Case Study

What role does the textbook play in the era of the Interactive Whiteboard? A didactic approach to teachers' professional writings

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Abstract

This article presents the questions raised and the first results of an exploratory study in the field of didactics that investigates, from a subjectivist perspective, the processes of search, selection and adaptation of teaching or learning resources by teachers, and in particular when an interactive whiteboard (IWB) is used. In continuation of the studies on the "documentary work" performed by teachers, we seek to identify how this process varies according to the disciplines taught. We will focus on the cases of teachers who primarily or exclusively use textbooks.

Keywords: *didactics; digital resources; IWB.*

Introduction

The development, utilization and transformation, as well as the search, circulation and exchange, of resources, be it in or outside the classroom, play a decisive role in the work of teachers (Barrère 2002, p. 59 sqq.). These various actions prompt us to consider the strictly didactic dimension, i.e., the dimension related to teaching and learning contents[1], as central to teachers' work (Daunay, eds., 2011, p. 16 sqq.).

The question of resources has taken on new significance and form due to the massive introduction in classrooms of digital tools that can make all the work carried out by a teacher on the basis of resources, more visible in the eyes of the teacher him/herself, of the students, of the parents and of the educational institution. Yet this question has thus far been little examined in research studies, and the context that has recently emerged

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[1] In Frenchspeaking research, didactics is a field of research that studies questions concerning teaching and learning in the school milieu. In particular, it focuses on the teaching and learning of specific contents, as opposed to the much broader questions raised by pedagogical research.

from the growing importance of digital tools used in schools calls for an investigation into this area[2]. It is with this in mind that we have undertaken an exploratory, specific and clearly delineated research study on the resources used by teachers (in late primary or early secondary school) to prepare their classes in the era of the IWB[3].

Our goal is to identify, describe and characterize, from the perspective of teachers, the educational or pedagogical resources used, and in particular IWBs: How do teachers use, combine and modify the available resources? What sources of teaching material do they prefer : colleagues, collaborative teacher networks, schools' websites, textbooks, newspapers and magazines, documentary websites? What strategies do they use to assess the relevance and adequacy of the resources for teaching their students? How do they adapt these resources to the needs of their students and to their objectives?

In order to address these questions we have adopted a subjectivist standpoint by focusing on the processes of classification and categorization conducted by the teachers themselves, as well as the methods of selection and evaluation of resources they implement effectively [4].

We will first discuss the sources of our theoretical reflections and provide some terminological clarification and methodological indications. We will then focus the discussion on the first results of our research: the importance given to the textbook both in the teachers' discourse and in the classroom practices observed. We will discuss the reasons, from the teachers' view point, for the renewed use of a tool that may be perceived as "traditional" in the digital age, as well as how teachers use the traditional textbook for writing documents to be used in the classroom.

The sources of didactic questioning

In the approach we have adopted, research questions are at the intersection of the study of three items: digital tools, teachers' professional writings, and their documentary work.

Didactic approaches to digital educational technologies and the IWB

Existing didactic studies on the IWB have mostly focused, in the French-speaking environment[1] on the functionalities of IWBs, on the subject of their diffusion and adoption by teachers (Villemonteix and Beziat, 2013), on the skills teachers must acquire and their needs in terms of training (Meyer, 2012) or on their representations of the tool (Boulc'H and Baron, 2011). Analyses that focus, among other things, on teachers' work (Numa Bocage, Clauzard and Monchaux, 2011, Skutil and Manenova, 2012, Turel and Johnson 2012), indicate that the IWB has been integrated into standard classroom practices and mechanisms. In Anglo-Saxon literature on the subject - more abundant than French-speaking literature - a number of studies have concentrated on the perceptions of the

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[2] This has prompted the ANR (National Agency for Research), led by Éric Bruillard, to undertake the current extensive project that consists of: firstly, a large-scale study on the resources used by teachers in four disciplines taught in secondary education, using various institutional sources; and secondly, an analysis, by monitoring a panel of teachers, of the recent changes in their practices.

[3] The research, conducted over a 15 month period, was commissioned by a district in the Lille area, in the context of the deployment of IWBs in Lille schools, and funded by the Senate.The project was led by Cédric Fluckiger, with the collaboration of Sylviane Bachy and Bertrand Daunay.

[4] Some of the results of this research were presented at the JOCAIR 5 symposium, Paris-Descartes, 26-28 June 2014 (Fluckiger, Bachy, Daunay, 2014).

