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## Environmental Literacy Dimensions of Pre-Service Teachers

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### Abstract

In this research, it is aimed to determine pre-service science teachers' environment attitude, behavior and perceptions in terms of different variables. In this research, the relational screening model method was used. The study group consists of 265 pre-service science teachers from a state university in Turkey. The research was conducted during the fall semester of 2015-2016. In this research, the Environment Attitude Scale (EAS), Environment Behavior Scale (EBS), and Environment Perceptions Scale (EPS) were used. Data were analyzed by using IBM SPSS-21 statistical program. For data analysis, Independent t-test, Mann-Whitney U-test, One-Way Variance Analysis (ANOVA), Tukey significance test and also Correlation Analysis were used. There was no statistically significant difference found in pre-service teachers' environment attitude, behavior and perceptions in terms of gender and longest-lived place. However, there was a statistically significant difference found in pre-service teachers' environment attitude, behavior and perceptions in terms of the variables of having an environment lesson, education department and grade level. There was a positive middle relationship between environmental literacy components and environment attitude behavior, and a positive weak relationship between environment attitude-perceptions.

**Keywords:** environment attitude, environment behavior, environment perceptions.



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## Introduction

While improvements in science and technology have enhanced lifestyles, it has also created new problems for the environment. Environmental problems are those caused by the negative effects of a manmade artificial environment upon the natural environment (Ozer, 1993). According to Titiz (1995), environmental problems result from humans not being able to provide a continuous life process for the ecosystem in which they live, and its elements. On the other hand, the thinking and attitude structure of humans is one of the main sources of harm caused to the environment (Kislioglu, 2009; Senyurt, Temel, & Ozkahraman, 2011; Watson & Halse, 2005). Human beings cannot be thought as separate from the environment in which they live, and negative environmental impacts by human beings will also directly affect them. Because of this, solution ideas should be created and applied for environmental problems. Environmental philosophers mention concepts, ideas, thoughts, living and cultural values that causes human beings to err against nature and accordingly such mistakes should be corrected (Ünder, 1996). From a young age, environmental consciousness and sensitivity should be bestowed upon individuals in order that they become active in the area of environmental protection. Environmental education plays a significant role in human attitudes and behaviors that cause harm to the environment and on the creation of responsibilities towards the environment (Gayford, 1996; Hungerford & Volk, 1990).

Environmental education was first described by William B. Stapp (1969) as a conceptual frame, with environmental education “processes that aim to create a citizen who has got information on biophysical environment and environment problems, aware of the ways of helping to the solution of these problems and willing to work on this area”. UNESCO’s 1977 Tbilisi Manifesto determined the aims and concept of environmental education as an international dimension (UNESCO, 1977). In Turkey, Kisoglu’s (2009) description as a “learning process that leads to responsible actions and improves the skills that are needed to evaluate the problems and increases the interest of human beings on environment problems” is the most commonly accepted.

Environmental education is also expressed as the process of creating individuals that have the information, attitude and behaviors for providing solutions to environment problems and are sensitive towards the environment and its problems (Gökmen, 2008; Tecer, 2007; Teksöz, Şahin & Ertepinar, 2010a; Uzun, 2007). Individuals with environmental education have a high level of thought, belief and personal awareness about the environment (Keles, 2007), hence education programs and the concept of environment education has widened in Turkey as well as other countries. When Turkish education programs are analyzed, it can be seen that before 2005, environment subjects belonged to the concept of social sciences for 4<sup>th</sup>/5<sup>th</sup> graders and in science for 6<sup>th</sup>/7<sup>th</sup> graders (Yavuz, Kiyıcı, & Yigit, 2014). In 2005, a new science and technology program from the National Ministry of Education aimed to express the relationship between nature, science, technology, society and the environment. As a result, one of the learning areas included in the program is Science – Technology – Society - Environment (STSE) relationships. In the science program prepared in 2013, subjects related with the environment are placed at each grade level, starting from the 3<sup>rd</sup> grade (Yavuz et al., 2014).

