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Education and Information Technologies
The Official Journal of the IFIP Technical Committee on Education

ISSN 1360-2357

Educ Inf Technol
DOI 10.1007/s10639-012-9228-6

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Abstract Interactive Whiteboards (IWBs) are a relatively new, but increasingly more common, tool in the classrooms of Flemish Secondary schools. This paper reports on research which attempted to map not only the amount of IWB use in Flemish secondary schools but, perhaps more importantly, to assess how they are used and the progress of teachers in developing their IWB skills in the classroom. An online quantitative survey was conducted, based on a detailed IWB transition framework. The survey (*n* =433) identified the distribution and usage levels of the IWB by teachers in Flemish Secondary Education. The results show that the distribution of IWBs is affected by the educational network to which a teacher belongs. In terms of the level of IWB use, teachers classified themselves predominantly in the first two stages of the transition framework (Black/ Whiteboard Substitute and Apprentice use). This would suggest that teachers in Flemish Secondary Education have been initiated (in a technological sense) in using the IWB and are beginning to initiate (in a pedagogic sense) wider usage, including incorporating pupil use of the IWB. In this process, however, teachers appeared to be more confident in technical use of the ICT skills, but less confident in developing new pedagogic approaches which may exploit the full potential of the IWB.

Keywords Interactivewhiteboard · Transitionframework · Onlinequantitativesurvey · Teachers · Flemishsecondaryeducation

1 Introduction

Interactive Whiteboards (IWBs), or digital school boards (digiboards) as they are often called in Flanders, are a relatively new phenomenon, perhaps not as technology, but certainly as a classroom tool. The main focus for growth in IWB use has been in the United Kingdom, where government investment in IWBs led to "an exponential increase in their numbers in UK schools" (Mercer et al. 2010). Higgins et al. (2007), in a review of literature, note that the uptake and impact on pedagogy of the IWB is not, however, restricted to the UK, but is increasingly apparent in other countries. This has been supported in recent years, by many IWB studies being published internationally including from Germany, (Cutrim Schmid 2010), Turkey (Somyürek et al. 2009; Turel 2011), Brazil (Freire et al. 2010), Hungary (Lavicza et al. 2010), South Africa (Slay et al. 2008), Taiwan (Jang 2010), USA (López 2010) and particularly Australia (for example, (Bennett and Lockyer 2008; Holmes 2009; Serow and Callingham 2011)).

The present study was prompted by the growing use of IWBs in Flanders and the potential for an increase in number over the coming years (Messenger 2009), seen within the current state of ICT use in Flemish and European education—as reported in 'Key Data on Learning and Innovation through ICT at School in Europe 2011' (EURYDICE 2011) and in the MICTIVO project (Clarebout et al. 2010). The latter study also mapped the number of IWBs in Flanders and showed that there are more IWBs in mainstream and special secondary education than in primary schools and that the amount of IWBs in a secondary school fluctuates from zero to ten. Having the IWBs, however, does not guarantee that they will be used, nor that they will be used in the most effective way. This paper arises from research carried out by Van Laer (2011) and his first attempt to map not only the amount of IWB use in Flemish secondary schools and, perhaps more importantly, to assess *how* they are used and the progress of teachers in developing their IWB skills in the classroom. To do this the research used an established transition framework to describe the evolution of the IWB-use by Flemish secondary teachers.

2 Literature review

The IWB may in essence be regarded as a projected computer that can be manipulated and controlled on the touch-sensitive surface of the board using a pen or fingers (depending on the manufacturer). The large screen enables the clear projection of text or images (still and moving) for a whole class, which is why it has been suggested that the IWB is particularly suited to whole class teaching (Gillen et al. 2007).

Miller and Glover (2010) argue that the value of an IWB in the classroom is related to the presentation and motivational qualities of the IWB technology. Researchers such as Buckinghamshire (2002), Austin (2003), Jamerson (2002), Ekhami (2002), Blanton (2008), and Branzburg (2008) focus on additional benefits such as gains in flexibility and versatility and stress the motivating power of the IWB. Such advan- tages do, however, require an investment in time for the development of IWB materials (Dillenbourg and Traum 2006; Miller, Glover, and Averis 2005; Walker 2002). Additional potential drawbacks regarding the introduction of the IWB relate to

pragmatic concerns about where and how they are installed to allow them to be seen and accessed effectively (Bell 2001; Miller, Glover, and Averis 2008; Smith 2001; Tameside 2003) and technical problems, which may be overcome when there is access to adequate support (Miller et al. 2008). The end result is that IWBs can be embedded only if all stakeholders, including the school board and parents are aware of the reasons for introducing them (Passey 2006).

