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An Investigation of the Educational Use of Facebook According to Physics Teachers and Students

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Abstract

Today, social networks are used in every field of education, contributing to the dissemination of knowledge and improving the quality of education. This study investigated the perceptions of high school students, undergraduate students and physics teachers have on the adaptation of Facebook as a social network, the intended use of Facebook, and its educational use in a physics course. The participants included 327 high school students, 40 preservice physics teachers, and 28 physics teachers, all from Ankara, Turkey. The data revealed that there was a significant difference in the participants' views on the adaptation of Facebook, the intended use of Facebook, and its educational use according to educational level, but not by gender. The teachers, compared to the high school students and the preservice teachers, scored significantly higher in the areas of adaptation of Facebook and its intended use. In the educational use of Facebook, the preservice teachers, compared to the high school students, and the teachers, compared to both high school students and preservice teachers, scored significantly higher. The variables of gender, educational level, intended use of Facebook, and its educational use were found to have a significant effect on the perceptions of the educational use of Facebook in physics education. In this study, while the use of Facebook in the field of education is not affected by gender in general, its use in physics education in specifically is affected by gender.

Keywords: Facebook; Facebook in education; physics education

1. Introduction

Social media is a communication platform utilized in virtually every field of daily life, including economics, politics, science, education, and casual and official communication and as such, it involves enormous amounts of audio, visual, written and interactive content to be produced and shared over the internet. Social media can be described in general terms as scalable communication technologies that transform internet-based communication into an interactive dialog platform (Montalvo, 2016, p. 45). With the technical structure of social media, which makes it available in all internet-enabled fields, information can be rapidly communicated across wide areas, making it a perfect social interactive tool in all fields of society, from economy and healthcare to education and social life.

The January 2020 annual report on internet users published by We Are Social and Hootsuite revealed that, of the 4.54 billion internet users, 3.484 billion were active social media users (Kemp, 2020). According to this report, the top three most used social media platforms in the world are Facebook, YouTube and Whatsapp in respective order. Being one of the most used social

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media platforms, Facebook has been widely studied in different fields, with researchers conducting studies on developing more effective ways to utilize the platform and benefit from it. While social media tends to be most often used for entertainment and social benefits, studies have nonetheless shown that it also has value for knowledge acquisition (Can, 2019, pp.125-126).

Physics, which is among the basic sciences, is perceived as a difficult field for students to learn (Wambugu & Changeiywo, 2008; Oladejo, Olosunde, Ojebisi & Isola, 2011). For this reason, it is important for researchers to use social media platforms, which students frequently use in daily life, for educational purposes in order to make the physics course more interesting and better understood. Using Facebook for educational purposes by taking advantage of its ubiquity and collaboration capabilities will positively affect learning. The correct use of social media in education is the key to successful education (Liu, 2010). By determining the opinions of students, pre-service teachers and teachers about Facebook, the development of content that will contribute to physics teaching and learning will ensure the preparation of a quality and effective learning environment.

As t there are few studies on the application of social media for teaching physics, this study investigated the views of high school students of physics, preservice physics teachers, and physics teachers on the adaptation of Facebook, the intended use of Facebook, and its educational use in a physics course. The results obtained by the study are expected to contribute to education in general and to physics education in particular.

2. Literature review

The number of social media users increases daily, which means it has become part of daily life. Gezgin et al. (2018, p. 220) found that 88% of university students use social networks simply to pass the time, while 83% of them also use it for communication through their smartphones. Students' ability to reach large masses through social media independent of space and time also affects learning-teaching environments (Sarsar et al., 2015, p.19). The many free, easy-to-use features offered by Facebook, such as membership, texting, adding text, picture or video content, following activities, group membership, opening a business account, and selling and buying in its marketplace environment, are what makes the platform so appealing to such a wide audience. With these features in place, learning environments too can benefit from the use of Facebook.

