not specify concept map/gave uncertain responses for star-constellation association, there is a decrease in association but no proposition/nonscientific and partial association". Besides, there are three preservice teachers who establish scientific connection in post-test. When looked at associations between star-comet, it is understood that majority of preservice teachers (n=32) associated concepts in pre-test, but they did not present a proposition or scientific proposition. While 24 preservice teachers gave uncertain / unclear responses in pre-test regarding being no association between star-comet, it was seen no partial connection or scientific connection. It is ascertained in post-test that while there is a decrease in the number of preservice teachers who associate concepts, present no proposition or present non-scientific proposition, there is an increase in the number of preservice teachers who gave uncertain / unclear responses regarding being no association between star-comet. While there is no partial connected responses in post-test as in pre-test, it is seen that there are five preservice teachers who establish scientific association.

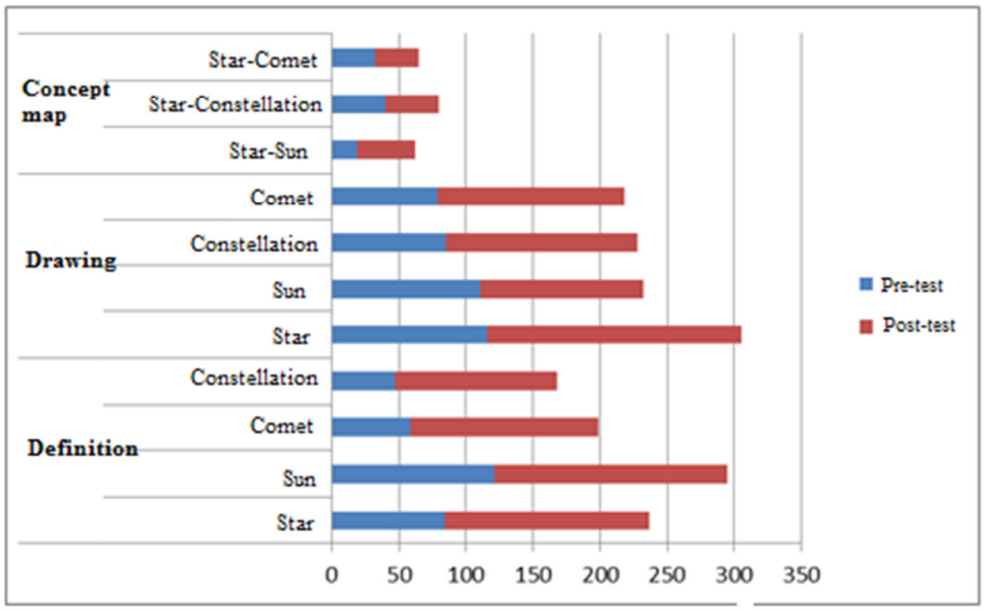
Table 9. Examples for the association of celestial bodies

		Student response	Score*
O53	Pre-test		0-0-1
	Post-test		1-3-2

*Points ranking: Star-Sun Relationship, Star- Constellation Relationship, Star-Comet Relationship

When looked at sample student responses in Table 9, it is seen that O53 preservice teacher do not indicate any association in pre-test between star concept and sun-comet concepts in concept map, but O53 preservice teacher associated star and comet non-scientifically. While star-sun association have non-scientific content, star-comet is connected scientifically and star-constellation is connected partially in post-test. Scores

obtained from responses that were given by preservice teachers' in pre-test and post-test regarding definition of stars, sun, constellation and comet were presented in Graphic 1.



Graphic 1. The total score of the pre-test and post-test responses of prospective teachers

When Graphic 1 is examined, it can be stated that total post-test scores regarding definition of stars, sun, constellation and comet are higher than total pre-test scores. It is seen that preservice teachers tried to write expressions regarding definition of the sun mostly in pre-test an d post-test, it can be stated that the number of preservice teachers who gave response is quite low, therefore the scores are low, too. There is an increase in the scores of preservice teachers in post-test regarding figures of star, sun, comet and constellation. Especially, it is seen an increase in total score on account of high scores which was taken for star concept in post-test. When it is examined according to concept map (see. Graphic 1), even though there is an increase in star-sun concept and constellation-comet concept associations in post-test in contrast with pre-test, it is understood that there is no big change. While there is few preservice teachers who associated star-sun concepts in pre-test, it is seen an increase in post-test in contrast with pre-test.

Generally (see. Graphic 1), preservice teachers have difficulty in associating concepts/creating concept maps mostly, therefore it is seen that they took lower scores in comparison with definition and figuration. There is another finding that preservice teachers express star concept well by using figures rather than definition. The results of the t-test can be seen in Table 10.

