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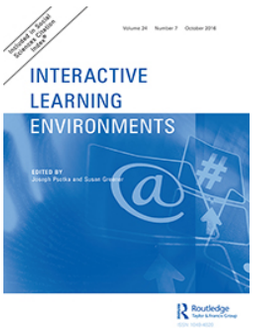

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Interactive whiteboards: do teachers really use them interactively?

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The aim of this quantitative study is to examine high school teachers' use of specific features of interactive whiteboards (IWBs). During the 2012–2013 academic school year, 535 teachers in pilot schools from 10 provinces under the FATIH Project (Movement of Enhancing Opportunities and Improving Technology) participated. Data were collected through a three-factor usage level scale developed by the researchers and analyzed through descriptive statistics and non-parametric tests. No significant difference was found between the use of the interactive features of an IWB and sex, education level, or subject area. However, a significant difference was found between the use of interactive features and professional experience, city, computer ownership, in-field IWB training, previous IWB experience, usage duration, frequency of use, and the case of suggesting the use of IWBs to other teachers.

Keywords: interactive whiteboards; classroom technology; interactivity; FATIH Project

Introduction

Interactive whiteboards (IWBs) are one of the most important technologies used in contemporary education and training environments. In addition to being usable as blackboards, anything done on a computer can also be done on an IWB's touchable screen (Ashfield & Wood, 2008). As Türel (2011) has described, IWBs feature technology that works with a computer and projector, allowing content to be used interactively. For the effective use of any technological tool, a teacher must know how to implement it correctly and efficiently in the classroom. Therefore, it is important to examine teachers' use of the interactive features of IWBs. Current studies have investigated teachers' attitudes and perceptions toward IWBs (Glover, Miller, Averis, & Door, 2007), their effectiveness in classrooms (Slay, Siebörger, & Hodgkinson-Williams, 2008), and how teachers use and address problems with IWBs in practice (Wall, Higgins, & Smith, 2005). Türel (2012) has stated that not only teachers but also students and even parents have positive attitudes regarding this technology. Moreover, he adds that this attitude is because IWBs offer positive contributions to training when their features are used correctly. The current study will examine at what level teachers use interactive features of IWBs in their lessons. The results will guide which features should be enhanced or modified.

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Use of IWBs as tools in education

The use of IWBs in education dates back to 1990 (Beeland, 2002), and the first examples resembled standard whiteboards. Thanks to their easy-to-use touchscreens, IWBs have now become common for instructional purposes (Adıgüzel, Gürbulak, & Sarıçayır, 2011). Many countries around the world have recognized IWBs' contributions to education and have been developing plans to equip classrooms with them (Lee, 2010; Smith, Higgins, Wall, & Miller, 2005). Specifically, in 2010, Turkey embarked on a project to update all government schools with this modern technology (Milli Eğitim Bakanlığı [Ministry of National Education], 2011).

IWBs offer faster and more fluent presentations than overhead projectors, providing teachers opportunities to observe students better in terms of pedagogical interaction (Gillen, Kleine, Littleton, Mercer, & Twiner, 2007). IWBs can play an active role in increasing interaction and participation, making learning enjoyable and enriching the environment (Cogill, 2001). This technology also makes classroom management easier since it allows teachers to make more frequent eye contact with students (Beauchamp, 2004). According to British Educational Communications and Technology Agency (BECTA, 2003), other advantages of IWBs include providing creative and attractive training equipment and increasing student motivation. IWBs help teachers to generate rich content and vivid, visually interactive lessons (Gillen et al., 2007). Türel and Demirel (2010) concluded similarly about the advantages of IWBs, calling attention to how teacher and student comments can be added during presentations, further increasing social interaction and learning.

Literature review

In their study, Pamuk, Çakır, Ergun, Yılmaz, and Ayas (2013) indicated that teachers and students show positive attitudes toward IWBs. Furthermore, they stressed that course contents are insufficient on their own and teachers need to be supported in the pedagogical and professional aspects of technology use. Kennewell and Morgan (2003) stated that the use of IWBs in education and training will become more common once teachers and students understand the technology. In his study with 140 teachers, Türel (2012) underlined some problems that must be resolved, especially issues stemming from a lack of technical infrastructure, technical and pedagogical information, and appropriate materials.

