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Teachers' perception and use of interactive whiteboards for teaching and learning in secondary schools in Nadia district of WB

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ABSTRACT

Interactive whiteboards (IWB) are regarded as one of the most revolutionary instructional technologies for various educational levels. While the impacts of IWBs in classroom settings have been examined recently in a number of studies, this study not only looks at the perception but also examines the actual usage and behaviors associated with promising IWB features in practical settings. The main goal of this paperwork was to evaluate both teachers' perceptions and their use of IWBs. A questionnaire was developed based on an extensive literature review as well as related instructional theories and models. The questionnaire consisted of questions about demographics, usage, and teachers' perceptions related to IWBs. For this study, 174 teacher-participants, who have actively used IWBs for instruction, were selected from various educational levels (from grade 6 to 12) from different schools in Nadia District of West Bengal. The results show that teachers believe that IWBs can be used for different subject domains. Also, teachers believe that IWBs can be used to facilitate learning and instruction under the ideal teaching learning conditions.

KEYWORDS

Interactive whiteboards, Instructional Technology, Secondary Education, Technology acceptance model, Technology integration

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INTRODUCTION

Educational institutions have tried to provide students better learning environments by equipping them with the latest educational technology. This effort has encouraged instructors to use various assistive technologies such as computers and the Internet in their classrooms especially over the last decade; this process is called integration of information and communication technologies (ICT) (Hsu¹, 2010). As a part of the ICT integration process, the interactive whiteboard (IWB) has been one technology most invested in especially by European countries such as England, Spain, and Turkey (Holmes², 2009; Türel³, 2010). As of 2010, England has the highest IWB penetration rate (73%) in the world and many countries including Denmark (50%) and the USA (35%) have substantially increased IWB using rates in classrooms; however, the average rate for Asia is still lower than 2% according to a recent research report (McIntyre-Brown⁴, 2011). IWB's promising benefits to learning and instruction have led to its increased popularity and attractiveness as expressed by a number of researchers (Levy⁵, 2002; BECTA⁶, 2003; Smith, Higgins, Wall, & Miller⁷). It is asserted that IWBs can enhance the functionality of existing ICT such as computers and projectors by adding interactivity to these media that make it distinct from traditional PowerPoint presentations (Smith et al⁷, 2005; Törff & Tirotta⁸, 2010).

Very recently the ICT has taken its place in teaching-learning process even in secondary schools and IWBs more profusely used to develop the learning technology in India, Australia and China not only in various subject domains but also in teachers' competency areas. However, in 2011, Francisca and Vimala⁹ opined that effectiveness of Interactive Whiteboard on the achievement is much more significant in teaching and learning Physics than the conventional method among higher secondary school students in Thirunelveli District in Tamil Nadu of India. Sharma¹⁰ (2012) had surveyed through secondary school students in India and found that Interactive Whiteboards in English language teaching classrooms in India is fairly suitable for equally students and teachers and it speedily is adopting a pivotal role in teaching learning process of new age. Interestingly, in 2013, Uma Maheshwari and Jeyanthi has found that Utility of Interactive Whiteboards in second language classrooms is very much significant between male and female graduate students of Urban and Rural B.E. colleges of Thirunelveli District of Tamil Nadu in India but they need more in-service training and awareness.

SIGNIFICANCE OF THE STUDY

The place of the use of latest technology in education is very much significant in correlation of other cognitive experiences of school education. Some attempts have been made to develop teaching methodology by integrating use of whiteboards with other audio-visual aids to better describe the science curriculum, but no systematic study has been conducted on identifying the various factors that determine technological knowledge of high school students. Hence a need has arisen to study the usefulness of interactive whiteboards among the secondary school students.

Additionally, teacher-participants who have not used or have just started to use IWBs in their classes may be an inappropriate data source for an evaluation of perceptions because of their insufficient knowledge, experience, and attitudes about the use of IWBs. Another critical issue for IWB research is the use of appropriate surveys and questionnaires that were developed based on existing research as well as sound instructional theories and strategies associated with the use of IWBs. Addressing the issues regarding the evaluation of IWB use, we conducted this study by means of an original instrument on a particular group of IWB-experienced teachers who were teaching at different educational levels and various disciplines in Nadia District of West Bengal.

Bearing in mind the increase of IWB technology investments, there is a strong need for the evaluation and thus, improvement of actual IWB use in schools. Considering the importance of teachers' perceptions, attitudes and beliefs about IWB use, this study focuses on the multiple component investigation of IWBs based on teachers' perceptions on their current IWB use including frequencies of usage, preferred IWB features, status quo of IWB skills and training as well as perceptual benefits of IWB in classroom teaching and learning.