Environmental education aims to provide objections on scientific, skill and attitude dimensions as related to the environment. Environmental education’s scientific dimension

includes environment and problems, the level of information level about ecology and nature, and skill dimension and attitude dimension enables individuals to feel themselves a part of the environment and to motivate them though individuals having an active role and gaining necessary skills to address environmental problems (Hungerford, Peyton, & Wilke, 1980; Kim, 2003; Sadik, 2013). Part of the aims of environmental education include improving individuals' responsibility on the environment and environmental literacy (Knapp & Barrie, 2001). In order for this responsibility to be realized in individuals, teachers and learners require environmental education.

Environmental literacy is described by Roth (1992) as "individuals" demonstrating an active effort to provide a qualitative balance of motivation, life and environment, having studies about solving environmental problems, having information about the environment and environmental problems, and having the attitude and skills related to the environment and environmental problems. As a result of his studies, Roth (1992) proposed environment literacy as having four basic dimensions; information, skill, perception, and behavior.

Research about environmental literacy states that learners have environmental literacy deficiencies in areas of information (Atasoy & Ertürk; 2008; Avci, 2006; Erol, 2005; Kuhlemeier, Van Den Bergh, & Lagerweij, 1999; Makki, Abd-El-Khalick, & Boujaoude, 2003; Yılmaz, Morgil, Aktuğ, & Göbekli, 2002) and behavior (Erdogan, 2009; Kuhlemeier et al., 1999; Ozdemir, 2010). Additionally, studies showed that learners have concept mistakes on some environmental subjects (e.g. global warming, serum effect, depletion of the ozone layer, and acid rain).

Many factors are relevant for environment awareness and ecological culture to occur. One of the most important of these factors are the teachers (Atasoy, 2006). On environment education, teachers are expected to provide environmental information, and provide inspiring actions and back feeding the values and judgments' by materializing the applications (Sarac & Kan, 2015). On that point, teacher candidates' environment education and their attitude, behavior and point of view held towards environment literacy is a matter of interest to educational researchers.

When the literature is analyzed, it is seen that environmental literacy levels of teachers and pre-service teachers is still largely unknown. In their study, Sevinc, Kıyıcı, Altas, and Altınöz (2010) mentioned that primary school science teachers' level of environment literacy is of an average level. Akıllı and Genc (2015) analyzed middle school students' environmental literacy sub-dimensions through different variables and noted their effects. Kısoglu (2009) mentioned that biology pre-service teachers had an average level of environmental literacy, and Koc and Karatekin (2013) analyzed geography pre-service teachers' environmental literacy level according to different variables and reported that biology instructors had an average level of environmental literacy.

Artun, Uzunöz, and Akbas (2013) researched the factors that affect social science pre-service teachers' level of environmental literacy level and saw that variables of gender, mother's education level, and father's education level had no effect. Kıyıcı, Yigit, and Darçın (2014) analyzed the change of nature education and pre-service teachers' environmental literacy level and determined the differences between pretest and posttest points.

Sargin et al. (2016) researched the information, behavior and attitude levels of pre-service teachers towards the environment and noted the pre-service teachers' sensitivity towards education as high. Sahin, Unlü, and Unlü (2016) researched pre-service teachers'

environmental literacy awareness levels according to their department and grade level and expressed that whereas first-grade pre-service teachers had no differences, there was a statistical difference for fourth-grade teacher candidates. Artun et al. (2013), and Karatekin and Aksoy (2012) researched factors that affect social science teachers' level of environmental literacy and mentioned the effect on environmental literacy of variables such as gender, mother's education level, father's education level, graduated school, having or not having environment classes at university.

When various past research studies were analyzed, no interaction between the dimensions of environmental literacy could be found. If it is taught that these dimensions of environmental literacy will be meaningful when put together, it raises the importance of finding relationships between the dimensions. Research studies included dimensions of attitude (Bilim, 2012; Gürbüz et al., 2012; Güven et al., 2013; Kahyaoglu, Daban & Yaygın, 2008; Sadık, 2013; Sama, 2003; Timur, Timur & Yılmaz, 2013) and behavior (Bilim, 2012; Timur, Timur & Yılmaz, 2012) in gathering results on environmental literacy.

