

The Technological Plan for Education and the ICT Teachers' Certification in Portugal: A Case Study of the Use of Interactive Whiteboards

Daniela Guimarães, *danidesg@gmail.com*

Secondary School of Idães, Felgueiras, Portugal

Ana Amélia Carvalho, *anaameliac@fpce.uc.pt*

Faculty of Psychology and Education Sciences, University of Coimbra, Coimbra, Portugal

Abstract

Interactive Whiteboards were largely introduced in Portugal through the Technological Plan for Education that also empowered teacher education training in their use. In this paper we present the conclusions of a case study that has been developed in the Sousa Nascente Association of Schools Training Center. The study focuses on 386 trainees from different subject areas, the trainers and the Director. The reported data include trainees' reactions to the training collected by two questionnaires, an interview to the Sousa Nascente Association of Schools Training Center's Director and a questionnaire implemented to the trainers. Results allow concluding that there is a contrast between the positive reaction to the training by the trainees and their use of the IWB in the classroom one year later.

Keywords

teachers' training in Portugal, Technological Plan for Education, interactive whiteboards.

INTRODUCTION

The adoption of new tools is not always consensual in education and teachers have a natural resistance to change. Concerning the full integration of Interactive Whiteboards (IWB) it is no exception. Despite several studies showing they are an efficient tool in the teaching process (Betcher & Lee, 2009; Wong et al., 2013) specially in regard to motivation issues (Glover & Miller, 2001; National Centre for Technology in Education, 2008) there is still much resistance about its current implementation and use (Glover & Miller, 2001; Santos & Carvalho, 2009).

Interactive whiteboards potential is enormous and allows, for example:

- To explore layers that enable the user to move some objects without changing others from place (Betcher & Lee, 2009);
- To present works in more interactive and collaborative ways, show video clips, use other educational software or display Internet resources (National Centre for Technology in Education 2008);
- To save, edit and retrieve stored data and to easily browse between flipchart pages (Betcher & Lee, 2009);
- To empower flexibility and versatility, multimedia/multimodal presentation, modelling ICT skills, efficiency, supporting planning and development of resources (Smith et al., 2005);

- To e-mail the materials produced and presented in several formats (Betcher & Lee, 2009);
- To improve the behaviour of pupils with special education needs, despite the relatively small impact on raising their attainment (Somekh et al., 2007).

Despite its potential, some concerns can be reported, namely: the shadow caused by the projector screen (Betcher & Lee, 2009); the trouble that sunlight can cause when is directly on it (Smith et al., 2005); technical support issues and a steep learning curve in the initial stages of interaction (National Centre for Technology in Education, 2008).

LITERATURE

Teachers' training was legislated in Portugal for the first time in 1986 (Lei 46/86). In 1990 the Teachers Professional Development (TPD) arose associated to career progression (DL 139A/90). Since then, several authors criticized the training as it was viewed almost exclusively as a means of obtaining credits for a career and not as a need to update knowledge and discover new practices (Batista, 2009; Pereira, 2008). Later, in 2007, the Portuguese Government published, in law (RCM 137/2007), a diagnosis study about the use of ICT in Portugal that intended to modernize Portuguese education. In this study three problems were identified: first, some schools had obsolete ICT technology; second, teachers needed to fully adopt ICT technology thus making imperative the ICT teachers' certification and, third, the need of a digital model that could be adopted in school management. Besides this diagnostic study, the Technologic Plan for Education (TPE) also arose from government policies. This document aimed to equip Portuguese Schools with IWB, computers connected to Internet, printers and projectors, using European Community funds. Moreover, TPE aimed to implement a TPD with four years of extension through four fifteen-hour courses that aimed to provide the certification of ICT teachers' in three levels, being the first one the most basic and the third, the most advanced. The first phase would cover only 30% of teachers. Table 1 below explains the organic training, per calendar year, as was thought prior to its suspension, due to financial constraints. The designation G1 was used for the first 30% of teachers, G2 for the following 30% and G3 for the last 30%.

