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Exploring Pre-service Science Teachers' Self-efficacy Beliefs towards Use of Internet in Education*

Fen Bilgisi Öğretmen Adaylarının Eğitsel İnternet Kullanımı Özyeterlik İnançlarının İncelenmesi

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ABSTRACT: The aim of this study is to determine pre-service science teachers' self-efficacy belief levels towards educational internet use and to find out what variables affect these beliefs. The participants of the research consist of 300 voluntary pre-service teachers, who study at the department of Science Teaching in a state university in the Black Sea region. 88 of these students are first year students, 65 of them are second year students, 67 of them are third year students, and 80 of them are fourth year students. With the objective of determining self-efficacy beliefs of pre-services teachers towards educational internet use, "Educational Internet Use Self-Efficacy Scale", which was developed by Şahin (2009), was employed as the data collection tool of the study. The data retrieved from the participants were analyzed via Shapiro-Wilk normality test, independent groups t-test, and variance analysis (One-way ANOVA) techniques. The results of the research suggest that the participants' internet use self-efficacy beliefs towards educational purposes is affected by their technological knowledge level, whether they have their own computer or smart phone, their weekly use of technology and internet access durations. It was observed that variables such as gender, economic status, and academic GPA do not have a statistically significant difference on the participants' internet use self-efficacy beliefs towards educational purposes.

Keywords: internet usage for educational purposes, pre-service science teachers.

ÖZ: Bu çalışmanın amacı Fen Bilgisi öğretmen adaylarının eğitsel internet kullanımı özyeterlik inanç düzeylerini belirlemek ve bu inançların hangi değişkenlerden etkilendiğini tespit etmektir. Araştırmanın katılımcı grubunu Karadeniz bölgesindeki bir devlet üniversitesinde Fen Bilgisi Öğretmenliği bölümünde öğrenim görmekte olan 88 birinci sınıf, 65 ikinci sınıf, 67 üçüncü sınıf ve 80 dördüncü sınıf olmak üzere toplam 300 öğretmen adayı oluşturmaktadır. Veri toplama aracı olarak Şahin (2009) tarafından geliştirilen "Eğitsel İnternet Kullanımı Özyeterlik Ölçeği" kullanılmıştır. Araştırma betimsel tarama modelinde yürütülmüştür. Analizler SPSS 17 paket programı ile gerçekleştirilmiş ve katılımcılardan elde edilen verilerin analizinde Shapiro-Wilk normallik testi, bağımsız gruplar t-testi ve varyans analizi (One-way ANOVA) teknikleri kullanılmıştır. Araştırmanın sonucunda katılımcıların eğitsel internet kullanımına yönelik özyeterlik inançları üzerinde teknoloji bilgi düzeylerinin, kendilerine ait bir bilgisayar ve akıllı telefona sahip olmalarının ve haftalık teknoloji kullanım ve internet erişim sürelerinin etkili olduğu sonucuna ulaşılmıştır. Cinsiyet, ekonomik durum ve akademik ortalama değişkenlerinin ise eğitsel internet kullanımı özyeterlik inancı üzerinde istatistiksel olarak anlamlı bir farklılık meydana getirmediği görülmüştür. Ayrıca katılımcıların tamamına yakın bir bölümünün eğitsel internet kullanımı yeterli olarak belirlenmiştir. Elde edilen buğular ışığında fen bilgisi öğretmen adaylarının eğitsel internet kullanımıyla ilgili önerilerde bulunulmuştur.

Anahtar kelimeler: eğitsel internet kullanımı, fen bilgisi öğretmen adayları, özyeterlik inancı.