In their study with 54 Romanian teachers, Paragină, Paragină, and Jipa (2010) claimed that using IWBs in lessons is useful on account of visual learning and practice, leading to enhanced computer skills. In his study, Beeland (2002) found that IWBs helped teachers increase student interest, attention, and success. Gillen, Staarman, Littleton, Mercer, and Twiner (2006) agreed that IWBs increase students' participation, make lessons more captivating, simplify presenting instructional texts, and provide a balance between a lesson plan and lesson flow. In a study with 275 students and 15 teachers, Geer and Barnes (2007) claimed that using IWBs leads to complete learning, providing a student-centered approach. Smith et al. (2005) concluded that IWBs had positive effects on learning, increasing classroom interaction and participation, and providing positive contributions to versatility and motivation.

Erduran and Tataroğlu (2009) found that, according to the teachers in their study, IWBs had positive effects on students. Similarly, in his study with 458 students and 82 teachers, Elaziz (2008) found that both groups had positive attitudes toward IWBs in English as a foreign language classrooms. Additionally, in their study with 174 teachers, Türel and Johnson (2012) found that using IWBs frequently increased the proficiency of teachers in their fields, created cooperation among teachers, and improved functionality of the

overall educational process. According to Wood and Ashfield (2008), using IWBs prevents loss of time during learning and training. Glover, Miller, and Averis (2003) concluded that IWBs ensured a smooth transition to interactivity, and teachers were ready to volunteer to use them in their lessons. Smith (2000) indicated in another study that teachers' first impressions about IWBs were positive, that using them in lessons was helpful, and that they increased interaction in the classroom. Beauchamp (2004) suggested that before using IWBs, training should be offered and teachers should be given opportunities to practice using them actively. In their study with 30 social science teachers, Bulut and Koçoğlu (2012) warned that a majority of teachers lack the necessary information and skills to use IWBs effectively without additional training.

Significance of the study

Although many studies have been carried out recently (Ashfield & Wood, 2008; BECTA, 2003; Beeland, 2002; Bell, 1998; Ekici, 2008; Elaziz, 2008; Erduran & Tataroğlu, 2009; Gillen, Littleton, Twiner, Staarman, & Mercer, 2008; Higgins, Beauchamp, & Miller, 2007; Jang & Tsai, 2012; Lewin, Somekh, & Steadman, 2008; Schmid, 2008; Slay et al., 2008; Smith et al., 2005; Tatli & Kıilic 2013; Türel, 2011, 2012; Wall et al., 2005), few have examined how often the interactive features of IWBs are used by teachers. The aim of this study is to identify how teachers use those interactive features at schools under the FATIH Project. Two research questions will be investigated:

- What is the level of teachers' use of IWB interactive features, both overall and in terms of three sub-factors: applied audio-visual interactivity, interactivity as sharing, and interactivity as ability?
- Do use levels of IWB interactive features, including applied audio-visual interactivity, interactivity as sharing, or interactivity as ability, show significant differences according to demographic variables?

Method

Research design

Quantitative research was used for the current study.

Participants

The sample consisted of 535 teachers at high schools in 10 provinces under the FATIH Project during the 2012–2013 academic year.

Data collection

A scale developed by the researcher was used as the data collection instrument regarding usage of IWB interactive features. The instrument consisted of two parts: demographic information and interactive features usage. Demographic questions consisted of 16 items about sex, professional experience, educational level, subject area, computer ownership, Internet experience, computer experience, and IWB training. The second part included 15 items about IWB interactive features.

Data analysis

Descriptive statistics and non-parametric tests were used to analyze the data. The literature was reviewed by the researcher, and interviews were conducted with experts. For the interactive feature scale, a pool of 30 questions was rearranged and reassessed until a final 18-item scale was developed. This scale was applied to the sample, and obtained data were analyzed using a statistical analysis packet program. Since the factor load value was not ideal, three items were omitted; statistical methods were used to analyze the quantitative data of the remaining 15 items. Within the scope of validity studies, the opinions of experts were applied. Cronbach's alpha was calculated for the reliability of all items on the scale.

Findings and comments

The reliability and validity analysis of the scale, the frequency and percentage distribution of the demographic variables, and the total item scores for use levels of IWB interactive features were studied. Additionally, relationships were investigated between demographic variables and both overall usage of interactive features and the three sub-factors: applied audio-visual interactivity (F1), interactivity as sharing (F2), and interactivity as ability (F3).

