An Analysis of University Students' Attitudes towards Personalized Learning Environments

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ABSTRACT
The aim of this research is to analyze university students' attitudes towards personalized learning environments with respect to the independent variables of gender, age, university, year of study, knowledge about the environment, participation in the environment and being willing to participate in the environment. The correlative survey model is the method used in the research. The participants are 1,197 students of Computer Education and Instructional Technologies programs at 10 different universities. The personalized learning environment attitude scale (PLEAS) was used as an instrument to collSect data. The *t*-test, one way analysis of variance (ANOVA) and Tukey's test were used to analyze data.

The analysis found a significant difference in university students' attitudes towards personalized learning environment with respect to the variables of gender, age, year of study, knowledge about the learning environment, participation in the environment and being willing to participate in the environment. The university variable had no effect on attitudes.
Keywords: Personalized learning environments, attitude scale, university students.

INTRODUCTION
Recent developments in information technologies have influenced education as deeply as other fields. The adoption of information technologies in education has shown that learners' willingness to participate actively, to interact and to construct information is not adequate in face-to-face classrooms (Jaros and Deakin-Crick, 2007). Many learning environments such as computer-aided instruction, computer-based instruction and e-learning have been designed since the start of web technology use in education. However, these learning environments fail to provide an environment appropriate for the paces and learning styles and personal characteristics of learners (Martinez, 2001, El-Bakry and Mastorakis, 2009; Sahabudin and Ali, 2013; Savio-Ramos 2015). Individuals with different purposes and different levels of knowledge demand information presentation methods which offer alternatives and interesting to them (Brusilovsky, 1996). Personalized learning environments were designed to eliminate the limitations of other environments. Personalization is the presentation of correct information to right person at the right time (Speretta and Gauch, 2005). According to Gomez et al. (2013), personalized learning is learner-centered and provides content and guidance that fulfills the needs of individuals. Personalized learning environments offer learning experiences that are designed appropriately for individual learning styles and learning needs (Özarslan, 2010). The development of personalized learning environments is in its infancy, despite the fact that many personalized environments have already been developed (Kışla and Şahin, 2015).

In the literature, personalized learning environments are also referred to as adaptable learning environments. Adaptable learning environments were developed to offer an alternative to the"one size fits all" approach of traditional education (Brusilovsky, 2003; Lee, 2013). Instruction with one-type of content in a learning environment is not an appropriate approach for learners with varying amounts of prior knowledge, paces and learning styles. Knowledge should be presented by developing a learning environment which is suitable for learner's purposes and needs (Dağ, 2008).

Many personalized learning systems have already been developed and used. Şahin and Kışla (2013) reviewed these systems under three headings: (1) the development of personalized learning environments, (2) the development and use of personalized learning environments, and (3) research that describes the necessary features of personalized learning environments. This research tested the efficiency and effectiveness of these systems. Their positive and negative elements were investigated and studied to see if they affect learners' success positively or negatively.

Studies which developed personalized learning environments includes examples such as Schwarz et al. (1996) ELM-ART (Episodic Learner Model – Adaptive Remote Tutor), De Bra and Calvi (1998) AHA (Adaptive

Hypermedia Architecture), Kurzel et al. (2002) AMLE (Adaptive Multimedia Learning Environment), Pu et Al. (2004) DALE (Distributed Adaptive Learning Environment), Niyomiya et al. (2007) WebClass RAPSODY, Zhang (2008) PSSEM (Personalized Service System Based on E-learning Model), Li and Li (2009) PLSIA (Personalized Learning Environment based on Intelligent Agent), Muntean and Muntean (2009) PEACOCK (Performance-based E-learning Adaptive Cost-efficient Open Corpus Network), Hurson and Sedigh (2010) PERCEPOLIS (Pervasive Cyberinfrastructure For Personalized Learning And Instructional Support) and Sezer (2011) Ax2ELS (Adaptable-Adaptive English Learning Support).

Examples of studies which found that personalized learning environments affect learner's success positively include Wang (2008) IDEAL, Powell et al. (2008) Ultraversity, Bahçeci (2011) LessonTutor, Martinez (2001), Mustafa and Sharif (2011), Hwang et al. (2012) and Saiyd and Al-Sayed (2013).