Hew (2011) in his study observed that students use Facebook to maintain their current relationships, meet new people, hang out in virtual reality, present themselves, and learn (p.664). Besides, students also use Facebook because it is a popular, cool trend, entertaining, and easy to use. Being one of the most visited social networks and possessing key technological advantages, Facebook can provide many pedagogical benefits to both teachers and students (Munoz & Towner, 2009, p. 5), and it can serve as an alternative to face-to-face learning environments for both students and teachers. In a Facebook environment, teachers can interact with their students in terms of assisting them with homework, alerting them to upcoming activities, and providing useful links and out-of-classroom study opportunities. Students, on the other hand, can interact with other students in terms of studying for exams, participating in group projects and engaging in cooperation with one another (İşman & Albayrak, 2014, p.136; İşman & Hamutoğlu, 2013, p. 66). Madge et al. (2009) stated in their study that in addition to using Facebook for social interaction with the environment, students use it to share academic-related information, such as collaborative work for group projects, activities, and announcements (p.152). Furthermore, students indirectly create a learning community by interacting with other students.

Milosevic et al. (2015) reported that university students had positive views on the educational use of Facebook, stating that they found Facebook to be useful for issues like communication with other students and teachers, announcements, exams, and being informed about activities (p.584). Gikas and Grant (2013) observed that Facebook allowed students to interact more with the course content, and the students in their research added that they were already very familiar with some of the applications used for academic-related matters, like texting, as they actively used them in their daily lives (p.19). In addition to studies highlighting the positive aspects of using Facebook in education, there are also those that draw attention to its negative aspects, which includes inordinate amounts of time spent on social networks and a decrease in the academic performance of students, both of which have been shown by the literature to have a negative effect on the learning processes (Paul et al., 2012, p.2122; Kirschner & Karpinski, 2010, p. 1243).

Teachers can limit access to course-related pages to only course participants by creating a closed group on Facebook. Moreover, video, audio, picture, or text content related to the course can be shared, which boosts students' interaction both with other students and with the teacher and course material. The platform also provides rapid access to announcements and solutions to problems (İşman & Albayrak, 2014, p. 36).

Busuyi (2020) investigated the effects of social media use on the academic performance of university undergraduate education students and observed that there were both positive and negative effects. In the study 80% and more of the participants stated that social media reduces commitment to academic activities as a negative effect; they stated that social media have positive effects such as allowing students to express their opinions on social issues, carrying academic issues beyond the classroom environment, rapid dissemination of information, creating a collaborative working environment, sharing learning materials easily, and increasing interaction with groups.

3. Methodology

A questionnaire was used in this study. Research participants were high school students, preservice physics teachers (physics teacher candidates) and in-service physics teachers. In the research, the effect of gender and education level on participants' adaptation of Facebook, their intended use of Facebook and educational use of Facebook; and the effects of these variables on the use of Facebook in physics lessons were investigated.

3.1. Universe and sample

The universe of the study consists of high school students taking physics course, preservice physics teachers and physics teachers. Sampling was carried out with the convenient sampling method (Büyüköztürk et al., 2008, p. 90), which was chosen by the researcher, which was easily accessible, suitable and volunteered participants. The sample consists of a total of 395 participants, including 327 high school students studying in different classes at high school level, 40 preservice physics teachers and 28 physics teachers within the provincial borders of Ankara in Turkey.

3.2. Data collection tools

The Adaptation of Facebook Scale (AFS), Intended Use of Facebook Scale (IUFS), and Educational Use of Facebook Scale (EUFS), all developed by Mazman (2009, p. 90), were used to collect the data for the study. Reliability and validity studies of the scales used were performed by the researcher of the present study. Information related to these scales is presented in Table 1.

