

THE INTERACTIVE WHITEBOARD IN PRIMARY SCHOOL: a case study of a Brazilian district school.

Mr. Rodolfo Fernandes Esteves

PhD Student in School Education, Faculdade de Ciências e Letra, UNESP – Univ. Estadual Paulista, Campus de Araraquara – FCLAr.

E-mail: rfesteves@fclar.unesp.br

Dr. Silvio Henrique Fiscarelli (Corresponding author)

Doctor of School Education and Post-Doc in New Technologies. Faculdade de Ciências e Letra, UNESP – Univ. Estadual Paulista, Campus de Araraquara, Departamento de Didática e da Pós-Graduação em Educação Escolar da FCLAr.

Rodovia Araraquara-Jaú -Km 1 – Araraquara-São Paulo – CEP: 14800-901 – Tel:551633346244

Email: silvio@fclar.unesp.br

Dr. José Luís Bizelli

Associate Professor of Public Policy and Post-Doc in Education. Faculdade de Ciências e Letra, UNESP – Univ. Estadual Paulista, Campus de Araraquara Departamento Antropologia, Política e Filosofia e da Pós-Graduação em Educação Escolar da FCLAr.

Email: bizelli@fclar.unesp.br

ABSTRACT

Interactive whiteboards (IWB) consist of a set of technological equipment organized in order to fulfill a specific task, enabling the development of didactic activities. Because they are associated to computers' potentiality, interactive whiteboards can provide bigger interactivity between: teacher and students, students and content, and among students. This work's main objective is to present some of the results yielded from a research related to the way students perceive interactive whiteboards in the classroom. In order to analyze the IWB usage dynamics, some educational applications in the field of mathematics were applied in the 3rd grade of elementary school. Aside from observation, video recordings were made and students were interviewed about the interactive whiteboard, in order to understand how these students observe and engage with the technological tool. IWB do not transform classroom's reality by themselves, however, their physical presence and usage amount to external reinforcement can change student's behavior positively.

Keywords: Public Education, Interactive Whiteboard, ICT.

1. Introduction

Information and communications technologies (ICT) have been one of the big innovation possibilities in the teaching-learning process for little more than a decade. Nevertheless, only recently are considerable results being shown to the community. An example comes from BECTA's report (Somekh et al, 2007), which presents the introduction of new technologies such as portable computers, interactive boards and the Internet, in a combination of software, hardware and connectivity, producing significant improvement in the teaching and learning process. Additionally, E-learning Nordic (Pedersen et al., 2006) indicates not only gains in students' performance, but also in the commitment and motivation to learn.

In the last few years, studies have been made in order to demonstrate how ICT may help in improving the performance of Brazilian public education system students. Since 2009, Carlos Chagas Foundation (Fundação Carlos Chagas – FCC) has been researching the records of those who study in classrooms equipped with interactive whiteboards, individual laptops and educational software, to the detriment of those who were taught traditional lessons, in all public schools of José de Freitas, a town in countryside Piauí. Research results indicate that the students increased their mathematics average grade to 8.3 points and their Portuguese grade to 6.2. In the opposite direction, students who had no access to technology advanced only 0.2 points, both in mathematics and Portuguese. Another study, undertaken by Unesco, showed an improvement between two and seven points in relation to ordinary classrooms, among public school students from Hortolândia, São Paulo, who used interactive whiteboards and computers.

These are not the only studies trying to show the extent to which new technologies can be useful tools for learning. Also in São Paulo state, in Guarujá, students from different public schools have multimedia rooms at their disposal. In one of these schools, in order to ascertain the

degree to which ICTs facilitated students' access to knowledge, a group's performance in geography was compared in two distinct moments. While having classes in a traditional classroom, 35% of the students in the Sixth Grade (A) obtained satisfactory grades. When the group started to have classes in a multimedia room, the percentage increased to 80%.

An innovation cannot be faced in the same way by those who promote it, those who execute it and those for whom it is intended. For this reason, Hernández et al. (2000) reiterates that an innovation's recognition in school life depends on the outlook, the opinion and the relation established with it. That is, the most representative innovations are those which offered some alternative answer to the school's legitimate needs, once only this way can they be legitimated and remain in the school's culture.