The purpose of the current research is to determine pre-service science teachers' environmental attitudes, behaviors and perceptions in terms of different variables, and answers to the following research questions were sought:

- Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of their gender?
- Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of having received environment lessons?
- Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of their education department?
- Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of their longest-lived place?
- Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of their grade level?
- What is the relationship level between environment attitude- behavior and perceptions that construct environment literacy?

## **Methodology**

In this current research, the relational screening model was used. The relational screening model is a general screening model used in research to determine changes in two or more variables and the degree of such change (Karasar, 2006).

In this research, convenience sampling method was used. The study group consists of 265 pre-service science teachers from a state university in Turkey. The research was conducted during the fall semester of 2015-2016. Demographic information of the participants is presented in Table 1.

**Table 1.** Demographic Information of Pre-Service Teacher Participants

		f	%
Gender	Female	224	84.5
	Male	41	15.5
Department	Science education	159	60.0
	Primary school education	106	40.0
Grade level	1 <sup>st</sup> grade	67	25.3
	2 <sup>nd</sup> grade	90	34.0
	3 <sup>rd</sup> grade	71	28.8
	4 <sup>th</sup> grade	37	14.0
Longest-lived place	City	154	58.1
	District	72	27.2
	Village-Town	39	14.7
Having environmental lesson	Yes	144	54.3
	No	121	45.7
Total		265	100.0

When Table 1 is examined, it is seen that 25.3% (n=67) of the sample are 1<sup>st</sup> graders, 34.0% (n=90) are from the 2<sup>nd</sup> grade, 26.8% (n=71) from 3<sup>rd</sup> grade, and 14% (n=37) are 4<sup>th</sup> grade pre-service teachers. 84.5% (n=224) of these students are female and 15.5% (n=41) are male.

In this research, the Environment Attitude Scale (EAS) was employed, having been developed and tested in terms of its validity and reliability by Sarac and Kan (2015). Additionally, the Environment Behavior Scale (EBS) and the Environmental Perceptions Scale (EPS) developed by Kisioglu (2009) were used. The EAS consists of 20 attitude sentences in a five-point, Likert-type scale (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree). The minimum points that can be scored on the EAS is 20 and the maximum is 100. The EBS consists of 20 behavior sentences prepared as a three-point, Likert-type scale (1=never, 2=sometimes, 3=always). The minimum score for the EBS is 20 and the maximum is 60. The EPS, which is for determining the points of view of pre-service teachers towards environment literacy, includes three evaluation sentences that are graded from 1 to 5 (1=min, 5=max). The minimum score for the EPS is 3 and maximum is 15.

**Table 2.** Reliability of Scales (Cronbach alpha)

Scale	Cronbach alpha
EAS	.780
EBS	.828
EPS	.754

Data were analyzed by using the IBM SPSS-21 statistical program. For data analysis, Independent t-test, Mann-Whitney U-test, One-Way Variance Analysis (ANOVA), Tukey significance test, and also Correlation analysis were employed. Significance level was determined as .05. Percentage, frequency, average, and standard deviation values were also derived.

## Findings

In this section, data gathered from the analysis of pre-service teachers' attitudes, behaviors and points of view through various variables are presented. Minimum, maximum, average, and standard deviation values of the three scales used in the research are presented in Table 3.

**Table 3.** Values for Environment Literacy Attitude, Behavior and Point of View Scales

Scale	N	Min	Max	$\bar{x}$	SD
EAS		2.05	4.60	3.09	0.42
EBS	265	1.25	4.25	2.17	0.31
EPS		1.00	5.00	3.49	0.74

When Table 3 is analyzed, it can be seen that the EPS average value (EPS=3.49) is the maximum according to the answers that sample teacher candidates provided.

In this research, the effect of gender, grade level, having environment lessons, and longest-lived place were analyzed for attitude, behavior, and point of view, which are the dimensions of environment literacy.

Firstly, the research question "*Does pre-service teachers' environment attitudes, behaviors and perceptions differ in terms of their gender?*" was investigated, and Independent t-Test results are given in Table 4, while the Mann-Whitney U test results are given in Table 5.