Findings of reliability and validity analysis

After the 18-item scale was applied to the sample, item analysis was conducted. Since items 5, 6, and 15 were smaller than 0.45, the lower bond of the factor load value, they were removed from the scale. Factorial analysis and the varimax rotation technique were applied to the items, and the scale was gathered under three factors. Appropriateness of the sample size was approved by Kaiser–Meyer–Olkinb (KMO) and Barlett's test (KMO = .893; $\chi^2 = 2{,}605{,}324$, $p \cong .000$); a KMO value greater than .60 shows that it is appropriate for factorial analysis. In addition, the Barlett test value was also found to be greater, showing that not only was factorial analysis applicable but the correlation between items was high (Günüç, 2009). Three factors explained the variance of the applied scale at 46.43%: the first factor explained 17.179%; the second factor, 16.674%; and the third factor, 12.576%.

The average value for F1 was 15.189, the average value for F2 was 16.461, and the average value for F3 was 5.549 (see Table 1). Table 1 shows that the total item average for the use level of IWB interactive features was 37.200. The lowest total item score was 15, and the highest was 75.

Item distribution of the scale's three sub-factors is shown clearly in Table 2. The first sub-factor, applied audio-visual interactivity, included m7, m8, m9, m14, and m18. The second sub-factor, interactivity as ability, included m1, m2, m3, m4, m10, m12, and m13. The third factor, interactivity as sharing, included m11, m16, and m1.

As shown in Table 2, Cronbach's alpha (α) was calculated for all sub-factors: the reliability coefficient of the first sub-factor, which consisted of five items, was found to

Table 1. Descriptive statistics of item total scores for the scale.

	Mean	SD	Minimum	Maximum
F1	15.189	4.978	5	25
F2	16.461	6.037	5	35
F3	5.549	2.912	1	15
Total score	37.200	11.593	14	75

Table 2. Information about the structure of the scale.

Sub-factor	Name of sub-factor	Included items	A	Factor load value
1	Applied audio-visual interactivity	7. Using the drag and drop feature of the touchscreen function of IWBs	.826	.665
		8. Showing incomprehensible parts again and again using the recording feature of IWBs		.678
		9. Using audio files and materials on IWBs		.726
		14. Zooming in on the image on the screen using the touchscreen function of IWBs		.622
		18. Working on screenshots taken on IWBs		.503
2	Interactivity as ability	1. Converting handwriting that is written on the board into computer text using the IWB's special pen	.819	.552
		2. Saving writings on IWBs using the recording feature		.600
		3. Using materials prepared on IWBs in other courses		.601
		4. Distributing printed lesson notes to students after a course taught with IWBs		.458
		10. Preparing scrapbooks on IWBs		.523
		12. Making alterations on maps, schema, or photos prepared for different aims using the IWB drawing feature		.493
		13. Underlining important points of content using the spotlight feature of IWBs		.474
3	Interactivity as sharing	11. Sharing prepared scrapbooks with students with the feature of talking on the Internet of IWBs	.814	.741
		16. Sharing classroom activities on the Internet simultaneously		.665
		17. Searching for content that will be presented on the IWBs, providing URLs to software, files, and web pages		.491

be .826; the reliability coefficient of the second sub-factor, which consisted of seven items, was found to be .819; and the reliability coefficient of the third sub-factor, which consisted of three items, was found to be .814. For the first factor, the index of discrimination was between.503 and .726; for the second sub-factor, between.458 and .601; and for the third factor, between .491 and .741. Cronbach's alpha (α) of the whole scale was calculated to be .880.

Descriptive statistics of demographic variables

In this study, the relationship between teachers' use of IWB interactive features and demographic variables was examined. Frequency and percentage distributions are given in this section.

As shown in Table 3, data were collected from teachers in 10 representative cities in the east and southeast Anatolian regions of Turkey: 56 teachers (10.5%) were from Van, 80 (15%) from Diyarbakır, 88 (16.4%) from Erzurum, 32 (6.0%) from Bitlis, 46 (8.6%)

Table 3. Frequency and percentage distributions related to demographic variables.

Variables		*n*	%
Gender	Female	229	42.8
	Male	302	56.9
	Total	531	99.3
Cities	Van	56	10.5
	Diyarbakır	80	15
	Erzurum	88	6.4
	Bitlis	32	6.0
	Hakkâri	46	8.6
	Agrı	39	7.3
	Sırnak	32	6.0
	S. Urfa	40	7.5
	Mus	61	11.4
	Batman	59	11.0
	Total	533	99.6
Education level	Bachelor's degree	414	77.4
	Master's degree and above	119	22.2
	Total	533	99.6
Subject area	Math/science	216	40.4
	Social sciences	197	36.8
	Language	82	15.3
	Others	34	6.4
	Total	529	98.9
Trained in the use of IWBs	Yes	301	56.3
	No	229	42.8
	Total	530	99.1
Years of professional experience	0–5	209	39.1
	6–10	108	20.2
	11–15	106	19.8
	16–20	73	13.6
	21 and above	33	6.2
	Total	529	98.9
Computer experience	Inexperienced	35	6.5
	Mid-level	306	57.2
	Advanced	155	29.0
	Expert	36	6.5
	Total	529	98.9
Computer ownership	Yes	466	87.1
	No	64	12.0
	Total	530	99.1
Internet experience	Inexperienced	34	6.4
	Mid-level	303	56.6
	Advanced	166	31.0
	Expert	28	5.2
	Total	531	99.3
In-field IWB training	Yes	120	22.4
	No	413	77.2
	Total	533	99.6