Table 1. Information on the Scales Used in Data Collection

Scale	Reliability (Cronbach's alpha)	Factor/Item number	Likert-type
AFS	0.91	5/22	Ten-point
IUFS	0.88	3/11	Five-point
EUFS	0.93	3/11	Ten-point

In addition to these scales, there was one item on the educational use of Facebook in physics course (EUFPC). The participants were asked to respond to the following item on a scale from 1 to 10:

'Please state the degree to which you agree or not to the appropriateness of the educational use of Facebook in a physics course.'

3.3. Data collection

The data collection tools (i.e. the three aforementioned scales and the one item added by the present research authors) were administered to the participants in printed form, and the data collection was completed in a single session. The data were collected from 467 high school students, preservice physics teachers, and physics teachers from Ankara, Turkey. In the general examination of the data forms, 72 of the forms were found to be incomplete or deviated from the groups assigned and therefore were excluded. Therefore, the data from 395 participants were included for the data analysis.

3.4. Data analysis

IBM SPSS 21 software was used to analyze the data. The scores obtained on the AFS, IUFS, and EUFS were first analyzed according to gender and educational level. The gender variable had two categories, female and male, and the educational level had three, high school students, preservice physics teachers, and physics teachers. In the comparison of the AFS, IUFS, and EUFS mean scores, the score levels (low, medium, and high) were determined and are presented in Table 2 below. The AFS, IUFS, and EUFS scores were compared according to the mean score levels and to results from the multivariate analysis of variance (MANOVA). The relationship between the EUFPC score and gender, educational level, and scores on the AFS, IUFS, and EUFS was investigated using multiple regression analysis.

Table 2. AFS, IUFS, and EUFS Score Levels

Dependent Variable	Score		Level		
	Minimum	Maximum	Low	Medium	High
AFS	22	220	22-88	89-154	155-220
IUFS	11	55	11-25.67	25.68-40.35	40.36-55
EUFS	11	110	11-44	44-77	77-110

3.5. Testing MANOVA assumptions

A dataset must satisfy the following assumptions for MANOVA to be applied: sufficiently large sample size, normal distribution for both univariate and multivariate data, a reasonable linear relationship between dependent variables, and no significant difference between the covariance, homogeneity of error variances, and independent data.

The sample size is considered sufficiently large if each category contains at least 20 participants (Tabachnick & Fidell, 2013, p.253). For the gender variable, one of the independent variables of the study, 214 of the participants were female and 180 were male. The distribution of the participants according to educational level was as follows: 327 participants in the high school student category, 40 participants in the preservice physics teacher category, and 28 participants in the physics teacher category, all figures indicating that the sample size was large enough.

Mahalanobis distance was used to determine multivariate normal distance. The critical value for the Mahalanobis distance for three dependent variables is 16.27 (Balcı & Ahi, 2015, p.318). A Mahalanobis distance value above this critical value indicates the absence of multivariate normal distribution. For the three dependent variables used in this study (AFS, IUFS, and EUFS), the Mahalanobis distance was found to be 9.45 at maximum, which is indeed below the critical value.

Multiple correlations were determined with the simple linear correlation coefficient. A correlation coefficient that is between the dependent variables at the $p<0.05$ significance level and below 0.9 indicates no multiple correlations. The correlation coefficients were found to be $r_{AFS-IUFS}=0.69$ ($p<0.05$), $r_{AFS-EUFS}=0.60$ ($p<0.05$), and $r_{IUFS-EUFS}=0.63$ ($p<0.05$), which indicate there was no multiple correlation ($p<0.05$). Multivariate normal distribution was present.

The assumption related to the homogeneity of between-group variance-covariance matrices was examined with the Box test. A significance level of $p>0.001$ means that the assumption is not violated. The Box test variance-covariance matrices were homogenous ($p=0.08$).

