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**Abstract.** *The purpose of research is to examine the changes in attitudes towards astronomy following alternative astronomy education among pre-service teachers with different cognitive styles. Accordingly, it was thought to be appropriate to use pre- and post-test control group design among the experimental designs. The sample of the study included 4th year students at Abant İzzet Baysal University Department of Science Teaching during 2015-2016 spring term (N=64). In the treatment group, a process enriched with activity-based astronomy practices was followed, while the control group used a 12-week program designed as consistent with the program developed by Higher Education Council. The results seem to evidence that at undergraduate level there is an urgent need to intensify the efforts, education and practices that focus on increasing the levels of attitudes towards astronomy regardless of cognitive styles and on transferring these attitudes to skill areas and these kinds of studies need to be encouraged and extended.*

**Keywords:** *attitude towards astronomy, cognitive style, pre-service teacher.*

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## ATTITUDES TOWARDS ASTRONOMY AMONG THE PRE-SERVICE TEACHERS' DIFFERENT COGNITIVE STYLES: ALTERNATIVE COURSE SAMPLE

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### Introduction

Astronomy and science are sources feeding each other mutually (Taşcan, 2013). When it is considered, that astronomy is an educational appliance which can be used in teaching people how to correctly and logically think, the developments in space sciences, which have gained more and more speed in recent years, have also accelerated the developments in the other basic branches of science. In this context, the importance of education and training of astronomy in science education emerges (Emrahoğlu & Öztürk, 2009). When the studies carried out abroad are examined it can be stated that the studies on astronomy education are quite limited in number. (Brunsell & Marcks, 2005; Bussotti 2015; Frede, 2006, Frede, 2008; Trumper, 2001; Trundle, Atwood & Christopher, 2007). When the studies done in Turkey on astronomy education are handled, it was achieved that they are the ones analyze the level of understanding of the concepts of astronomy, knowledge level and misconceptions of the teachers' and students' at different learning levels (Ekiz & Akbaş, 2005; Ünsal, Güneş & Ergin, 2001; Bülbül, İyibil & Şahin, 2013; Taşcan, 2013; Arı Kurt, Durukan & Şahin, 2015). Furthermore, various studies related to astronomy were done with pre-service teachers studying at higher education in Turkey (Bayraktar, 2009; Bilici, Armağan, Çakır & Yürük, 2012; Durukan & Sağlam-Arslan, 2013; Durukan & Sağlam-Arslan, 2015; Düşkün, 2011; Emrahoğlu & Öztürk, 2009; İyibil, 2011; Kalkan, Ustabaş & Kalkan, 2007; Kalkan & Kiroğlu, 2007; Küçüközer, 2007; Okulu & Ünver, 2011; Türkoğlu, Örnek, Gökdere, Süleymanoğlu & Orbay, 2009; Durukan & Sağlam-Arslan, 2013; Durukan & Sağlam-Arslan, 2015; Ünsal, Güneş & Ergin, 2001).



It was seen in studies, which contained determination of astronomical misconceptions and were done with pre-service teachers studying at elementary departments, that pre-service teachers developed many alternative concepts related to astronomical concepts and they were not sure about even correct answers they gave to questions in the scales applied (Bektaşlı, 2013). Misconceptions which students have about the science are believed to cause abstract and complicated science concepts to be misstructured and spread into daily life of the individual with an increasing mistake (Yılmaz, Türkoğuz & Şahin, 2014). Furthermore, it was detected in a study in which science pre-service teachers' levels of understanding of astronomical concepts and their misconceptions were examined with a longitudinal study. It was seen that pre-service teachers completed their undergraduate education with many misconceptions and some of these misconceptions were the same as primary education students' (Emrahoğlu & Öztürk, 2009). In this regard, when it is considered that pre-service teachers will teach these concepts to their students during their professional lives in the future, it is stated that, firstly, misconceptions of pre-service teachers on this subject should be removed in order to prevent emergence of misconceptions in students and prevent these misconceptions from having an effect on their daily lives (Yılmaz, Türkoğuz & Şahin, 2014).

