Research article

Attitude of Students towards the Use of Interactive Whiteboard in Higher Education

Tarun Kumar Tyagi[1] & Krishna Kumar Rajak[2]
[1]Assistant Professor, Department of Teacher Education, School of Education
Central University of South Bihar, Gaya, Bihar, Email: taruntyagi@cusb.ac.in
[2]Research Scholar, Department of Teacher Education, School of Education
Central University of South Bihar, Gaya, Bihar

Abstract

The present study aimed to examine the attitude of university students towards the use of Interactive Whiteboard (IWB) in higher education along with differences in attitude resulting from some demographic variables. 129 University students, age ranged from 19-25 years who actively used IWBs in the classroom for instruction, were selected purposively in the sample. A self-developed tool based on a five-point Likert scale followed by three open-ended items was used to collect the data. Mann-Whitney U test, Kruskal Wallis H test and percentage analysis were used to analyze the data. The results showed that students have a positive attitude towards the use of IWB in higher education. The results further revealed the significant differences in the attitude of students towards IWB based on gender, types of discipline and basic knowledge of computers. However, the gender difference was found only in one dimension i.e., perceived teaching effectiveness. Furthermore, the students of education discipline showed higher scores on the attitude towards IWB than their counterparts. Students with high basic knowledge of computers were found to be higher in attitude towards IWB than the students of science and social science discipline. Students agreed that IWB is more effective than traditional boards in terms of accuracy, drawing the multidimensional figures and shape perfectly and its movement from different angles effectively, increasing interaction, making the teaching-learning process more enjoyable and providing facilities to use the stored learning material. Nevertheless, students have highlighted the major problems like- lack of trained ICT teachers, lack of technical support and internet access. Possible education and policy implications are outlined.

Keywords: Students' attitude, interactive whiteboard, higher education

Introduction

Due to technological and scientific advancement, the world is transforming into a digital world that comprises real and digital worlds (Zhu, et al. 2016). Undoubtedly, the advancement of ICT has brought drastic changes not only in industry, business, and other sectors but also into the entire spectrum of the education system across the world (Murcia, 2014). Ergo, the traditional pedagogical practices are replaced by the ICT based pedagogical practices. As a result, Interactive whiteboard (IWB) is one of the latest examples of technological developments in the field of the education system. However, initially, it was developed for other sectors, but over the last decade, it has begun in the education system also. The use of IWBs makes the teaching and learning atmosphere more enjoyable, creative, and interesting (Elaziz, 2008) by integrating different pedagogical strategies (Serdyukov, 2017). The earlier context of the learning process has been morphed to a new sight, which harmonizes hi-tech as a tool for teaching-learning processes. Hence, the

students enhance their knowledge in different fields beyond the classrooms and create a metamorphosing learning environment. For the significant use of digital technologies in Indian classrooms, Govt. of India, and various organizations have taken positive steps to make the education system dynamic and extravagant. Despite efforts, however, all education institutions at higher levels are not well-equipped with smart boards and projectors. But a road map may be outlined for the developing countries like India that are in the process of ameliorating their education system by orienting them with technological advancement and innovation. It plays a pivotal role to resolve different issues like access, equity, and quality.

An IWB is also known as an electronic board, touch-sensitive board, digital whiteboard, smartboard. It has taken the place of a blackboard or green board for offering an attraction through different colours of pictures and to be able to manipulate, save texts, objects, pictures, voice, etc., as per the requirement of the teaching-learning process. Due to the indispensable role of IWB in the digital world, it is also described as a 'digital hub through which other technologies can be channelized' (Warwick, Mercer, Kershner & Staarman, 2010).

