Teaching Aids for the Interactive Whiteboard: The Trainee Teacher as a Materials Designer

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Abstract In 2011 thirteen pre-service teachers participated in a University of Antwerp e-learning project involving the development and design of didactic modules for the Interactive Whiteboard (IWB) used in French, German and Spanish L2 classes. The project was part and parcel of the European interactive Technologies In Language Teaching programme (iTILT). This article will focus on the subject-related, i.e. linguistic, quality of the products, shedding some light on the participants' language proficiency. To this end we will zoom in on the development process proper because it provides information on trainee teachers' views on the requirements of qualitative interactive teaching aids. Next to analysing the developed modules from a linguistic perspective, we also look at the logs all partaking teachers-to-be had to keep reflecting on their experiences and at the peer reviews they wrote about each other's products.

Key words Teacher Training, Interactive Whiteboard, Materials Design, Language Learning

1. Introduction

In many countries, ICT competences are an essential part of a teacher's key competencies (e.g. the 2007 "Basiscompetenties voor de leraar secundair onderwijs" in Flanders) as well as of their career profiles (e.g. Besluit Vlaamse Regering, 2007; Standaert, 2008). In order to prepare trainee teachers for their role of ICT users, the teacher training curriculum has an important function to

fulfil. For the boom of computers or tablets and electronic learning environments in education not only calls for trainee teachers being taught how to implement these modern technology-driven tools in the teaching (and learning) process. Of equal importance is the awareness that these media do not substitute for teachers (Laurillard, 2012).

In over half of the European countries ICT is part of the initial teacher training curriculum. Elsewhere in Europe there is institutional autonomy, meaning that institutions can decide whether they include ICT in their teacher training (Key Data ICT, 2011). Research suggests that the use of ICT in class depends in part on how much relevant training teachers have received during their pre-service education (Drent, 2005). Other findings stress that teachers need time and the opportunity to develop their own understanding of technology (Cutrim Schmid, 2010). This is even more important as new technologies do not make the teacher redundant but change his or her role (Laurillard, 2012).

1.1. IWB as a teaching and learning tool

Interactive whiteboards (IWBs) are a relatively new ICT tool. IWBs are large, interactive displays, connected to a computer. The computer's desktop is projected on the board and is controlled by its users (teachers and/or learners) by means of a pen, finger or other device. In short, IWBs allow for multimedia teaching and learning.

As far as the availability of IWBs in classrooms is concerned, there are important differences between countries as well as between schools on a national level. Over the last decade, IWBs have become popular tools, especially in primary education (Northcote et al., 2010) but also in other educational settings (Hacifazlioglu, Sacli & Yengin, 2007). Differences have also been detected between schools situated in urban and rural regions.

It is a fact that the use of IWBs in the classroom has increased significantly. Future Source Consulting Ltd. provides comparative data on the current classroom penetration as well as on the expected penetration in the years to come. In 2012, spread of IWBs in classrooms was highest in the UK (85%) and Denmark (62%), and was lowest in France (10%). By 2016 Future Sources Consulting Ltd. expects 94% of UK schools to have an IWB, 79% in Denmark and 77% in the Netherlands. The highest increase in IWB use is expected in Turkey (from 22% to 82%). In Belgium, where the project described in this article took place, 21% of the classrooms are equipped with an IWB. This number is likely to rise to 43% by 2016.

1.2. IWB teaching materials

The presence of IWBs incites teachers to search for adequate teaching materials, for which there are several possibilities. Teachers can produce their own teaching materials, using specific software allowing them to create their own contents, but they can also use existing resources. These can either be produced by commercial enterprises or they can be created by teachers for teachers and shared in online communities (e.g. Promethean Planet, SMART's Exchange, Hitachi StarBoard Community and eI Community).

It has been established that science subjects teachers are rather spoilt, as concerns the availability of interactive software. On the site of the online resource centre SMART Exchange, 30% of the resources are for mathematics; only 2% for foreign languages. Furthermore, among arts subjects the presence of English materials is many times greater compared to other languages. On the website of Promethean Planet, resources for English (as a foreign or as a second language) are ten times as frequent as teaching materials for other foreign languages (Chinese, French, German, Italian, Latin, Spanish).

Despite the array of materials available, there are many reasons why teachers choose to design or adapt their teaching materials when using an

IWB. One obvious reason being the connection between the materials or exercises projected on the IWB and the available course book or course materials. The quantity of course books that include complementary exercises for IWB is still limited. A second reason is contextualisation (Howard & Major, 2005): teachers want to use materials that fit the teaching context. Designing or adapting their own teaching materials enables teachers to take into account their particular learning environment and the individual needs of the target group.