Table 1: Training teachers scheme call

Year	Group	Number of hours of training	Contents
2010	G1	15	IWB or Other themes
2011	G1	15	To be defined
	G2	15 + 15	IWB or To be defined
2012	G1	15	To be defined
	G2	15	To be defined
	G3	15 + 15	IWB or To be defined (both)
2013	G1	15	To be defined
	G2	15	To be defined
	G3	15 + 15	To be defined (both)

Therefore, it was only between July and December 2010 that the first fifteen-hour course was fulfilled. This course was entirely designed centrally, by the Ministry of Education and implemented by the Association of Schools Training Centers (ASTC) throughout the country. Most courses were dedicated to the use of Interactive Whiteboards in different subject areas. However, in a much smaller scale, there were two other courses, namely "School Library, Literacy and Curriculum" and "ICT Teaching and Learning in preschool and 1st cycle (1st to 4th grades)".

METHOD

A qualitative research was developed with the design of a case study (Yin, 2009) in Sousa Nascente training center. Two questionnaires, applied to the trainees, were used to collect data: one, of the responsibility of the Ministry of Education applied at the end of the training, and another one, developed exclusively for the research, applied one year later, based on UTAUT (Unified Theory of Acceptance and Use of Technology) model (Venkatesh et al., 2003). It allows to explain about 70% of the behavior variation in the acceptance of technology. The first questionnaire evaluates the training's immediate impact and the other intends to identify the training impact one year later and if the trainees were using IWB effectively.

Besides, a questionnaire to the trainers was also developed aiming to identify constraints founded before and during the training's implementation. A part of it was also based on the UTAUT model, since we wanted to know how the trainers interacted daily with IWB.

Finally, the ASTC of Sousa Nascente's Director was interviewed to provide some insight on the interaction between the different ASTCs and how the center directors organized the training's implementation among themselves.

PRESENTATION OF RESEARCH

Sousa Nascente Association of Schools Training Center implemented the training course of TPE about the use of IWB, under the 2010 plan, to 386 trainees.

The 19 classes are characterized in table 2, which contains the course name, number of classes, the number of trainees per class, the number of sessions, and hours per session and course duration.

Table 2: Organization of IWB training in the ASTC of Sousa Nascente (n = 386)

Course name	Number of classes and trainees	Number of sessions (hour)	Duration
Interactive Whiteboards in Portuguese Language	Class 1: 19 Class 2: 21	3 x 5h 5 x 3h	1 Week 1 Month
Interactive Whiteboards in Foreign Languages	Class 3: 22	3 x 5h	1 Week
	Class 4: 20 Class 5: 20	5 x 3h	1 Month
Interactive Whiteboards in Mathematics	Class 6: 20 Class 7: 20 Class 8: 21	5 x 3h	1 Month
Interactive Whiteboards in Humanities and Social Science	Class 9: 20 Class 10: 20	5 x 3h	1 Month
	Class 11: 20 Class 12: 20 Class 13: 20	3 x 5h	1 Week
	Class 14: 21 Class 15: 20 Class 16: 21	5 x 3h	1 Month
Interactive Whiteboards in Sciences	Class 17: 21 Class 18: 20 Class 19: 20	5 x 3h	1 Month

The study in progress is centered in Sousa Nascente ASTC and it intends to investigate the impact that IWB training has had in the teachers' practice and aims to answer the following questions:

- Have the teachers of the Sousa Nascente ASTC, who received IWB training, started to integrate this technology into their lessons?
- How often do they use the IWB?
- Is the IWB used taking into account its real interactive potential or just to be operated as a traditional framework or as projection screen?