Rationale of the Study

Several research studies paid scholarly attention to the use of IWB in English language learning (Shams & Ketabi, 2015), Mathematics learning (Vita, Verschaffel & Elen, 2014) and the attitude of students and teachers towards the use of interactive whiteboards in particular (Elaziz, 2008). Research studies demonstrated that the average level of ICT awareness of teachers is influenced by their gender and age (Bindu, 2017). Singaravelu (2017) reported that the student-teachers have favourable attitudes towards the use of IWB and are more comfortable in using IWB instead of a traditional blackboard. In support, Balta and Duran (2015) also reported similar findings and concluded that the students and teachers both have positive attitudes towards using IWB, but their attitudes differ across their genders at the school level. In contrast, the gender difference was not reported by Bindu (2017) and Mahajan (2016). Gashan and Alshumaimeri (2015) studied the analysis of the teachers' responses and revealed negative opinions toward the IWB. Most of the teachers agreed positively that they were not scared to use IEB in the class as it makes them comfortable in the teaching-learning process. The major challenges that they faced were: the lack of sufficient training and the non-appropriate curriculum content for the application of the IWB. It has been demonstrated through research studies that due to lack of ICT competency, teachers face challenges, while using IWB in their classrooms (Al-Faki & Khamis, 2014) therefore, training is required to support teachers (Akkoyunlu & Erkan, 2013). Elaziz (2008) reported the positive attitude of student teachers towards IWB and highlighted IWBs as useful devices for ameliorating the standard of the teaching-learning process. It increases their interest, motivation and draws their attention for effective learning (Tataroglu & Erduran, 2010). The lack of teacher involvement in technology-based instruction is primarily due to a lack of training, support, time, and resources. Therefore, as new technology continues to evolve, educators must challenge themselves to become technologically savvy in today's digital world (Williams, 2017). Based on the analysis of the previous research findings from India and overseas, it is realized that in the developing country the biggest challenge in front of the education system is to modernize the classroom environment and to equip well-trained teachers for developing a

positive attitude towards the use of ICT in education. Due to the importance of IWB in education, the majority of students and teachers showed a favourable attitude towards the use of ICT like the use of an interactive whiteboard in the classroom (Singaravelu, 2017; Gashan & Alshumaimeri, 2015; Balta, 2015; Elaziz, 2008). In contrast, less effective learning through smart classrooms was reported (Yang, Zhou & Huang, 2018). There are different barriers in the willing to use ICT in the teaching-learning process (Singhavi & Basargekar, 2019; Gashan & Alshumaimeri, 2015) namely lack of interest, not having proper training and facilities in the classroom (Ghavifekr & Rosdy, 2015).

After analysis of the research findings, first and foremost, it was found that State-of-the-art literature is deficient to address the transformation of cutting-edge technology like the use of IWB especially in the higher classrooms of the Indian context. In India, IWB technology has been recently introduced in the field of education. However, it has not yet reached use in the entire spectrum of education, i.e. higher to pre-primary level. Besides this, it was also found that there is no standardized certified tool to measure attitude towards IWB at the level of higher education. The development of the certified tools for investigating the students' attitude towards IWB in Indian higher education represents the novelty of this study. With all claimed benefits and possible disadvantages of IWBs, and to add additional knowledge in the area of possible differences based on demographic variables, the study may be helpful to teacher educators, teachers, and prospective teachers. In the light of the above-mentioned discussion, the present study has been conducted to address the following research questions:

1. What is the attitude of university students towards the use of IWB in higher education?
2. Do the differences based on gender, discipline, level of education (UG/PG), and basic knowledge of computers exist in students' attitudes towards the use of IWB in higher education?
3. What are the views of university students towards the use of IWB in higher education?

Objectives of the Study

The following objectives of the present study were:

1. To study the attitude of students towards the use of an interactive whiteboards in higher education.
2. To compare the attitude of students towards the use of interactive whiteboard in higher education for (i) Gender (ii) Locality (iii) Level of programme (iv) Discipline

Hypotheses of the Study

The following null hypotheses were formulated to achieve the objectives of the study:

There is no significant difference in the attitude of students towards the use of an interactive whiteboard in higher education with respect to (i) Gender (ii) Locality (iii) Level of programme (iv) Discipline

Research Methodology

Method: Descriptive survey method was used to achieve the objectives of the study.

Participants: 129 University students were selected through a purposive sampling technique from three schools of central institution namely science, social science, and education discipline. The age group of the selected sample was from 19-25 years.