[5] Where they are still relatively rare, probably due to the fact that France is lagging behind in terms of equipment (Boulc'h and Baron, 2011; ETIC survey, 2010), especially compared to Britain (where 100% of primary schools are equipped with IWB).

learners regarding the use of IWBs (Hall & Higgins, 2005), on the development of the pedagogical creativity of teachers (Wood et Ashfield, 2008) and on the impact of IWBs on teaching strategies (Higgins, Beauchamp and Miller, 2007; Türel and Johnson, 2012). The results of these studies reveal positive feedback from the learners in that IWBs allow access to wider resources than the ordinary blackboard does, e.g., it provides access to the internet, game programs, videos, assessment tasks, and works done by others (Hall & Higgins, 2005). In addition, according to Higgins et al. (2007), the ease with which elements from the different settings can be combined and integrated into teachers' presentations enables them to develop lessons more adapted to the different learning profiles. However, no research study has specifically examined the effect of the IWB on teachers' relations to resources.

In addition to the IWB, the recent development of digital technology raises new research questions about teachers' resources due to the introduction of new teaching tools, to changes in teacher-learner practices (research and dissemination of information or documents into networks that are more or less independent from academic institutions, etc.), and to the emergence of new institutional requirements (common knowledge foundation, etc.). Alongside the prescribed school textbooks, teachers have access to multiple sources enabling them to design and prepare their lessons: material borrowed from colleagues, posted on personal websites, disseminated via collaborative teacher networks, proposed by academic websites, etc. In particular, the presence of an IWB in the classroom gives teachers the opportunity to offer a variety of document formats to their students: images and graphs, texts, exercises, videos, sounds, etc.

Given the number of possible resources available, the question arises as to how teachers manage to respond to the challenges facing them. How do they choose, select and assess the relevance and validity of these resources and documents? E.g., in science or history, what criteria do teachers use to assess whether the resource is suitable for the level of students of a particular class? What types of exercises does it enable learners to practice? Under what conditions does it foster investigative processes? In what way is it adapted to the learning objectives of the lesson? What changes or adaptations can be made to it? What is its origin? What are its underlying point(s) of view or value (s)? How are those point (s) of view and value (s) compatible with the principles and missions of the school (see Bruillard, 2007, on Wikipedia)? How do teachers master those complex dimensions of resources, making choices and deciding how to use them? What references do they construct? What types of resources can they share easily? What, in terms of these resources, do they decide to modify and adapt for their pupils, e.g., keep a graph, but edit the text?

The above-mentioned questions are in line with those raised by Mishra and Koehler (2006). They study the systemic links found between pedagogical practices (teaching methods), the use of technology and the disciplinary content. This theoretical model is known as Technological and Pedagogical Content and Knowledge (TPACK). Bachy (2014) has added personal epistemology to this theoretical model by discussing the beliefs and perceptions of teachers in relation to other elements of the system.

More specifically and regarding the IWB, four elements seem to contribute to this evolution in the management of resources:
- The large number of possible sources of educational or didactic materials that teachers with an IWB can use, allows them to integrate resources with different origins and forms into their classroom practices (Higgins et al, 2007);
- The integration of new online media sources enables teachers to choose from a wider

range of resources. The resources can be modified and adapted differently to suit the disciplines taught (Higgins et al. 2005). This leads to the analysis of the organization, management and compilation of resources of various types in different disciplines;

- Changes in the views on the teaching and learning contents and practices that accompany the adoption of new educational technologies (Mishra and Koehler, 2006) raise the question of teachers' perceptions on the use of documentary resources, particularly digital ones;
- Finally, the IWB enables (and to a large extent encourages or even forces) teachers to make modifications in the "text" of the documents and resources, in the course of the lessons (Bastide and Fluckiger, 2013). This changes their relations to resources that can no longer be considered as distinct and autonomous "sources".

Teachers' professional writings

The questions raised by research on the use of digital technology in the work of teachers are close to those concerning teachers' professional writings, which remain a "blind spot of research" (Daunay, 2015), which Françoise Clerc already noted in 1999. Indeed, the professional writings of teachers have received little attention outside training situations, even in the many studies performed by the Language and Work Network (Lazar *coord*., 1999; Borzeix, Fraenkel*coord*,. 2001/2005). Neither have disciplinary *didactics* produced extensive studies on the professional writings of teachers. This is probably due to the fact that classroom tools, such as exercise books or blackboards, have been given little attention in the field of *didactics* (Nonnon, 2004).

However, a comprehensive approach to teachers' writings has been proposed from a didactic perspective, in a book (Daunay ed., 2011) that reports on a collective research project. This approach is didactic in the sense that its aim is to understand the didactic element of teachers' writings, and to examine what makes the teachers "didactic subjects" in their writings. Because the research project and Daunay's book were only intended to describe the *writings* produced, certain aspects were overlooked - the actual writing process, and also the reading process. Furthermore the focus placed on teachers' writings on paper have led the researchers to overlook an important aspect of this realm of teachers' writings: the role of electronic writing, which has only been discussed during interviews.

This approach to teachers' writings shows, among other things, the discrepancy between the observed importance of teachers' writings in their professional exercise and the lack of recognition of the producers of those writings, i.e., the teachers themselves as educators and researchers. Thus, it has contributed to uncovering disciplinary specifities in teachers' writings and writing practices on the basis of indicators that can potentially help in the description of the categories of writings (the recipients, circulation between the actors, time factors, public or private status, genres, etc.), which are all methodological paths to be explored.