Astronomy, one of the subjects containing a great number of abstract concepts, has an important place in science education thanks to its relation with universe, Earth and nature and since it contains mathematics, physics, chemistry and biology (Göncü & Korur, 2012). In this sense, it is very important to make basic astronomical knowledge as a part of curriculum and structure the individuals within the framework of these curricula (Yılmaz, Türkoğuz & Şahin, 2014).

#### *Research Focus*

The types of changes the students with different cognitive styles and studied astronomy will have, and the analyses of the influence of activities used in astronomy courses in terms of attitudes are the main points that make the research significant.

The science education programmes applied in the universities in Turkey are using a common course content suggested by the Higher Education Council (CoHE) which is the main decision mechanism in terms of higher education. This content does not seem effective and efficient in terms of astronomy education, this is why it is thought that there is an emergent need for an alternative course content.

The prediction of increasing the attraction and motivation of prospective teachers about the lessons by enriching some abstract lessons as astronomy and space sciences with activities has the quality to make a significant contribution to the body of literature. In this context, the main aim of this research is to examine the change in attitudes of pre-service teachers with different cognitive styles towards astronomy as a result of the alternative astronomical education.

## **Methodology of Research**

### *General Background of Research*

CoHE program and astronomical applications enriched by 12-week activities were applied to science teacher candidates. In this regard, alternative astronomical education lessons were developed by the researchers with the objective to change in attitudes towards astronomy of the experimental group. In the control group the influence of the CoHE programme was examined. Pre-and post-test control group research model, one of the experimental designs, was adopted for the research.

### *Sample of Research*

The study sample consists of 64 senior year students of the Department of Science Teaching at one of the established universities located in the north-west of Turkey at the spring term of 2015-2016 academic year (N=64). Students enrolled on Astronomy course as 2 groups. Randomly, one of the groups was determined as the control group (N=33), and the other group was determined as the experimental group (N=31).



### Data Collection Tools

Cognitive styles of pre-service teachers were determined using "Group Embedded Figures Test (GEFT)", developed by Witkin et al. (1971) and used by many researchers (Aydın, 2009; Blanton, 2004) in their studies. This test was used to determine which of the field dependent, field intermediate or field independent cognitive styles the pre-service teachers had. GEFT consists of three parts. The first part formed for individual to practice consists of 7 figures and is not included into evaluation. Second and third parts consist of total 18 figures, the evaluation of which shall be carried out on 9 figures each. In GEFT test composed of complicated designs in which a simple figure is hidden, individuals are expected to be able to find the relevant simple figure hidden in complicated design in a short time. Being able to find this simple figure indicates the degree of field independence of the individual (Aydın, 2009). Attitudes of pre-service teachers towards astronomy were determined using Astronomy Attitude Scale (AAS) developed by Yılmaz (2014). This attitude scale consists of 20 articles, and maximum 100 points and minimum 20 points can be gathered.

### Application

Application was carried out at spring term of 2015-2016 academic year. In experimental group, a 12-week program, which was enriched with activity based astronomical applications prepared by researchers, was pursued. Every week, 1-3 activities were done after lessons were given with presentations. Activities were prepared regarding to lessons. Generally, activities were done such as introduction of astronomical museum through drama, planetary card game, moon-earth activity with masks, activity of having sundial prepared, 6 words with 6 hats activity, critical film and video activity, activity of making and applying astrolabe, activity of preparing celestial cartography, activity of making rocket by means of origami, activity of forming constellation by installing electrical circuit, interview with astronomer, making telescope and looking up at the sky. Furthermore, in the corner of looking up at the sky together, the phases of the moon, celestial events of that week and next week and Stellarium program and applications of discovering planets and stars were carried out every week. In control group, a 12-week program, which was designed in accordance with the Council of Higher Education (CoHE) program, was pursued.

The lessons were given with presentations. GEFT and Astronomy Attitude Scale were applied to both groups at the beginning of the term. Instructions were expressed clearly for both groups in carrying out Group Embedded Figures Test and explanations were given in finding figures in the exercise part. Pre-service teachers were asked to complete the test within a period of 12 minutes in total, by granting then 2 minutes for first part, 5 minutes for second and third parts to find the hidden figures. Then, Astronomy Attitude Scale was applied and control-experimental groups' pre-testing processes were completed. At the end of 12-week period, only AAS was applied to control and experimental groups and their attitudes were reviewed.