Instrument: The tool consists of three sections A, B, & C. In the first section, demographic information was asked by the participants. In the second section, 39 items (positive and negative*) based on the five-point Likert's scale and in the third section three open-ended questions were asked to collect the data from participants. The "Attitude Scale towards the Use of Interactive Whiteboard" (ASTUIWB) is based on a five-point Likert's scale (from strongly agree=5 to strongly disagree=1 for positive items and reverse for negative items/Statements) was developed by the investigators. However, after receiving the feedback of the expert, 40 items out of 50 items and three open-ended questions were finalized for the tryout phase of the test construction. After an item analysis procedure, one item was rejected. However, one item was modified and included in the test. Ergo, 39 items out of 50 items were finally included in the scale. Thus, the tool consisted of two measuring instruments in which one is based on the five-point Likert's scale with 39 items and the second is questionnaire type with three open-ended questions. The scale has four dimensions namely Perceived Learning Experience (PLE), Perceived Teaching Experience (PTE), Basic Knowledge (BK), and Usability (U). Reliability of the tool

Cronbach's alpha (coefficient alpha) is used to calculate the reliability coefficient of the tool along with dimensions. The reliability coefficients of the four dimensions namely PLE, PTE, BK, and U were found to be 0.80, 0.77, 0.51, and 0.84, respectively. Based on internal consistency analysis, the reliability coefficient of the entire scale was found to be 0.91. This value indicates good internal consistency of the items in the attitude scale towards the use of IWBs. Hence, the scale was considered to be highly reliable.

Validity of the tool: The content validity of the tool was established through the experts' judgement. Three experts from the University: one a psychologist, second an ICT Expert and language expert reviewed all items of the tool by considering the fundamental aspects like content, items, language, vagueness, length, dimensions etc. After receiving the experts' feedback and using item analysis, a minor revision was applied to the tool for improving its validity to the research questions of the study. Thus, 39 items and three open-ended items were found to be appropriate for the final draft of the tool.

Procedure of data collection: First, permission was taken from the concerned authorities of the concerned schools; thereafter the investigator administered the tool through online mode to collect the data from the concerned participants. Participants were fully informed about the purpose of the study before the distribution of the tool. Besides this, they were invited to participate in this study voluntarily and were allowed to withdraw from the study at any time. After establishing a rapport with the participants, all required instructions were given very clearly in the tool. All the procedure of data collection was completed in seven days in September 2020. After the collection of the data, the scoring procedure was done.

Statistical analysis: Descriptive statistics like mean, SD, kurtosis, skewness and the sampling procedure both are required to choose the appropriate statistical procedure for analysing data. Table 1 shows the basic statistics of the group of the participants' age ranging from 19-25 years. It is apparent from Table 1 that the SD value of attitude towards IWB is 16.90 for mean 147.88 which is approximately one-ninth to mean and even skewness (- 0.18) and kurtosis (0.03) values are not close to the ideal values of Normal Probability Curve (NPC).

Table-1: Details of Participants

Variable	N	Min	Max	Mean	SD	Skewness	Kurtosis
Attitude towards IWB	129	99	187	147.88	16.90	- 0.18	0.03

As can be seen from Table 1, the nature of data is non-normal due to the positively skewed and not mesokurtic nature of data. Because of not showing the Gaussian distribution of data, the best alternatives of t-test and F-test in nonparametric statistics are the Mann-Whitney U test and the Kruskal Wallis H test respectively. Statistical Package for Social Sciences (SPSS-20) was used to analyze the data except for the three open-ended items of the questionnaire. Furthermore, percentage analysis was used to analyse the data in the case of three open-ended items of the tool.