In order to implement policies for the improvement of education quality, dozens of municipal school departments in Brazil have been acquiring the so-called Interactive Whiteboards, a tool acclaimed as technological resource, capable of helping teachers transmit information to their students in a more efficient and appropriate way. This work aims to present some results obtained through research (from which the Masters dissertation *Barriers to the implementation of Interactive Whiteboards – A Case Study* is derived) and thus contribute in the systematization of knowledge about this resource, so that it may be conceived as an instrument for improving education quality.

2. The interactive whiteboard

What we call interactive whiteboard consists of a set of technological equipment organized so as to fulfill a specific task. Such equipment comprise: a motor user interaction system, a projector to project information from the computer, the computer (which manages all interactions)

and the interactive whiteboard software, which offers diverse tools, enabling its users to prepare activities, presentations and actions, in conjunction with the computer's other applications.

Literature on interactive whiteboard's impact and potential is extremely positive, since it is based mainly on teachers' and students' opinions. However, a big part of the evidence of improvements on students' performances is presented in terms of affective learning rather than cognitive domain. Schroeder (2007) revealed that, in the United States and the United Kingdom, both students and teachers recognize the interactive whiteboard's value, for its versatility, multimedia resources, motivational impact, and reinforcement of concentration and attention. Students enjoyed didactic games and the interactive whiteboard was felt to affect their self-esteem. According to Schroeder (2007), interactive whiteboards take classrooms a level further, once they strongly increase students' emotions, stimulating bigger participation, giving students the possibility of interacting directly with materials and contents. In her mathematics study, Quashie (2009) verified that the interactive whiteboard contributed to easier learning of some specific mathematics topics, also showing that it influences content's retention.

Production of videos, animations and simulations are artifices that enable the creation of learning situations which are difficult or even impossible to be repeated or created in real situations. In the context of subjects which require practical intervention, such as chemistry, physics and biology, as well as in other subjects that may be facilitated with the insertion of images and videos, animations can be much more efficient than a model's description, however detailed it might be. A video can demonstrate the use of equipment unavailable to the students, in the same manner as a simulator allows students to manipulate such equipments virtually, and many more examples could be presented. Glover and Miller (2001, p. 256) identify three levels in using interactive whiteboards:

[...]

- to increase efficiency, enabling teachers to draw upon a variety of ICT-based resources without disruption or loss of pace;
- to extend learning, using more engaging materials to explain concepts;
- to transform learning, creating new learning styles stimulated by interaction with the whiteboard;

According to Schneiderman (2004), federal educational policy director at the Software & Industry Association (SIIA), “education technology is neither inherently effective nor inherently ineffective; instead, its degree of effectiveness depends upon the congruence among the goals of instruction, characteristics of the learners, design of the software, and educator training and decision-making, among other factors” (Schneiderman, 2004, p.30). Even if the aforementioned factors are approached, it is necessary to ensure that everyone uses the interactive whiteboard. Studies published in the Becta Report (Somekh et al., 2007) state that it might take an average of two years for all teachers to incorporate interactive whiteboards in their pedagogy and for them to be assimilated by students, before any impact can be measured in a significant way. Nevertheless, different philosophical teaching perspectives still exist, claiming that little can be achieved with technology in comparison with what can be achieved with traditional methodologies.

As noted by McCrummen (2010), if any technology is to make a difference in conquering knowledge, it must be used regularly and become part of the learning process. Interactive whiteboards are only one of the media which can help teachers to lead their classes, by aggregating even more value to students who are already immerse in the world of media and visual stimulation. Despite this, as Quashie (2009) infers, not all interactive characteristics will be appropriate to each and every lesson, and using interactive whiteboards without any sort of interactivity is also possible. In this sense, the teacher’s role is fundamental “[...]”to make their lessons interactive in order to engage and motivate their students”. (Curwood, 2009, p.30) Interactive whiteboards “[...] certainly aren't a one-stop solution for raising achievement in your

classroom. But under the right conditions, they can help promote student engagement and foster content area learning in a constructivist, learner-centered classroom". (Curwood, 2009, p.30).

Esteves et al. (2014) present a brief summary of Interactive Whiteboards' main applications:

[...]