### Data Analysis

In evaluation of GEFT, analyses were carried out under three categories, similarly to the process which Garton and Raven (1994) pursued in their works. The ones getting points between 0-9 were defined as Field Dependent, the ones getting points between 10-11 were defined as Field Intermediate and the ones getting points between 12-18 were defined as Field Independent. At this point, which cognitive style the pre-service teachers are closer to is evaluated using a scale with 0-18 range. Distribution of cognitive styles of pre-service teachers is as follows:

**Table 1. GEFT results of control and experimental groups pre-service teachers (distribution of cognitive style).**

Distribution of Cognitive Style	Control (n)	Experimental (n)
Field Dependent	14	10
Field Intermediate	12	3
Field Independent	7	18



Difference between pre-and post-test points for control group among pre-service teachers taking part in the study was examined using related samples of t-test because of the fact that the data had normal distribution. On the basis of astronomy attitude points of pre-service teachers' in control group, as the data did not have a normal distribution, to check whether or not there exists a significant difference in terms of cognitive styles Kruskal Wallis H-Test was used.

As the data did not have normal distribution Wilcoxon Signed-Rank Test was applied to the difference between the pre and post-test points of pre-service teachers in experimental group.

In order to find out whether or not there exists a significant difference in terms of cognitive styles of pre-service teachers in experimental group on the basis of astronomy attitude points, Kruskal Wallis H-Test was used as the data did not have normal distribution. Pre-test and post-test points of both experimental group and control group were examined using Mann-Whitney U-Test.

## Results of Research

T-test analysis was used for analysis of data which occurred in points of attitudes of control group science pre-service teachers taking part in the study towards astronomy subject at the beginning and at the end of 12-week astronomy lesson. Analysis results were shown in Table 2.

**Table 2. T-test results of points, which pre-service teachers got from astronomy attitude scale, according to pre-and post-test factor.**

Measurement	N	Mean	S	df	t	p
Pre-test	33	63.94	4.56	32	-.397	.694
Post-test	33	64.27	4.14			

T-test results show that there is not a statistically significant difference between pre-test and post-test average points of control group ( $t(32) = -.397$ ,  $p > .05$ ). This finding can be interpreted in the way that course process, which was carried out in control group and designed in accordance with CoHE program, could not enable a significant increase in attitudes of pre-service teachers towards astronomy. Whether there was a significant difference in terms of cognitive styles between astronomy-related pre-test and post-test points of control group science pre-service teachers taking part in the study was examined using Kruskal Wallis H-Test for Unrelated Measurements. Analysis results were shown in Table 3.

**Table 3. Change of pre-and post-test points, which control group pre-service teachers got from astronomy attitude scale, according to cognitive styles.**

Cognitive Styles		n	Mean Rank	SD	$\chi^2$	p
Pre-test	Field Dependent	14	16.50	2	.586	.746
	Field Intermediate	12	18.58			
	Field Independent	7	15.29			
Post-test	Field Dependent	14	18.11	2	.326	.850
	Field Intermediate	12	16.08			
	Field Independent	7	16.36			

When analysis results are examined, it is seen that astronomy attitude points of control group pre-service teachers did not change significantly according to cognitive styles both in pre-tests and post-tests,  $\chi^2$  ( $SD = 2$ ,  $n = 33$ ) = .746 and .850,  $p > .05$ . This finding shows that cognitive styles of pre-service teachers do not have a significant effect on attitudes of control group pre-service teachers towards astronomy. When rank averages of groups are considered, it is determined that attitudes of pre-service teachers with field intermediate cognitive style are seen to be higher for pre-test while this goes in favor of pre-service teachers with field dependent cognitive style in post-test. Wilcoxon Signed-Rank Test was used for Related Samples to be able to observe the



change, which occurred in points of attitudes of experimental group science pre-service teachers taking part in the study towards astronomy subject at the beginning and at the end of 12-week astronomy lesson. Analysis results were shown in Table 4.