**Table 4.** Results of t-Test for Gender Variable

Scale		N	$\bar{x}$	sd	t	p
EAS	Male	41	3.15	263	0.914	.361
	Female	224	3.08			
EBS	Male	41	2.24	263	1.659	.098
	Female	224	2.15			

\*p<.05

When the results in Table 4 are examined, there was no significant difference found in the pre-service teachers' environment attitude ( $t_{263} = 0.914$ ;  $p > 0.05$ ), or environment behavior ( $t_{263} = 1.659$ ;  $p > 0.05$ ) in terms of their gender.

**Table 5.** Mann-Whitney U Test Results According to Gender

Scale		N	Line Avg.	U	p
EPS	Male	41	131.79	4542.50	.911
	Female	224	133.22		

\*p<.05

When the results in Table 5 are examined, there was no significant difference found in the pre-service teachers' environment perceptions ( $U = 4542.50$ ;  $p > 0.05$ ) in terms of their gender. It could be claimed that gender is not an affective factor for environment attitude, environment behavior and environment perceptions of pre-service teachers.

For the research question "*Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of having received environment lessons?*", the independent t-test results are given in Table 6.

**Table 6.** Results of t-Test for Environment Lessons

Scale		N	$\bar{x}$	sd	t	p
EAS	Yes	144	3.15	263	2.44	.01*
	No	121	3.02			
EBS	Yes	144	2.20		1.97	.04*
	No	121	2.13			
EPS	Yes	144	3.55		1.44	.15
	No	121	3.41			

\*p<.05

When the results in Table 6 are examined, there was a significant difference seen in the pre-service teachers' environment attitude ( $t_{263} = 2.44$ ;  $p < .05$ ), and environment behavior ( $t_{263} = 1.97$ ;  $p < .05$ ) in terms of having received environment lessons. However, there was no significant difference in the pre-service teachers' environment perceptions ( $t_{263} = 1.44$ ;  $p > 0.05$ ) in terms of having received environment lessons.

For the research question "Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of their education department?", the Independent t-Test results are presented in Table 7.

**Table 7.** Results of t-Test for Education Department

Scale		N	$\bar{x}$	sd	t	P
EAS	Science education	159	3.11	263	.876	.382
	Primary school education	106	3.06			
EBS	Science education	159	2.20		1.93	.049*
	Primary school education	106	2.12			
EPS	Science education	159	3.56		1.91	.049*
	Primary school education	106	3.38			

\*p<.05

When the results in Table 7 are examined, there was a significant difference seen for the pre-service teachers' environment behavior ( $t_{263} = 1.93$ ;  $p < .05$ ), and environment perceptions ( $t_{263} = 1.91$ ;  $p < .05$ ) in terms of education department. However, there was no significant difference found for the pre-service teachers' environment attitude ( $t_{263} = 0.876$ ;  $p > .05$ ) in terms of their education department.

For the research question "Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of their longest-lived place?", One-Way ANOVA results are given in Tables 8 and 9.

**Table 8.** Frequency, Mean and Standard Deviation for Longest-Lived Place

Longest-lived place	N	EAS		EBS		EPS	
		$\bar{x}$	ss	$\bar{x}$	ss	$\bar{x}$	ss
Village-Town	39	3.16	0.40	2.21	0.31	3.66	0.65
District	72	3.07	0.41	2.14	0.30	3.38	0.76
City	154	3.08	0.43	2.17	0.32	3.49	0.75

**Table 9.** Results of One-Way ANOVA Test for Longest-Lived Place

Scale		Squares All	sd	Squares Average	F	P
EAS	Between Groups	.244	2	.122	.678	.508
	In-Group	47.057	262	.180		
	All	47.301	264			
EBS	Between Groups	5.698	2	.54	.538	.585
	In-Group	332.180	262	.101		
	All	337.878	264			
EPS	Between Groups	2.680	2	.978	1.770	.172
	In-Group	414.718	262	.552		
	All	417.398	264			

\*p&lt;.05

When the results of Table 8 and Table 9 are examined, no significant difference was found for the pre-service teachers' environment attitude [ $F_{2,262}=.673$ ;  $p>.05$ ], environment behavior [ $F_{2,262}=.538$ ;  $p>.05$ ], or environment perceptions [ $F_{2,262}=1.770$ ;  $p>.05$ ] in terms of their longest-lived place.