Despite the growth in IWB use outlined above, and the potential advantages, the research literature is far from unanimous regarding the added value of the IWB. The benefits outlined by Higgins, Beauchamp and Miller's literature review of the IWB (2007) include: the IWB can capture and maintain pupils' attention; increase the speed of lessons; model conceptual ideas novel ways; and make it easier to integrate and use a range of multimedia resources in lessons. The benefits of multimodal use of the IWB have also been highlighted by others (for example Maher 2011). More recently, as teachers become more confident in using the IWB, research has also highlighted its potential to orchestrate classroom dialogue (Mercer et al. 2010). All of the above, however, remain of limited use in education unless it can help in enhanc- ing learning and on this matter the literature is much from unanimous. Some large- scale studies in the UK show that the IWB can lead to some gains in learning, but this is not consistent across abilities. The main factor leading to attainment gains is the length of time the IWB has been in the classroom (Somekh et al. 2007), leading to the technology becoming embedded in the teacher's pedagogy. During this process, however, the teacher (and indeed the pupil) has to make both technical and pedagog- ical changes as they learn new skills and see the potential for these in teaching and learning. It is these challenges that present a potential barrier to the effective intro- duction and further use of the IWB in educational settings.

3 Transition frameworks

In this context, the ability to measure or quantify teacher development is important. Frameworks, and typologies, which attempt to measure progress in the transition of both technical and pedagogical changes have been developed by various scholars including, in chronological order: Beauchamp (2004); Haldane (2007); Miller and Glover (2007); Lewin et al. (2008); and Jones and Vincent (2010) (developed from Beauchamp 2004)).

These frameworks can be considered in two broad categories, those that involve pupil use of the IWB and those that do not. In the first category Lewin et al. (2008) suggest a three-stage model that concentrates on teachers' pedagogic development. They chart the use of the IWB as a mediating artefact which helps teacher move from a situation where they embed the IWB into their established pedagogy, to a situation where they skillfully and intuitively use the IWB to 'extend and transform' their pedagogic practice. A similar focus on the teacher is reflected in the 'typography' of Haldane (2007 and 2010) which suggests five generic stages from 'foundation' to 'flying', reflecting the 'competence development' of teachers. The 'flying' stage is compared to the creativity of a jazz musician (Haldane 2010) reflecting the emphasis in the model on the development of technical skills, albeit used for pedagogic purposes. Miller and Glover (2007) propose a three stage model (supporteddidactic,

interactive and enhanced interactive) where the teacher moves from using the IWB as visual support through to using the IBW as an integral part of the teaching, exploiting the interactive potential of the IWB.

The use of the IWB by teachers *and* pupils is reflected in Beauchamp's original model (which will be returned to in detail below), which has five detailed stages. Jones and Vincent (2010), in turn developed a four-stage model (examining teachers' skills, ICT usage and management) using two stages from Beauchamp (2004) as the two 'extremes' of progress. They suggest Beauchamp's mid-stages are 'judgmental' and instead introduce two alternatives: experimental and interactional. Overall they categorise three elements of practice (Teacher skills, ICT usage and Classroom management and pedagogy) for each of the four stages. Overall, they reflect Beau- champ's suggestion that the IWB moves from being a tool dominated by the teacher, to a mutual tool for pupils and teachers to construct meaning.

All of these models provide useful indicators but Beauchamp provides the most detailed model and it has been used and validated in international studies, including use in Turkey (Türel and Johnson 2012), South Africa (Thinyane et al. 2008) and particularly in Australia (for example, (Bennett and Lockyer 2008; Holmes 2009; Serow and Callingham 2011). Given this international use, and the greater detail in the model allowing teachers to map their use across a range of domains, Beauchamp's framework was adopted as the focus for the study reported here.