Preparing a lesson plan, creating a handout for students or a document to be projected on the IWB, including combining and arranging various resources, is undoubtedly an activity whereby teachers produce written materials. This is why the above-mentioned results prompt an examination of the writing processes that specifically pertain to class preparation. More particularly, they call for an examination of the processes of adaptation and modification of resources that occur during "documentary work" performed by teachers (Gueudet and Trouche, 2008).

Educational resources

Educational resources, particularly digital resources, have been the subjects of several studies. Bibeau (2006) for example, proposes a taxonomy of educational resources. Baron and Dané (2013) distinguish three modes of resource validation - via an institution, private means or via a community. These studies point to the question of the typologies or of the validation processes used by the actors themselves.

Gueudet and Trouche (2008, 2010) have, for their part, concentrated on the documentary work of teachers. According to them, "the growth of the internet" has made available a wealth of resources that has changed the work of teachers and contributed to the development of collective work.

They define resources as follows: "We give this word a very broad meaning: a textbook, school curricula, software dedicated to education are, of course, resources (they are part of what the Anglo-Saxon literature calls the material curriculum)." (Gueudet and Trouche 2008). They show "the importance of the documentary work of teachers, the variety of sources from which their work draws, the evolving nature (especially because of the rise in digital technology) and the complexity of what it produces, the interweaving of individual and collective factors"(ibid.).

They propose a specific approach they call "the documentary approach to didactics", inspired by Rabardel's instrumental approach (1995). In their view, a teacher's activity consists of searching for, combining, designing, and reviewing resources for teaching. Then they develop what they call the document (by analogy with the concept of the instrument in the instrumental approach) incorporating both the re-combined resources and utilization patterns "saturated with professional experience and knowledge." Thus, they talk of "documentary geneses". Furthermore, and again using an approach rooted in the theory of activity – including Engestrom's works (1987) - they examine the collective forms of this work as well as communities of practice of teachers, in the sense meant by Wenger (1998).

Based on these works, we have formulated a minimal definition of what we consider a resource. A resource is what a teacher consults, creates, modifies, adapts with the conscious objective of preparing or giving a class lesson: it can be in the form of a textbook, website, preparation sheet, sound document, video or photo, newspaper article, sheets for students, a class lesson sheet designed for the teacher or for students, existing or newly prepared documents, etc.

The distinction made by Gueudet and Trouche (2008) between "resource" and "document" is heuristic and is not central to our approach, even though it does shed light on some of the results. We consider resources to be what teachers utilize for the conscious purpose of teaching. This excludes, for example, their general knowledge, the information they possess, etc., unless the teachers themselves designate them as resources, under the subjectivist stance we have adopted, and present in the following section.

Towards a typology of resource uses with the IWB

Bétrancourt's typology (2007) of the uses of information and communication technologies in the classroom seems to be an invaluable tool for reflecting on the question of resources. The author distinguishes four taxonomies of actions for supporting information processing and storage during a teaching activity. This can be linked to our reflections regarding adaptations or creations of textbooks.

 - The storage and re-use of complex and/or mass information (websites, access to

stored images, CD-ROM, etc.). This category is not really specific to the IWB. It could be implemented with a computer in conjunction with a projection system. The choice of resources tends to be made before hand. Interactivity is considered underdeveloped in the sense that the resources can only be slightly modified. However, we have seen that a teacher can select certain resources and adapt them to respond to his/her students' needs. S/he may leave out an element of a document (a video for example) or use annotations related to other sessions in the framework of a new activity.

- Automatic processing of complex information (exercisers, educational software such as the *Actimath* textbook, etc.). This category largely supports the interactivity specific to the IWB in relation to the basic resources. The teacher or student can act directly on the latter. Türel and Johnson (2012) argue that this high level of interactivity greatly benefits learning (e.g., it supports motivation, involvement, multimodality, fast feedback). The testimonies of teachers are in keeping with this: "the students understand the concepts more easily, so they are more interested and it is more enjoyable, and I like its interactive dimension" (Teacher 5).

- The representation and visualization of information (graphic representation, enlargement of illustrations, conceptual map, text scrolling upwards as it is read). The teachers in our study emphasize the benefits of this category. For Teacher 5, when the students have the same documents in front of them, "it makes it easier for them to follow; they are not lost." According to the teachers, better visibility of resources and the "power of images" (by being able to see an exact replica of the printed textbook students use) increase the learners' participation. In addition, these graphic representations can be interactive, thereby creating cognitive conflict situations as in an interactive simulation.

- The process of production and creation (multiple writing on the IWB, adding to or modifying the base). This category of action is not specific to the IWB either, in terms of the initial production of the textbook or of the resources. Indeed, in the absence of an IWB, one could, for example, use a collaborative writing program. However, some teachers can, in the course of a lesson, use different media and create, "live", a new didactic material. The IWB makes it possible to retrieve the history log of the session or, for example, to modify a text. This allows the sharing of resources between colleagues.