(*Continued*)

Table 3. Continued.

Variables		*n*	%
Use of IWBs in previous years	Yes	95	17.8
	No	438	81.8
	Total	533	99.6
Duration of IWB use	Less than 1 year	442	82.6
	More than 1 year	89	16.6
	Total	531	99.2
Frequency of IWB use	Every lesson	151	28.2
	Only for special subject	282	52.7
	Once a week	45	8.4
	Once a month	23	4.3
	Never	28	5.2
	Total	529	98.9
Suggesting the use of IWBs to others	Yes	486	90.8
	No	40	7.5
	Total	526	98.3

from Hakkari, 39 (7.3%) from Ağrı, 32 (6.0%) from Şırnak, 40 (7.5%) from Ş. Urfa, 61 (11.4%) from Muş, and 59 (11.0%) from Batman. A total of 302 male (56.9%) and 229 female (42.8%) teachers participated. Table 3 shows the range of teachers' professional experience: 209 (39.1%) had 0–5 years of experience, 108 (20.2%) had 6–10 years, 106 (19.8%) had 11–15 years, 73 (13.6%) had 16–20 years, and 33 (6.2%) had 21 years or more. The number of teachers who had completed IWB training was 301 (56.3%), compared to 229 (42.8%) who had not.

Sub-factors, the use of IWB interactive features, and demographic variables

In this section, the relationships between demographic variables and applied audio-visual interactivity (F1), interactivity as ability (F2), and interactivity as sharing (F3) are investigated, as well as between demographic variables and the overall use of IWB interactive features. Non-parametric tests were applied to investigate these relationships because of sample distribution. The Mann–Whitney U test was conducted on demographic variables with two categories, while Kruskal–Wallis tests were applied to those with three or more.

As shown in Table 4, no significant difference was found between sex and the scores of IWB interactive features use, $p = .099$ ($p > .05$), or applied audio-visual interactivity, $p = .811$ ($p > .05$). On the other hand, a significant difference was found between sex and interactivity as ability, $p = .020$ ($p < .05$), and interactivity as sharing, $p = .043$ ($p < .05$).

Table 4. Scores of sub-factors F2 and F3 in accordance with gender.

	Gender	*N*	Mean rank	Sum of ranks	*U*	Sig.
F2	Male	302	279.47	84,398.50	30,512.50	.020
	Female	229	248.24	56,847.50		
F3	Male	302	277.49	83,801.00	31,110.0	.043
	Female	229	250.85	57,445.00		

Table 5. The effect of professional experience on using interactive features of IWBs.

Professional experience	Years	*n*	Mean rank	SD	χ^2	Sig.
F2	0–5	209	251.85	4	14.281	.006
	6–10	108	270.45			
	11–15	106	241.51			
	16–20	73	297.38			
	21 and above	33	334.29			
F3	0–5	209	264.44	4	12.068	.017
	6–10	108	249.01			
	11–15	106	241.68			
	16–20	73	299.72			
	21 and above	33	318.97			
Total	0–5	209	265.09	4	12.227	.016
	6–10	108	260.37			
	11–15	106	234.28			
	16–20	73	285.47			
	21 and above	33	333.00			

The applied audio-visual interactivity and interactivity as sharing scores of males were higher than those of females. Therefore, the levels of males' use of IWB interactive features related to audio-visual interactivity and interactivity as sharing were also higher.

As shown in Table 5, no significant difference was found between teachers' professional experience and applied audio-visual interactivity, $p = .60$ ($p > .05$). A significant difference was found between teachers' professional experience and interactivity as ability, $p = .006$ ($p < .05$), and between teachers' professional experience and interactivity as sharing, $p = .017$ ($p < .05$). A significant difference was also found between teachers' professional experience and the use of IWB interactive features, $p = .016$ ($p < .05$). Therefore, greater professional experience indicated higher scores for and greater use of IWB interactive features, applied audio-visual interactivity, and interactivity as sharing.