Beauchamp (2004) describes a transition from 'blackboard substitute' to 'synergistic user' in five phases and in four domains: operating system use and file management (OS), mechanical skills (MS), program variables (PV) and classroom management and pedagogy (CMP). Each phase contains characteristics of the four domains for both teachers *and* pupils—see Table 1 below. Indeed, the growing and more sophisticated use of the IWB by pupils is a central facet of the move to synergistic use of the IWB (by both teachers and pupils). Of the four domains, three

Table 1 Example within the four domains in phase 1 (Beauchamp 2004)

Black / whiteboardsubstitute			
Operating system use and file management (OS)	Mechanical skills (MS)	Program variables (PV)	Classroommanagement and pedagogy (CMP)
1.1 Predominant use of text and drawing on the IWB – opening program	1.1 Teacher learningto write and draw on the IWB	1.1 Predominant use of native IWB software with perhaps one additional word processingprogram	1.1 Board used by teacher only
1.2 Limited use of storedfiles (e.g. *Word* files with spelling lists or grammar exercises) – openingfiles	1.2 Use of IWB pen to navigate theoperating system (click and drag) in place of mouse		1.2 Quicker pace to lessons
1.3 Changes made to filesand annotations rarely saved			1.3 More eye contact with class
			1.4 Presentation of information over questioning

(OS, MS and PV) relate primarily to hardware and software skills, which both pupils and teacher learn and apply. The fourth (CMP) is perhaps the most important in facilitating the use of the other three and also reflects the pedagogical vision of the teacher, as it requires pupils at the advanced stages of the transition to become equal partners in using the IWB to influence the course of the lesson. As such, they become co-constructors of knowledge. In the context of the research reported here, it was judged that, given the relatively short time the IWB had been available to participants in the study, the fifth stage of the transition (Synergistic user—requiring both pupils and teachers to have 'advanced' skills) would not be suitable (although it will be outlined below).

Taking account of the above, the different transition phases in the Beauchamp (2004) may be summarized as:

Phase 1, *Black/Whiteboard Substitute.* In this phase the teacher uses the IWB as a simple substitute for the chalkboard and continues to teach in a familiar teaching style. The IWB use is what Beauchamp (2011) has later labeled a 'passive tool'.

An detailed example of the four domains within this phase is shown in Table 1 but other stages are summarised:

Phase 2, *Apprentice User.* In this phase teachers are "beginning to reassess their own practice in the light of greater technical ability" (Beauchamp 2004, p. 335) and begin to let pupils use the IWB themselves. The teacher uses a wider range of computer skills but the trajectory of lessons is mainly linear in direction.

Phase 3, *Initiate User.* The key advance in this stage "is an awareness of the potential of the IWB to change and enhance practice" (Beauchamp 2004, p. 338). In this phase teachers combine their own skills with those of their students and a new practice appears. An important feature of this stage is that teachers consciously plan for pupil use of the IWB as an integral part of learning. The teacher now sees the potential of the IWB and would 'never go back to not using it'. The initiate user is therefore a teacher "who is *initiated* (in a technological sense) and also one who is able to *initiate* (in a pedagogic sense)." (Beauchamp 2004, p. 338)

Phase 4, *Advanced User. In this* stage teachers move "beyond a fascination with technical capabilities, towards the excitement of discovering their impact on teaching and learning." (Beauchamp 2004, p. 340) Alongside a grow- ing use of peripheral devices (such as visualisers or IWB 'Slates') with the IWB, teachers also acknowledge the greater skills of their pupils by handing over 'power' in lessons, including using the IWB in unplanned or spontaneous moments. By now the IWB has becomes an 'active tool' (Beauchamp 2011) in learning for both teachers and pupils to interact through and with.

Phase 5, *Synergistic User.* At this final stage of IWB use, "Teachers are able not only to see how the technology works on a functional level, but are also able to see how this can be used to facilitate a synergy of learning in

which pupils and teacher combine joint technical skills and teachers' pedagogic vision to create a new learning praxis. It is the realization that the IWB can create a new freedom in pedagogy, and is not an end in itself, or a means to deliver existing practice in another format, which perhaps encapsulates this final stage in the transition framework." (Beauchamp 2004, p. 343)

As already outlined above, this final stage was not included in the study below but remains available for future study.