The studies of Dimitrova (2003) STyLE OLM (Scientific Terminology Learning Environment Interactive Open Learning Modelling), Martinez (2001), Saiyd and Al-Sayed (2013) and Powell et al. (2008) Ultraversity are related to the design and construction of personalized learning environments. The results of these studies indicate that the systems were successfully implement and their construction was good.

Some research has examined the effects of personalized learning environments on the motivation of learners. Powell et al. (2008) Ultraversity, Popescu and Badica (2009) WELSA (Web based Educational system with Learning Style Adaptation) and Hwang et al. (2012) are examples of studies which found positive effects.
In addition, there is research that investigates the effects of personalized learning environments on the attitudes of learners. These studies include Powell et al. (2008) Ultraversity, Bahçeci (2011) and O'keeffe et al. (2012) AMASE (A Framework for Composing Adaptive and Personalized Learning Activities on the Web). These studies show that attitudes towards these environments are positive.

Nevertheless, there is not much research that investigates learners' attitudes towards these environments. According to Fishbein and Ajzen, "Attitudes are learned, they determine actions, and these actions are either positive or negative towards an object" (as cited in Köklü, 1995). Attitude studies are designed to obtain information about learners' approach to courses, levels of learning, interests, success and attitudes towards subjects (Demir and Akengin, 2010). Learners' attitudes towards personalized learning environments also determine their behaviors in the environment. To increase the success and the effectiveness of personalized learning environments, all the partners in the system must participate in the development of the environment. One of the partners is the individual who benefits from the environment. The opinions of these individuals should be taken, their motivation should be increased, and their attitudes towards the system should be positive. Attitude consists of aspects as direction (positive or negative feelings towards an event or subject, enjoyment), level (acceptance or rejection levels) and intensity (the possibility of becoming an extravert behavior) (Köklü, 1995). The aim of this study is analyzing the effects of different variables on university students' attitudes towards personalized learning environments. In accordance with this purpose, the sub-issues of this study are:

a) Are there any gender differences in students' attitudes towards personalized learning environments?
b) Are there any age related differences in students' attitudes towards personalized learning environments?
c) Are there any year of study differences in students' attitudes towards personalized learning environments?
d) Are there any differences related to the university variable in students' attitudes towards personalized learning environments?
e) Are there any differences related to the variable of students' knowledge about the environment in students' attitudes towards personalized learning environments?
f) Are there any differences related to variable of participation in personalized learning environments in students' attitudes towards personalized learning environments?
g) Are there any differences related to the variable of students' willingness to participate in personalized learning environments in students' attitudes towards personalized learning environments?

METHODS

This section includes detailed information about this research's design, sample, data collection instrument, procedure and data analysis.

Research Model:

The correlative survey model was used in this study to collect data about students' attitudes towards personalized learning environments. In survey research, the aim is to identify participants' opinions, attitudes and abilities regarding an event or a situation (Büyüköztürk et al., 2011). This study investigates the effects of

the variables such as gender, age, university, year of study, knowing about PLEs, having participated in PLEs and willingness to participate in PLEs on computer education and instructional technologies (CEIT) students' attitudes towards personalized learning environments (PLEs).

Population and Sample:
Random stratified sampling was used to select the sample. Stratified sampling assumes that population consists of strata, and sample selection is done independently from these strata. The population of this study includes the students of 42 different CEIT programs in public universities. The 2013 minimum national university entrance examination scores of the universities in the population were arranged in descending order. The first stratum consists of the top 21 universities, and the second stratum consists of the bottom 21 universities. Five universities from each stratum were randomly selected to sample. More detailed information is shown in Table 1.