- Presenting software or web resources to the whole class;
- Moving and manipulating objects in real time (Essig, 2011);
- Increasing interaction capacity between student and content;
- Being used as simulators, allowing to manipulate variables, make predictions and see phenomena which would be otherwise impossible to observe (Bell, 2002)
- Showing animations or videos to help explain concepts;
- Making the learning process more contextualized;
- Presenting students' works to the rest of the group;
- Creation of digital flipcharts;
- Text manipulation and handwriting practice;
- Saving notes and activities done by the students on the whiteboard for future analysis.

Other authors present some positive effects of the Interactive Whiteboard on teaching and learning: general benefits, for the teachers and for the students, as seen in the table 1 below.

3. Case study of a school unit

Araraquara, a city in São Paulo state, has 40 ERC (education and recreation centers), 14 municipal elementary schools, 28 state elementary schools, 15 state high schools, 17 private elementary schools and 18 private high schools. Approximately 8700 children attend the municipal nursery school network, through 35 children's education units and two preschool groups in rural areas, and 7272 students attend high school.

According to Araraquara City Hall data, 100% of its schools have broadband internet connection (02 links of 20Mbps), as a result of a municipal digital inclusion project. Currently, the city also owns approximately 46 operating interactive whiteboards, 16 of them in elementary education and 30 in the ERCs. In addition to the Interactive Whiteboards acquisition, training and continuing education services were hired and offered to teachers, educational agents, technical staff,

as well as school and Education Board managers. Initially, professionals were trained at the Board Qualification Center (Centro de Formação da Secretaria, CEDEPE) and, according to the Municipal Education Board, the continuity of such training is undertaken by agents of the board itself.

For this research, we conducted a detailed study in one of the local schools which may be considered a case of good practices with the interactive whiteboard and a model to be followed and achieved by other units. The school in question is located in Selmi Dei III, a neighborhood on the northeast outskirts of Araraquara. According to School Census/INEP 2011 data, the unit is attended by 489 students from early years (1st to 5th grade), divided in two shifts (morning and afternoon), and is served by 30 teachers. The school holds the best educational indicators in the city, and for having achieved the best IDEB¹ indicators for consecutive years, it has deservedly obtained two extra sets of interactive whiteboards.

The School Unit has eleven classrooms with furniture appropriate to the age and size of children who use them. Three out of these eleven classrooms have interactive whiteboards, two in the 3rd grades and one in the 5th grade.

The unit also maintains a computer lab with 20 operating computers connected to the internet. According to the school administration, all students visit the lab twice a week for complementary activities of either research or recreational nature, with bigger emphasis being given to mathematics contents. The lab has a monitor who oversees the activities with teachers, monitors and directs the handling of the material and website access. The school also maintains a library, playroom, playground, indoor court, indoor patio, kitchen, stockroom, bathrooms for students and staff, and wooded area.

¹ Basic Education Development Indicator (Índice de Desenvolvimento da Educação Básica, in Portuguese)

4. Analysis of classroom interactive whiteboards use

Due to a request from the administration, all uses were related to mathematics, once in 2014 the school would favor that subject in its pedagogical policies and management plan.

In order to analyze Interactive Whiteboard use dynamics, a set of educational applications in the Field of mathematics was defined in collaboration with the teachers, according to the lesson plans. In each of the groups (3rd A, 3rd B and 5th A) a preliminary observation was made (P-OB) and two suggested observations (S1-OB and S2-OB). The themes related to curriculum contents are listed in table 2:

In addition to *in loco* observation, video recordings were made during the research in order to ensure an assortment of registers about how the interactive whiteboard is being used and how its use reflects upon students. Students' behavior varies according to the amount of use they habitually make of it, that is, the more students use the interactive whiteboard, the more patient and well behaved they are. Students were not obliged to go to the board, but few refused to do so.

Noticeably, students who refused to go to the board did so because they had questions regarding the content, in other words, for fear of not knowing how to do the activity. While a student was at the board the others remained seated and attentive, but always heavily participating. For example, by making suggestions about the exercise to the classmates at the board, mainly when they made mistakes: the students corrected them, or else the student at the board exchanged information with the nearest classmate, and sometimes with the farthest classmate.