Thus, we find, as Meyer did (2012), that the interactivity of the IWB has a different impact on resource uses depending on the categories of action. This typology (adapted to include the use of the IWB and to address the question of educational and teaching resources) could serve as a frame of reference for comparing disciplines.

A specific and circumscribed approach: some methodological elements

Our research, which is built on a didactic framework and based on the studies cited above, is characterized, on the one hand, by a focus on the perspectives and perceptions of teachers, and on the other hand, by a search for disciplinary specificity with a view to a comparative analysis.

Indeed, the originality of our study, in comparison with other works on the documentary resources of teachers, lies in our seeking to adopt a subjectivist stance and in our focusing on the processes of classification and categorization of teachers themselves. We do not attempt to pre-establish a categorization of the resources and of how they are used by teachers. Our aim is to characterize teachers' practices while focusing attention on the means of selection and evaluation of the resources (evaluation of their relevance,

correctness, legitimacy, suitability for the students and the didactic or educational objectives), and on the resource sharing mechanism, less from the perspective of the actual processes than from that of the possibilities, aspirations, fears of being judged, pride, etc. which this evokes (Skutil and Manenova, 2012).

Furthermore, we devote attention to the disciplinary variations, whether actual or perceived, as expressed by the subjects.

Our methodology consists of:
- Collecting, from between 10 and 15 teachers, the resources and educational or didactic materials used in different disciplines (science, French, history, mathematics) and in the preparation for the *Brevet Informatique et Internet* (B2i), the examination for the Internet and computer user's certificate in France;
- Categorizing the above-mentioned resources and materials according to their nature (image, sound, text, etc.), origin (textbook, academic website, a teacher's personal website, magazine, etc.), the context of their development, the modifications made by the teachers, and their didactic functions, etc.;
- Questioning the teachers about the resources. - search methods, the methods used for evaluating their relevance and legitimacy, the possible adaptations of the resources to the didactic needs, the importance and role given to these resources in the processes, the types of tasks assigned to students in order for them to master the resources, etc.;
- Observing how the resources are used in class, by comparing our observations with the teachers' statements.

For this purpose we will proceed in three stages (Appendix 1), using a methodology similar to that implemented in the previously mentioned research on teachers' professional writings (Daunay, dir, 2011):
- A first informal and short, designed to enable the teachers to cite the resources used, to determine where they found them, to ascertain what in their experience has changed with the introduction of the IWB, to specify the problems they encounter in terms of resources, to describe the resources and the content of the class we will observe;
- An observation of the classes, and the collection of all the resources used by the teachers over a determined period of time or according to a specified content;
- A long interview, the purpose of which is to compare the teachers' statements with our observations and the resources collected from them.

The observations are structured by a framework common to all the researchers, consisting of three parts:
- The general context elements - we identify the discipline, content, teaching methods and case scenarios;
- Elements for identifying the resources used - the observation serves to identify what they are called in class, their nature (editable text, images, graphics, etc.), their origin (textbook, website, software), how the resources are used (support tool for the teacher, illustration, problem solving, etc.), what are the changes made by the teacher and / or students and how they circulate in the classroom;
- Elements of the technological setup put in place in a given context depending on the resources available - the detailed description of technological equipment makes it

possible to compare the different situations observed. Indeed, there is considerable variety in the infrastructure related to the use of an IWB. The observation grid helps to describe whether the classroom is equipped with a fixed IWB, a mobile IWB (on wheels) or a portable IWB, and if the IWB is used in conjunction with a video projector, a computer and speakers, or if it is a touch screen IWB (i.e., used with fingers or a special stylus), or if it is electromagnetic, optical (laser) or ultrasonic (makes the surface interactive). We also establish whether the resources can be exported, whether the users' actions can be stored, whether the source files can be exported, whether there is handwriting recognition, and finally whether the IWB is software compatible, i.e., compatible with minimalist software that allows for screen shots, or compatible with advanced software that enables the user to use a large range of different resources with the IWB.

The results presented below, based on the analysis of the transcripts and documents relative to 10 observed teachers who agreed to be interviewed, illustrate this aspect quite representatively, in that it shows how a traditional resource – the textbook - continues to be used while being transformed in the presence of an IWB[6].

The future of the textbook in the context of the IWB

The choice made by the majority of the teachers we have observed is to use the students' textbook as the base resource. This choice implies that the IWB is becoming a mode of usage of textbooks. "I have used the textbook even more since I got an IWB." says Teacher 3. We try here to explain the reasons for this form of usage and to examine how the textbook is, in practice, used for "writing" class materials.

In addition we report here what teachers say about their choices, indicating the similarities and differences, and describe what we have observed in their classrooms.

The distinction between the digital and paper

Understanding the use of the textbook during classroom practices structured around an IWB implies, first of all, determining the classic distinction between "digital" and "non-digital" resources.