LIMITATIONS OF THE STUDY

This study, which represents a snapshot of IWB use, has several limitations that may provide guidance for future research. For example, a qualitative analysis would be helpful for the examination of the underlying reasons of significant differences emerging between the teachers who most and least frequently use IWBs in their classes. Moreover, the study has been based on a smaller sampling area of Nadia District with a very limited number of teacher participants which affects the study to be more inconspicuous. On the other hand, the questionnaire developed specifically for this study considering the existing literature and associated theories and models. This instrument may be exposed to confirmatory factor analysis to examine the fitness of themes with various fit-indexes (Anderson & Gerbing¹¹, 1988).

Finally, similar research may be conducted by considering additional IWB factors such as issues of IWB-assisted courses and effects of receiving IWB trainings on the IWB use.

SAMPLE OF THE STUDY

The sample for this study consisted of 174 teachers from different schools in Nadia District of West Bengal, ranging from grades six to twelve, who have actively used IWBs for at least one year in their schools. The volunteer participants were selected based on the purposeful and convenience sampling method. Since the focus of this study is to evaluate how teachers use IWBs rather than why teachers do not use IWBs, it was essential to select participants among ones who have had sufficient knowledge of and experience with IWBs and also were familiar with the issues of IWBs in practice. All participants were college educated and 104 of them were male. The majority of participants were less than 36 years old (158) and the majority of all the teachers (154) had been teaching for less than ten years. Teachers' responses were examined in terms of their fields of teaching by categorizing them into six areas: Computer Science, Foreign Language (English), Mathematics, Science, Social Sciences, and Bengali Language and Literature. Necessary care has been taken to include several rural schools from the outskirts of the city which forms the total population for the study.

TOOLS USED AND INSTRUMENT DEVELOPMENT

In order to create a questionnaire consistent with the study's purpose, the researcher examined current studies looking at instructional theories and strategies, current practices, problems and perceptions of IWB users. The initial draft of the questionnaire was distributed for feedback from 10 teachers who were active IWB users across various subject areas, two instructional designers, two language teachers, and two educational science teachers. Revisions were made based on expert opinions. This step was vital to achieve a comprehensible and relevant questionnaire in terms of face and content validity.

As well as demographics and multiple-choices items, the final questionnaire ($\alpha = .93$) included 26 Likert scale items from strongly disagree to strongly agree. We also classified the Likert scale items along with the existing literature into themes to provide a better understanding of main dimensions of IWB use. Those themes were labeled as instructional effects of IWBs ($\alpha = .86$), motivational effects of IWBs ($\alpha = .89$), and the usability of IWBs ($\alpha = .60$). The first theme included items related to effects of IWBs on teaching and learning while the second theme had items addressing the motivational issues of

IWBs. The last theme included three items concerning the usability of IWBs. Original language of the paper-based questionnaire delivered for this study was English.

OBJECTIVES OF THE STUDY

The present study aims at findings out the effectiveness of the use of interactive whiteboards in teaching and learning process at secondary stage. Research design is the arrangement of the conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. The followings are the objectives of the present investigation:

1. To measure teachers' perception and to find out cognizable effect of using interactive whiteboards for teaching and learning in secondary schools.
2. To find out the differences in teachers' perception in usefulness of interactive whiteboards for teaching and learning towards high school students based on the following variables.
 - a. locality
 - b. type of schools
 - c. method of teaching
 - d. use of audio-visual aids

HYPOTHESIS

Teachers' perception and use of interactive whiteboards during teaching and learning towards secondary school students does not differ in their achievement in school subjects.

Further it is divided into some sub-hypotheses according to the main objectives of the present study. The sub-hypotheses are as follows.

Sub-hypotheses

1. The teachers of urban and rural area schools do not differ significantly in their perception and use of interactive whiteboards during teaching and learning process towards secondary school children.
2. The teachers of different type of schools do not differ significantly in their perception and use of interactive whiteboards during teaching and learning process towards secondary school children.
3. There is no significant difference in the achievement of the students taught by teachers adopting different methods of teaching for use of interactive whiteboards during teaching and learning process towards secondary school children.
4. There is no significant difference in the achievement of the students taught by teachers using

various audio-visual aids for teaching using interactive whiteboards during teaching learning process towards secondary school children.