**Table 4. Wilcoxon Signed-Rank Test results of points, which pre-service teachers got from astronomy attitude scale, according to pre-and post-test factor.**

Pre-test/Post-test	N	Mean Rank	Sum of Ranks	Z	p
Negative Rank	22	16.50	363	3.154	.002
Positive Rank	7	10.29	72		
Equal	2	-	-		

Analysis results show that astronomy attitude points of pre-service teachers taking part in the application changed significantly before and after the application,  $z=3.154$ ,  $p<.05$ . When difference points and rank average are considered, this observed difference is seen to be on positive ranks' (post-test) side  $\bar{x}=65.48$ . Activity based applications, which were carried out according to these results, can be interpreted to have an important effect in developing the attitudes of students towards astronomy. Whether there is a significant difference in terms of cognitive styles between astronomy-related pre-test and post-test points of experimental group science pre-service teachers taking part in the study was examined using Kruskal Wallis H-Test for Unrelated Measurements. Analysis results were shown in Table 5.

**Table 5. Change of pre-and post-test points, which experimental group pre-service teachers got from astronomy attitude scale, according to cognitive styles.**

Cognitive Styles		n	Mean Aver.	SD	$\chi^2$	p
<b>Pre-test</b>	Field Dependent	10	12.50	2	4.720	.094
	Field Intermediate	3	8.67			
	Field Independent	18	19.17			
<b>Post-test</b>	Field Dependent	10	11.35	2	5.718	.057
	Field Intermediate	3	22.50			
	Field Independent	18	17.50			

When analysis results are examined, it is seen that astronomy attitude points of experimental group pre-service teachers did not change significantly according to cognitive styles both in pre-tests and post-tests,  $\chi^2$  (SD= 2, n=31) = 4.720 and 5.718,  $p>.05$ . This finding can be interpreted in the way that cognitive styles of pre-service teachers did not cause a significant effect on attitudes of experimental group pre-service teachers towards astronomy. When rank averages of groups are considered, it is an interesting finding that attitudes of pre-service teachers with field intermediate cognitive style are seen to be at a very low level while they showed increase by approximately a 12-point difference in post-test. It is clearly seen that applications carried out affected field intermediate group mostly. Whether there is a significant difference between astronomy-related pre-test points and post-test points of control and experimental group pre-service teachers taking part in the study was examined using Mann-Whitney U-Test. Analysis results were shown in Table 6.



**Table 6. U-Test results of points, which control and experimental pre-service teachers got from astronomy attitude scale, according to pre-and post-test factor.**

Groups		N	Mean	Mean Rank	U	p
Pre-test	Control	33	29.80	983.5	422.5	.229
	Experimental	31	35.37	1096.5		
Post-test	Control	33	28.34	878.5	382.5	.081
	Experimental	31	36.34	1201.5		

In the first measurements carried out in experimental group, with which activity-based astronomy course process was pursued, and in control group, with which CoHE program was pursued, it is seen that there is not a significant difference in terms of astronomy attitude,  $U=422.5$ ,  $p>.05$ .

## Discussion

While the findings of the study are examined, it was observed there has not been a significant change in astronomy attitude scores of the control group where Council of Higher Education (CoHE) program was applied. While the results of attitude scale of the control group are examined without cognitive styles, there is thought the increase in scores about .33 shown by the students as a result of the fact the application could not have answered the expected positive increase sufficiently. It is a surprising and saddening situation Council of Higher Education (CoHE) program remains incapable in such way while the necessity for the prospective teachers to have a certain level of attitude about ingratiating the science. While the influence of cognitive styles on attitude, values is examined, it is seen the cognitive styles of prospective teachers in the control group after application does not have any influence on attitudes towards astronomy. When the mean ranks of groups are considered, it was observed the attitudes of prospective teachers having field mean cognitive style were higher and this situation has gone in favor of prospective teachers having a field-dependent cognitive style. Similar to the findings arisen in the control group, it was found that different cognitive styles in the experimental group also do not have a significant influence on their attitudes towards astronomy. Among the findings, it is a remarkable finding the opportunity of observing the difference transparently in the attitudes of prospective teachers having field mean cognitive style after the activities performed. At this point, the interpretation emerges that these activities could be applied to these teachers having different cognitive styles. While the mean rank in pre-tests of pre-test and post-test scores of control and experimental groups were considered, it emerged that experimental group students had higher astronomy attitude scores than control group students.