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Introduction

The rapid changes in information technologies impose a tremendous effect on societies. Using technology is not a luxury only enhancing living conditions but it became a necessity in this century (Odabaşı, 2010). Countries go through some transformations in order to meet these modern necessities in their education programs. In Turkey, Increasing Opportunities and Improvement of Technology Movement (FATİH) is conducted as one of these transformation projects. The main purposes of FATİH project are to provide an equality of opportunity for all students by enhancing technological infrastructures of schools and to create learning environments which address many senses (Kurt, Kuzu, Dursun, Güllüpınar, & Gültekin, 2013). Teachers are one of the major elements in this project because teachers emerge as the leaders of educational process in this project who are expected to transfer the knowledge to students by using technological opportunities such as interactive whiteboard, high speed internet connection, and instructional e-content. For this reason, teachers should have certain knowledge, skills, attitudes and values in order to use these technologies in an effective way (Doğan, 2010, s. 536). The studies which are conducted with first products of FATİH Project reveal the importance of technological competences teachers should have (Aktaş, Gökoğlu, Turgut, & Karal 2014; Keleş & Turan 2015; Pamuk, Çakır, Ergun, Yılmaz, & Ayas 2013). According to Baş (2011), teachers should have high level of educational internet usage self-efficacy in order to succeed the educational activities in and out of school.

Accessing knowledge ways change depending on developments in technology and internet is now one of most frequently used ways for accessing knowledge; therefore it has become a popular topic for researchers to investigate for what purposes and how frequently teachers use internet. In their study which examines internet usage purposes and frequencies of pre-service teachers, Akkoyunlu and Yılmaz (2005) state that a large number of pre-service teachers get access to internet every day and they use internet for purpose of accessing knowledge and communication. Also, in study of Ergun, Yurdatapan and Sürmeli 2013, it is observed that knowledge and skills related to technology usage which science pre-service teachers acquire during their higher education contribute to their improvement in scientific and technological developments, also it becomes an effective element in professional development. National Ministry of Education often expresses the importance of technology usage in specific area competences of Science and Technology Teachers (MEB, 2008).

Within the framework of internet use, educational purposes include utilizing the opportunities provided by internet in order to meet individual's education-oriented needs. In order to utilize these opportunities, it is expected that individuals should have high perceptions related to internet usage self-efficacy (Durmuş & Başarmak, 2014). When literature is reviewed, it is seen that there have been conducted some studies which analyze educational usage self-efficacy beliefs of pre-service teachers (Şahin, Aydın & Balay 2016; Topal & Akgün 2014; Yoldaş & Argın 2015). They analyze pre-service teachers' internet usage self-efficacy beliefs for educational purposes depending on not those variables such as gender, age, weekly computer usage, social media usage but self-efficacy of using technologies in FATIH Project, self-efficacy of finding materials on internet for educational purpose in their professional life. As a result of

study, it is found out that as pre-service teachers' computer experiences increase, so do their self-efficacy perception levels related to educational internet usage.

In their studies which analyze pre-service mathematics teachers' educational internet usage self-efficacy, Yenilmez, Turğut, Anapa and Ersoy (2011) obtain findings which show that self-efficacy perceptions differ depending on gender in favor of males but don't differ according to class level and GPA. As internet usage duration increases, so does educational internet usage self-efficacy perception. Tuncer and Özüt (2012) -who conducts research about primary school pre-service teachers' educational internet usage self-efficacy perceptions-, find out that self-efficacy levels significantly differ depending on education type, time allocated for internet usage, class level and settings where they connect internet. Keskin and Özay-Köse (2015) have analyzed pre-service biology teachers' educational internet self-efficacy beliefs and expressed that pre-service teachers are at good level with respect to using internet for purpose of learning and instruction. Also, in terms of gender, male pre-service teachers show more positive attitudes than females; however, educational internet use doesn't differ depending on class level. Additionally, Dursun (2016) report that there is no statistically significance in educational internet use self-efficacy beliefs among individuals -who gain the right of becoming a teacher- depending on the following variables: age, gender, owning a computer, internet use frequency and time spent whenever they access internet.

The aim of this study is to identify educational internet use self-efficacy beliefs of pre-service science teachers and to analyze depending on which variables their self-efficacy beliefs differ.

Method

Survey method -which is one of the descriptive research methods- has been used in this study. This method aims to describe the current situations of events, institutions and groups (Kaptan, 1998). Therefore, survey method has been found suitable for identifying pre-service teachers' educational internet use self-efficacy beliefs. Also, it has been investigated whether their educational internet use self-efficacy beliefs differ depending on gender, age, academic success, financial situation, technology knowledge level, owning a personal computer and/or a smartphone, opportunities and types of internet access via smartphone and computer, weekly technology use duration and weekly internet access duration.