Table 1. Information about the sample

	Gender		Total	Grade				
University	**Female**	**Male**		**1. Grade**	**2. Grade**	**3. Grade**	**4. Grade**	**Total**
Ağrı İbrahim Çeçen University	36 (%3.00)	41 (%3.42)	77 (%6.42)	0	20	34	23	77
Anadolu University	42 (%3.50)	66 (%5.51)	108 (%9.01)	28	47	33	0	108
Ankara University	53 (%4.42)	35 (%2.92)	88 (%7.34)	0	40	17	31	88
Balıkesir University	60 (%5.01)	49 (%4.09)	109 (%9.10)	31	25	22	31	109
Çanakkale 18 Mart University	114 (%9.52)	151 (%12.61)	265 (%22.13)	44	29	96	96	265
Gaziosmanpaşa University	64 (%5.34)	57 (%4.76)	121 (%10.10)	35	28	26	32	121
Hacettepe University	51 (%4.26)	51 (%4.26)	102 (%8.52)	15	21	28	38	102
Necmettin Erbakan University	33 (%2.75)	32 (%2.67)	65 (%5.42)	0	0	2	63	65
Osmangazi University	49 (%4.09)	64 (%5.34)	113 (%9.43)	35	41	35	2	113
Trakya Üniversitesi	65 (%5.43)	84 (%7.01)	149 (%12.44)	36	24	42	47	149
Total	**567 (%47.36)**	**630 (%52.64)**	**1197 (%100)**	**224 (%18.71)**	**275 (%22.98)**	**335 (%27.99)**	**363 (%30.32)**	**1197 (%100)**

The sample (n=1197) consists of first, second, third and fourth year CEIT students at 10 public universities.

Data Collection Instrument:
In this study, the personalized learning environment attitude scale (PLEAS) developed by Şahin (2014) was used to collect data. PLEAS consists of 27 items and one subcomponent. Its KMO score is .95. Its Barlett sphericity is (=6367.9, .000). Its content validity was determined by expert opinion. Its Cronbach alpha internal consistency coefficient is .95. It is a 5-point Likert-type scale which uses these responses: "strongly agree," "agree," "neither agree nor disagree," "disagree," and "strongly agree."

Procedure:
The researchers contacted the university instructors who administered the survey. The questionnaire took 5-7 minutes for the students to complete. The research ethics committee's approval was sent along with the questionnaires for administration. Detailed information about the procedure is shown in Table 2.

Table 2. Procedure

University	Procedure Start	Procedure Finish
Hacettepe University	06.12.2013	13.01.2014
Anadolu University	06.12.2013	31.01.2014
Ankara University	06.12.2013	20.01.2014
Balıkesir University	10.12.2013	28.01.2014
Çanakkale 18 Mart University	10.12.2013	30.01.2014
Ağrı İbrahim Çeçen University	07.12.2013	20.01.2014
Necmettin Erbakan University	06.12.2013	15.01.2014
Eskişehir Osmangazi University	06.12.2013	31.01.2014
Tokat Gaziosmanpaşa University	11.12.2013	31.01.2014
Trakya University	10.12.2013	23.01.2014

Data Analysis and Interpretation:
The *t*-test was conducted in order to assess whether there is a significantly meaningful difference among university students' attitudes toward personalized learning environment with respect to variables such as gender, knowing about PLEs, having participated in PLEs and willingness to participate in PLEs. The one-way analysis of variance (ANOVA) was conducted to assess whether there is a significantly meaningful difference among university students' attitudes toward personalized learning environment with respect to variables as age, university and year of study. The Levene test was used to assess homogeneity of variances. Tukey's test was used to determine the reason for the significant differences that were found.

FINDINGS AND INTERPRETATION
Extreme value and missing value analysis were conducted to investigate the attitude of the participants towards personalized learning environments. Missing values were removed from the dataset. Data that matched $|Z|<3.24$ was evaluated as outliers (Leech et al., 2008). The data for 8 students with $|Z|>3.24$ were removed, since they were specified as outliers.

When the coefficient of skewness is smaller than 2.5, or the kurtosis and coefficient of skewness is between +1 and -1, it indicates a normal distribution (Leech et al., 2008). The data used in the analysis is normally distributed. The results of the descriptive analysis for the set of data from 1,197 students are shown in Table 3.