It has been determined there was not a significant difference between post-test attitude scores of the experimental group and the control group. Nevertheless, it is clearly seen the difference approximately about 8 points in terms of post-test scores in experimental group where the applications were performed was in favor of the experimental group. The interpretation could be made that the activities performed during the application process in experimental group could be more effective in increasing the attitudes of prospective teachers towards astronomy than the program determined by CoHE. In this sense, it is a very important fact that basic astronomy information is a compound of teaching programs and the individuals are configured within the framework of these programs as stated also by Türkoğuz, & Şahin (2014). Furthermore, also stated by Ezberci, Çevik & Kurnaz (2016), it is thought the interdisciplinary nature of astronomy and interest in celestial bodies will make contributions to the perception of some facts in science learning correctly and to learn the basic astronomical concepts well by students. In this context, as stated by Bektaşlı (2013) in his study, it could be said there should be more course hours of astronomy in the current science education curriculum.

## Conclusions

In this research the influences of change for the attitudes of the groups towards astronomy and cognitive styles as a result of the education taken by the control group where Council of Higher Education (CoHE) program taught and by the experimental group which consists of prospective teachers with different cognitive styles and



where the applications enriched with activities that include different educations and techniques (drama, 6 hats, video watching, origami etc.) are performed have been examined. Generally, regardless of considering the fact the teacher candidates are in the experimental and control groups, it emerged that the cognitive styles do not have any influence on attitudes. Moreover, the significant and certain differences have been observed in the attitudes as expected in the experimental group, where activities enriched with different educational techniques and strategies are applied. It is foreseen the astronomy and space sciences whose global education and instruction attribute importance vitally as of the 21st century will be a model for a sample course application in Turkey and World as a result of this study performed.

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### References

- Arikurt, E., Durukan, Ü., & Şahin, Ç. (2015). Examination of students' ideas in different grades about the astronomy developmentally. *Amasya Education Journal*, 4 (1), 66-91.
- Aydın, F. (2009). *Development of pre-service science teachers' views and concepts about nature of technology and effectiveness of dilemmas in teaching*. Unpublished doctoral dissertation, Gazi University, Ankara, Türkiye
- Bayraktar, Ş. (2009). Pre-service primaryteachers' ideas about lunar phases. *Journal of Turkish Science Education*, 6 (2), 12-23.
- Bektaşlı, B. (2013). The effect of media on pre-service science teachers' attitudes toward astronomy and achievement in astronomy class. *The Turkish Online Journal of Educational Technology*, 12 (1), 139-146.
- Bilici C, S., Armağan Ö, F., Çakır K, N., & Yürük, N. (2012). Adapting the astronomical attitude scale to Turkish: Validity and reliability study [Astronomi tutum ölçeğinin Türkçe'ye uyarlanması: geçerlik ve güvenilirlik çalışması]. *Journal of Turkish Science Education*, 9 (2), 116-127
- Blanton, E. L. (2004). *The influence of students' cognitivestyle on a standardized reading test administered in three different formats*. Doctoral dissertation, University of Central Florida Orlando, Florida.
- Brunsell, E., & Marcks, J. (2005). Identifying a baseline for teachers' astronomy content knowledge. *Astronomy Education Review*, 2 (3), 38-46.
- Bülbül, E., İyibil, Ü. G., & Şahin, Ç. (2013). Determination of the perception of the 8th grade students of middle school by the concept of astronomy [Ortaokul 8.sınıf öğrencilerinin astronomi kavramıyla ilgili algılamalarının belirlenmesi]. *Journal of Research in Education and Teaching*, 2 (3), 182-191.
- Bussotti, P. (2015). The teaching of history of science at the university: Some brief considerations. *Journal of Baltic Science Education*, 5 (14), 564-568.
- Ezberci Çevik, E, & Kurnaz, M. (2016). Thematic review of some studies about the stars in Turkey. *Elementary Education Online*, 15 (2), 421-442.
- Durukan, Ü. G., & Sağlam-Arslan, A. (2013). Analysis of the relationships between basic astronomy concepts of science teacher candidates [Fen bilgisi öğretmen adaylarının temel astronomi kavramlarını ilişkilendirme durumlarının analizi]. *Journal of Science Teaching Education*, 9 (2), 97-109.
- Durukan, Ü. G., & Sağlam-Arslan, A. (2015). The analysis of the understanding levels of teacher candidates in different department about basic astronomy concepts. *Participatory Educational Research*, 2 (2), 28-46.
- Düşkün, İ. (2011). *Sun-earth-moon development and the effect on academic success in astronomy education of pre-service science teachers*. Unpublished master dissertation, İnönü University, Ankara, Türkiye.
- Ekiz, D., & Akbaş, Y. (2005). Primary school 6th grade students' understanding level of conceptions related to astronomy and misconceptions. *National Education*, 165, 61-78.
- Emrahoğlu, N., & Öztürk, A. (2009). A longitudinal research on the analysis of the prospective science teachers' level of understanding the astronomical concepts and their misconceptions. *Journal of Çukurova University Institute of Social Sciences*, 18 (1), 165-180.
- Frede, V. (2006). Pre-service elementary teacher's conceptions about astronomy. *Advances in Space Research*, 38, 2237-2246.
- Frede, V. (2008). Teaching astronomy for pre-service elementary teachers: A comparison of methods. *Advances in Space Research*, 42, 1819-1830.
- Göncü, Ö., & Korur, F. (2012). *Determination of the misconceptions of primary school students in astronomy-based units by three-step test (İlköğretim öğrencilerinin astronomi temelli ünitelerdeki kavram yanlışlarının üç aşamalı test ile tespit edilmesi)*. 9 th. National Science and Mathematics Education Congress, Niğde University, Niğde, Türkiye.
- İyibil, Ü. (2011). The candidate teachers' perception about basic astronomy concepts. *Western Anatolia Journal of Educational Science, Special Issue*, 443-448.
- Kalkan, H., & Kiroglu, K. (2007). Science and nonscience students's ideas about basic astronomy concepts in preservice training for elementary school teachers. *Astronomy Education Review*, 6 (1), 15-24.