Sample of Study

The participants of this study consist of 300 pre-service teachers -88 freshmen, 65 sophomores, 67 junior and 80 seniors- who continue their education in department of Science Teaching in 2015-2016 Spring Term in a state university in Black Sea region. Table 1 presents the statistics about class, gender and age of pre-service teachers included in the study.

Table 1

Distribution of Students in the Study according to Gender, Age And Grade

		f	%
Grade	First Year	88	29.7
	Second Year	65	22.3
	Third Year	67	21.7
	Fourth Year	80	26.7
Gender	Female	235	78.3
	Male	85	21.7
Age	18	22	7.3
	19	59	19.7
	20	56	18.7
	21	64	21.3
	22	65	21.7
	23	31	10.3
	24	3	1
Total		300	100

Data Collection Tool

"Educational Internet Use Self-Efficacy Scale" (EIUSS) has been used in this study as a data collection tool which was developed by Şahin (2009). Internal reliability coefficient of this scale, which is one-dimensional 5-likert type scale with 28 items, was found as 0.96 by the developers of the original scale. Internal reliability of scale has been recalculated with the samples of this research and it has been verified as (Cronbach Alpha) 0.96.

Results

Firstly, it has been analyzed whether the data obtained from the study samples have a normal distribution or not. According to test of normality results performed based on total score, Shapiro-Wilk value is found as .089 and this situation has been accepted as an indication for normal distribution of data (Tabachnick & Fidell, 2007). Table 2 presents the values related to test of normality.

Table 2

Test of Normality Results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Self-efficacy beliefs Total Score	*Statistics*	*n*	*p*	*Statistics*	*n*	*p*
	.041	300	.200*	.992	300	.089

Based on test of normality results, it has been found appropriate to use parametric analysis techniques (p>0.05).

It is reliably accepted that total scores obtained from EIUSS scale determine the participants' educational internet use self-efficacy beliefs. In this five-likert scale with 28 items, the possible lowest score is 28 while the possible highest score is 140. In this sense, educational internet use self-efficacy beliefs of students who are in 28-50 score interval are accepted as "not adequate", 51-72 score interval "partially adequate", 73-95 score interval "adequate", 96-117 score interval "very adequate" and 118-140 score interval "absolutely adequate". Table 3 presents samples' score distributions.

Table 3

Distributions of Total Scores Participants Obtained from EIUSS Scale

Scores	Self-efficacy Beliefs	*f*	*%*	$\overline{x}$	*ss*
28-50	Not adequate	2	0.6	41.5	9.19
51-72	Partially inadequate	24	7.9	64.5	6.15
73-95	Adequate	108	36	84.1	6.76
96-117	Very adequate	126	42.2	105.9	5.71
118-140	Absolutely adequate	40	13.3	128.55	8.17
	Total	300	100		

As seen in Table 3, in terms of educational internet use self-efficacy levels, 0.6 percent of participants have inadequate levels, 7.9 percent of participants have "partially adequate", 36 percent have "adequate", 42.2 percent have "very adequate" and 13.3 percent have "absolutely adequate" educational internet use self-efficacy levels. Considering from a general framework, it is possible to claim that educational internet use self-efficacy levels of participants are "very adequate". Table 4 presents analysis of descriptive statistics performed with total scores of participants such as arithmetic mean, median and standard deviation.

Table 4

Descriptive Statistics of Total Scores Participants Obtained from EIUSS Scale

N	$\overline{x}$	*Min*	*Max*	*Median*	*Variance*	*sd*
300	97.52	35	140	99	369.07	19.21

According to Table 4, participants' score mean has been calculated as 97,52. This value shows that participants describe their educational internet use self-efficacy levels as "very adequate".

The first sub-problem of the research is whether educational internet use self-efficacy beliefs significantly differ according to variable of gender. Accordingly, the independent groups t-test results of total scores which participants obtained from EIUSS scale have been given in Table 5.

Table 5

Examining the Educational Internet Use Self-Efficacy Levels Depending on Gender Variable

	Gender	*f*	$\bar{x}$	*Sd*	*t*	*p*
Educational Internet Use Self-Efficacy Belief	Female	235	96.91	19.54	1.024	.306
	Male	65	99.67	17.95		

As shown in Table 5, according to independent groups t-test result, it is determined that the difference between total scores is not meaningful (t300=1.024, p>.05). In consideration of these findings, it can be expressed that gender variable is not an effective factor which affects educational internet use self-efficacy beliefs in this research.