The homogeneity of error variances regarding the dependent variables was determined with the Levene test, where a significance level of $p>0.05$ means the equality of variances. If the variances are not equalized, the significance of the variable is tested with a more conservative alpha level, which is 0.025 or 0.01, and the analysis should be made considering this significance level in the F test (Balcı&Ahi, 2015, p.324). The Levene test results showed that $p=0.42$ for AFS and that $p=0.05$ for IUFS; therefore, the equality of the variances was met ($p<0.05$). The significance level found for EUFS was $p=0.01$, which indicates that the equality of the variances was not met ($p<0.05$). Since the equality of the variances was not met for EUFS, the significance of the variable was tested with the univariate F test at the $p<0.01$ level.

In MANAVO, if the dependent variable has three or more categories, ANOVA should be performed on the variable found to be significant for testing between-group significance (Balcı & Ahi, 2015, p.326). To compare the groups with significant difference, a multiple comparison Post Hoc tests was used if the group variances are the same. In cases where the parametric variances are not met, the Kruskal-Wallis test was used to determine the significance of the between-group differences.

3.6. Testing the assumptions of multiple linear regression

For multiple linear regression analysis, the following points should be met: the normality of the variables, the linear relationship between the independent variables and the dependent variable, a high-level relationship between the dependent variables, and the normality of the difference between the predicted and observed values (Can, 2017, p.275).

The normal distribution of the variables was investigated considering the central tendency measures and skewness and kurtosis coefficients. The skewness coefficient was found to be between -1.12 and -0.01 and the kurtosis coefficient between -

0.38 and 0.54, which indicates that the data was normally distributed. Outliers of the dataset were determined with the Mahalanobis distance. There were five dependent variables in this study, namely, educational level, gender, AFS, IUFS, and EUFS, and the chi-square distribution of the outlier criterion was found to be 15.08 at the p=0.01 significance level (Can, 2017, p.283). Mahalanobis distance values observed to be greater than this were excluded from the analysis.

The relationships between the independent variables were investigated by calculating the multiple correlation Pearson coefficient for each group. All the pairwise comparisons were found to be between 0.08 and 0.47, which indicates no multicollinearity between the variables.

In the multiple linear regression analysis, a representative variable transformation should be made to determine the correlation between a dependent variable with more than two categories and the dependent variable. A variable with more than two categories should be transformed into a variable with two categories. This process is referred to as Dummy Variable Transformation (Can, 2017, p.277).

Gender, which was one of the independent variables, consists of two categories, male and female. A variable with two categories can be considered as a variable with a single category by coding it with 0 and 1. In the study, the male participants were coded with 1 and the female participants were coded with 0. If the data belonged to a male participant, it was expressed with the Gender_M variable.

The educational level variable consists of three categories, namely, high school students, preservice teachers, and physics teachers. Therefore, the dummy variable transformation was performed. For variables with three categories, two artificial variables were created. First, one of the categories was chosen as reference, and 0 was assigned to the reference category. Therefore, the other two categories were defined as artificial variables. The value of the first artificial variable, which is either 1 or 0, indicates its existence and the value of the second artificial variable, which is either 1 or 0, indicates its existence. The dummy variable transformation for the educational level variable is presented in Table 3 below.

Table 3. Dummy variable transformation of the educational level variable

Categories of the Educational Level	Artificial Variable-1(AV-1)	Artificial Variable-2(AV-2)
High school	0	0
Preservice teacher	1	0
Teacher	0	1

As shown in Table 3, the categories AV-1=0 and AV-2=0 represent high school students, the categories AV-1=1 and AV-2=0 represent preservice teacher, and the categories AV-1=0 and AV-2=1 represent teachers.

3.5. Results and analysis

The results are presented under two main headings: the comparison of the AFS, IUFS, and EUFS scores according to the independent variables of gender and educational level, and the effect of EUFPC scores on the AFS, IUFS, and EUFS in terms of the variables of gender and educational level.

AFS, IUFS, and EUFS scores

Comparison of the Group Means: Gender

Descriptive statistics and distributions regarding the AFS, IUFS, and EUFS scores according to the gender variable are presented in Table 4, along with the level of the scale scores. Determination of whether there was a difference in all or some of the independent variables was performed by considering the criterion of p=0.017. The p-value here of 0.017 was obtained by dividing 0.05 by the number of dependent variables (Balcı & Ahi, 2015, p.325).