- Kalkan, H., Ustabaş, R., & Kalkan, S. (2007). Misconception of basic astronomy concepts in preservice training for high school and elementary education teachers. *Ondokuz Mayıs University, Journal of Faculty of Education*, 23, 1-11.
- Küçüközer, H. (2007). Prospective science teachers' conceptions about astronomical subjects. *Science Education International*, 18 (2), 113-130.
- Okulu, H. Z., & Ünver, A. O. (2011). Determination of the teacher candidates' attitudes towards astronomy. *Western Anatolia Journal of Educational Science, Special Issue*, 107-112.
- Ünsal, Y., Güneş, B., & Ergin, İ. (2001). A study to investigate the fundamental astronomy knowledge levels of undergraduate students. *Gazi University, Journal of Faculty of Education*, 21 (3), 47-60.
- Taşcan, M. (2013). *Determine of science teachers knowledge level about basic astronomy subjects* (The example of Malatya. Unpublished master dissertation, İnönü University). Malatya, Turkey.
- Türkoğlu, O., Örnek, F., Gökdere, M., Süleymanoğlu, N., & Orbay, M. (2009). On pre-service Science teachers' preexisting knowledge levels about basic astronomy concepts. *International Journal of Physical Sciences*, 4 (11), 734-739.
- Trumper, R. A., (2001). Cross- collegeageestudy 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.
- Trundle, K. C., Atwood, R. K., & Christopher, J. E. (2007). A longitudinal study of conceptual change: Preservice elementary teachers' conceptions of moonphases. *Journal of Research In Science Teaching*, 44 (2), 303-326.
- Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. (1971). *Manual for embedded figures test, children's embedded figures test, and group embedded figures test*. Palo Alto, California: Consulting Psychologists Press.
- Yılmaz, E., Türkoğlu, S., & Şahin, M. (2014). Teachers' views about misconceptions of solar system and space subjects and its effect on daily life. *Dokuz Eylül University, Journal of Faculty of Education*, 37, 37-44.
- Yılmaz, E. (2014). *An action research towards effective teaching of the 7th grade basic astronomy concepts*. Unpublished master dissertation, Dokuz Eylül University.

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