The second sub-problem of the research aims at revealing whether educational internet use self-efficacy beliefs significantly differ depending on academic success. T-test results conducted with this purpose have been given in Table 6.

Table 6

Educational Internet Use Self-Efficacy Beliefs Depending on Academic Success

	Academic GPA	*f*	$\bar{x}$	*sd*	*t*	*p*
Educational Internet Use Self-Efficacy Beliefs	2.00-2.99	219	97.64	19.42	.188	.851
	3.00-4.00	81	97.17	18.74		

As seen in Table 6, according to independent groups t-test result, it is determined that the difference between total scores is not meaningful (t=.188, p>.05). In the light of these findings, it can be expressed that academic success (academic average) is not an effective factor which affects educational internet use self-efficacy beliefs in this study.

As the third sub-problem, the results of one way ANOVA test -conducted with the purpose of determining the effect of financial situation on participants' educational internet use self-efficacy beliefs- have been given in Table 7.

When Table 7 is examined, it can be claimed that there is not a statistically significant difference between educational internet use self-efficacy beliefs according to participants' financial situations (F:.656, p>.05).

Table 7

Mean, Standard Deviation and One-Way ANOVA Test Results Depending on the Variable of Financial Situation

	Financial Situation (monthly income)	*f*	$\bar{x}$	*sd*	*df*	*F*	*p*	Significant Difference
Self-Efficacy	Less than 500	144	96.45	19.19	3/296	.656	.579	---
	500-1000	121	97.98	19.08				
	1000-2000	21	97.95	20.91				
	More than 2000	14	103.71	18.51				

The forth sub-problem of the study is to examine whether there is a significant difference on participants' educational internet use self-efficacy beliefs according to their technological knowledge levels. Accordingly, one-way ANOVA test has been conducted and the results have been given in Table 8.

Table 8

Mean, Standard Deviation and One-Way ANOVA Test Results Depending on the Variable of Technology Knowledge Levels

	Technology Knowledge Levels	*n*	$\bar{x}$	*sd*	*df*	*F*	*p*	*Significant Difference*
Self-Efficacy	Not adequate	24	82.83	21.84	3/296	24.376	.000	A-B, A-D, B-C, B-D
	Not bad Adequate	105	89.26	16.00				
	Adequate	151	103.82	15.96				
	Very good	20	110.80	25.79				

* A=not adequate, B=Not bad, C=Adequate, D=Very Good

According to the results of one-way ANOVA test conducted with the purpose of examining whether educational internet use self-efficacy beliefs significantly differ according to technology knowledge levels, it has been determined a significant difference (F:24.376, $p<.05$). Therefore, it can be claimed that technology knowledge levels affect educational internet use self-efficacy beliefs.

In the fifth sub-problem of the study, it has been examined whether there is a significant difference between educational internet use self-efficacy beliefs of participants who have a computer and who have not. Accordingly, the findings related to independent groups t-test results conducted on total scores have been given in Table 9.

Table 9

Results Related to Educational Internet Use Self-Efficacy Beliefs Depending on Having A Personal Computer

	Owning a Computer	*f*	$\bar{x}$	*Sd*	*t*	*p*
Educational Internet Use Self-Efficacy Beliefs	Yes	199	100.13	18.34	3.326	.001
	No	101	92.43	20.01		

According to the results of independent groups t-test -conducted with the purpose of determining whether educational internet use self-efficacy beliefs significantly differ according to owning a personal computer-, it is determined that the difference between total scores are significantly meaningful (t=3.326, p<.05). In the light of these findings, it can be claimed that there is a significant difference between educational internet use self-efficacy beliefs of participants who have an individual computer and who have not.

Independent groups t-test results -which has been conducted with the purpose of determining there is a significant difference between educational internet use self-efficacy beliefs of participants who have a personal smart phone and who have not- are given in Table 10.