The interest of a subjectivist stance lies in its not confining the analysis to categories a priori. This would not make any sense for the actors, nor would it fit the contours of their practices. Therefore, this applies to the distinction between digital and non-digital resources.

Consequently, we do not talk of digital resources. In addition to the fact that their definition is subject to debate (Bibeau, 2006; Baron and Dané, 2013), and that a resource may or may not have a digital dimension depending on how or when it is used and who uses it (Higgins et al 2007), it is interesting to examine all the resources in order to:
- Identify the differences between those perceived by their users as digital or not;
- Perceive the differences between the practices of teachers, in terms of resources, according to whether or not they use digital tools;
- Consider the future of traditional resources in the context of a growing use of digital technology (in particular, and in this case, the IWB).

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[6] Some information concerning the teachers are attached in the annex. We thank them warmly for their help. For anonymity' sake we do not name them or their workplace. We do not specify their gender or their age or the characteristics of the schools and students involved, because these are indications that we will not use as variables in this article.

A section of the textbook can be scanned (a page, an image, a text, etc.) so that it can be displayed on the IWB. Paper documents can be distributed to students while being projected on the IWB - consisting of a combination of photocopied or scanned excerpts of a textbook and of documents found on the internet. Which ones are "digital" and which ones are not? That is why we essentially talk of *resources in a digital environment*.

Thus, depending on the textbooks used, teachers choose whether to use their electronic version or not. Those using *Actimath à l'infini* (Van In) in grade 9 (S1, S2 - advanced science option) choose to use the electronic version because they find the design of that particular version to have user-friendly functions (evaluation, exercise corrections, new subjects of study, etc.). In grade 5 Teacher 2, who uses *Cap Math* (Hatier) and *Le français à la découverte de l'histoire-géographie* (Hachette), considers the versions for IWBs to be of no added value and prefers to digitize the printed textbook and project it through the IWB. This teacher thinks that the electronic version of *Cap Math* (Hatier) is not designed to be used with the IWB, whereas the e-version of *Cleo* (Retz) "goes a little further, it can be modified: you can use colour and shading, you can circle areas of the document." These are choices of opportunities that either facilitates or not some of the operations involved in the document-writing task. However, it does not fundamentally change the writing process, which constantly shifts from paper to digital and vice versa. The teachers who hold such points of view use Smart Board type IWB without any additional software.

It is interesting to take a look at how the IWB is used in conjunction with textbooks because, as mentioned above, it helps understand where digital and non-digital resources overlap. Moreover, the question of how textbooks are used is relevant to understanding teaching practices, which, in our opinion, is a subject not yet sufficiently documented. For a long time textbooks have served to operationalize official instructions (see Choppin, 1992, p. 114 ff.). As Nicole Tutiaux-Guillon (forthcoming) stated regarding the teaching of history and geography, textbooks can be used as a tool for updating teachers' knowledge concerning new topics. In line with this author, we think hat, although they are not indicative of the knowledge or practices at play in the classroom, textbooks often aid the teachers in their work with students and are a relevant indicator of the organization of the contents of school subjects. It is also worth adding that some of the teachers participating in the survey elected to create their own lesson materials or teaching resources. Using the IWB in conjunction with software such as *Active Inspire*, they are able to construct and organize contents, as well as adapt and manipulate resources themselves during class.

The textbook: a tool for organizing contents and developments

The fact that textbooks serve to operationalize and update the contents to be taught largely explains why the teachers we interviewed use them as support, or even as a fulcrum for writing class materials. As Teacher 6 said: "I often use the textbook as a base and then I add one or two extra documents".

The textbook is a reliable tool for teachers. "In general, I tend to trust what is in the textbooks, especially in history and geography" (Teacher 5). This confidence relates not only to accuracy, but also to the fact that the proposed contents are suited to the target level. A textbook is a tool "that is designed upstream; that is what it is for" (Teacher 6), and "it is reassuring" (Teacher 5). Conversely, for this teacher, the videos she downloads as illustrations for her lessons are used with caution, "I had seen in the comments on the

internet that there were small historical errors in a short video".

Apparently, paradoxically, it is precisely the growing number of possible resources used in the writing process and the diversity of their origin and formats (films, texts, images, etc.) that reinforces the use of the textbook as a content organizer.

Indeed, the textbook primarily serves as an organizer for the teacher. At the individual level, the textbook is used by some as an organizer of the contents to be taught: "I do not wonder what I am going to do in class because I follow the textbook," says a teacher in P1, and goes on to say "The preparation is structured by the textbook" - to the point that he adapted and re-worded the whole teacher's guide because "I find it difficult to get into the process if I do not rewrite it. I syphon the guide". This dimension of content organization is sometimes related to a degree of distrust in the information found online which is why Teacher 3 distinguishes between "sources" found on the internet, which she extensively draws from, and "knowledge", the reliability of which the print out guarantees: "I try to find sources, but in terms of knowledge I still use the textbooks and other books more."