For the research question "Does pre-service teachers' environment attitude, behavior and perceptions differ in terms of their grade level?", the One-Way ANOVA results are given in Table 10 and Table 11, whilst the Kruskal-Wallis H results are given in Table 12.

**Table 10.** Frequency, Mean and Standard Deviation for Grade Level

Grade level	N	EAS		EBS		EPS	
		$\bar{X}$	SS	$\bar{X}$	SD	$\bar{X}$	SD
1 <sup>st</sup> grade	67	2.97	0.34	2.06	0.24	3.34	0.79
2 <sup>nd</sup> grade	90	3.06	0.38	2.13	0.26	3.37	0.64
3 <sup>rd</sup> grade	71	3.15	0.43	2.23	0.30	3.57	0.80
4 <sup>th</sup> grade	37	3.27	0.55	2.35	0.44	3.85	0.62

**Table 11.** Results of One-Way ANOVA Test for Grade Level

Scale		Square All	sd	Square Average	F	p	Tukey
EAS	Between Groups	2.519	3	.840	4.893	.003*	3>1, 4>1
	In Group	44.782	261	.172			
	All	47.301	264				
EPS	Between Groups	7.975	3	2.658	5.003	.002*	4>1, 4>2
	In Group	138.696	261	.531			
	All	146.671	264				

\*p&lt;.05

When the results in Table 10 and Table 11 are examined, there was a significant difference seen between pre-service teachers' environment attitude [ $F_{3,261}=4.893$ ;  $p<.05$ ], and environment perceptions [ $F_{3,261}=5.003$ ;  $p<.05$ ] in terms of their grade level. When 1<sup>st</sup> grade, 3<sup>rd</sup> grade, and 4<sup>th</sup> grade pre-service teachers' mean scores are compared, it can be said that the environment attitude of 1<sup>st</sup> grade pre-service teachers' is less than the 3<sup>rd</sup> and 4<sup>th</sup> grade pre-service teachers. When the 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> grade pre-service teachers' mean

scores are compared, it can be said that environment perceptions of 1<sup>st</sup> and 2<sup>nd</sup> grade pre-service teachers' is less than 4<sup>th</sup> grade pre-service teachers.

**Table 12.** Results of Kruskal-Wallis H Test for Grade Level

	Grade level	N	Line Avg.	Sd	X <sup>2</sup>	p
EBS	1 <sup>st</sup>	67	106.90			
	2 <sup>nd</sup>	90	124.58	3	19.922	.000*
	3 <sup>rd</sup>	71	150.65			
	4 <sup>th</sup>	37	166.88			

\*p<.05

When the results in Table 12 are examined, a significant difference was found in the pre-service teachers' environment behavior ( $X^2=19.922$ ;  $p<.05$ ) in terms of their grade level. It could be claimed that grade level is an affective factor for environment attitude, environment behavior and environment perceptions of pre-service teachers.

For the finals research question "*What is the relationship level between environment attitude- behavior and perceptions that construct environment literacy?*", correlation analysis results are given in Table 13.

**Table 13.** Results of Correlation Analysis for Environment Attitude-Behavior and Perceptions

	Attitude	Behavior	Pow
Attitude	1	.311**	.166**
Behavior	.311**	1	.412**
Perceptions	.166**	.412**	1

\*p<.05 \*\*p<.01

When the results of Table 13 are examined, there was a positive middle relationship found between environmental literacy components as environment attitude behavior ( $r=0.311$ ;  $p<.01$ ), and a positive weak relationship between environment attitude-perceptions ( $r=0.166$ ;  $p<.01$ ).

## Discussion and Conclusion

In this research, it was aimed to determine pre-service science teachers' environment attitude, behavior and perceptions in terms of different variables. In addition, the relationship between environmental literacy dimensions was examined. When the literature about the subject was researched, not many studies about the relationship between these dimensions was found, hence this study focusses on the relationship between environmental literacy dimensions.