Trainees' opinion about IWB training

At the end of the training the trainees answered a questionnaire, designed by the Ministry of Education, using a five points Likert scale. It included four dimensions – overall assessment of the training, assessment of trainers, organization of the training by the center and overall assessment. From all the questions, we enhance those in table 3 which are particularly important to the study. We present the mean for each question and the partial mean by class and subject area. The questions were:

1. The training has met my training needs;
2. The acquired skills will have an impact on my teaching practice;
3. After this training I will use ICT in the teaching/ learning process more often;
4. The duration was appropriate;
5. Overall assessment.

Table 3: Reactions to the training (Ministry of Education questionnaire) (n=386)

Subject Area	Classes	Question				
		1	2	3	4	5
Portuguese Language	1	4,7	4,6	4,5	3,9	4,2
	2	4,3	4,2	4,2	4,0	4,2
Foreign Languages	3	4,1	4,2	4,5	3,5	3,3
	4	4,0	3,9	4,2	4,2	4,0
	5	4,4	4,3	4,3	4,4	4,3
Mathematics	6	4,5	4,6	4,5	4,3	4,2
	7	4,5	4,3	4,4	4,3	4,3
	8	4,6	4,7	4,6	4,3	4,6
Humanities and Social Science	9	3,9	3,8	3,8	4,0	3,7
	10	3,7	3,7	3,8	3,0	3,7
	11	4,3	4,4	4,5	4,2	3,9
	12	4,3	4,3	4,3	3,6	3,5
	13	4,4	4,4	4,4	4,0	4,2
Arts and Expressions	14	4,4	4,5	4,5	3,8	4,3
	15	3,9	3,9	4,0	4,0	4,0
	16	4,5	3,9	4,2	4,3	4,7
Sciences	17	3,4	3,2	3,4	4,2	3,3
	18	4,3	4,0	4,1	4,1	4,0
	19	3,9	3,8	4,1	4,5	4,3
Global Mean	-	4,2	4,1	4,2	4,0	4,0

The presented values allow us to conclude that globally the training courses have been well-accepted by the trainees, since the mean varies from 3.0 to 4.8 considering that the overall mean, per question, varies from 4.0 and 4.2. This first impression seems promising in what concerns the inclusion of IWB into trainees practice. Class

17 of Sciences' teachers had the lowest scores to several questions, namely at the three first questions.

Trainees' use of IWB

One year after the training course, the trainees answered a questionnaire (Babbie, 1997) about their use of IWB purposely designed for the research. From 386 trainees, 229 (59%) answers were collected. Below we present the characterization of the trainees as well as their answers.

- Sample characterization

In terms of age, figure 1 shows that the highest percentage of respondents age ranged from 40-49 years old (46%). Most of the trainees (65%) are in their forties and above. Most trainees who have answered the questionnaire (74%) are female.

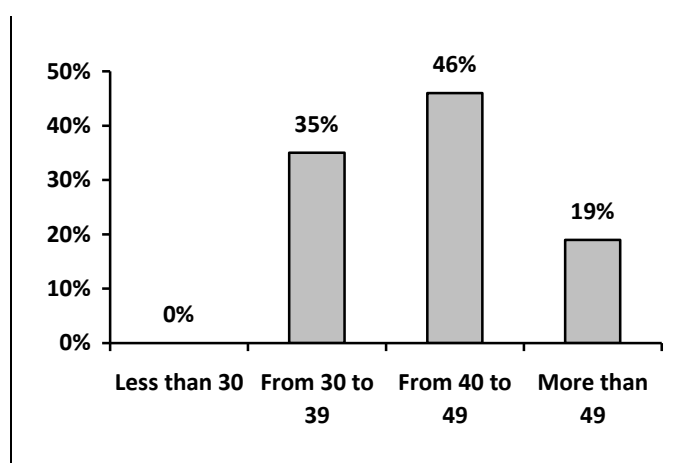


Figure 1: Respondents' age (n=229)

- About the training and the use of IWB

Eight questions focus on the training and use of the IWB. A Likert scale of five points was used: 1. Strongly Disagree; 2. Disagree; 3. Undecided; 4. Agree; 5. Strongly Agree, and the results are available in Table 4.