But the textbook can also play the role of collective organizer between several teachers, for example. Thus, teachers justify their choice by the fact that using the textbook ensures more coherence in the progressions common to a cycle, a school or even a class when it has rotating teachers. This is the case with one of the teachers we interviewed.

Therefore the textbook constitutes a benchmark for assessing the suitability of other resources to be used in class. Teacher 5 used the beginning of a long video she found on the internet to illustrate a lesson on the arrival of the Celts in France: "I had seen in the comments on the internet that there were small historical errors. However they were either related to details only experts would know, or they appeared later [in the video], because when I watched it I did not find any discrepancies with the information I had and which was given in the textbooks" It is also on the basis of the textbook's contents that, during the collective viewing of the video, this teacher decides to say to her students " this is complicated, but it does not matter". Indeed, she continues "I did not explain because it was not useful". The teacher relies on the textbook to define the relevant contents, which explains why she decides to exclude one element of the video from the content of her lesson.

Finally, according to the teachers, the textbook helps to ensure coherence and "readability" of the contents for the students. The fact that learners in the same learning cycle have the same textbook, for example, helps them to not become disoriented. Indeed, as a teacher in P1 explains, "they can see that we work in the same way and this gives them some bearing". For this teacher, the textbook is something of a "ritual", which does not change, even if the teacher changes.

Thus, the editorial choices in the textbook, the presentation of concepts and standardized progressions it proposes seem to provide a framework for teachers' writing process, including when modifications in the components (texts, illustrations, exercises) are made – modifications made all the more easily and quickly when the components are digitized.

The capabilities of the IWB expands the range of possible uses of the textbook

One reason why the textbook is an important (or the main) resource in the process of writing educational materials is that, by using it in association with the IWB, the teacher and learners are able to work in ways that are not possible with the printed version of the books.

For example, the actions performed in class can be saved. According to some teachers, one advantage lies in being able to save the notes taken during class and to reuse explanations given in previous lessons if need be, e.g., when a pupil is absent.

Another advantage in using a textbook in combination with an IWB is that it offers opportunities for individual and collective work. All the teachers are of the opinion that being able to project a textbook onto an IWB is "a definite plus for the kids" (Teacher 2). The attention and motivation of the students are thought to increase. The same teacher explains that there used to be "difficulties with collective activities" because of the time it took and the students' lack of attention. S/he adds "With the IWB, things like manipulations, phases of collective learning, explanations to the class, and getting students to explain procedures to others are easier than with the blackboard. That is what you can do with the IWB". Teacher 3 says "I use it a lot for interactivity when they have to perform manipulations". Individual exercise is one thing, but the IWB makes collective stimulation possible: "There is exercise that each child performs, and then manipulation that is done collectively".

These educational capabilities, perceived positively by teachers, also relate to the latter's representations of students. Indeed students are presented by the media and by educational institutions as "digital natives" (Prensky, 2001), an image which also imposes itself upon teachers (Fluckiger, 2011). Teacher 5 expresses this clearly "It is a generation that does virtually everything through video technologies, game consoles, TV, etc. When something is projected onto a whiteboard, they are interested, or at least they pay more attention than if I tell them to open their textbook at page x and to look at the document".

All teachers also stress the time gained during exercise evaluation: answers can be automatically displayed without having to re-write the questions as the questions are already there. As far as the complex resources, such as graphics, are concerned, they are already in an educational format.

Two teachers in S1 and S2 who use *Actimath à l'infini* like to use the blank space on the IWB to return to concepts that have already been taught. This also allows them to use the automatic text recognition and to save what has been written in class with a direct connection to the page of the Smart Board handbook. However, Teacher 2 states that he cannot do without what he calls (jokingly) the "real board" – whether "black" or "white". According to him "the writing is done on that board". He explains that writing on the IWB is not easy and, furthermore, that the projected image of the text is not always of good quality. This implies that a lot of work is needed to ensure that the text "that comes on the IBW" is the same quality as the text printed on paper. The type of IWB used may therefore also influence how and how much they are used, and the continued use of the traditional blackboard. Those among the observed teachers who used the *Active Inspire* program with an IWB no longer have a traditional blackboard in their classroom. This is not a problem except in cases of technical failure. Other teachers still have a blackboard in their classroom, but it is not central to the room and is mostly used to hang maps from, or for magnet panels.

Thus, in the discourses and practices of the teachers as a whole, the IWB appears as a tool that helps optimize the use of the textbook, whether for didactic or pedagogical purposes, as is shown in the aspects discussed above.