When students went to the interactive whiteboard, teachers instructed those with bigger difficulties at it: whenever it was needed, they recalled the contents and, if necessary, made some sort of intervention. However, from what was observable, presenting contents on the interactive whiteboard is not a recurrent practice, once teachers seem to be more interested in having students

to do activities on the board. Only when an activity demanded teachers to use the interactive whiteboards to present a given content to students was it possible to observe them doing so.

Finally, we briefly interviewed the students, asking them about the interactive whiteboard, aiming to comprehend how these students observe and engage with the technological instrument, as we can see in table 3 below:

In general, students see the Interactive Whiteboard (IWB) in an overwhelmingly positive way, once 62% of them claim to understand the content better when the teacher uses the resource to do activities. The vast majority (96%) enjoys going to the board and doing activities and 92% thinks doing activities on the board is more stimulating than on the notebook. However, 50% still prefers the teacher to explain the subject on the traditional board, this preference coming mainly from third-grade students - as opposed to fifth-grade students, 95% of whom still prefer the teacher to explain the contents using the IWB. A big part of the students (78%) thinks the IWB improves the visualization of images and general contents and 90% would like the teacher to use this resource more frequently. On the other hand, an interesting aspect is that a big part of the students thinks the activities and exercises developed on the IWB are conducted in a fast-paced way, that is, there is not enough time for the student to think during the exercise.

5. Final considerations

By itself, the interactive whiteboard does not change the reality in the classroom, but its physical presence and usage add external reinforcement, which may change students' behavior positively, since technology acts as a motivator. On account of often being something new, it arouses students' curiosity, making them concentrate more. It can also give rise to some indiscipline, due to the anxiety caused. Because it is directly connected to a computer, it is more

efficient for presenting certain contents, since it is possible to present them with movement and, mainly, providing complex interaction forms.

We believe interactive whiteboards are tools especially aimed at teachers' use, with contents presentation, and secondly to students' use. With current technological resources teachers can prepare their classes using diverse tools, always being able to modify them, adding or removing content fragments. Interactive whiteboards, used in all their potential by the teacher, can dynamize the presentation of contents which would be static on the traditional board, whereas on the interactive whiteboard they may be moving, they may transform into something completely new, be fractionated, multiplied, moved, among other possibilities. However, no repositories producing contents for the teachers on a large scale exist, and when such production exists, there is no possibility for the teacher to make changes to their classroom reality. Thus, we can claim that the main barrier to teachers' effective use of the interactive whiteboard is the lack of suitable and customizable applications.

Reference

Bell, M. A. (2002, January). *Why use an interactive whiteboard? A baker's dozen reasons!*.

Retrieved from <http://teachers.net/gazette/JAN02/mabell.html>

Campbell, C. & Kent, P. (2010). *Using interactive whiteboards in pre-service teacher education.*

Examples from two Australian universities, *Australasian Journal of Educational Technology*, 26 (4), pp. 447-463.

Curwood, J. S. (2009). Education 2.0: The case for interactive whiteboards. *Instructor*, 118(6), 29-33.

Digregorio, P. & Sobel-Lojeski, K. (2010) *The effects of interactive whiteboards (IWBS) on student performance and learning.* A literature review. *Journal of Educational Technology Systems*, 38 (3), pp. 255-312.

Essig, D. A. (2011). *Case Study of Interactive Whiteboard Professional Development for Elementary Mathematics Teachers*, PhD, Walden University.

Esteves, R. F., Fiscarelli, S. H., & Souza, C. B. G. (2013). *A lousa digital interativa como instrumento de melhoria da qualidade da educação – um panorama geral*. Revista Eletrônica de Política e Gestão Educacional. n.15, pp.186-197.

Retrieved from

<http://www.fclar.unesp.br/Home/Departamentos/CienciasdaEducacao/RevistaEletronica/artigo-4---a-lousa-digital...-rodolfo-fernandes-esteves1.pdf>

Esteves, R. F., Fiscarelli, S. H., & Souza, C. B. G. (2014). *As barreiras para implementação das TIC na sala de aula*. Revista Ibero-Americana de Estudos em Educação, 9 (3), pp. 583-598.