There was no statistical significance found for the pre-service teachers' environment attitude, behavior and perceptions in terms of gender. That is, gender was not found to be an affective factor on pre-service teachers' environment attitude, behavior and perceptions. Results of other studies (Akillı & Genc, 2015; Artun et al., 2013; Gürbüz et al., 2012; Kahyaoglu et al., 2008; Kıyıcı et al., 2014; Koç & Karatekin, 2013; Bilim, 2012) have similarities in their studies. Kahyaoglu et al. (2008) found no significant difference in environmental attitudes of elementary school teachers in terms of gender, and Bilim (2012) found no significant difference in environmental attitude, environmental behavior and environmental perceptions of the education faculty students in terms of gender. Yet, there are also studies that did not reflect the results of this current study (Karatekin & Aksoy,

2012; Sama, 2003; Sargin et al., 2016; Teksöz et al., 2010a; Timur et al., 2013). When the findings of these studies are examined, gender is seen as an influential factor on the dimensions of environmental literacy.

In the current study, there was statistical significance found for pre-service teachers' environment attitude and behavior in terms of having an environment lesson. That is, having an environment lesson is an effective factor on pre-service teachers' environment attitude, environment behavior. However, having environment lessons is not an affective factor on pre-service teachers' environment perceptions.

Pre-service teachers mean scores were compared (see Table 6), and it can be said that environmental lessons have a positive effect on environmental attitudes and environmental behaviors of pre-service teachers. The results of studies by Karatekin & Aksoy (2012) and Sadik and Sari (2010) support the findings of this current research. However, various other researchers (Kahyaoğlu et al., 2008); Kiyıcı et al., 2014; Koc & Karatekin, 2013; Sadık, 2013; Timur et al., 2013) found that having environment classes did not affect pre-service teachers' attitudes towards the environment.

There was also statistical significance found for the pre-service teachers' environment behavior and environment perceptions in terms of their education department. That is, education department is an affective factor on pre-service teachers' environment behavior and environment perceptions. When pre-service science and primary school teachers' mean scores were compared (see Table 7), it can be said that environment behavior and environment perceptions of pre-service primary school teachers is less than pre-service science teachers.

Sargin et al. (2016) found a statistical difference in environmental behavior scores in favor of primary school teachers in terms of education department. However, Timur et al. (2013) and Kahyaoğlu et al. (2008) found no statistical significance in pre-service teachers' environment attitudes in terms of education department. These results overlap with the effect found for environment lessons, which are known to be delivered to both pre-service primary school teachers and pre-service science teachers.

There was no statistically significant pre-service teachers' environment behavior and environment perceptions in terms of longest-lived place. That is, longest-lived place is not an affective factor on pre-service teachers' environment behavior and environment perceptions. Similar to this finding, Bilim (2012), Gürbüz et al. (2012), Köse (2010), Altınöz (2010) and Kısıoğlu (2009) found in their research. However, Erol (2005) and Sama (2003) found that longest-lived place is an affective factor on pre-service teachers' environment attitude.

There was a statistically significant difference in pre-service teachers' environment behavior and environment perceptions in terms of their grade level. That is, grade level is an affective factor on pre-service teachers' environment behavior and environment perceptions. As the grade level increases, environmental attitudes, environmental behavior, and environmental perception scores of pre-service teachers also increase. Findings by Sahin et al. (2016), Akıllı & Genç(2015), and Sadik and Sari (2010) shared similarities with the results of this current study. However, Güven et al. (2013), Gürbüz et al. (2012), and Sama (2003) found no significant difference for grade level in the environmental literacy dimensions.

In the current research, the relationship between environmental literacy dimensions and their relation to each other was examined. A positive middle degree relationship was seen between attitude and behavior, a positive weak relationship found between attitude and point of view, and a positive middle relationship between behavior and point of view. These results overlap with the research results of Bilim (2012).

As a result, pre-service teachers have a significant responsibility for educating individuals with high level of attitude, behavior and point of view. According to the results of this research, it can be said that to improve environmental literacy, increasing the number and duration of classes about the environment will have a positive effect.

On the other hand, there should be further studies about increasing the awareness on the points of environment attitude, environment behavior and environment point of view, which are the components of environment literacy for both teachers and students. It can be said that the combination of Science, Technology, Society, and Environment, as in the changes seen in Ministry of Education programs, should also be transferred to higher education institution programs.

## Notes

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