The link between IWB and textbooks seems an important aspect of the question of resources in the digital era. First of all, as mentioned above, the class textbook seems to structure the use of the IWB. Secondly the textbook, when used in connection with the internet (Gueudet, Trouche, 2008; 2010), allows the teachers access to a greater number

of resources that can be used in class. Thirdly, far from reducing the usage of textbooks (other than those of the class), it seems to reinforce it. Teacher 2 explains that he has been using textbooks more since he got an IWB: "I use textbooks more because they provide a variety of documents". Indeed textbooks are identified as necessary resources for other teachers. For example, Teacher 3 says: "I have a few copies of various textbooks, so I look at different books, I look at how they approach the content of a lesson and then from that, I make my own plan, choose my own documents which I can show to the children and use".

Digital tools and IWBs enable and require the teachers to adapt the textbook

All the teachers participating in the study use the textbook as their main resource when they prepare and teach their lesson. It can even be said that the textbook structures the use of IWBs. Here the question arises of the benefits of reproducing information from the textbook on to the IWB.

The combined use of the textbook with an IWB makes it both necessary and possible to modify and adapt the textbook.

Several teachers stress the fact that they can enlarge the image, and raise or lower it to increase its visibility. This is not possible when a document is simply projected on to a screen without using an IWB or when they write on a blackboard. As Teacher 2 points out, it is also possible to edit the page, to change the colour of words or circle them. This practice makes it possible to keep track of classroom interactions. The printed textbook, whose content cannot be modified, is transformed, in the discourse and practices of the teachers observed, into an evolutive object which can be modified - in the margin - during the didactic interaction.

However, the relation between the IWB and the textbook lies beyond the mere possibility of modifying the document. The malleability of the tool facilitates the adaptation of textbooks by teachers. This is an important aspect of the "documentary work" of teachers and its "evolving nature" (Gueudet, Trouche, 2008). Indeed, as Teacher 1 indicates: "even if you use the textbook, you select information here and there" or as Teacher 5 explains: "I scanned the textbook, but also other history textbooks that I had at home." Teacher 3 who is faithful to the textbook when preparing her classes and feels compelled to use it ("I spent so much money on buying this textbook, I must use it, otherwise I do not see the point"). It is the rigidity of the textbook that causes her to not favour using it with the students in class: "It is not something I will use for class, because I feel constrained to use only what the book offers in terms of documents". She added: "We have to follow the approach of the textbook, but I think it is not open enough".

We can, in light of the discourses and practices of the teachers we interviewed, identify some reasons for adapting textbooks:
  - Prettifying the object by adding "nice illustrations even if they may not have any disciplinary content, will create an attractive presentation, "as Teacher 1,who uses emoticons, indicates;
  - Making the work that is being carried out more attractive: some teachers annotate the answers, by highlighting, circling or by adding different icons for errors and good answers;
  - Modifying the content along the way - to get the class "back on track" when it seems to be "lost" - by using a resource that is more or less related to, and sometimes disconnected from the lesson. The fun element is mentioned several times in this con-

text;

- Adding or modifying content in the preparation of or during the class when an internet resource seems more relevant from a didactic point of view: "I took more photos, I browsed the internet" (Teacher 4). "We had to talk about the Greeks arriving by way of the sea. They were talking about the ship, so I looked on Google Images for Greek ships of that era so that they could visualize it" (Teacher 5).
- Making the learning of a concept that has already been taught more stimulating when a teacher goes over "the teachable content of *Cap Math*", by taking one page of the textbook and "turning its content into a maths challenge" as did Teacher 1. This not only helps the teacher teach a given content but it also enables him/her to "work on social and civic competences" by implementing group work;
- Focusing on the learning objective: "I feel that in a textbook there can be a huge number of different tasks [...], but actually I want to focus on [...] as the core of my lesson" (Teacher 4);
- Adapting the textbook to suit the students' level by doing "what the textbook says, but in different stages. We get the same results, but often in a more segmented way, because the students need that" (Teacher 2);
- Following the textbook, but organizing work in a different and better suited way: "You have to go over things again before and then see what can be worked on with groups, in workshops, etc., depending on the constraints of the class."(Teacher 4);
- Modifying the order in which the textbook's content is displayed: "I do the same thing, but I teach the subjects separately (geometry, numeration, etc.), as opposed to the textbook *Cap Math* where the subjects are mixed together" (Teacher 2);
- Keeping track of what has been done in class which the textbook does not always allow, explains a teacher: "I like to keep track of what has been done" (Teacher 2);
- Differentiating the students: e.g., a teacher can ask half the class to do an exercise alone, using the textbook, while the other students who have more difficulty, work with the modified textbook and the IWB, with help from the teacher.

The choice to adapt the textbook depends on the teachers and the textbooks, e.g., a teacher may choose to follow a mathematics textbook to the letter, whilst another teacher using the same textbook will modify it to suit his/her needs. However, in turn, s/he will use the French textbook "as it is". The teacher may modify the book during his/her preparation work before teaching the class, or while s/he is teaching the class, depending on the reactions of the students. The IWB proves a powerful ally for the teacher in cases where the latter changes how s/he uses the textbook in class without prior preparation. But it is also useful when the teacher adapts the textbook using other resources because it helps to create coherent "collages". As Teacher 2 explains: "You find different elements and you arrange them your own way".