Retrieved from: <http://seer.fclar.unesp.br/iberoamericana/article/view/7619/5300>

Esteves, R. F., Fiscarelli, S. H., & Souza, C. B. G. (2014). *Barreiras para implementação da lousa digital interativa: um estudo de caso*. Dissertação de Mestrado. UNESP/FCLAr. Retrieved from:

<http://www.fclar.unesp.br/#!/pos-graduacao/stricto-sensu/educacao-escolar/teses-e-dissertacoes/>

Gerard, F. et al. (1999). *Using SMART Board in foreign language classrooms*. Paper presented at SITE 99: Society for Information Technology and Teacher Education International Conference, San Antonio, Texas, 28 February–4 March 1999.

Goodison, T. A. M. (2002). *Learning with ICT at primary level: pupils' perceptions*. Journal of Computer Assisted Learning 18, pp.282-295.

Glover, D. & Miller, D. (2001). *Running with technology: the pedagogic impact of the large-scale introduction of interactive whiteboards in one secondary school*. Journal of Information Technology for Teacher Education, 10 (3), pp.257-276.

Hernández, F. & Sancho, J. M.; (2000). *Aprendendo com as Inovações nas Escolas*. Porto Alegre: ArtMed.

Kennewell, S. (2001). *Interactive whiteboards – yet another solution looking for a problem to solve?* Information Technology in Teacher Education, 39, pp.3-6.

Levy, P. (2002). *Interactive Whiteboards in learning and teaching in two Sheffield schools: a developmental study*. Sheffield: Department of Information Studies, University of Sheffield.

McCrummen, S. (2010, June 11). Some educators question if whiteboards, other high-tech tools raise achievement. *Washington Post*. Retrieved from: <http://www.washingtonpost.com>

Pedersen, S. G.; Malmberg, P.; Christensen, A. J.; Pedersen, M.; Nipper, S.; Græm, C. D.; Norrgård, J.; (2006): *E-learning Nordic 2006- Impact of ICT in education*, Ramboll Management, Copenhagen;

Quashie, V. (2009). How interactive is the interactive whiteboard? *Mathematics Teaching*, 214, 33-38.

Retrieved from: <http://thejournal.com/Articles/2010/08/04/Interactive-Whiteboards-Truths-and-Consequences.aspx?Page=1>

Schneiderman, M. (2004). What does SBR mean for education technology?. *T.H.E. Journal*, 31(11), 30. Retrieved from <http://thejournal.com/articles/2004/06/01/what-does-sbr-mean-for-education-technology.aspx>

Schroeder, R. (2007). Active learning with interactive whiteboards: A literature review and a case study for college freshmen. *Communications in Information Literacy*, 01(02), Retrieved from: [http://www.comminfolit.org/index.php?journal=cil&page=article&op=view&path\[\]=Fall2007AR2&path\[\]=50](http://www.comminfolit.org/index.php?journal=cil&page=article&op=view&path[]=Fall2007AR2&path[]=50)

Smith, A. (1999). *Interactive whiteboard evaluation*. MirandaNet. Retrieved from: <http://www.mirandanet.ac.uk/pubs/smartboards.htm>

Smith, H. (2001). *SmartBoard evaluation: final report*. Kent NGfL. Retrieved from: <http://www.kented.org.uk/ngfl/whiteboards/report.html>

Software & Information Industry Association (2009, March 9). *Software implementation checklist for educators*. Washington, DC: SIIA. Retrieved from: <http://www.siiia.net>

Somekh, B. et al., (2007). *Evaluation of the Primary Schools Whiteboard Expansion Project - summary report*. London: Report to the Department for Children, Schools and Families.

Syh-Jong, J. (2010). *Integrating the interactive whiteboard and peer coaching to develop the TPACK of secondary science teachers*. *Computers & Education*, (55) 4.

Walker, D. (2002). *White enlightening*. *Times Educational Supplement*. p. 19.

Walker, D. (2003). *Quality at the dockside*. *TES Online*. pp. 66-67.

Sponsoring: Fapesp - Processo 2012/06526-1

Table 1 – Activities developed on the Interactive Whiteboard.