As shown in Table 6, no significant difference was found between teachers' subject areas and interactivity as ability, $p = .137$ ($p > .05$); interactivity as sharing, $p = .545$ ($p > .05$); or the use of IWB interactive features, $p = .982$ ($p > .05$). On the other hand, a significant difference was found between teachers' subjects and applied audio-visual interactivity, $p = .025$ ($p < .05$). Specifically, the item scores for applied audio-visual interactivity of language teachers were higher than those of their peers, indicating that the language teachers used applied audio-visual features more often.

No significant difference was found between computer ownership of teachers and applied audio-visual interactivity, $p = .481$ ($p > .05$); interactivity as ability, $p = .087$ ($p > .05$); interactivity as sharing, $p = .279$ ($p > .05$); or the use of IWB interactive features,

Table 6. Scores of sub-factor F1 in accordance with subject area.

	Subject area	*n*	Mean rank	SD	χ^2	Sig.
F1	Math/science	216	232.66	2	7.403	.025
	Social Sciences	197	250.36			
	Language	82	282.74			
	Others	34	300.99			

Table 7. The effect of city on using IWBs' interactive features.

	Cities	*N*	Mean rank	SD	χ^2	Sig.
F1	Van	56	279.01	9	46.235	.000
	Diyarbakır	80	289.65			
	Erzurum	88	309.09			
	Bitlis	32	249.31			
	Hakkari	46	291.21			
	Agrı	39	256.36			
	Sırnak	32	258.56			
	S. Urfa	40	267.34			
	Mus	61	271.53			
	Batman	59	266.08			
F2	Van	56	246.39	9	53.019	.000
	Diyarbakır	80	337.33			
	Erzurum	88	283.55			
	Bitlis	32	241.84			
	Hakkari	46	313.63			
	Agrı	39	275.85			
	Sırnak	32	267.97			
	S. Urfa	40	277.25			
	Mus	61	228.16			
	Batman	59	229.78			
F3	Van	56	236.88	9	26.336	.000
	Diyarbakır	80	321.06			
	Erzurum	88	272.36			
	Bitlis	32	245.27			
	Hakkari	46	274.53			
	Agrı	39	210.95			
	Sırnak	32	251.53			
	S. Urfa	40	289.38			
	Mus	61	238.47			
	Batman	59	245.80			
Total	Van	56	267.54	9	49.361	.000
	Diyarbakır	80	314.84			
	Erzurum	88	300.74			
	Bitlis	32	238.39			
	Hakkâri	46	305.84			
	Agrı	39	252.36			
	Sırnak	32	258.77			
	S. Urfa	40	277.25			
	Mus	61	241.48			
	Batman	59	229.78			

$p = .550$ ($p > .05$). In other words, whether a teacher had a computer or not had no effect on the use of IWB interactive features.

As shown in Table 7, a significant difference was found between cities and applied audio-visual interactivity, $p = .000$ ($p < .05$); interactivity as ability, $p = .000$ ($p < .05$); interactivity as sharing, $p = .000$ ($p < .05$); and the use of IWB interactive features, $p = .000$ ($p < .05$). Erzurum had the highest score (309.09) and Bitlis had the lowest total score (249.31) for applied audio-visual interactivity. Diyarbakır had the highest score (337.33) and Muş had the lowest score (228.16) for interactivity as ability. Diyarbakır had the highest score (321.06) and Agrı had the lowest total score (210.95) for interactivity as

Table 8. The effect of Internet experience on using IWBs' interactive features.

	Internet experience	*n*	Mean rank	SD	χ^2	Sig.
F1	Inexperienced	34	206.97	3	26.552	.000
	Mid-level	303	245.37			
	Advanced	166	313.13			
	Expert	28	281.50			
F2	Inexperienced	34	189.34	3	24.265	.000
	Mid-level	303	249.90			
	Advanced	166	303.09			
	Expert	28	313.46			
Total	Inexperienced	34	187.59	3	28.383	.000
	Mid-level	303	247.44			
	Advanced	166	308.80			
	Expert	28	308.38			

sharing. Finally, Diyarbakır had the highest score (314.84) and Batman had the lowest score (229.78) for overall use of IWB interactive features.