4 Method

The research had two fundamental aims: firstly, to establish availability of IWBs in Flemish secondary education; and, secondly, to explore the way they were used by teachers. Scheys(2010a)helps to describe the relevant educational landscape and the teacher popula- tion in the school year 2009–2010 (Scheys 2010a) is shown in Table 2 below:

In choosing a suitable method to research this population three core characteristics were considered: the large number of respondents in the target population; the geographical distribution; and finally the complexity of collecting the contact infor- mation of the respondents. As it was likely that the respondents in the target population were likely to be included in the 80 % (Taylor 2010) of the Belgian population who have access to the Internet, an online quantitative questionnaire was selected as the most appropriate instrument. There are many benefits in such an approach such as high response rates (Glover and Bush 2005), being potentially easier to administer than paper surveys, allowing anonymity and less work than paper-based surveys (Harlow 2010). There are also, however, limitations such as the possibility of self-selection bias (where those who choose reply, for example, have an interest in the IWB) (Wright 2005) or the non-representative nature of the Internet population (Eysenbach and Wyatt 2002). In the latter case, the use of carefully selected networks (see below), ensured as much as possible that only secondary school teachers in Flanders replied. On balance, as these issues are not unique to online surveys, and if care was taken not to generalise the findings, it was decided that the potential advantages outweighed any disadvantages so an online question- naire was developed.

Before developing the online questionnaire, however, in view of the concerns about online questionnaires above, it was important to determine how this questionnaire could

Table 2 Number and percentage of teachers in total and per gender per educational network

Educational network	Number of teachers	Number of females	Number of males
Education of the Flemish Community (Go!)	13,775 teachers (19.81%),	8,203 female teachers (59.55%)	5,572 male teachers (40.45%)
Publicly funded, privately run schools (VGO)	48,909 teachers (70.33%)	30,197 female teachers (61.74%)	18,712 male teachers (38.26%)
Publicly funded, publicly run education (OGO) (provinces and cities)	6,860 teachers (9.86%)	3,536 female teachers (51.55%)	3,324 male teachers (48.45%)
Total	69,544 teachers (100.00%)	41,936 female teachers (60.30%)	27,608 male teachers (39.70%)

be brought to the attention of the respondents. To try and encourage schools to respond they were contacted from a list using multiple and carefully timed contacts, such as pre- notificationof the project, the actual invitation to participate and a number offollow-ups. (Dillman 2000) The process began with an e-mail to the principals of the schools which outlined the research and asked them to pass the link to their teachers. As there was the potential for schools to 'filter' this invitation (for instance to those who may reflect the school in a favourable light), other channels were also used to disseminate the link to the survey. These were KlasCement, Flanders' biggest portal for educa- tional content and publication on the website of digiborden.be (digiboards). This was followed by the actual invitation, including the link and password and a letter with general information on how to use the survey.

Besides the introduction, the actual invitation and subsequent reminders, there were other opportunities for interaction between respondents and the researcher. Once respondents were invited and had found their way to the questionnaire, the introduc- tory page of the online questionnaire tried to persuade the respondents to take the time to complete the questionnaire, to motivate them by showing the simplicity of the task, to reassure them the data would be secure and confidential, and to instruct the respondents on how to complete the job.

The tone of the introduction to the questionnaire was important and took account of the Bauman et al. (2000) view that the traditional letter-style introduction is unsuccessful. Nevertheless, the introduction also had to outline important ethical issues regarding the security of the data and the confidentiality of responses to the questionnaire. To maintain cooperation and secure trust from the respondents, it was important that they were assured that at all times their data would be securely stored and rendered anonymous (de Leeuw et al. 2008).

After initial questions collecting demographic information about age, gender, school and district, and so on, a series of statements were formulated to assess teachers'development in using the IWB. The questions reflected the first four stages of the Beauchamp framework above, with statements reflecting elements of each of the domains (see, for example, Table 1 above), allowing a mapping of responses against stages and domains. As the study did not attempt to measure the frequency of use or attitudes towards the IWB, it was decided to use a dichotomous response option (Yes, I do [when necessary] / No, I do not [when necessary]) to ensure clear and unambiguous responses.

Examples included:

- I use the IWB software to write on the board.
- I use the IWB software to draw on the board.
- I keep interesting websites in my browser (Internet Explorer) under favorites, bookmarks, etc.
- My resources are stored in a structured way.
- I keep notes on an existing document by using "SAVE AS …".
- I use scanned images on the IWB.
- Only I use the IWB.
- The students use the IWB.

Once the questionnaire has been developed, a pilot study was undertaken to

ensure participants both understood the questions and were able to complete the online survey successfully. After this was completed, and any necessary changes made, the survey was deployed as above.

