Studies Evaluating the Effectiveness of IWB on Students' and Teachers' Outcomes

Liliana Mata[1], Iuliana Lazar[2], Gabriel Lazar[2]

Abstract

In recent years there is an increasing of studies based on the integration of interactive whiteboard in teaching and learning activities to improve academic results and other psychological development processes. This study aimed to analyze the current research focused on investigating the impact of interactive whiteboard IWB use on students' and teachers' outcomes. There are identified two categories of studies: one related to assessment of the influence of IWB integration on students' outcomes and another to study the effect of IWB use on teachers' outcomes under various aspects, focusing on pedagogical issues. The analysis of these studies showed the prevalence of the researches which aim at investigating the impact of IWB use on student learning outcomes. The research that have as an objective to determine the IWB integration effect on the development of teachers' outcomes are very few and mainly aim at improving technological skills. On the other side, the results of qualitative methods based on documentary research revealed that most of the studies predominantly concentrate on the use of IWB as modern technology to improve student learning informative aspects, and less on developing formative aspects of student learning.

1. Introduction

An important way of running teaching-learning activities is to use modern technologies with innovative teaching tools and a pedagogical purpose [1]. But technology itself cannot influence students' performance if teachers are not able to create a learning environment pro-active, collaborative [2] and based on assuming self-responsibility of the learning process [3]. The interactive whiteboard (IWB) is a modern technological tool successfully used at class, but also can be used to increase or improve various skills needed by pre-service teachers [4]. The main pedagogical benefits offered by the use of IWB are captured by Smith et al. [5]: flexibility; effectiveness in the use of multimedia; support in teaching design; diversity of resources; developing ICT operating skills; increased interaction and participation of students in lessons. There are also negative effects of using IWB, such as restructuring students' autonomy and restoring the teacher-centred classroom [6]. The extent to which teachers use these new tools and the degree of interactivity [7] mainly depend on the individual teachers' teaching styles. As Gatlin emphasizes [8], there are factors which are important to be taken into account in applying the new technologies, such as student motivation, educational changes, professional learning needs and the ability to effectively integrate technology in curriculum design. Considering the last factor, teachers' ability of integratind IWB, Winkler [9] notes that teachers do not benefit from training programs focused on providing best practice examples on the effective use of IWB.

2. Studies investigating the effects of using IWB on students' and teachers' outcomes

There has been an increasing interest in science education in relation to valorisation of the modern technologies [10] in recent years, with a growing number of studies based on the integration of IWB in teaching and learning activities in order to improve academic results and other psychological development processes (creativity, motivation, attitudes, etc.).

Some of these studies have mainly aimed at determining the impact of IWB use on various components of the educational process and most of the results highlight the positive effect of the use of IWB on the students' progress. The studies focused on investigating the effects of IWB use are structured in the present study on two main directions: *researches focused on assessing the influence of IWB integration on students' outcomes in terms of learning, creativity, attitudes etc*. and *studies focused on studying the effect of IWB use on teachers' outcomes under various aspects*.

[1] Faculty of Sciences, "Vasile Alecsandri" University of Bacau, Romania
[2] Faculty of Engineering, "Vasile Alecsandri" University of Bacau, Romania

2.1. Researches focused on assessing the influence of IWB integration on students' outcomes in terms of learning, creativity, attitudes etc.

The influence of IWB integration on *students*' outcomes is demonstrated in literature from the perspective of different aspects of psychological development: improvement of the cognitive outcomes; skills' development; school motivation development; stimulation of the creativity; memory development.

Most of the studies predominantly focus on the use of IWB as modern technology to improve student learning informative aspects, and less on developing formative aspects of student learning, such as boosting school motivation and students' creativity, as it can be seen from Table 1.