As shown in Table 8, no significant difference was found in accordance with Internet experience and interactivity as sharing, $p = .103$ ($p > .05$); on the other hand, a significant difference was found between Internet experience and applied audio-visual interactivity, $p = .000$ ($p < .05$), and between the use of IWB interactive features and interactivity as ability, $p = .000$ ($p < .05$). The greater the level of Internet experience, the greater the scores for use of IWB interactive features, applied audio-visual interactivity, and interactivity as ability. Thus, more Internet experience equates to increased use of IWB interactive features.

As shown in Table 9, no significant difference was found between the computer experience of teachers and interactivity as sharing, $p = .162$ ($p > .05$); on the other hand, a significant difference was found between computer experience and applied audio-visual interactivity, $p = .000$ ($p < .05$), and between the use of IWB interactive features and interactivity as ability, $p = .000$ ($p < .05$). The more the level of computer experience increased, the more the scores increased for teachers' use of IWB interactive features,

Table 9. The effect of computer experience on using IWBs' interactive features.

	Computer experience	*N*	Mean rank	SD	χ^2	Sig.
F1	Inexperienced	35	210.84	3	21.959	.000
	Mid-level	306	248.68			
	Advanced	155	310.74			
	Expert	36	281.57			
F2	Inexperienced	35	214.24	3	19.265	.000
	Mid-level	306	249.21			
	Advanced	155	302.35			
	Expert	36	309.89			
Total	Inexperienced	35	214.64	3	20.993	.000
	Mid-level	306	247.88			
	Advanced	155	305.56			
	Expert	36	307.00			

Table 10. The effect of training on using IWBs' interactive features.

	Trained in the use of smartboards	*n*	Mean rank	Sum of ranks	*U*	Sig.
F1	Yes	301	288.74	86,911.50	27,468.50	.000
	No	229	234.95	53,803.50		
F2	Yes	301	287.78	86,621.00	27,759.00	.000
	No	229	236.22	54,094.00		
Total	Yes	301	288.63	86,877.00	27,503.00	.000
	No	229	235.10	53,838.50		

applied audio-visual interactivity, and interactivity as ability. Therefore, the more computer experience the teacher had, the more she or he used the interactive features.

As shown in Table 10, a significant difference was not found between teachers being trained in the use of IWBs and interactivity as sharing, $p = .549$ ($p > .05$). However, a significant difference was found between IWB training and applied audio-visual interactivity, $p = .000$ ($p < .05$); interactivity as ability, $p = .000$ ($p < .05$); and the use of IWB interactive features, $p = .000$ ($p < .05$). Therefore, IWB-trained teachers, compared to untrained teachers, applied more audio-visual and interactivity features and had higher overall usage values.

As shown in Table 11, a non-significant difference was found between in-field IWB training and both applied audio-visual interactivity, $p = .100$ ($p > .05$), and interactivity as sharing, $p = .142$ ($p > .05$). However, a significant difference was found between in-field training and interactivity as an ability $p = .002$ ($p < .05$) and use of IWB interactive features, $p = .007$ ($p < .05$). Comparatively, scores were higher for teachers receiving in-field training.

As shown in Table 12, a significant difference was found between teachers who had used IWBs in previous courses and applied audio-visual interactivity, $p = .037$ ($p < .05$); interactivity as an ability, $p = .002$ ($p < .05$); interactivity as sharing, $p = .001$ ($p < .05$); and overall use of interactive features, $p = .002$ ($p < .05$).

As shown in Table 13, a significant difference was found between the duration of IWB use and applied audio-visual interactivity, $p = .025$ ($p < .05$); interactivity as ability, $p = .001$ ($p < .05$); interactivity as sharing, $p = .000$ ($p < .05$); and overall use of interactive features, $p = .000$ ($p < .05$). A longer duration of IWB use indicated higher scores for use of interactive features and all three sub-factors.

As shown in Table 14, no significant difference was found between the frequency of teachers' IWB use and interactivity as sharing, $p = .181$ ($p > .05$). On the other hand, a significant difference was found between the frequency of teachers' IWB use and applied audio-visual interactivity, $p = .000$ ($p < .05$); interactivity as ability, $p = .030$ ($p < .05$);

Table 11. The effect of in-field training on using IWBs' interactive features.

	In-field IWB training	*N*	Mean rank	Sum of ranks	*U*	*p*
F2	Yes	120	305.39	36,647.00	20,173.00	.002
	No	413	255.85	105,664.00		
Total	Yes	120	300.30	36,036.50	20,783.50	.007
	No	413	257.32	106,274.50		

Table 12. The effect of previous IWB experience on using IWBs' interactive features.