Table 4. AFS, IUFS, and EUFS According to the Gender Variable

Dependent Variable	Group	N	Mean Rank	Level	S	sd	F	p
AFS	Female	180	124.22	Medium	42.60	1-393	0.39	0.53
	Male	214	128.83	Medium	38.13			
IUFS	Female	180	30.52	Medium	9.75	1-393	0.87	0.35
	Male	213	29.04	Medium	7.93			
EUFS	Female	180	60.46	Medium	28.96	1-393	0.81	0.36
	Male	214	56.10	Medium	24.54			

No significant difference was found between the female and male participants in all scale scores measured according to gender [AFS (1, 393)=0.39 and p>0.017; IUFS (1, 393)=0.87 and p>0.017; EUFS(1, 393)=0.81 and p>0.017]. Both the female and male participants had medium-level scores on the AFS, IUFS, and EUFS (Table 4).

Comparison of the Group Means: Educational Level

Descriptive statistics and distributions regarding the AFS, IUFS, and EUFS scores according to the educational level variable are presented in Table 5. The level of the scale scores was determined considering Table 2.

Table 5. AFS, IUFS, and EUFS according to the educational level variable

Dependent Variable	Group	N	Mean Rank	Level	S	sd	F	p
AFS	High school	327	110.22	Medium	40.81	2-392	11177	0.00
	Preservice teacher	40	128.52	Medium	33.45			
	Teacher	28	144.25	Medium	27.71			
IUFS	High school	327	26.37	Medium	8.72	2-392	10797	0.00
	Preservice teacher	40	30.80	Medium	7.19			
	Teacher	28	34.78	Medium	7.86			
EUFS	High school	326	46.58	Medium	26.42	2-392	12296	0.00
	Preservice teacher	40	60.20	Medium	21.84			

	Teacher	28	73.92	Medium	20.26

A significant difference was found in all scale scores according to educational level [AFS (2,392)=11177 and p<0.017; IUFS(2, 392)=10797 and p<0.017; EUFS(2, 392)=12296 and p<0.017]. All groups had medium-level scores on the AFS, IUFS, and EUFS according to educational level (Table 5).

The multiple comparison test results revealed significant differences according to educational level (p<0.017), as shown in Table 5. The significance of the between-group differences was examined with the ANOVA

The equality of the group variances according to the educational level was determined with the Levene test.

Table 6. Homogeneity of variances test

Independent Variable	Levene statistics	df1	df2	p
AFS	1.96	2	392	0.14
IUFS	1.81	2	392	0.16
EUFS	4.58	2	391	0.01

As shown in Table 6, AFS (p=0.14) and IUFS (p=0.16) variances were distributed homogeneously (p>0.05), but the variances for EUFS (p=0.01) were not distributed homogeneously (p<0.05). One-way ANOVA test results were interpreted when the variance distribution of the groups was homogenous, and the Kruskal-Wallis test was interpreted when the distribution was not homogenous.

The variances were homogenous for AFS and IUFS, and the significance of the difference between the groups was examined with the ANOVA test.

Table 7. ANOVA Test

Source of Variance		Sum of Squares	df	Mean of Squares	F	p
AFS	Between-group	38622.24	2	19311.12	12463	0.00
	In-group	607376.47	392	1549.43		
IUFS	Between-group	2336.56	2	1168.28	16071	0.00
	In-group	28497.34	392	72.69		

The between-group difference for the AFS and IUFS scores was found to be significant since p<0.05. Determination of which groups had the difference was further investigated using the Scheffe test, which is a post hoc test, and the results are presented in Table 8 and Table 9.

AFS

Determination of which groups had differences in the AFS scores was performed with the Scheffe test, and the results are presented in Table 8.