Table 4: The training and the use of IWB (n=229)

About the training and the use of IWB	Likert Scale (%)					Mean
	1	2	3	4	5	
The training has contributed to my professional development	5	7	21	51	16	3.7
IWB is effective in the teaching/ learning process	0	4	16	60	20	4.0
I have the suitable knowledge to use IWB	4	23	18	46	9	3.3
I feel comfortable to use IWB	4	32	23	34	7	3.1
Using IWB is easy	3	21	29	43	4	3.4
Using IWB improves my work	3	13	33	41	10	3.4
The person who evaluates me recognizes the importance of IWB	6	15	46	27	6	3.1
At school I have the required means to use IWB	14	27	15	31	13	3.0

Despite the IWB being effective in the teaching/learning process (mean 4.0) and the training has contributed to trainees' professional development (mean 3.7), trainees do not consider that they have the suitable knowledge to use it (mean 3.3), they do not feel comfortable about its use (mean 3.1), they do not consider it easy to use (mean 3.4) and schools do not have the required means to use IWB (mean 3.0).

- About IWB use in practice

Asked if they were using IWB, 37% of the trainees were but 63% were not. From those, 11% admit that despite not having used it they intend to do it during this school year (figure 2).

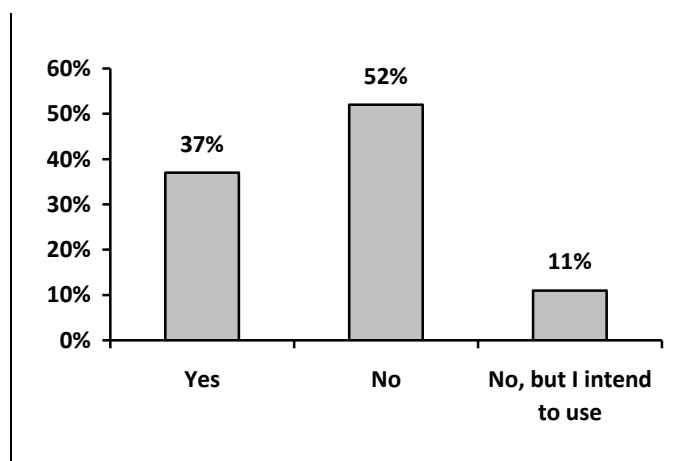


Figure 2: Use of IWB (n=229)

The reasons presented for not using the IWB are several (Table 5) although the most frequent answer is the absence of this resource in all classrooms (47.9%). However, the lack of time to prepare the lessons (16.7%), the impossibility of using it, since not all the teachers teach in equipped rooms (15.3%) and insufficient training (15.3%) are reasons with higher percentage.

Table 5: Reasons for not using IWB (n=144)

Reasons for not having used IWB	f	%
There are no IWB in all classrooms	69	47.9
Lack of time to prepare the lessons	24	16.7
There is not an IWB at school	22	15.3
Insufficient training	22	15.3
Content not appropriate to use IWB	12	8.3
Technical problems or software problems	11	7.6
Lack of practice	11	7.6
Insecurity	8	5.6
Lack of didactical material to use in IWB	7	4.9
Do not like IWB	5	3.4
No particular reason	5	3.4
Delay in the program	2	1.4
No exchange experiences	2	1.4
Lack of refresher courses	1	0.7
Lack of motivation to use it	1	0.7
Had retired	1	0.7

Of the 85 (37%) trainees who use the IWB, 50 (59%) mentioned that they have produced materials to work with the IWB (table 6). Concerning the sort of materials that they have produced we identify that the use of PowerPoint presentations (74%), the resources of the IWB software (62%) and the didactical software (54%) are the most selected options.