Table 3. Result of descriptive analysis

Mean	105.2
Median	106
Variance	220.8
Std.	14.86
Range	81
Skewness	-.337 – .071
Kurtosis	.222 – .141
Minimum Value	54
Maksimum Value	135

The Effect of Gender on University Students' Attitudes towards PLEs

The *t*-test was conducted to determine whether the attitudes of students towards personalized learning environments varied by gender. Table 4 indicates that gender affects personalized learning environment attitude scale scores.

Table 4. Gender affects personalized learning environment attitude scale scores

Gender	N	□	SS	sd	t	p
Male	630	103.94	15.55	1195	3.146	.002
Female	567	106.64	13.92			

p< .05

The university students' attitudes towards personalized learning environments vary significantly by gender ($t(1,195)=3.146$, $p<.05$). Female students' attitudes (=106.64, s=13.92) are much more positive than those of male students (=103.94, s=15.55). This finding indicates a correlation between the student's attitude towards personalized learning environments and gender. The effect size calculated for the gender variable is .09. This result shows that 9% of the variance in the attitude scale scores is due to gender. The Cohen d value is .18, which means that the difference between the attitude scale mean scores of the male and female students equals a .18 standard deviation. The values calculated show that the effect size is small for the gender variable (Leech et al., 2008).

The Effect of Age on University Students' Attitudes towards PLEs

One-way analysis of variance (ANOVA) was used to determine whether the students' attitudes towards personalized learning environments varied by age. The descriptive statistics for the age groups are shown in Table 5, and the results of ANOVA are shown in Table 6.

Table 5. Descriptive statistics for the age groups

Age Group	N	□	SS
1 (17-19)	257	103.63	13.39
2 (20-22)	760	105.52	15.10
3 (23-25)	150	105.18	16.45
4 (26 and over)	30	111.43	9.74

Table 6. Results of ANOVA about age groups

	Sum of squares	sd	Mean Square	F	p	Difference
Between groups	1877.542	3	625.847	2.847	.037	4-1
Within groups	262284.903	1193	219.853			
Total	264162.445	1196				

p< .05

These results show that the students' attitudes towards personalized learning environments varies significantly by age ($F(3, 1193)=2.847$, $p<.05$). Tukey's test was performed to find the range of ages where the difference exists. According to the results, group 4 (26 and older) and group 1 (ages between 17 and 19) are significantly different. The attitudes of students who are 26 or older are more positive than those of other groups. The age groups, 17-19, 20-22 and 23-25, do not have significantly different attitudes towards personalized learning environments. No significant difference was found between the age groups, 23-25, 20-22 and 26 or older. These results show that the students' attitudes towards personalized learning environments are more positive as their age increases.

To identify the reason for differences in attitudes by age, the analysis of covariance (ANCOVA) method was performed. The adjusted scores are shown in Table 7.

Table 7. Adjusted scores about age groups

Age groups	N	Mean	Adjusted Mean
17-19	257	103.63	105.35
20-22	760	105.52	105.15
23-25	150	105.18	104.37
26 +	30	111.43	109.92

The results of ANCOVA determine if the difference in the age groups' adjusted attitude scores is significant. They are shown in Table 8.

Table 8. Results of ANCOVA

	Sum of squares	sd	Mean Square	F	p
Knowing about PLE	19060.922	1	19060.922	93.414	.073
Age Groups	777.646	3	259.215	1.270	.003
Error	243223.981	1192	204.047		
Total	13516872.6	1197			

p< .05

The results show that, if the variable of the students who know about personalized learning environments is controlled, the difference between the age groups' adjusted attitude scores is not statistically significant. It shows that the reason for the variance among attitude scale scores is not due to age, but due to knowledge about personalized learning environments.

The Effect of Year of Study on University Students' Attitudes towards PLEs

One-way ANOVA was used to determine whether the students' attitudes towards personalized learning environments vary by year of study. The descriptive statistics are shown in Table 9.

Table 9. Descriptive statistics about grade

Grade	N	□	SS
1. grade	224	103. 70	13.65
2. grade	275	102.28	14.07
3. grade	335	105.18	15.64
4. grade	363	108.41	14.86

The result of ANOVA for the students' attitudes towards personalized learning environments with respect to their year of study is shown in Table 10.