General benefits	Benefits for teachers	Benefits for students
<ul style="list-style-type: none"> •Versatility, with applications for all ages across the curriculum (Smith, A. 1999) •Increases teaching time by allowing teachers to present web-based and other resources more efficiently (Walker, D. 2003) •More opportunities for interaction and discussion in the classroom, especially compared to other ICT (Gerard et al 1999) •Increases enjoyment of lessons for both students and teachers through more varied and dynamic use of resources, with associated gains in motivation (Levy, P. 2002). 	<ul style="list-style-type: none"> •Enables teachers to integrate ICT into their lessons while teaching from the front of the class (Smith, H 2001); •Encourages spontaneity and flexibility, allowing teachers to draw on and annotate a wide range of web-based resources (Kennewell, S. 2001); •Enables teachers to save and print what is on the board, including any notes made during the lesson, reducing duplication of effort and facilitating revision (Walker, D. 2002); •Allows teachers to share and re-use materials, reducing workloads (Glover, D; Miller, D. 2001); •Widely reported to be easy to use, particularly compared with using a computer in whole-class teaching (Smith, H. 2001) •Inspires teachers to change their pedagogy and use more ICT, encouraging professional development (Smith, A. 1999). 	<ul style="list-style-type: none"> •Increases enjoyment and motivation; (Syh-Jong, J. 2010; Digregorio; P. Sobel-Lojeski, K. 2009) •Greater opportunities for participation and collaboration, developing students’ personal and social skills; (Levy, P. 2002); •Reduces the need for note-taking through the capacity to save and print what appears on the board; (Levy, P. 2002); •Students are able to cope with more complex concepts as a result of clearer, more efficient and more dynamic presentation (Smith, H. 2001); •Different learning styles can be accommodated as teachers can call on a variety of resources to suit particular needs (Bell, 2002); •Enables students to be more creative in presentations to their classmates, increasing self-confidence (Levy, P. 2002); •Students do not have to use a keyboard to engage with the technology, increasing access for younger children and students with disabilities (Goodison, T.A.M. 2002); •Improves performance (Syh-Jong, J. 2010; Digregorio; P. Sobel-Lojeski K. 2009; Essig, 2011; Campbell; C. Kent, P. 2010)

Source: ESTEVES, R. F. et al. (2013). A Lousa Digital Interativa como Instrumento de Melhoria da Qualidade da Educação – um panorama geral.

Table 2 – Applications used for developing activities on the Interactive Whiteboard.

GROUP	P-OB	S-1-OB	S-2-OB	S-3-OB
3rd A	Golden Material	Arranging Numbers	More than a Thousand	X
3rd B	Forming 10	Arranging Numbers	More than a Thousand	X
5th A	Golden Material	Correct the Result	Space and Location	Perimeter and Area

Source: Esteves, R. F. (2014). Barreiras para Implementação da Lousa Digital Interativa - Um estudo de caso. Masters dissertation.

Table 3 – Answers from students' interviews

GROUP QUESTION/ANSWER	3 rd A		3 rd B		5 th A		AVERAGE	
	YES	NO	YES	NO	YES	NO	YES	NO
Do you understand the lesson better when the teacher uses the interactive whiteboard?	70%	30%	78,94%	21,06%	40%	60%	62,98%	37,02%
Do you enjoy going to the interactive whiteboard and doing exercises?	95%	5%	94,73%	5,27%	100%	0	96,58%	3,42%
Do you prefer that the teacher only explains the content without using the interactive whiteboard?	95%	5%	52,63%	47,27%	5%	95%	50,88%	49,12%
Are you ashamed to go to the interactive whiteboard?	40%	60%	15,78%	84,22%	55%	45%	36,93%	63,07%
Do you think doing exercises on the interactive whiteboard is more enjoyable than on the notebook?	100%	0	89,47%	10,53%	95%	5%	94,82%	5,18%
Do you think the exercises on the interactive whiteboard are too fast?	100%	0	89,47%	10,53%	85%	15%	91,49%	8,51%
Do you think you can see images better on the interactive whiteboard?	100%	0	84,21%	15,79%	50%	50%	78,07%	21,93%
Do you think the teacher should use the interactive whiteboard more?	95%	5%	100%	0	80%	20%	91,67%	8,33%

Fonte: Esteves, R. F. (2014). Barreiras para Implementação da Lousa Digital Interativa - Um estudo de caso. Masters dissertation.