Results

Table-2: Result of Mann Whitney U Test for Attitude towards IWB (Gender)

S No.	Areas	Gender	N	Mean Rank	Rank sum	U	z	p value	Decision
1.	Perceived Learning Effectiveness	Male	70	67.85	4749.50	1865.50	-0.94	p > .05	NS
		Female	59	61.62	3635.50				
2.	Perceived Teaching Effectiveness	Male	70	72.54	5077.50	1537.50	- 2.50	p < .05	S
		Female	59	56.06	3307.50				
3.	Basic Knowledge	Male	70	65.24	4567.00	2048.00	- 0.81	p > .05	NS
		Female	59	64.71	3818.00				
4.	Usability	Male	70	68.63	4804.00	1811.00	- 1.21	p > .05	NS
		Female	59	60.69	3581.00				
5.	Attitude towards IWB	Male	70	69.68	4877.50	1745.00	-1.55	p > .05	NS
		Female	59	59.45	3507.50				

S-Significant; NS-Not Significant

As can be seen from Table 2 the obtained 'U' value (z = - 2.50; p<.05; df = 127) was found to be significant only in the case of the Perceived Teaching Effectiveness (PTE) dimension of attitude towards IWB. Hence, Ho is rejected and it indicates that male and female students were found to differ in the PTE dimension i.e., male students were significantly higher in PTE of attitude towards the IWB than their female students' counterparts.

Table-3: Result of Mann Whitney U Test for Attitude towards IWB (Locality)

S No	Areas	Locality	N	Mean Rank	Rank sum	U	z	p value	Decision
1.	Perceived Learning Effectiveness	Rural	62	67.76	4201.00	1906.00	- 0.81	p > .05	NS
		Urban	67	62.45	4184.00				
2.	Perceived Teaching Effectiveness	Rural	62	65.52	4062.00	2045.00	- 0.15	p > .05	NS
		Urban	67	64.52	4323.00				
3.	Basic Knowledge	Rural	62	66.67	4133.50	1973.50	- 0.49	p > .05	NS
		Urban	67	63.46	4251.50				
4.	Usability	Rural	62	66.57	4127.50	1979.50	- 0.46	p > .05	NS
		Urban	67	63.54	4257.50				
5.	Attitude towards IWB	Rural	62	67.00	4154.00	1953.00	- 0.56	p > .05	NS
		Urban	67	63.15	4231.00				

S-Significant; NS-Not Significant

It is evident from Table 3 that the obtained 'U' values (z = -0.81, -0.15, -0.49, -0.46, & -0.56; df = 127; p > .05) were found to be not significant in the scores of attitude towards the use of IWB along with its all dimensions with respect to locality. Hence, the decision failed to reject H_o in favour of H_1. It indicates that there is no statistically significant difference between the attitude of urban and rural students towards the use of the IWB i.e., both rural and urban students have a similar extent of attitude towards the use of IWB.

Table-4: Result of Mann Whitney U Test for Attitude towards IWB (Programme)

S No	Areas	Programme	N	Mean Rank	Rank sum	U	z	p value	Decision
1.	Perceived Learning Effectiveness	PG	68	61.40	4175.50	1829.50	-1.15	p > .05	NS
		UG	61	69.01	4209.50				
2.	Perceived Teaching Effectiveness	PG	68	64.60	4392.50	2046.50	-1.30	p > .05	NS
		UG	61	65.45	3992.50				
3.	Basic Knowledge	PG	68	66.67	4533.50	1960.50	-0.53	p > .05	NS
		UG	61	63.14	3851.50				
4.	Usability	PG	68	66.10	4494.50	1999.50	-0.35	p > .05	NS
		UG	61	63.78	3890.50				

5.	Attitude towards IWB	PG	68	64.47	4384.00	2038.50	-0.17	p > .05	NS
		UG	61	65.59	4001.00				

S-Significant; NS-Not Significant

Table 4 shows that the obtained 'U' values (z = -1.15, -1.30, -0.53, -0.35 & -0.17; df = 127; p>.05) were found to be not significant in attitude towards the use of IWB between UG and PG students respectively. Hence, the decision failed to reject H_o in favour of H_1. Therefore, it is concluded that both UG and PG students are having similar attitudes toward the use of IWB.