Table 1. Studies focused on the assessment of the influence of IWB integration on students' outcomes

Categories	Author(s)	Objectives	Methodology	Results
improving the cognitive outcomes	Amolo & Dees [11]	assessing the influence of IWB on the learning of students specializing in social studies	- participants: 26, 5th grade students; - research tools: survey, content analysis of students' journals	- students' perception towards IWB was influenced positively. - students' learning and their commitment also increased
	Riska [12]	determining the impact of using IWB on the growth of mathematical performance	- participants: 175 gifted students in the fourth grade; - research tools: pre-test and post-test	- no significant increase among gifted students
	Yang & Wang [13]	exploring the efficiency of IWB integration on the learning outcomes in Biology	- participants: 54, 7th grade students; - research tools: pre-test and post-test	- significant differences in the effectiveness of learning in Biology.
developing skills	Chen & Tsai [14]	determining the effectiveness of using IWB on reading skills	- participants: primary school students; - research tools: attitudes questionnaire	- increase in the students' interest in reading - improvement of their literacy level.
developing school motivation	Huang et al. [15]	investigating the impact of IWB use on students' learning motivation	- participants: 6th grade students; - research tools: attitudes questionnaire	- a significant difference in terms of the motivation towards learning Mathematics.
stimulating creativity	Behzadi & Manuchehri [16]	-measuring the creativity level of high school students who learn in a learning -environment based on using IWB compared to the traditional learning environment	- participants: 62 high school students; - research tools: creativity test	- significant differences between the creativity of students who learn Mathematics by using IWB and students who learn Mathematics by the traditional method.
developing memory	Norouzi et al. [17]	identifying the impact of IWB use on the retention level of the new words learned by EFL learners	- participants: 50 secondary school students; - research tools: English language skills test	- no significant difference in retention of new words when teaching vocabulary using IWB.

2.2. Studies focused on studying the effect of IWB use on teachers' outcomes under various aspects

IWB use effect on *teachers*' outcomes can be noticed in some research conducted in the development of professional skills categories: development of specialized competences, scientific concepts [18]; improvement of technological skills [19, 20].

The research that have as an objective to determine the IWB integration effect on the development of teachers' professional skills are very few and mainly aim at improving technological skills as it can be seen in Table 2. No studies were found in the literature to highlight the role of new technologies on training and practicing teachers' pedagogical skills. According to Coyle et al. [21], it is a priority for teacher training programs to focus on developing teachers' interactive teaching, as well as on technological skills.

Table 2. Studies focused on studying the effect of IWB use on teachers' outcomes

Categories	Author(s)	Objectives	Methodology	Results
developing specialized competences	Emre et al. [18]	- exploring the impact of IWB use on the results of future Science teachers on the topic of cell membrane structure	- participants: 42 students; - research tools: knowledge test, attitudes scale	- no significant difference in terms of students' performance on the topic of cell membrane structure.
improving technological skills	DeSantis [20]	- measuring the effects of professional development by using IWB on technological self-efficacy	- participants: 46 teachers; - research tools: IWB technological self-efficacy questionnaire	- no statistically significant difference between the results of teachers from experimental group and control group.
	Akyuz et al. [19]	- investigating the IWB use effect centered on micro-teaching activities on teachers' technological pedagogical content knowledge (TPACK)	- participants: 48 future teachers; - research tools: TPACK Self-confidence Scale; Interactive Whiteboard Student's Perception Survey	- positively influences the TPACK Self-confidence level. The experiment did not alter the positive perceptions of future teachers towards IWB.

3. Conclusions

The present study analysed the main pedagogical approaches of using modern techniques and explores the latest research focused on evaluating the effectiveness of IWB on students' outcomes, but especially on teachers'. The studies focused on measuring the effects of using IWB were divided into two main directions: studies focused on assessing the influence of IWB integration on improving student learning informative aspects, and the formative aspects of student learning (developing skills, boosting school motivation and students' creativity) and studies focused on studying the effect of IWB use on the development of teachers' professional skills. These studies revealed the preference of the researches which aim at investigating the impact of IWB use on student learning outcomes. Also we notice that the development of teachers' professional skills who use modern technologies are a few. There is a lack of research related to valorising IWB in order to develop teachers' pedagogical skills.