	Previous use of IWB	*n*	Mean rank	Sum of ranks	*U*	Sig.
F1	Yes	95	296.87	28,203.00	17,967.00	.037
	No	438	260.52	114,108.00		
F2	Yes	95	311.23	29,566.50	16,603.50	.002
	No	438	257.41	112,744.50		
F3	Yes	95	314.33	29,861.50	16,308.50	.001
	No	438	256.73	112,449.50		
Total	Yes	95	311.35	29,578.00	16,592.00	.002
	No	438	257.38	112,733.00		

Table 13. The effect of duration of IWB use on using IWBs' interactive features.

	Duration of IWB use	*N*	Mean rank	Sum of ranks	*U*	Sig.
F1	Less than 1 year	442	259.31	114,616.00	16,713.00	.025
	More than 1 year	89	299.21	26,630.00		
F2	Less than 1 year	442	256.09	113,190.00	15,287.00	.001
	More than 1 year	89	315.24	28,056.00		
F3	Less than 1 year	442	255.46	112,913.00	15,010.00	.000
	More than 1 year	89	318.35	28,333.00		
Total	Less than 1 year	442	255.01	112,716.50	14,813.50	.000
	More than 1 year	89	320.56	28,529.50		

Table 14. The effect of frequency of IWB use on using IWBs' interactive features.

	Frequency of IWB use	*n*	Mean rank	SD	χ^2	Sig.
F1	Every lesson	151	300.34	4	24.944	.000
	Only for special subject	282	265.98			
	Once a week	45	202.23			
	Once a month	23	248.85			
	Never	28	178.68			
F2	Every lesson	151	284.20	4	10.674	.030
	Only for special subject	282	268.75			
	Once a week	45	221.98			
	Once a month	23	250.22			
	Never	28	204.98			
Total	Every lesson	151	292.49	4	20.577	.000
	Only for special subject	282	269.73			
	Once a week	45	200.60			
	Once a month	23	246.11			
	Never	28	188.18			

and the use of interactive features, $p = .000$ ($p < .05$). Increased duration of IWB use indicated increased scores for teachers' use of interactive features, applied audio-visual interactivity, and interactivity as ability.

Table 15. The effect of suggesting the use of IWBs on using IWBs' interactive features.

	Suggesting the use of IWBs	*N*	Mean rank	Sum of ranks	*U*	Sig.
F1	Yes	486	259.31	132,239.00	5542.00	.000
	No	40	159.05	6362.00		
F2	Yes	486	269.65	131,050.50	6730.50	.001
	No	40	188.76	7550.50		
Total	Yes	486	271.00	131,707.00	6074.00	.000
	No	40	172.35	6894.00		

As shown in Table 15, no significant difference was found between teachers' suggestions about the use of IWBs to other teachers and interactivity as sharing, $p = .145$ ($p > .05$). On the other hand, a significant difference was found between teachers' suggestions about the use of IWBs to other teachers and applied audio-visual interactivity, $p = .000$ ($p < .05$); interactivity as ability, $p = .001$ ($p < .05$); and the use of interactive features, $p = .000$ ($p < .05$). The more teachers' suggestions to other teachers about the use of IWBs increased, the more the scores for using interactive features, applied audio-visual interactivity, and interactivity as ability increased. Further, the scores for applied audio-visual interactivity and interactivity as ability for teachers who suggested the use of IWBs to other teachers were higher than those of their peers. In other words, more suggestions about the use of IWBs led to increased use of interactive features.

Discussion and results

This study was carried out to investigate secondary school teachers' usage levels of interactive features of IWBs under the FATIH Project. No significant relationship was determined between levels of use of interactivity features and sex. Agbatogun (2006) also reported that sex has little or no impact on teachers' attitudes toward the use of technology in classrooms. However, a significant relationship was found between sex and both applied audio-visual interactivity and interactivity as ability, with men scoring higher.

A significant difference was also found between teacher professional experience and both interactivity as sharing and the use of IWB interactive features. As teachers' professional experience increased, their capabilities for applied audio-visual sharing and the use of interactive features also increased. Although Niederhauser and Stoddart (2001) have claimed that experience in teaching does not influence teachers' use of technology, like this study, most research shows the contrary (Hernandez-Ramos, 2005; Wong & Li, 2008).

No significant relationship was found between subject areas and interactivity as sharing or use of IWB interactive features. Türel (2012) similarly found no significant relationships between the attitudes of teachers in math, science, and social sciences. However, a significant relationship was determined in the present study between subject areas and applied audio-visual interactivity. The mean of the language teachers' total scores for applied audio-visual interactivity was higher than that of their peers teaching math, science, and social science. As a result, it can be said that language teachers use applied audio-visual interactive features more than teachers of other subjects.