Table-5: Result of Kruskal Wallis H test for Attitude towards IWB (Discipline)

S No.	Areas	Variable (Disciplines)	N	Mean Rank	H value	p value	Decision
1.	Perceived Learning Effectiveness	Social Science	27	45.59	9.25	p < .05	S
		Education	73	70.38			
		Science	29	69.52			
2.	Perceived Teaching Effectiveness	Social Science	27	45.65	9.32	p < .05	S
		Education	73	70.99			
		Science	29	67.95			
3.	Basic Knowledge	Social Science	27	50.07	11.78	p < .05	S
		Education	73	74.77			
		Science	29	54.31			
4.	Usability	Social Science	27	47.80	8.87	p < .05	S
		Education	73	72.47			
		Science	29	62.22			
5.	Attitude towards IWB	Social Science	27	43.54	12.72	p < .05	S
		Education	73	73.50			
		Science	29	63.79			

S-Significant; NS-Not Significant

It is evident from Table 5 that the obtained Kruskal-Wallis H values (H = 9.25, 9.32, 11.78, 8.87, & 12.72; df =2; p < .05) were found to be statistically significant in attitude towards the use of IWB along with its all dimensions among the students of three disciplines namely, social science, education and science. Hence, H_o is rejected. Therefore, a post-hoc analysis was used to examine the differences between the mean ranks of two different groups.

Table-6: Procedure of Post-hoc Analysis (Disciplines)

Variable	Disciplines	N	Mean Rank	Sum of Ranks	U value	z value	p-value
Attitude towards IWB	Social Science	27	33.93	916.00	538.00	-3.48	p < .05
	Education	73	56.63	4134.00			
	Education	73	53.87	3932.50	885.50	-1.23	NS
	Science	29	45.53	1320.50			
	Science	29	33.05	637.50	259.50	-2.17	p < .05
	Social Science	27	23.61	958.50			

S-Significant; NS-Not Significant

Table 6 depicts that obtained z values (z = 3.48, & 2.17, p < .05, df = 98) were found to be significant in the scores of attitude towards IWB. Hence, Ho is rejected. Statistically, it indicates the significant difference in an attitude of students towards the use of IWB with respect to social science & education and similarly with social science and science discipline. Therefore, it is concluded that students of education discipline are having higher scores in attitude towards the use of IWB than their social science discipline. Furthermore, it is also concluded that students of science discipline are having a higher score on attitude towards IWB than their social science discipline.

Table-7: Result of Kruskal Wallis H test for Attitude towards IWB (Basic knowledge of computer)

S No	Areas	Knowledge of computer	N	Mean Rank	H value	p value	Decision
1.	Perceived Learning Effective-ness	High	30	83.35	24.68	p < .05	S
		Average	81	66.34			
		Low	18	28.39			
2.	Perceived Teaching Effective-ness	High	30	74.35	9.47	p < .05	S
		Average	81	66.85			
		Low	18	41.08			
3.	Basic Knowl-edge	High	30	76.65	17.42	p < .05	S
		Average	81	67.96			
		Low	18	32.25			
4.	Usability	High	30	76.73	14.01	p < .05	S
		Average	81	67.06			
		Low	18	36.19			
5.	Attitude towards IWB	High	30	79.33	20.96	p < .05	S
		Average	81	67.56			
		Low	18	29.58			

S-Significant; NS-Not Significant

As can be seen from Table 7, the obtained Kruskal-Wallis H values (H= 24.68, 9.47, 17.42, 14.01, & 20.96, df =2, $p < .05$) were found to be statistically significant in students' attitude towards the use of IWB along with its all dimensions for high, average, and low level of basic knowledge of computer. Hence, H_o is rejected. Ergo, post-hoc analysis was used to examine the differences between the mean ranks of two different groups.

Table-8: Procedure of Post-hoc Analysis (Basic knowledge of computer)

Variable	Level	N	Mean Rank	Sum of Ranks	U-value	z-value	p-value
Knowledge of Computer	High	30	64.08	1922.50	972.50	-1.16	NS
	Average	81	53.01	4293.50			
	Average	81	55.56	4500.00	279.00	-4.08	p < .05
	Low	18	25.00	450.00			
	Low	18	14.08	253.50	82.50	-3.99	p < .05
	High	30	30.75	922.50			

S-Significant; NS-Not Significant

It is evident from Table 8 that obtained z values (z = -4.08, p < .05, df =109; z = -3.99, p < .05, df = 97) were found to be statistically significant in students' attitude towards the use of IWB scores with respect to students' knowledge of computer. Hence, Ho is rejected. It indicates the statistically significant difference in attitude towards the use of IWB among the students having different degrees of computer knowledge. Furthermore, it is also concluded that students with high basic knowledge of computers were having a highly positive degree of attitude towards IWB along with its dimension than their counterparts.