Table 6: Sort of materials produced for the IWB (n=50)

Resources used in the production of materials	f	%
PowerPoints	37	74
IWB Software	31	62
Didactical Software	27	54
Others (Applets, HotPotatoes, Video)	3	6

Most of the trainees (84%), who use the IWB in their lessons, have reused materials to work in the IWB (Table 7).

Table 7: Source of the materials reused in the IWB (n=71)

Source of the materials reused	f	%
Sites	55	77
Teachers	38	54
Own materials	7	10
Didactical Software	3	4
Does not specify	3	4

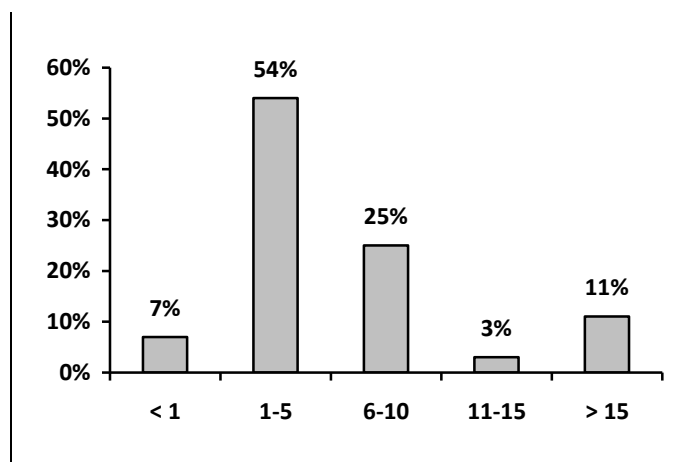
In what concerns the origin of the materials reused, a great part admit being from websites (77%), from teachers (54%) and 10% reuse their own materials (table 7). A few reuse didactical software (4%) and a few did not specify their choice (4%).

Most of the trainees use the IWB to explore the interactivity (85%), however 62% admit using it to project contents and 26% use it as a traditional board (table 8).

Table 8: Use of the IWB (n=85)

Purpose of the use of the IWB	f	%
To explore the interactivity	72	85
To project contents	53	62
To use as a traditional board	22	26

In Figure 3 it is possible to identify the number of times the teachers usually use the IWB per month.

**Figure 3:** Number of days per month of IWB use (n=85)

The use of IWB is still reduced, with 7% of the trainees reporting that they use it less than one time per month and 54% use it between 1 to 5 times a month. The percentage declines to 25% when the usage is referred as 6 to 10 times a month. A minimum percentage of 3% of the trainees use the IWB from 11 to 15 times a month, but more than 15 times is indicated by 11% of the teachers.

Training Center Director's interview about IWB training

The interview to the Training Center Director of Sousa Nascente has allowed us to understand some important issues related to the training.

It has enabled us to realize that the training provided was initially designed as a 25-hour workshop and not as a 15-hour course. Moreover, he has reported that this shortened version was contested by several Training Center Directors, since it was mandatory for teachers to progress in their career to fulfil 25 hours of training yearly.

The Director has also explained that some of the courses were condensed into just three or four days because their timeline overpassed the end of the school year. However, other courses were implemented throughout a whole month because they occurred during the school year. When asked about the difficulties in implementing the training, the trainers' profile was pointed out. Not always the highly regarded trainers were the most successful ones. Some classes, namely class 17 of Sciences and class 10 of Humanities and Social Science, had the lowest scores in several questions in the Ministry of Education questionnaire. The Director mentioned that it could have happened a mismanagement during the training process or for some other reason, since the training is a complex process.

Finally, the Director has pointed out as a weakness the suspension of the training without any suitable justification and without an effective evaluation of the full process.

Trainers' opinion about IWB training

Two years after the training course, the trainers (n=20) involved in the mentioned Training Center were inquired about the training and their own use of the IWB. 14 (70%) trainers answered our questionnaire. Below there is the characterization of the trainers as well as their answers.

- Sample characterization

In terms of age, 36% ranged from 30-39 years old and more than 49, and no subject is under 30 (figure 4). More than half of the respondents were females (57%).