Table 10. ANOVA results about year of study

	Sum of square	sd	Mean square	F	p	Differences
Between groups	6597.126	3	2199.042	10.186	.000	4. sınıf – 1. sınıf, 4. sınıf – 2. sınıf, 4. sınıf – 3. sınıf
Within groups	257565.318	1193	215.897			
Total	264162.445	1196				

p< .05

The analysis shows that there is a significant difference in the students' attitude towards personalized learning environments with respect to their year of study (F(3.1193)=10.186, p<.05). To identify the year of study where the difference exists, Tukey's test was conducted. According to the results, the attitudes of seniors (=111.43) are more positive than those of students in other years of study. No significant differences were found between freshmen, sophomores and juniors.

The Effect of the University Variable on University Students' Attitudes towards PLEs

One way ANOVA was used to determine whether the students' attitudes towards PLEs vary by the university they attend. The descriptive statistics for the analysis of this variable are shown in Table 11.

Table 11. Descriptive statistics about university variable

University	N	□	SS
Ağrı İbrahim Çeçen University	77	109.25	12.25
Anadolu University	108	102.42	14.53
Ankara University	88	104.28	16.62
Balıkesir University si	109	106.94	13.45
Çanakkale 18 Mart University	265	106.48	14.63
Hacettepe University	102	105.80	16.17
Necmettin Erbakan University	65	108.76	12.99
Osmangazi University	113	104.54	13.77
Tokat Gaziosmanpaşa University	121	101.58	15.05
Trakya University	149	103.72	16.14

The results of ANOVA for students' attitudes towards personalized learning environments with respect to the university is summarized in Table 12.

Table 12. ANOVA results about university variable

	Sum of square	sd	Mean square	F	p	Differences
Between groups	5762.272	9	640.252	2.941	.002	Ağrı-Tokat
Within groups	258400.173	1187	217.692			
Total	264162.445	1196				

p< .05

Analysis shows that there is a difference in the students' attitudes towards personalized learning environments with respect to the university (F(9.1187)=2.941, p=<.05). To identify the universities where the difference exists, Tukey's test was used. The results showed a significant difference between Ağrı İbrahim Çeçen University (=109.25) and Tokat Gaziosmanpaşa University (=101.58). No significant differences were found for the other universities. Since there is no significant difference in 9 universities, but only in 2, it can be concluded that the university variable does not significantly affect students' attitudes towards PLEs.

Paired comparisons of universities only shows a significant difference between Ağrı İbrahim Çeçen and Tokat Gaziosmanpaşa University, in favor of Ağrı İbrahim Çeçen University. No significant difference was found in the paired comparisons of the other universities.

The Effect of Knowing about PLEs on University Students' Attitudes towards Them

The *t*-test was used to find out how knowing about PLEs affects attitudes towards them. The results of the test are shown in Table 13.

Table 13. Results of the t-test knowing about PLEs

Knowing about PLE	N	□	SS	sd	t	p
Yes	533	109.64	14.37	1193	9.69	.000
No	662	101.58	14.22			

p< .05

The results show a significant difference for students know about personalized learning environments (*t*(1,193)=9.96, p<.05). The attitudes of students who know about personalized learning environments (=109.64, s=14.37) are more positive than those who do not (=101.58, s=14.22). This means there is a meaningful correlation between the attitudes toward and knowledge about PLEs. The effect size calculated for the variable of knowing about PLEs is .27. According to this value, it can be stated that approximately 27% of the variance found in the attitude scale scores is due to knowing about personalized learning environments. The Cohen d value is .56, which shows that the difference between mean scores of attitude scales of 2 groups equals a .56 standard deviation. The values indicate that the effect size of the variable of knowing about PLEs is mid-sized (Leech et al., 2008).

The Effect of Participation in PLEs on University Students' Attitudes towards Them

The *t*-test was used to find out how having participated in PLEs affects the attitudes towards PLEs. The results of the test are shown in table 14.