5 Analysis

The results below reflect the views of 433 teachers. Once results had been collected a logistic regression analysis was conducted to trace the effect of the personal data on the availability of the IWB. Data regarding the sample was tested relating to sex (A1), age (A2), work regime (A3), experience in education (A4), experience in school (A5), educational network (A6), education form (A7) and educational stage [4 stages in secondary education: year 1 & 2, 3 & 4, 5 & 6 and 7] (A8). A model with eight independent categorical variables was used. The null model (with only constant) showed
the following indicators: −2LL=512.475 with df=1. Afterwards a model was created with all the data (nominal variables). This model has the key indicators −2LL=469.634 and df=9. If both models are compared it is clear that model 2 (nominal variables), is better (Chi_2 =10.094, Hosmer and Lemeshow Test >0.05). Following analysis of the significance of the different personal data towards the IWB possession of the school where the respondents work for, only educational network (A6) was withheld (p<0.001) as significant predictor for the availability of the IWB.
To trace the effect of the personal data on the IWB-use another logistic regression was conducted. A model with eight independent categorical variables was used. The null model (with only constant) shows the following indicators: −2LL=399.403 with df=1. Afterwards a model was created with all the data (nominal variables). This model has the key indicators −2LL=363.685 and df=9. If both models are compared
it is clear that model 2 (all nominal variables), is better (Chi_2 =10.640, Hosmer and Lemeshow Test >0.05). After analyzing the significance of the different personal data towards the IWB use, only educational network (A6) (p<0.05) and education form (A7) (p<0.05) were withheld as significant predictors for the use of an IWB.

After analyzing the personal data of the respondents, and considering the goals for the study, a descriptive analysis was performed to understand the current state of teachers' IWB use. To provide a clear picture, percentages of teachers' situation per concept are presented. These concepts were measured by using constructs. These constructs measured the following properties::

1. Operating system and file management (OS), Mechanical skills (MS), Program variables (PV) and classroom management and pedagogy (CMP) and;
2. Level of use (Black and white board substitute (1) Novice user (2) Initiate user (3) and Advanced user (4))

A total of 16 constructs were designed. For internal consistency and reliability, Cronbach's Alpha coefficients were calculated and interpreted for each theme based on the rules (.90= high level, .80= moderate, .70= low level, .60= acceptable level, and <.60= unacceptable level) (Murphy and Davidshofer 1991).

To determine if teachers belonged to a certain domain within a stage in the transition framework a standard setting (cut score) was needed. A criterion-referenced standard of 80% was adopted, where only if a teacher scored 80% on

a certain domain were they considered part of the relevant phase—otherwise they were allocated to the previous phase. To determine this standard the findings of Berk (1986) were taken into account. After calculating the individual scores of the teachers percentages of teachers per phase were calculated and will be discussed below.

6 Results and discussion

Before making wider assumptions it was necessary to establish if the teachers who responded to the survey represented the general population. As there were 433 respondents from 241 schools, although individual school differences were not identified, Table 3 below suggests that the actual data collection may be assumed to be a representative sample of the population and thus the findings can usefully form the basis of discussion for the population as a whole.

In answering the first aim of the study to assess the availability of the IWB in Flanders, the first key findings were that 70.75% of respondents stated their school has an IWB and 61.67% (43.74% of total) of these teachers use the IWB. Within these schools 15.67% of teachers (11.11% of total) reported that their school also possesses IWB-related technologies (clickers, IWB-tablets, etc.). It is important to note, however, that 83.06% of respondents whose school did not have an Interactive Whiteboard said that they would like to use an IWB.

In addressing the second research aims, to assess *how* they are used and the *progress* of teachers in developing their IWB skills in the classroom, the data made it possible to show the distribution of the amount of teachers per usage level over the different phases and in the different domains. Of these domains, three (OS, MS and OV) can be called technical and would reflect teachers' skills. On the other hand, the fourth domain, classroom management and pedagogy (CMP), is more pedagogical and didactic and thus more reflective of teachers' fundamental beliefs about teaching. The distribution of teachers within the domains was also a useful test of the validity of the framework's use as a measure of progress, which will be returned to below.