Table 8. Groups with a Significant Difference According to AFS

Source of Variance	Sum of Squares	Sd	Mean of Squares	F	p	Significant Difference
Between-group	38622.24	2	19311.12	12463	0.00	High school-Preservice teacher
In-group	607376.47	392	1549.43			High school-Teacher

The AFS scores were at the medium-level according to educational level (Table 5). The AFS scores were found to be significant both between the high school students and the preservice teachers, and between the high school students and the teachers ($p<0.05$), as shown in Table 8. Considering the group means according to educational level, the high school students (110.22) had lower AFS scores, compared to both the preservice teachers (128.52) and the teachers (144.25) (Table 5). The scores of the high school students were lower than those of both the preservice teachers and the teachers.

IUFS

Determination of which groups had differences in the IUFS scores were made with the Scheffe test, and the results are presented in Table 9.

Table 9. Groups with a significant difference according to IUFS

Source of Variance	Sum of Squares	Sd	Mean of Squares	F	p	Significant Difference
Between-group	2336.56	2	1168.28	16071	0.00	High school-Preservice teacher
In-group	28497.34	392	72.69			High school-Teacher

The IUFS scores were at the medium-level according to the educational level (Table 5). As shown in Table 9, the high school students, compared to both the preservice teachers and the teachers, showed a significant difference ($p<0.05$). The high school students' IUFS scores (26.37) were lower than those of both the preservice teachers (30.80) and the teachers (34.78).

EUFS

There was no significant homogenous distribution in the variances for EUFS (Table 6, $p<0.05$). The relationship between the group means was investigated with the Kruskal-Wallis test, a non-parametric test. The Kruskal-Wallis test results are given in Table 10.

Table 10. Kruskal-Wallis Test

Educational Level	N	Mean Rank	sd	χ^2	p
High school	326	183.30	2	33.01	0.00
Preservice teachers	40	243.70			
Teacher	28	296.86			

A significant difference was found between the groups' mean scores on the EUFS, as shown in Table 10 ($p<0.05$). The mean scores of the groups found to have a significant difference according to the Kruskal-Wallis test ($p<0.05$) were compared using the Mann-Whitney U test, and the results are presented in Table 11.

Table 11. Mann-Whitney U Test results

Group Comparison	Group	N	Mean rank	Rank sum	U	p
High school-Preservice teachers	High school	326	177.27	57789.50	4488.50	0.00
	Preservice teachers	40	234.29	9371.50		
High school-Teacher	High school	326	177.27	169.53	1965.50	0.00
	Teacher	28	234.29	270.30		
Preservice teachers	Preservice teachers	40	29.91	1196.50	376.50	0.02
	Teacher	28	41.05	1149.50		

A significant difference was found between high schools and preservice teachers (U=4488.50, $p<0.05$) and between high school students and teachers (U=1965.50, $p<0.05$), as shown in Table 11. The high school students' EUFS scores were lower than those of both the preservice teachers and the teachers. A difference was also found between the preservice teachers and the teachers (U=376.50, $p<0.05$), that is, the preservice teachers' EUFS scores were lower than those of the teachers.

Multivariate Wilks' Lambda and Pillai's Trace tests were used to compare the group means, and the effect size was interpreted according to the eta square value. The groups were evaluated according to Wilks' Lambda, if they have a similar observation and according to Pillai's Trace, if they were not. The gender variable was examined with the Wilks' Lambda test and the educational level variable, with the Pillai's Trace test, and the effect size values were determined. Effect sizes between 0–1 are categorized as 0.01 low, 0.06 medium, and 0.14 high (Büyüköztürk, 2005, p.48).

Table 12. Multivariate tests

Effect		Value	F	Hypothesis df	Error df	p	Partial eta squared
Gender	Wilks' Lambda	0.988	1.49^{b}	3.00	385	0.21	0.01
Educational level	Pillai's Trace	0.07	5.05	6.00	772	0.00	0.03

There was no significant difference in effect size according to gender ($p>0.05$), while a statistically significant difference was however found in the between-group effect size according to educational level (e=0.03, $p<0.05$). The group means had a low effect size when compared based on educational level.