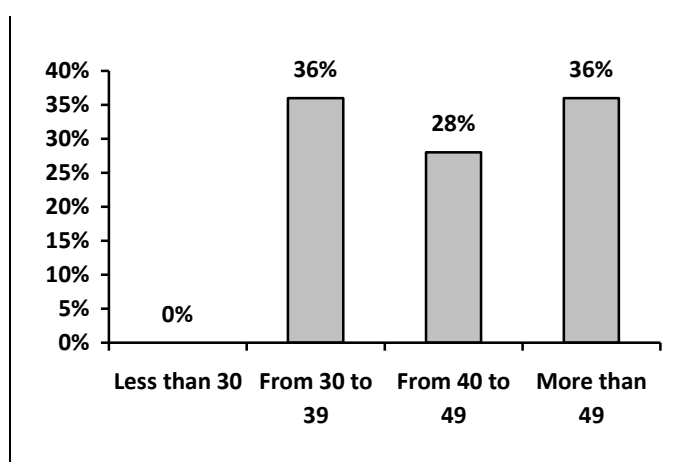


Figure 4: Trainers' age (n=14)

Most respondents (76%) have been teachers' trainers for a period of at least 5 years, and 21% have trained teachers for less than 5 years.

- About the use of IWB

Four questions focused on the use of the IWB and a Likert scale of five points was used: 1. Strongly Disagree; 2. Disagree; 3. Undecided; 4. Agree; 5. Strongly Agree.

Using IWB is easy (mean 4.4) and learning to use it was also easy (mean 3.9), however at school trainers do not have the required Software to use IWB (mean 3.4) and they are not regular IWB's users (mean 2.8).

Table 9: About the use of IWB (n=14)

About the use of IWB	Likert Scale (%)					Mean
	1	2	3	4	5	
I use the IWB regularly	21	29	7	36	7	2.8
Learning to use IWB was easy	0	14	7	50	29	3.9
Using IWB is easy	0	0	7	43	50	4.4
At school I have the required Software to use IWB	29	7	7	14	43	3.4

- About IWB training

The training was provided by one or two trainers. Only one trainer was provided when he/she had scientific and technical competences. Otherwise it was necessary the participation of two trainers, one was responsible for the scientific issues (9 hours of training) and the other was responsible for the technological issues (6 hours of training).

Most trainers (71%) have had preparatory training given by the Ministry of Education and only (29%) had not.

From those who received previous IWB training, only 30% consider that it was enough for the training. The majority of the trainees claimed that it was a short time training – one day only, and it required self-learning.

From those who considered that the training received in the Ministry of Education was enough, they said that they were taught IWB basic skills and the training was an excellent base of work.

Most trainers (93%) worked in pairs and only 7% worked alone. They were asked if they liked to work in pairs, and all of them (n=14) liked the experience.

Despite the training did not imply the trainers' presence for 15 hours, 62% of them decided to do it. The reasons pointed out were to connect the contents with the partner and support each other, to enhance technical knowledge or due to the trainer's lack of scientific or technical knowledge.

The majority of the trainers (79%) have considered that the training was not enough to make the trainees regular IWB users, while only 21% consider that it was enough (table 10).

Table 10: Points of view related to the course duration (n=14)

Opinion	Justification	f	%
The training was not enough because (n=11)	Short time for the training course	9	64
	It requires previous basic technological skills	3	21
	Most trainees could not practice with an IWB outside the training	2	14
	New knowledge was not practiced enough because the classes had too many trainees	1	7
	Classes were very mixed-ability	1	7
The training was enough because (n=3)	The training provided the teachers with basic skills	3	21

According to the trainers, the strengths were related to sharing experiences, a friendly mood, the combination of the technological and scientific parts of the training, and the trainees' interest, among others. The weaknesses of the training were the short time, some trainees with lack of previous computer skills, too many train-

ees in each class, some schools were not equipped and the trainees' could not practice.