Let us note that in our observations, we distinguish two groups of teachers:
- Those who essentially use the software provided with the IWB as a source of resources: the modification of the resources then consists for the most part of highlighting keywords in the instructions, in the solutions to the exercises or in adding explanations in the blank space on the board;
- Those who create their own resources using resource creation software, such as *Active Inspire*: the creation or modification of resources consists of choosing content among different sources and creating specific tasks.

Conclusion

This article has aimed to present the premises, methodology and some results of a research study that raises questions, which we believe, pave the way for new areas of study concerning new tools that have emerged in school classrooms. It shows that technological innovations have major implications in terms of didactics and pedagogy. They have an effect on the training of future teachers and the management of educational institutions. We believe that, in order to understand the new ways in which resources are used and the obstacles related to the growing number of resources, a subjectivist approach is required, attentive to the typologies used by teachers, their attitudes, their selection process, and to the methods used to validate the relevance of resources and adapt them accordingly.

We have presented here the choices made by some teachers to use primarily, or even exclusively, a "traditional" textbook, either in a digital format or in a scanned version. The textbook seems to serve as a guide for teachers who are confronted with a growing wealth of resources. While minimizing, de facto, the problem related to the choice of resources, the IWB allows, according to teachers, for greater didactic flexibility. Indeed, while allowing the teachers to rely on the structuring and guiding properties of the textbook, the IWB helps them free themselves, at least partially, from some of the constraints associated with the printed textbooks, by modifying the stages of the process, by adapting or adding illustrations to the resource, etc.

Our study shows that the extent to which available resources are modified and new resources are created could be influenced by the type of IWB used (Smart Board or ActivBoard) and by the teachers' experience in the use of this tool. As Higgins, Beauchamps and Miller (2007) pointed out, the extent to which resources are modified and adapted depends on the teacher's level of experience in using the IWB. This suggests that, from a didactic point of view, increasing technological skills and a growing sense of confidence in the use of the IWB may help teachers to become more autonomous and to reinforce their selectiveness and even their creativity in the face of the growing number of resources.

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Appendix 1 - Guide to interviews and observation grids[7]

Short Interview

1. What do you plan on showing us during our observations?
2. (if using the IWB) What has changed for you in the course preparation?
3. What sources / resources do you use?
4. Where do you find them?

Observation grids

1 / Elements of general context:

-   Discipline (s) identified
-   Content in the discipline
-   Collective / individual / Group work
-   Situation / phase of the course
-   Material available in class

2 / Elements to be identified for each resource used

•   How are class resources named ? : document, resource, image ...
•   Type of the resource: editable, non-editable, image, graphic, video, sound ...
•   Origin of the resource: Journal, website
•   New resources or already used
•   What is the Activity Support
•   What is not discussed, even hidden from the resource
•   What changes have been made by the teacher (on the surface or in the "text"-itself)
•   What changes have been made by the students
•   Circulation of resource distribution by a student

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[7]TNI research: Teachers face digital resources (Fluckiger C., Daunay B., Bachy S., Orange D., Sido X., Souplet, C., 2013-2015, Lille3)

3 / Typology - Interactive whiteboard
- Basic Equipment: Whiteboard, Blackboard, Digital board, Wall Video projector, Computer Loudspeakers...
- Type: Fixed, Mobile (on wheels), Portable (roll-up panel)
- Technologies Used: Touch screen (fingers or stylus), Electromagnetic (stylus with programmable buttons), Optics (laser - use of a stylus), Radio or ultra-sound (via a box in a corner that makes the surface interactive)
- Accessories: Tablets - Voting boxes - Scanner- Pen
- Interactivity: With a pen, with fingers, with both, via a computer
- Export of possible activities: Save any changes (annotation, ..), Exports source files to new files, Recognizes handwriting, Exporting files not possible
- Software: Just screenshot, Minimalist (screenshot, annotation, insert different elements such as pictures or texts into notepad), Advanced (resource libraries images, animation navigation, ...)

Long Interview   Topics to be covered:
1. If TBI: what has changed for the resources
2. If you had to choose / keep a document, which one and why? Where did you find it...?
3. Evaluation of the relevance of a resource ("how do you know if this resource is adapted to the students, is correct, if you can use it in class ...")
4. Difficulties of the "document" preparation, preparation of courses, how do you prepare
5. Investments in time, equipment - ease / difficulty, satisfaction / dissatisfaction in preparing courses, searching for resources, adapting them ...
6. The typologies and categories of resources mobilized (possible question: "but you put it with what?")
7. Modification of resources in class, during classes
8. Safeguarding resources, re-using in the following years: opportunities, problems ...
9. Sharing resources: easy to give, exchange, put online modified ones?
10. Explore links with epistemology, discipline, pedagogy
11. If you lost all data on the IWB, what would you do?