Multiple linear regression

In the study, the relationship between the participants' EUFPC scores and their educational level, gender, and AFS, IUFS, and EUFS scores was determined with multiple linear regression analysis. In the multiple linear regression analysis, the enter method, where all variables are included in the model at the same time, was applied. The results are presented in Table 13.

Table 13. Multiple regression results

Variable	B	Standard Error	B-beta	t	p	Pairwise r	Partial r

Constant	0.54	0.52	-	1.02	0.30	-	-
Gender_M	0.84	0.32	0.13	2.60	0.00	0.13	0.86
AV-1	0.57	0.52	0.05	1.10	0.27	0.05	0.89
AV-2	1.66	0.80	0.10	2.07	0.03	0.11	0.86
AFS	-0.00	0.00	-0.08	-1.24	0.21	0-.06	0.47
IUFS	0.05	0.02	0.15	2.19	0.02	0.11	0.43
EUFS	0.04	0.00	0.38	5.99	0.00	0.30	0.51

$R=0.50$; $R^2= 0.25$

$F_{(4-351)}= 20.02$ $p=0.00$

When all of the independent variables (gender, educational level, AFS, IUFS, and EUFS) were addressed together, their relationship with the dependent variable (EUFPC) was shown to have a simple correlation coefficient of R=0.50, and all the independent variables explained 25% of the variance in the dependent variable (Table 13).

According to the standardized regression coefficients, the independent variables significantly explained the EUFPC in the following order, from most effective to least: AV-2; that is, being a teacher AV-2=1.66(p<005), Gender_M; that is, being a male Gender_M=0.84 (p<0.05), the IUFS score IUFS=0.05(p<0.05), and the EUFS score EUFS =0.047(p<0.00).

The mathematical equation used to determine the EUFPC was formulated as follows:

EUFPC=0.54+(0.84*Gender_M)+(1.66*AV-2)+(0.05*IUFS)+(0.04*EUFS)

These results showed that the use of Facebook in a physics course was not affected by the AFS score, but was most affected by educational level, followed by the IUFS and EUFS scores in decreasing order.

3.6. Discussion

Facebook, being one of the most visited websites throughout the world, has been widely studied by educational researchers. This study investigated the perceptions that high school students, preservice teachers, and teachers have on the adaptation of Facebook as a social network (AFS), the intended use of Facebook (IUFS), and the educational use of Facebook (EUFS) according to the participants' gender and their educational level. The variables affecting the perceptions about the educational use of Facebook in a physics course were also determined as part of the study.

The AFS scores were at the medium-level for gender and educational level. A significant relationship was observed between perceptions and educational level but not for gender. In terms of educational level, the high school students, compared to both preservice teachers and teachers, had more negative views. The study results revealed that as the educational level increased, there were more positive views on the adaptation of Facebook.

Considering the intended use of Facebook, the IUFS scores were found to be at the medium level according to both gender and educational level. There was a significant difference in the IUFS scores according to educational level but not according to gender. The high school students, compared to both preservice teacher and teachers, had more negative views according to their IUFS scores, which, as in the case of the adaptation of Facebook, shows that Facebook is used more effectively as the educational level increases. Sezgin et al. (2011) found that in terms of the students' use of Facebook, its value in establishing and maintaining social relations and daily intended use was considered its most effective feature, while its value in doing course work and supporting their studies was considered its least effective feature (p.1383).