ANALYSIS AND INTERPRETATIONS OF DATA

After collection of various data through proper technique and tools, it must be interpreted accordingly. The raw data were assorted and central tendency had been found out along with descriptive and inferential statistical measures were applied, analyzed and interpreted with vivid discussion for the collected data. Considering the goals for the study, a descriptive analysis was performed to understand the current state of teachers' IWB use as well as teachers' general perceptions about using IWBs. To provide a clear picture, percentages of teachers' agreement levels are presented in two groups: agreeing (agree and strongly agree options), and disagreeing (disagree and strongly disagree options). For internal consistency and reliability, Cronbach's Alpha coefficients were calculated and interpreted for each theme based on the rules (0.9 = high level, 0.8 = moderate, 0.7 = low level, 0.6 = acceptable level, and <0.6 = unacceptable level).

Chi-square tests of independence were performed to analyze the relationships of key categorical variables such as the frequency and duration of IWB use with teachers' fields, IWB competencies, and their perceptions. Cramer's V values were examined for the effect size of associations in accordance with the intervals presented by Kotrilik and Williams¹² (2003). Results for the study are presented here in three parts: 1) statistical results of teachers' IWB use and skills, 2) descriptive results of teachers' responses to the questionnaire items, 3) results focusing on individual differences between IWB usages and perceptions. In the first section of the IWB questionnaire, teachers were asked several questions about their use of IWBs in their courses. The measures of Central Tendency and the measures of variability are calculated for the data collected and the worked out Mean, Median, Mode, Standard Deviation, Quartile Deviation, Skewness and Kurtosis values are shown here in the following table (see Table 1).

Table 1 Different Values for the Total Sample

N	Mean (M)	Median (Mdn)	Mode (Mo)	Standard Deviation (SD)	Quartile Deviation (Q)	Skewness (Sk)	Kurtosis (K)
174	23.9	26.2	30.8	10.7	7.2	0.083	0.345

From the above findings it can be inferred that the distribution is negatively skewed since median of the sample is greater than mean of the said sample. Also it can be concluded that the distribution is Platykurtic since the obtained value of kurtosis is greater than 0.263. The difference in means calculated

from the two groups is tested for their significance by applying appropriate statistical technique. To test whether the two groups differ significantly in mean difference, the standard error of the difference between two means is worked out.

HYPOTHESES TESTING

In order to find out the Teachers' perception and use of interactive whiteboards for teaching and learning process towards secondary school students, the major hypothesis is that "Teachers' perception and use of interactive whiteboards during teaching and learning towards secondary school students does not differ significantly in their achievement in school subjects". Further it is divided into some sub-hypotheses according to locality, type of schools, methods of teaching, use of audio-visual aids etc. The sub-hypotheses are analyzed as follows.

Sub-hypothesis 1

The teachers of urban and rural area schools do not differ significantly in their perception and use of interactive whiteboards during teaching and learning process towards secondary school children (see Table 2).

Table 2 Showing t-scores for teachers' adaptability from different area of the sample

Hailing Area of Schools	Mean	Standard Deviation (σ)	t-score	P
Urban	28.38	11.32	3.16	Significant
Rural	19.54	7.66		
Semi-urban	21.24	8.48		

The obtained "t" score 3.16 is higher than the table value at 0.01 and 0.05 levels of significance. Hence the hypothesis is rejected. It can be concluded that the secondary school teachers of urban area differ significantly in their belief in using IWBs from their contemporaries hailing from rural area schools. From the scores it is found that the teachers in urban schools have greater affinity to use Interactive Whiteboards in comparison to rural and semi-urban schools. This can be attributed to the availability of various facilities in urban schools are better in comparison to semi-urban and rural schools.

Sub-hypothesis 2

The teachers of different type of schools do not differ significantly in their perception and use of interactive whiteboards during teaching and learning process towards secondary school children (see Table 3).

Table 3 Showing t-scores for performance of different school teachers from the sample

Sources of variation	df	Sum of squares	Mean	f-score	P
Between sets	3	364.08	128.04	11.64	Significant
Within sets	597	404.02	90.66		

The computed “f” value 11.64 is much higher than the table value at 0.01 and 0.05 levels of significance. Hence the hypothesis is accepted. It is inferred from the above table that the secondary school teachers of different types of schools differ significantly in their performance according to their perception and use of interactive whiteboards during teaching and learning process at secondary level. Hence the scores are further analyzed as below (see Table 4).