Table 10

Results Related to Educational Internet Use Self-Efficacy Beliefs Depending on Owning A Personal Smart Phone

	Owning a smart phone	*f*	$\bar{x}$	*d*	*t*	*p*
Educational Internet Use Self-Efficacy Beliefs	Yes	289	97.86	18.87	.395	.693
	No	9	95.33	20.76		

As seen in Table 10, it is determined that the difference between total scores is not statistically significant according to the analysis (t=.395, p>.05). In the light of the findings, it can be claimed that there is not a significant difference between educational internet use self-efficacy beliefs of the participants who have an individual smart phones and who have not in this study; in other words owning a smart phone does not significantly affect educational internet use self-efficacy beliefs.

One-way ANOVA test has been conducted with the purpose of examining another sub-problem of the study, which investigates whether educational internet use self-efficacy beliefs differ according to opportunities of internet access via smart phones. The findings have been given in Table 11.

Table 11

Mean, Standard Deviation and One-Way ANOVA Test Results Related to the Opportunities of Internet Access via Smart Phones

	Internet Access	*f*	$\bar{x}$	*sd*	*Df*	*F*	*p*	Significant Difference
Self-efficacy	Mobile (limitless)	49	96.45	20.48	2/297	.217	.805	---
	Sometimes mobile sometimes wifi (limited)	25	95.88	20.46				
	Wifi (limited)	226	97.93	18.85				

When Table 11 has been examined, it is seen that there is not a statistically significant difference between educational internet use self-efficacy beliefs according to participants' opportunities of internet access via smart phones (F:.217, p:.805) and total scores obtained from the test are absolutely close to each other ($X_{limitless}$:96.45, $X_{limited}$:95.88, $X_{wifilimited}$:97.93). In this situation, it can be stated that having opportunities of limitless internet access via smart phones is not a variable which affects educational internet use self-efficacy beliefs.

Independent groups t-test has been conducted with the purpose of examining whether there is a significant difference between educational internet use self-efficacy beliefs of participants who have opportunities of internet access via computers and who have not. The findings have been given in Table 12.

Table 12

Independent Groups t-Test Results Which Examine Educational Internet Use Self-Efficacy Beliefs According to the Opportunities of Internet Access via Computers

	Internet Access via Computers	*f*	$\bar{x}$	*sd*	*T*	*p*
Educational Internet Use Self-Efficacy Beliefs	Individual internet subscription	179	98.26	18.91	.811	.418
	Open Wifi spots	121	96.42	19.67		

As a result of independent groups t-test -conducted with the purpose of examining whether educational internet use self-efficacy beliefs significantly differ according to opportunities of internet access via computers-, it is determined that the difference between total scores is not statistically significant (t=.395, p>.05). In the light of the findings, it can be claimed that in this study there is not a significant difference between educational internet use self-efficacy beliefs of the participants who have opportunities of internet access via computers and who have not; in other words opportunities of internet access via computers do not significantly affect educational internet use self-efficacy beliefs.

One-way ANOVA test results -conducted with the purpose of examining the effects of weekly technology use duration on educational internet use self-efficacy beliefs- have been given in Table 13.

Table 13

Mean, Standard Deviation and One-Way ANOVA Test Results Related to the Variable of Weekly Technology Use Duration

Weekly Technology Use Duration		*f*	$\bar{x}$	*sd*	*df*	*F*	*p*	Significant difference
Self efficacy	Less than 24 hours	53	90.60	19.82	3/296	4.571	.004	A-C, A-D, D-A, C-A
	25-76	112	96.40	17.47				
	77-120	103	100.17	19.12				
	121-168	32	104.34	20.91				

* A=less than 24 hours, B:25-76, C=77-120, D=121-168

As a result of one-way ANOVA test -conducted with the purpose of examining whether educational internet use self-efficacy beliefs significantly differ according to weekly technology use duration-, there has been found statistically significant difference (F:4.571, p<.05). Accordingly, it can be implied that educational internet use self-efficacy beliefs of people are higher who spend much more time with technology in a week.

Analysis of educational internet use self-efficacy beliefs depending on variable of weekly internet access duration, which is the last sub-problem of the study have been done with One-way ANOVA test. The findings are presented in Table 14.