Views on the educational use of Facebook were investigated with EUFS. The EUFS scores were at the medium-level according to gender and educational level. A statistically significant difference was found between the groups in terms of educational level, but not in terms of gender. These scores were observed to increase in line with the increase in educational level, that is from students to preservice teachers, and to teachers, meaning the teachers had the most positive views on the educational use of Facebook. There are also studies in the literature that do not coincide with the findings of this study. For example, Roblyer et al. (2010) in their study observed that students, compared to lecturers, had more positive views on the educational use of Facebook. Soomro et al. (2014) found that preservice teachers, compared to teachers, had more positive views on the use of Facebook as a tool for cooperative learning. As social media continues to change and develop, it can be expected that different degrees of resistance shown by all participants to the educational use of Facebook will decrease (Chromey et al., 2016). In a study by Özgür (2013), preservice teachers stated that they use Facebook with an educational aim and have desire to use it. The opportunities offered by social networks, like cooperation, communication, and the sharing of sources and other material, affect learning positively. Liu (2010) offered two suggestions for the use of social media in education. The first of these is to use social media tools in the transfer of the curriculum. Course management systems usually provide this. The second is to use social media as a parallel learning environment. Real-life experiences and examples can be shared via social media, and the learning environment can be associated with the real world. The fact that Facebook is widely used, easily accessible and dynamic, and that users can interact before and after the course period, will ensure the continuity and permanence of learning. Facebook's ubiquity and collaborative ability will enable it to be used for educational purposes and positively impact learning. Teachers and content developers can increase the use of social media in education by developing course content and material compatible with social media (Karjo, 2020). Hussain et al. (2018) stated that social media contributes to learning by reinforcing university students' skills such as critical thinking and problem-solving approach (Hussain et al, 2018).

Keleş and Demirel (2011) in their study shared homework and course materials in a closed Facebook group within the scope of a course Computer-aided Physics Course (p. 6). They found that students helped one another and collaborated, and further reported that the student-student interaction and student-lecturer interaction were more intense compared to the intensity of the face-to-face learning environment. Teaching the Computer-aided Physics Course via Facebook made the course more attractive for students, that is, the visual presentation of course content and the use of videos increased students' interest in the course.

There was a relationship between the perceptions of the educational use of Facebook in a physics course according to gender and educational level and the IUFS and EUFS scores as reflections of the participants' views on the intended use of Facebook and its educational use. More specifically, male teachers had significantly more positive views on the educational use of Facebook in a physics course when their views on the intended use of Facebook and its educational use were taken into consideration. The interaction, cooperation, and sharing of resources facilitated by Facebook affect its educational use and enhance learning (Ekici & Kıyıcı, 2012, p.163; Sanchez et al., 2014, p.145). Thus, the educational use of Facebook in a physics course contributes to students gaining a better understanding of physics topics and boosts the student-teacher-content interaction through multimedia content like visuals (i.e. images or graphs and videos featuring natural events and experiments) (Bakri, Hanif & Rustana, 2020). Social media applications enable users to share content in line with their interests, to exchange information by joining communities, and to customize the learning environment (Öztürk &Talas, 2015). With its many education-friendly functions, which include its capacity to provide enriched content to preservice teachers and teachers, to organize groups according to learning and interest differences, and to facilitate opportunities for substantial interaction, the use of Facebook, whether in physics education or other courses, can contribute to all stakeholders.

4. Conclusion and Recommendations

Facebook, a social media platform created from Web 2.0 technology that allows users to interact with the content, is one of the most used applications worldwide. With the increased expansiveness of its use areas, a growing number of researchers are conducting studies on the use of Facebook in their respective fields. In the present study, the views of the students, preservice physics teachers, and physics teachers on the adaptation of Facebook, the intended use of Facebook, and its educational use were at the medium-level. The educational use of Facebook in a physics course was observed to be affected by gender, educational level, and individual views on the intended use of Facebook and its educational use. The teachers in this study had the highest appreciation for the value of Facebook in physics education, as shown by their responses to the single item used to assess the participants' views on the educational use of Facebook in a physics course. This study can contribute to researchers by serving as a preliminary study for the conduct of future studies.

Studies on the preparation and use of scientific content compatible with academic learning on social media platforms will contribute to future learning methods and policies.

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