The levels of use of IWB interactive features were also examined according to teachers' cities. A significant relationship was found between the cities and applied audio-visual

interactivity, interactivity as sharing, and use of IWB interactive features. The highest average for applied audio-visual interactivity scores belonged to Erzurum; the lowest average scores belonged to Bitlis. For interactivity as ability, Diyarbakır had the highest average and Muş had the lowest. While the highest average scores for interactivity as sharing belonged to Diyarbakir, Ağrı had the lowest. Finally, for the use of IWB interactive features, the highest average scores belonged to Diyarbakir, with Batman earning the lowest. The study was conducted across 10 provinces, and Diyarbakir and Erzurum had the highest overall scores. One reason for this difference is that Erzurum and Diyarbakır joined the FATIH Project a year before the other eight cities. In light of these findings, a linear relationship can be determined between the duration of FATIH Project participation and level of IWB interactive feature use. As pointed out by Hillier, Beauchamp, and Whyte (2013), time and experience are necessary conditions for pedagogical transformation. According to Beauchamp's (2004) transitional framework, nearly all the teachers in the current study fell between the first two stages of IWB use (blackboard/whiteboard substitute/apprentice user).

No significant relationship was found between the teachers' Internet experience and interactivity as sharing. However, a significant relationship was found between Internet experience and applied audio-visual, interactivity as ability, and the use of IWB interactive features. As Internet experience increased, applied audio-visual interactivity, interactivity as ability, and use of interactive features also increased.

Parallel to this study, Peralta and Costa (2007) stated that teachers who are more familiar with computers have more confidence in their competence to use them effectively. While no significant difference was found between computer experience of teachers and interactivity as sharing, a significant difference was found between computer experience and applied audio-visual interactivity, interactivity as ability, and the use of IWB interactive features. Increased computer experience indicated higher scores for use of interactive features, applied audio-visual interactivity, and interactivity as ability. Therefore, more computer experience indicated an increase in the use of interactive features.

No significant difference was found between having IWB training and interactivity as sharing; on the other hand, a significant difference was found between IWB training and applied audio-visual interactivity, interactivity as ability, and the use of interactive features. The scores for applied audio-visual interactivity and interactivity as ability of teachers who had training were higher than scores of teachers who did not. This result echoed the findings of Brinkerhoff (2006), who found that a beneficial training program enables teachers to apply technology and integrate it successfully into their teaching.

A significant difference was found between in-field IWB training and both interactivity as ability and the use of IWB interactive features. The scores of teachers who had training within their teaching field were higher than those of their peers.

Knezek and Christensen (2002) have claimed that teachers who are more familiar with technology tend to integrate it more often. Unsurprisingly, a significant difference was found between the use of IWBs in previous years and the use of IWB interactive features, as well as all three sub-factors. The mean scores for the three sub-factors of teachers who had previously used IWBs were higher than the scores of those who had not. In addition, the mean score for overall IWB interactive feature use of teachers who had used IWBs before was also higher.

A significant relationship was found between the duration of IWB use and the three sub-factors, as well as the use level of IWB interactive features. Hereunder, it can be said that the more a teacher uses IWBs, the more he or she uses their interactive features. Whereas no significant difference was found between the frequency of teachers' use of IWBs and

interactivity as sharing, a significant difference was found between applied audio-visual interactivity, interactivity as ability, and the use level of IWB interactive features. A similar result was found in Elaziz's (2008) study, where he stated that teachers using IWBs more have more positive attitudes about them than their colleagues.

Almost all of the teachers using IWBs in their lessons recommended their use to other teachers, which parallels Altıncelik's (2009) study. Whereas no significant difference was found between teachers' recommending the use of IWBs and interactivity as sharing, a significant difference was found between applied audio-visual interactivity, interactivity as ability, and the use level of IWB interactive features. In this sense, those teachers recommending the use of IWBs generally take more advantage of their interactive features.

Suggestions

Applied in-service training programs should be arranged so that teachers can use all interactive features of IWB, and a user manual should be prepared. Introductions to IWB features should be included in course programs at the undergraduate level for maximum impact. For instance, training about the use of IWB interactive features could be organized for pre-service teachers through their teacher education program, or education faculties could offer courses related to improving IWB materials. In addition, students should be educated about the use of IWBs in their own classrooms. Briefly, this study has provided positive contributions toward developing and rearranging education programs in this field.

Disclosure statement

No potential conflict of interest was reported by the authors.

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