Table 14

Mean, Standard Deviation and One-Way ANOVA Test Results Related To Weekly Internet Access Duration

Weekly Internet Access Duration		f	$\bar{x}$	sd	Df	F	P	Significant Difference
Self-efficacy	Less than 24	57	90.19	19.94	3/296	4.258	.006	A-C, A-D, D-A, C-A
	25-76	100	97.13	16.73				
	77-120	97	101.06	18.67				
	121-168	46	99.96	22.26				

* A=less than 24, B:25-76, C=77-120, D=121-168

As a result of one-way ANOVA test conducted with the purpose of examining whether educational internet use self-efficacy beliefs significantly differ according to weekly internet access duration, there has been found a statistically significant difference between groups (F:4.258, p<.05). Accordingly, it is possible to imply that

people who have more weekly internet access have higher educational internet use self-efficacy beliefs.

Discussion and Conclusion

Considering that science itself is frequently affected by scientific and technological developments and it goes through a transformation with each development, it becomes quite important that science teachers should adapt themselves to these developments and transformations. Nowadays, it is known that teachers often use internet as a source of information. This study has been planned with the purpose of revealing science teachers' educational internet use self-efficacy beliefs. In the study, it has been concluded that pre-service science teachers have generally expressed that their educational internet use self-efficacy beliefs are very positively high. Another purpose of this study is to identify depending on which variables pre-service teachers' educational internet use self-efficacy beliefs differ. Concordantly, this study has attempted to reveal whether educational internet use self-efficacy beliefs of pre-service teachers significantly differ according to gender, academic success, financial situation, technology knowledge level, owning a computer and a smart phone, opportunities and types of internet access, weekly internet use duration and weekly internet access duration.

It is concluded that pre-service science teachers in the study have educational internet use self-efficacy beliefs at an adequate level. Today, in the information age, it is an expected situation that pre-service teachers' educational internet use self-efficacy beliefs are found to be 'adequate' because of increasing opportunities of internet access and technology use. This situation shows parallelism with the results of similar studies in literature (Akman, 2016; Kahraman, Yılmaz, Erkol, & Altun-Yalçın, 2013; Kaya, Balay, & Adıgüzel, 2014).

When educational internet use self-efficacy beliefs are analyzed according to the gender variable, it has been observed that gender does not make a significant difference on educational internet use self-efficacy beliefs. According to the findings obtained from pre-service teachers, educational internet use self-efficacy scores obtained from male pre-service teachers are higher than female ones. This result shows similar relationship with studies of Eroğlu, Ünlü and Eroğlu (2011), Baş (2011), Tuncer and Özüt (2012). However, when the literature is reviewed, there are also found some studies in which gender variable makes significant difference in favor of males (Alrekabat, 2016; Yenilmez, Turğut, Anapa, & Ersoy, 2011) and females (Baş, 2011; Durmuş & Başarmak, 2014). In the literature, contradicting results about gender might be related to quality of sample and there should be made interviews with participants in order to analyze the reasons for such a contradicting result.

It has been concluded that educational internet use self-efficacy beliefs do not significantly differ depending on following variables: academic success, financial situation, having an internet subscription and types of internet access. It is considered that the environments such as computer labs and libraries provided to pre-service teachers at universities -which increase the opportunities of accessing internet- have an increasing effect on educational internet use self-efficacy and remove inequality of opportunity caused by variables such as financial situation, having internet subscription and internet access types. Educational internet use which doesn't differ depending on

academic success levels can be interpreted as "educational internet use is not affected by academic success". The findings of this study show similarity with the research results of Yenilmez, Turğut, Anapa and Ersoy (2011).

It is found out that pre-service teachers who accept themselves adequate in terms of technology knowledge level have higher educational internet use self-efficacy than other participants and this difference is found to be statistically significant. Also, it has been identified that as weekly technology use durations increase, so do their self-efficacy levels in a positive way. In this case, it is possible to infer that there will be an increase in self-efficacy levels of pre-service teachers who are more interested in technology. Additionally, it has been statistically manifested that those who own a personal computer & smartphone and don't have difficulty with internet access have higher self-efficacy levels in terms of educational internet use. Within this context, it is suggested that technological facilities should be developed to be used by teachers for educational purposes and problems related to necessary devices and lack of equipment should be solved. As this research is conducted with pre-service science teachers, it is suggested that the same study should be duplicated with in-service science teachers and qualitative research methods should utilized to obtain detailed and comprehensive data for a deeper understanding.

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