CONCLUSION

Despite the initial expectations about the trainees' IWB use, only a small percentage (37%) admit to use it regularly. Several reasons are pointed out for not using it, from which not having an IWB in all classrooms is the most significant, followed by the lack of time to prepare the lessons, the lack of an IWB at school and insufficient training. While trainers consider that it is easy to use an IWB, curiously they do not use it regularly. The Training Center Director of Sousa Nascente was also interviewed and he pointed out the importance of the IWB training and he stresses as a weakness the suspension of the training without an effective evaluation.

REFERENCES

- Babbie, E. (1997). *Survey Research Methods*. Belmont: Wadsworth Publishing Company.
- Batista, T. M. F. (2009). *Impacte dos Quadros Interactivos nas Escolas do Concelho de Oliveira do Hospital*. [Impact of interactive whiteboards in schools of Oliveira do Hospital] Master's Dissertation. Aveiro: Universidade de Aveiro.
- Betcher, C., & Lee, M. (2009). *The Interactive Whiteboard Revolution: teaching with IWBs*. Australia: ACER Press.
- 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): 257-278. Retrieved from <http://dx.doi.org/10.1080/14759390100200115>
- National Centre for Technology in Education (2008). *Interactive Whiteboards*. Advice sheet 16, Nov., 1-7. Retrieved from <http://www.ncte.ie/documents/advisesheets/16InteractiveWBsNov08.pdf>
- Pereira, A. S. C. A. (2008). *Integração dos Quadros Interactivos Multimédia em Contexto Educativo* [Integration of Multimedia Interactive Boards in Educational Settings] Master's Dissertation. Aveiro: Universidade de Aveiro.
- Santos, M. I., & Carvalho, A. A. A. (2009). O Digital e o Currículo. Os Quadros Interactivos Multimédia: da Formação à Utilização. [The Digital and the curriculum. Interactives Whiteboards: from training to use] *VI Conferência Internacional de TIC na Educação*, 941-954.
- Smith, H. J., Higgins, S., Wall, K., & Miller, J. (2005). Interactive whiteboards: boon or bandwagon? A critical review of the literature. *Journal of Computer Assisted Learning*, 21. 91-101.
- Somekh, B., Haldane, M., Jones, K., Lewin, C., Steadman, S., Scrimshaw, P., Sing, S., Bird, K., Cummings, J., Downing, B., Stuart, T. H., Jarvis, J., Mavers, D., & Woodrow, D. (2007). *Evaluation of the Primary Schools Whiteboard Expansion Project*. Becta.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: toward a unified view. *MIS Quarterly* 27(3), 425-478.
- Wong, K. T., Goh, P. S. C., & Osman, R. (2013). Affordances of Interactive Whiteboards and Associated Pedagogical Practices: Perspectives of Teachers of Science With Children Aged Five to Six Years. *The Turkish Online Journal of Educational Technology*, Vol. 12, 2013: 1 – 8, Issue 1. Retrieved from <http://www.tojet.net/volumes/v12i1.pdf#page=12>
- Yin, R. (2009). *Case Study Research: design and methods*. 3rd ed. Thousand Oaks (CA): Sage publications.

Biographies



Daniela Guimarães is a mathematics teacher at Secondary School of Idães, Portugal. She is a teacher trainer, she has a Masters Degree in Educational Science and she is a PhD student at Faculty of Psychology and Education Sciences, University of Coimbra, Portugal. She has published several papers in conferences related to educational technology.



Ana Amélia Carvalho is a full professor at Faculty of Psychology and Education Sciences, University of Coimbra, Portugal. She has published books, chapters of books, and papers in journals and conferences related to educational technology, teacher education and training. She has coordinated several research projects. She has organized conferences and she was a member of the Program Committee of WCCE'2009 and of WCCE'2013. She is the TC3 Secretary and the National Representative for Portugal in TC3.

Copyright

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/3.0/>