Table 14. Results of the t-test about participation in PLEs

Participation of PLEs	N	⎓	SS	sd	t	p
Yes	244	109.62	15.63	1195	5.24	.000
No	953	104.09	14.45			

p< .05

There is a significant difference in attitudes towards PLEs between students who have participated in PLEs and those who have not (t(1,195)=5.24, p<.05). The attitudes towards PLEs of students who have participated in PLEs (=109.62, s=15.63) are more positive (=104.09, s= 14.45). This finding is interpreted as there is a significant correlation between attitudes towards PLEs and having participated in PLEs. Calculated effect size for having participated in PLEs is r=.15. This value shows that approximately 27% of the variance found in the scores of attitude scale is due to having participated in personalized learning environments. The Cohen d value is .30, which indicates that the difference between mean scores of attitude scales of the 2 groups equals a .30 standard deviation. According to the results, the effect size of this variable is mid-sized (Leech et al., 2008).

The Effect of Willingness to Participate in PLEs on University Students' Attitudes towards the PLE

The *t*-test was conducted to determine the difference in attitudes towards PLEs between students who are willing to participate in PLEs and those who are not. The *t*-test results are shown in Table 15.

Table 15. Results of t-test about willingness to participate in PLEs

Willingness to participate in PLEs	N	⎓	SS	sd	t	p
Yes	1034	106.86	14.19	1195	10.06	.000
No	163	94.76	14.76			

p< .05

According to results there is a significant difference between the two groups (t(1195)=10.06, p<.05). The attitudes of students who are willing to participate in PLEs (= 106.86, s=14.19) are more positive (=94.76, s=14.76). The effect size value calculated for the variable of willingness to participate in PLEs is r=.28. This value shows that approximately 28% of the variance in the attitude scale scores is due to willingness to participate in PLEs. The Cohen d value is .58, which indicates that the difference between the 2 groups mean attitude scale scores equals a .58 standard deviation. These results show that the effect size for the variable of willingness to participate in PLEs is mid-sized (Leech et al., 2008).

CONCLUSIONS AND RECOMMENDATIONS

This research attempts to investigate the effects of different variables on university students' attitudes towards personalized learning environments. The effects of variables as gender, age, year of study, university, knowing about personalized learning environments, participating in personalized learning environments and willingness to participate in personalized learning environments on students' attitudes towards personalized learning environments were investigated. The participants are 1,197 university students from 10 different universities.

According to their scores on the personalized learning environment attitude scale (PLEAS), university students' attitudes towards these environments are positive. Furthermore, gender, age, year of study, knowing about PLEs, participated in PLEs and willingness to participate in PLEs have a statistically significant effect on attitudes towards PLEs, whereas there is no significant difference according to university variable.

According to the grade there is significance difference. The difference of the seniors from the other groups may be due to the course, "The Principles of Distance Education," which they attend in their fifth semester. The syllabus of the course includes subjects such as the use of technology in education and applied technology. Students' attitudes towards personal learning environments may be affected by the subjects studied in this course. Like this study, Berkant (2013) found that seniors' attitudes towards Computer Aided Instruction (CAI) are more positive.

If students have information about PLE, this affect their attitude. A study called STyLE OLM (Scientific Terminology Learning Environment Interactive Open Learning Modeling) by Dimitrova (2003) supports the conclusion that there is a meaningful difference between individuals who know about personal learning environment and those who do not. The literature shows that having participated in PLEs affects students'

attitudes towards PLEs positively. The studies of Wang (2008), Powell et al. (2008), Popescu and Badica (2009), Bahçeci (2011), O'keeffe et al. (2012) also support this finding.

Also the studies in literature show that attitudes of people who have participated in PLEs are significantly more positive than those of people who have not. The results of this study are similar, showing that the attitudes towards PLEs of people who have participated in PLEs are significantly more positive direction than those of people who have not.

Finally attitudes are affected by positive or negative feelings towards a situation or event and being comfortable with a situation or event. Students' willingness to participate in PLEs is a positive attitude, and it affects their attitudes positively. The reason for the more positive attitudes of students who are willing to participate in PLEs may be higher motivation.

Future research should study all the partners who participate in the environment, including students, instructors, designers and technicians. Additionally, environments should be designed using assessment methods with better validity, consistency and adaptability. Rich learning materials will increase the quality of these environments.

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