Table 4 Showing t-scores for teacher beliefs from different schools from the sample

Types of Schools	Mean	Standard Deviation (σ)	t-score	P
Private	22.88	9.42	2.08	Significant
Government	28.74	8.66		
Government aided	26.04	8.45		

It is clear that the teachers of various schools do not differ in their performance and perceptions in using IWBs, but the teachers from Private and Government aided schools in comparison have significant difference in their performances and beliefs in using IWBs for teaching various school subjects. This clearly indicates that in private and some government aided schools a congenial learning climate exists. Teachers are free to use different methods and various teaching aids unlike other category of schools, hence the teachers' perception and use of interactive whiteboards during teaching and learning process towards secondary school students vary significantly as the “t” score 2.08 is higher than that of the table value. Hence the hypothesis is accepted.

Sub-hypothesis 3

Similarly the sub-hypothesis 3 was tested and one way analysis is used to find out whether the students differ in their achievement test scores after using different methods during teaching and learning process towards secondary school students (see Table 5).

Table 5 Showing Degree of Freedom and F-test result for the groups adopting various methods of teaching

Sources of Variation	Degrees of freedom (df)	Sum of squares	Mean	F	P
Between sets	56	734.14	140.6	17.9	Significant
Within sets	544	876.86	85.25		

The computed value of “F” is higher than the table value at 0.01 and 0.05 levels of significance. Hence the hypothesis is accepted. It is inferred from the above table that the difference in the achievement of students taught by teachers who adopted various methods of teaching for their perception and use of interactive whiteboards during teaching and learning process towards secondary school students is significant. But in the other method pairs the comparison of the achievement of the students differ significantly in their teachers’ perception and use of interactive whiteboards during teaching and learning process towards secondary school students. It is also inferred that the Demonstration method is observed to be the most suitable method among all as the mean achievement score is the highest among the group.

Sub-hypothesis 4

There is no significant difference in the achievement of the students taught by teachers using various audio-visual aids for teaching using interactive whiteboards during teaching learning process towards secondary school children (see Table 6).

Table 6 Showing t-scores of using different kinds of teaching aids from the sample

Teaching Aids	Mean	Standard Deviation (σ)	t-score	P
Natural things	21.56	9.76		
Audio-visual aids	21.89	10.26	1.53	Not significant

The computed value of “t” that is 1.53 is less than the table value at 0.01 and 0.05 levels of significance. Hence the hypothesis is rejected. It is inferred from the above table that the students taught by the teachers using different kinds of teaching aids do not differ significantly in their achievement for their teachers’ perception and use of interactive whiteboards during teaching and learning process towards secondary school students. It is quite clear that there is no significant difference is found in the achievement of the students taught by their teachers who use different kinds of teaching aids during teaching and learning process as they use interactive whiteboards instead for the secondary school students.

CONCLUSION

This study provides a solid example of IWB integration and IWB effects on the teaching and learning process, in a rapidly developing country like India. It should be noted that this work neither reflects the status quo of IWB use in general, nor investigates the challenges and technical issues of

IWBs as it has been suggested in Eastern Europe and other countries. Rather, it attempts to uncover the more realistic effects of using IWBs for teaching and learning by recruiting active IWB users from various fields at a certain area.

The findings from this study demonstrate the key characteristics and strategic requirements of effective IWB use, it is important to represent their background, as shown in this study, regarding IWB use including the frequency of IWB use, IWB competency, sources of IWB skills, and demographics. In general, participants were satisfied with the IWB use and they accepted IWBs as a powerful and practical technology that facilitates teachers' instructions as well as students' learning and motivation. However, findings indicate that teachers were not able to design a social constructivist environment where students could be involved in active and collaborative learning process using IWBs. Interestingly, most teachers believed that IWBs provided time efficiency for their instruction; however, a majority of them admitted that they could not find enough time to let their students use IWBs.

Results of the study also indicate a moderate correlation ($p<0.05$) in the relationships between both the frequency of IWB use and perceptions about IWBs as well as the duration of IWB use and perceptions about IWBs. These variables are regarded as the key factors for effective use of technology. In addition, most teachers confirmed that their IWB skills were improved as they used the IWBs and stated that they learned IWBs mainly from their colleagues. Therefore, it seems critical to support teacher IWB collaborations. It is expected that the findings of this study may help teachers and researchers who are interested in effective IWB use and also administrators who are responsible for integration of ICT or organizing IWB training sessions. IWBs have the potential to engage students in various activities thereby supporting their learning and development. However if we are to expect students to improve their learning in the classroom, teachers need to develop their technology skills and positive attitudes through continued collaborative training and practice.

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