Qualitative analysis

The first item asked from the participants was- How does IWB facilitate the teaching-learning environment?

After analysis of the comments of participants, the result revealed that 63 percent of the students accepted that IWB is more effective than traditional boards in terms of accuracy, drawing the multidimensional figures and shapes perfectly and their movement from different angles effectively and increasing interaction between students and teachers. 57 percent of students Stated that IWB contributes to enhancing motivation and making the T-L process more enjoyable and fetching maximum attention of learners for long term retention. 10 percent of students Stated that IWB is very helpful in reviewing and revising any lesion effectively. In addition, it enhances the level of engagement with the IWB that supports for a better learning environment.

The second item of the tool asked from the participants was- What are major problems faced by the students when teachers use IWB in the classroom?

The generic Statement of 53 percent of students pointed out the lack of training of teachers because most of the teachers failed to calibrate the IWB with the projector properly. In addition, 43 percent of the students faced technological and network problems that affected their teaching-learning process. 52 percent of students felt

that the teachers lack experience and confidence during the use of IWB in the classroom. If teachers do not have the confidence to use IWB effectively then it may be the cause of poor performance and lack of effective use of the technology in the classrooms.

The third item of the tool was- Provide your suggestions for the effective use of IWB in the teaching-learning process.

Participants have highlighted several problems, however, these are short-term in nature i.e. 'teething troubles' than long term difficulties. Apart from showing a favourable attitude towards IWB, students have also shared their views for the effective use of IWBs in the T-L process. It was highlighted by 64 percent of participants that training and refresher courses should be given to the in-service teachers and pre-service teachers too for enhancing their confidence and competence to work with IWB effectively. In addition, they Stated that technical support is considered to be a vital component in any ICT related tasks. 18 percent of students responded that the teacher should simultaneously use the traditional board and IWB for an effective teaching-learning process. At last, 17 percent of students Stated that teachers may conduct assessments and evaluations for the effective use of IWBs.

Discussion & Conclusions

The aim of the present study is to examine the students' attitude towards the use of IWB in higher education and also focus and ferret out the differences for the same based on gender, locality and level of education, discipline and basic knowledge of computers. The findings of this study revealed that students have a positive attitude towards the use of IWB in higher education. Similar findings are also supported by different research studies (Tataroglu & Erduran, 2010; Elaziz, 2008: Hall & Higgins, 2005). IWB based teaching-learning processes are perceived by university students as more effective and enjoyable because of fetching attention, increasing interest, motivation and classroom interaction, multiple dimension presentation, etc. and even facilities not only for saving the lectures and material but also using it simultaneously. However, despite having advantages of IWB in the teaching-learning process, it is also suggested by the students that the IWB tool may be used in specific lessons or topics, but for creating a natural environment, improving writing skills on a blackboard, green board, and drawing the figure and pictures manually as feasible for teachers by considering the time and appropriateness, it would be better to use the blackboard, green board by teachers and students.

Furthermore, the gender difference was not found with respect to attitude towards the use of IWBs in higher education except for only one dimension, i.e. perceived teaching effectiveness. Male students were found to be significantly higher than their female students' for the same. However, it is not supported by the several research studies (Singaravelu, 2017; Bindu, 2017; Mahajan, 2016, Balta & Duran, 2015) that have reported the gender differences in attitude towards IWB. It is the gender bias notion, that male students are technologically more adapted than girls. It will be a barrier to maximum utilization of human resources for national development because of ignoring half of the population's efforts. However, the role of family and other agencies also play an active role to encourage them by highlighting their achievements in different fields from time to time.