Table 3 Comparison between population and sample by gender, educational network and age

		Population (*n*=69,544)	Sample (*n*=433)
Gender	Female	60.30%	59.40%
	Male	39.70%	40.60%
Educational Network	Go!	19.80%	28.50%
	OGO	8.90%	10.40%
	VGO	70.30%	61.10%
Age	<25 years	3.50%	5.50%
	25–29 years	13.90%	15.90%
	30–39 years	25.40%	28.90%
	40–49 years	23.30%	28.50%
	50–59 years	30.20%	21.00%
	> 60 years	3.70%	0.20%

As can be seen in Table 4, teachers placed themselves on all categories of IWB use. This helps us feel some confidence in their honesty in making such self-assessments and also helps to validate the Beauchamp transition framework as an effective way of measuring progress. Given that teachers had access to IWBs for varying periods of time, this spread may be expected, but we should note that most teacher responses placed themselves in the novice and initiated user categories. What is apparent, however, and supporting the original decision to omit the final 'syner- gistic' category in the framework, is that few teachers placed themselves within the advanced user categories in any domain. Although, again, this may be expected due to the relatively short time the IWB has been available, it is also reassuring in terms of the validity of the model in measuring progress. This is balanced by the fact that a significant amount of teachers placed themselves in the first 'blackboard substitute' category for all domains except OS. This may reflect the fact that many teachers will be familiar with operating systems and file management from their own personal PC use, both within and outside of school. Indeed, this is reflected by this domain being the most highly rated in the Advanced user category. This confidence in more general ICT skills may also help account for the anomalous figure for MS in the Novice use category. Given that figures for Blackboard substitute are similar to other domains, it is suggested that many teachers rated themselves higher for this domain given that this is the highest figure in the Initiate user category—but not transferred to Advanced user, again helping to validate the framework.

It is worth considering the potential impact of this in the context of technological pedagogical content knowledge [TPACK]. The concept derived from the work of Mishra and Koehler (2006) who presented a model which attempted to identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge. At the heart of the TPACK framework, is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK) (Koehler 2011). The results from this study suggest that in Flemish school there is a lacuna in pedagogical skills (PK) regarding IWB use, but a growing confidence in using the Technology (TK).

This is supported by data from the CMP domain results, shown in Table 4, which demonstrate a range of practice in using the IWB in the classroom. Key findings from this data are that teachers are more confident when only they use the IWB (statement 8. If only I use the IWB, I feel confident =84.6%) and that most (over 90%) do not

Table 4 Percentage of teachers per phase and domain (construct) (n=149)

	Black and white board substitute	Novice user	Initiate user	Advanced user	Total
Operating system and file management [OS]	10,34%	38,82%	41,35%	9,49%	100%
Mechanical skills [MS]	30,17%	16,46%	48,10%	4,22%	100%
Program variables [PV]	32,49%	26,16%	39,66%	3,38%	100%
Classroom management and pedagogy [CMP]	28,69%	34,81%	31,43%	5,91%	100%

use IWB-related hardware, such as voting devices, cameras and so on – although this may be because they are not available. The latter finding would perhaps also support the exclusion of the synergistic category from the original questions as very few would appear to be able to exploit the potential of such devices at present (Table 5). Despite the above, responses to statements 1 and 2 suggest that a significant majority of teachers do allow their pupils to use the IWB as well. Statements 3–7 and 9 suggest that teachers are, however, structuring this use before allowing pupils to take greater control (statements 10–12) and move to a more equal partnership(state- ments 13–15). As these statements reflect the CMP aspects of the framework we can again suggest that it may be useful in both monitoring the development both pupil and teacher use of the IWB. The anomaly in these results is in the response to statement 15 regarding spontaneous use of the IWB during the lesson. Whilst this response is welcome, it does seem at odds with the more structured use outlined in other responses. Due to the wording of the statement it is not possible to ascertain if this spontaneous use is by teachers or pupils, and it is difficult to draw any further conclusions from the data as we cannot check how teachers interpreted the statement. It is possible to use the IWB spontaneously in the highly structured lesson, but the intention was to try and assess if teachers were moving towards a more synergistic use. In this instance, we will note that a significant percentage of teacher, and/or pupils, felt confident enough to use it spontaneously which is encouraging in the relatively short time they have been available. Further research is thus needed for

Table 5 Use of IWB by teacher and pupil (*n*=149)