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References

[1] Kim, C., M.K. Kim, C. Lee, J.M. Spector, and K. DeMeester, *Teacher beliefs and technology integration.* Teaching and Teacher Education, 2013. 29(0): p. 76-85.
[2] Dobber, M., S.F. Akkerman, N. Verloop, and J.D. Vermunt, *Student teachers' collaborative research: Small-scale research projects during teacher education.* Teaching and Teacher Education, 2012. 28(4): p. 609-617.
[3] Smeets, E. and P. Mooij, *Pupil-centred learning, ICT, and teacher behaviour: observations in educational practice.* British Journal of Educational Technology, 2001. 32(4): p. 403–417.
[4] Davies, D., D. Jindal-Snape, R. Digby, A. Howe, C. Collier, and P. Hay, *The roles and development needs of teachers to promote creativity: A systematic review of literature.* Teaching and Teacher Education, 2014. 41(0): p. 34-41.
[5] Smith, H., S. Higgins, K. Wall, and J. Miller, *Interactive whiteboards: boon or bandwagon? A critical review of the literature.* Journal of Computer Assisted Learning, 2005. 21: p. 91–101.
[6] Tanner, H. and S. Jones, *How interactive is your whiteboard?* Mathematics Teaching Incorporating Micromath, 2007. 200.
[7] Vratulis, V., T. Clarke, G. Hoban, and G. Erickson, *Additive and disruptive pedagogies: The use of slowmation as an example of digital technology implementation.* Teaching and Teacher Education, 2011. 27(8): p. 1179-1188.
[8] Gatlin, M., *The impact of the interactive whiteboard on student achievement*. 2007, Mercer University: Mercer.

[9] Winkler, R., L., *Investigating the impact of interactive whiteboard professional development on lesson planning and student math achievement*. 2011, Liberty University: Liberty.
[10] Kabilan, M.K., *A phenomenological study of an international teaching practicum: Pre-service teachers' experiences of professional development.* Teaching and Teacher Education, 2013. 36(0): p. 198-209.
[11] Amolo, S. and E. Dees, *The Influence of Interactive Whiteboards on Fifth-Grade Student Perceptions and Learning Experiences.* Action Research Exchange, 2007. 6(1): p. 1-9.
[12] Riska, P., *The Impact of SMART Board Technology on Growth in Mathematics Achievement of Gifted Learners*. 2010, Liberty University: Liberty.
[13] Yang, K., T. and T. Wang, H., *Interactive WhiteBoard: Effective Interactive Teaching Strategy Designs for Biology Teaching*, in *E-Learning - Engineering, On-Job Training and Interactive Teaching*, S. Kofuji, Editor. 2012, InTech. p. 139-156.
[14] Chen, H., R., C. Chiang, H., and W. Lin, S., *Learning effects of interactive whiteboard pedagogy for students in Taiwan from the perspective of multiple intelligences.* Journal of Educational Computing Research, 2013. 49(2): p. 173-187.
[15] Huang, T., H., Y. Liu, C., W. Yan, T., and Y. Chen, C. *Using the innovative cooperative learning model with the interactive whiteboard to primary school students' mathematical class: Statistic vs. pie chart and solid diagram*. in *Proceedings of the 4th International LAMS Conference 2009: Opening up Learning Design*. 2009. Sydney Australia.
[16] Behzadi, M., H. and M. Manuchehri, *Examining Creativity of Students through Smart Board in Learning Mathematics.* Mathematics Education Trends and Research, 2013: p. 1-7.
[17] Norouzi, H., F. Mohammadi, A., and D. Madani, *The effect of interactive whiteboard on teaching vocabulary on Iranian EFL learners retention.* Enjoy Teaching Journal (ETJ), 2014. 2(1): p. 99-105.
[18] Emre, I., Z. Kaya, T. Özdemir, Y., and O. Kaya, N., *Effects of Using Interactive Whiteboard on Pre-service Science Teachers' Achievement in Topic of Structure of Cell Membrane and Attitudes toward Information Technology*, in *6th International Advanced Technologies Symposium (IATS'11)*. 2011: Elazığ, Turkey.
[19] Akyuz, H., I., M. Pektaş, M. Kurnaz, A., and E. Kabataş Memiş, *Akıllı Tahta Kullanımlı Mikro Öğretim Uygulamalarının Fen Bilgisi Öğretmen Adaylarının Tpab'larına ve Akıllı Tahta Kullanıma Yönelik Algılarına Etkisi.* Cumhuriyet International Journal of Education -CIJE, 2014. 3(1): p. 1-14.
[20] DeSantis, J., D., *Exploring the effects of professional development for the interactive whiteboard on teachers' technology self-efficacy.* Journal of Information Technology Education: Research, 2013. 12: p. 343-362.
[21] Coyle, Y., L. Yanez, and M. Verdu, *The impact of the interactive whiteboard on the teacher and children's language use in an ESL immersion classroom.* System, 2010. 38: p. 614-625.