In addition, locality differences were also not found in the attitude of students towards the use of IWB in higher classrooms. However, the findings of the study were supported by Loong,

Doig, and Groves (2011) because they reported a little difference across most aspects of ICT use between rural and urban students. But in contrast, Unlu, Dokme and Sarikaya (2014) reported a significant difference in the use of the internet in favour of urban students than their counterparts. The reason for this could be that the urban people are more exposed not only towards the use of computers and English language but also other aspects as they have better socioeconomic status and other facilities than rural background students. Rural Indian students face a more challenging situation for the effective use of ICT in education, because of the lack of technology, internet access, and qualified trainers. And this study suggested that in this situation ICT enabled education in rural schools can be an innovative step to fill this literacy gap and to uproot the teaching-learning process. In addition to the level of education, wise differences were also not found among the students of UG and PG programmes. Nevertheless, disciplinary differences were found. The students of education discipline were having a higher positive attitude towards the use of IWB than social science students. However, similar findings were reported by Balta & Duran (2015). The possible explanation of the result may be due to the training of the students of Education discipline.

At last, the difference based on the basic knowledge of computers was also found in the attitude of students towards the use of IWB along with its all dimensions. Students with high and average basic knowledge of computers showed a higher attitude towards IWB than the students having less basic knowledge of computers. This result may be due to one possible factor, i.e. the positive relationship between ICT knowledge and effective use of IWB. Therefore, the findings of this study suggested that a support system (learning material) may be provided to the students to enhance their competencies like including the course of ICT in education, orienting the students and faculty members for the effective use of IWB in their teaching-learning process.

The technology shifts the paradigm from the traditional system of learning to ICT enabled learning which helps to improve the learners' skills and promote active learning and interaction in the classroom (Aflalo, Zana, & Huri, 2018; Hall & Higgins, 2005). Most of the students agreed that IWB is helpful in making the teaching-learning process more interesting and effective (Mata, Lazar & Lazar, 2016; Hall & Higgins, 2005). In addition, it helps to increase motivation, level of engagement, and retention levels of the learners. IWB is also very useful for better understanding of content using cognitive, affective, and psychomotor domains of the learners. The important issue raised through the findings of the study is that there is a great need for adequate training to increase the maximum utilization of the IWB in the teaching-learning process (Hall & Higgins, 2005; Elaziz, 2008). Despite having a larger population in India, the Govt. initiatives are being incorporated to provide the IWBs facilities at the entire spectrum of education across the country. But several reasons may cause the ineffective implementation of IWB in the teaching-learning processes like (i) untrained teachers at the elementary level, secondary level and higher level too; (ii) no internet facilities, technological assistance and maintenance in remote areas and village schools (iii) unavailability of ICT expert teacher to assist other teachers for the use of IWBs by using update ICT knowledge. Although, the study suggests that the policymaker and administrator should observe such difficulties faced by the teachers and learners' practices with the IWB and initiate important

steps to remove the problems.

Despite the methodological strength, the present study has some limitations. One concern related to this study has been claimed to have a positive attitude of students towards the use of IWB in higher education, but with some limitations like a small sample, selection of only one institution and not using triangulations (interview, observation). Therefore, the findings of the study may be less valid to generalize the population. Secondly, teachers' views should be involved to validate the findings of the study in terms of the advantages and disadvantages of the use of IWB in the classroom. Even in most cases, teachers are not having a great deal of exposure to lessons or limited exposure with IWBs; therefore, it may be the reason for not capturing the true extent of the attitude of the students towards the use of IWB. Third, the content validity of the tool was only established.

Although this study includes both qualitative and quantitative data, classroom observations are missing to explore to what extent students and teachers will be benefitted from the potential use of this technological device as claimed in literature? Therefore, a longitudinal study may be conducted to confirm the findings of the study as required correlating the greater use of IWB and more positive attitude of students towards IWBs (Elaziz, 2008). Future research may be conducted at the primary and secondary levels to study the effectiveness of the use of IWB in the classroom in terms of learners' performance and teaching effectiveness. It could be extended for the subject-specific domain like social science and language. Past and present studies have not yet addressed the concerning issues such as how can we foster students' creative thinking by using IWB? Ergo, longitudinal and experimental research may be conducted to look at other issues and for a better understanding of the effectiveness of IWB.

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