ID	Statements used	% No	% Yes
1	Only I use the IWB.	81.2	18.8
2	The students use the IWB.	30.2	69.8
3	I use the IWB as a teaching tool, input from the students is of secondary importance	67.1	32.9
4	I provide exercises in which students develop their IWB skills. For this I put the appropriate tool (e.g. blue pen) ready.	77.9	22.1
5	I put the appropriate 'tool' (e.g. highlighter) ready for the students.	71.8	28.2
6	I provide exercises in which students write words on the IWB. Here I put the pen ready.	67.8	32.2
7	I provide exercises where the students highlight text. Here I put the highlighter ready.	77.2	22.8
8	If only I use the IWB, I feel confident.	84.6	15.4
9	I provide exercises in which students develop their IWB skills. Here I tell them what 'tool' (e.g. pen) to use.	75.8	24.2
10	The students select the appropriate 'tool' (e.g. highlighter) to perform a task on the IWB.	63.8	36.2
11	I give students assignments as: "Highlight in green." without the highlighter set ready.	71.1	28.9
12	I give students an exercise on the IWB without telling to us what 'tool' (e.g. blue pen) to use.	62.4	37.6
13	The students use the IWB even if this is not specifically part of the lesson.	72.5	27.5
14	The students also use the IWB when an exercise is not specific related to the IWB.	73.2	26.8
15	The IWB is used spontaneously during the lesson.	22.8	77.2
16	I use IWB-related hardware (e.g. voting systems, tablets, document cameras, etc.).	90.6	9.4
17	The students make use of voting systems	97.3	2.7

uncovering deeper, psychological factors that impinge on teachers' decisions to use an IWB or not, and on which level.

In addition, the Technology Acceptance Model "theorizes that an individual's behavioral intention to use a system is determined by two beliefs: perceived usefulness, defined as the extent to which a person believes that using the system will enhance his or her job performance, and perceived ease of use, defined as the extent to which a person believes that using the system will be free of effort." (Venkatesh and Davis 2000, pp. 186–187). Perceived usefulness and perceived ease of use might be two factors that determine the eventual level teachers reach after some experimenting with IWBs.

Self-Determination Theory (Ryan and Deci 2000) on the other hand defines six regulation styles which lead to behaviors ranging from *non-self determined* to *self-determined behavior*: non-regulation, external regulation, introjected regulation, iden- tified regulation, integrated regulation and intrinsic regulation. The correlation between Beauchamp's levels and these regulation styles, are relatively easy to identify within a given population, and would reveal another dimension of the interplay between actual behavior and the extent to which teachers determine their own behavior.

A third approach would be a further analysis into teachers' subconscious goals. Colpaert (2010) described an elicitation technique, based on theory and practical experience, for identifying personal goals. These personal goals can be considered subconscious volitions that hamper or stimulate someone's performance. Additional focus groups or in-depth interviews could yield more information about possible conflicts between teachers' personal and professional goals, and about their impact on teachers' decision to use IWBs on a specific level.

7 Conclusions

The aims of this research were to map not only the amount of IWB use in Flemish secondary schools and to assess *how* they are used and the progress of teachers in developing their IWB skills in the classroom. Beyond the results about IWB use outlined above it was found that within the study sample group the distribution is affected by the educational network to which a teacher belongs and this was a relevant predictor for the presence of an IWB at the school. Teachers who work in schools of the Flemish Community (Go!) have the biggest chance to have an IWB available at their schools, followed by the teachers in publicly funded, publicly run education (OGO). The teachers in publicly funded, privately run schools (VGO) have the smallest chance to have an IWB in their schools. This trend is similar to the findings of the MICTIVO report (2010) (Clarebout et al. 2010), which suggests that proportionally more schools from Go! have an IWB, than schools from other educational networks.

In examining how the IWB was used and teachers' progress in developing relevant skills, a range of usage and skills were outlined. This happened in all domains, but the influence of existing ICT skills means that progress was assessed by teachers as greater in the related technical domains (OS, MS and OV). Such a range of responses would be expected if the tool measuring them is appropriate, and the results support the notion that Beauchamp's framework may be an effective tool to map

develop- ment. Given the progress made by teachers, it is suggested that any future research would also need to include suitably nuanced questions to allow and assessment of progress within the 'synergistic' stage of theframework.

Although at this moment most teachers in the sample have yet to discover all the potential added value of the IWB, we may conjecture that as teachers, and their pupils, develop higher levels of pedagogical IWB-use, they will then discover potential synergies and the added value of this technology in teaching which could be the subject of furtherstudy.

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