Table 10. Results of t-test for the group

		N		SS	t	*p
Definition	Pre-test	56	5,55	1,82	-11,294	,000*
	Post-test	56	10,50	2,89		
Drawing	Pre-test	56	9,98	3,66	-6,779	,000*
	Post-test	56	10,57	3,12		
Concept map	Pre-test	56	1,63	1,24	-1,694	,096
	Post-test	56	2,07	1,95		
Total	Pre-test	56	14,16	4,25	-12,276	,000*
	Post-test	56	23,14	5,37		

*p<.05

As it is seen from the Table 10, it was found that there was a statistically significant difference between pre-test and post-test scores of preservice science teachers on definition [$t_{(55)}$=-11,294; p<.05] and drawing [$t_{(55)}$=-6,779; p<.05], separately. There was not a significant difference between pre-test and post-test scores of preservice science teachers on concept map [$t_{(55)}$=-1,694; p<.05]. When looking at the total score, there was a statistically significant difference between pre-test and post-test scores [$t_{(55)}$=-12,276; p<.05]. The group's total post-test average (=23,14) was higher than pre-test average (=14,16).

4. Discussion

As a result of findings obtained from open-ended questions regarding the star, sun, comet and constellation concepts for the first-sub objective of study, it is seen that there is no responses that contain complete scientific

knowledge in pre-test for the definition of aforementioned concepts and preservice teachers have many alternative ideas. Alternative ideas came out in this study such as "Comet is a star.", "Stars reflect light (come from the sun).", "The sun is not a star." show similarity with literature (etc. Agan, 2004; Comins, 2001; Emrahoglu & Ozturk, 2009; Kurnaz, 2012; Kucukozer, Bostan & Isildak, 2010). In Agan (2004)'s study high school and first-year undergraduate students were asked about their understanding of stars. At the end of the study, for example the earth science students did not generally identify the Sun as the nearest star to the Earth,and they differentiated the Sun from other stars through descriptive features, namely size. Besides that, it is determined in this study that there is an increase in the scores taken from post-test. So, we can say that astronomy courses at the high school level (Agan, 2004) and undergraduate can be very effective at improving students' astronomical content knowledge.

It is remarkable that while teachers gave unanswered, indifferent or uncertain / unclear responses regarding especially constellation-comet concepts in pre-test, there is a significant decrease in post-test. It is thought that student-centered implementations in astronomy teaching are efficient, thus students can configure concepts correctly and scientifically. Different studies also support this. Implementations carried out with observation and discussion methods, computer programs (Stellarium), models made by 3D Studio MAX 8 (trial) program of Kucukozer, Bostan and Isildak (2010) in astronomy education; implementations like Project STAR show that an individual have a significant conceptual chance in implementation that they take part in actively. Implementations referred in these studies, receiving education of participants may be the reason of success increasing.

As a result of findings obtained from drawings related to the star, sun, comet and constellation concepts for the one another objective of study, it is determined that there is an increase in correct drawings in post-test scientifically. While there are no scientific figures in pre-test and post-test regarding constellation concept, majority of students used partial scientific figures in post-test. Incorrect drawing of the location of stars in constellation on paper by students may have caused to be partial scientific. Besides that, although the comet is not a star, preservice teachers made similar drawing for star, comet and constellation. When it comes to star, preservice teachers draw star figure which is in Turkish flag known as five-pointed star, it shows that experiences and cultural values in daily life play a role in learning. In parallel with this, a comet was drawn like five-pointed star and as if there is a tail behind similar to kite tail. In a study carried out by Kurnaz (2012) with 7th grade students, similar results were obtained.

As a result of findings obtained from associations with regard to the star, sun, comet and constellation concepts for the last objective of study, even though there is an increase in star concept-sun, constellation and comet concept associations in post-test in comparison with pre-test, it is understood that some ideas of preservice teachers remained the same. According to studies, it is stated that conceptual change process may be difficult and continuity is required for change (Vosniadou, 1991; Yagbasan & Gulcicek, 2003).

5. Conclusions and Recommendations

When looked generally, it is seen that preservice teachers' insufficient knowledge and alternative ideas that determined in post-test showed a decrease, scientific correct information took the place of many alternative ideas. Based on the conclusion, this research lends a few recommendations as follows: It is thought that teaching practice is quite important, it is required to benefit from teaching materials such as three dimensional models, different astronomy programs, conceptual change texts, telescope, etc. in teaching basic astronomy concepts. Considering that different situations, it is also recommended for researchers that similar studies should be done on larger samples.

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