It is also important to mention that it is not the tool (i.e. the IWB) that will determine its success. In this approach – also known as the technology-driven approach – the teaching process is based on the advantages and innovative features of the new medium itself (Colpaert, 2006). History has proven that the success of ICT tool implementation depends greatly on a pedagogy-based approach. This approach starts from "a detailed specification of what is needed for language teaching and learning purposes in a specific content, defines the most appropriate method and finally attempts to describe the technological requirements to make it work" (Colpaert, 2006, p. 479). Therefore, teachers should continue to rely on the context and the curriculum in order to determine whether IWB use is useful and what contents are needed to realise the learning objectives.

Taking into account these elements, the project described in this article investigated the design (processes and products) of teaching materials for the IWB by trainee teachers, more specifically the design of teaching materials for the less well-stocked languages.

1.3. IWB and teacher training

As the availability of IWBs in classrooms increases, and taking into account that teachers should be able to create their own teaching materials, the teacher training has an important role to play. Trainee teachers should acquire

technical competences in order to use IWBs but also to create their own materials. At the same time, they should concentrate on the didactic/pedagogical quality of the materials used. A specific point of interest for language teachers is the linguistic quality of their teaching materials.

In this article, we discuss a project that investigated how pre-service teachers go about developing interactive exercises for the IWB. The project was conducted at the University of Antwerp, Belgium. It was carried out within the context of the iTILT project. iTILT stands for *Interactive Technologies in Language Teaching* (www.itilt.eu). It is a European project focussing on the use of the interactive whiteboard in language teaching. In this article, we focus on the linguistic quality of the developed exercises. The results of the didactic quality of the materials are described in Oberhofer, Simons and Smits (forthcoming).

Section 2 provides a general description of the project, including its context, objectives, research questions, participants and design. Section 3 presents the method of the linguistic analysis of all materials developed within the scope of the project: (a) IWB modules (i.e. a set of interactive language exercises for the IWB), (b) logs on the learning process and (c) peer reviews. Section 4 describes findings and lessons that can be drawn from the project's outcome. In section 5 the authors present their conclusions.

2. Project description

2.1. Context

The project was carried out in 2011 as an optional part of the one-year teacher training programme at the University of Antwerp. This programme prepares future teachers for employment in the final two forms of secondary

education or in adult education and builds on existing (discipline-related) knowledge acquired during their Master's programme.

In several modules during their studies at the University of Antwerp, pre-service teachers receive information and training on the use of ICT in language teaching (L1 and L2). They have the option to attend the course 'Educational Technology', in which students first deal with a wide variety of technologies related to topics such as interactive exercises, collaborative writing, open educational resources, virtual environments, construction and presentation tools, student response systems, etc. In a second step they design a specific learning environment and use some of these tools. Further, pre-service teachers get ICT training in the 'Didactics' course, which is compulsory. It focuses on tools and applications specifically relevant to their subject (e.g. for English, French, German or Spanish). Students learn how to choose, integrate and evaluate a specific set of dedicated applications (language teaching and learning software) and non-dedicated tools (e.g. social media, email, blog).

2.2. Project objectives and linguistic research questions

The main objective of the project was to gain insight into the learning process of pre-service language teachers that had never worked with an IWB before. More specifically, the project zoomed in on critical success factors in the education of language teachers, from which recommendations could be formulated for teacher trainers and teacher training programmes, as well as for in-service language teachers willing to engage in IWB-supported teaching (Oberhofer, Simons & Smits, forthcoming). To that end, participants had to produce a set of self-made IWB-modules, including reflective practice through logs and peer reviews.

This article focuses on the linguistic challenges future language teachers are confronted with when developing teaching materials for IWB use.

The findings from this analysis can help teacher trainers in their coaching of future teachers, but can also inform language teachers about the critical issues related to their role of ICT materials developer.

The research questions underlying this part of the project are:

RQ1: Which linguistic challenges trainee teachers are confronted with when designing IWB materials?

RQ2: How do trainee teachers cope with these challenges?

2.3. Participants

During the course of a term thirteen pre-service teachers with a Master's degree in languages joined the project as part of their curricula. Table 1 gives an overview on the number of pre-service teachers and the language(s) they specialised in:

Table1: Languages studied by the 13 participating pre-service teachers

	German	French	Spanish	German-Spanish	French-Spanish
(n =13)	2	5	2	1	3

2.4. Project design

LINGUAPOLIS, the coordinator of the iTILT project, together with the Institute of Education and Information Sciences set up an introductory course on teaching technology and educational design, providing a theoretical foundation and a pedagogical framework for the project as well as allowing for hands-on experience (Gray et al., 2007; Cutrim Schmid, 2010). This course consisted of five technical and pedagogical coaching sessions on proper IWB use, stressing its opportunities for activating teaching and learning. The programme's design was based on recommendations discussed in IWB

literature (e.g. Gray et al., 2007; Cutrim Schmid, 2010; Hennessy & London, 2013).

The participants were provided with a variety of pedagogical input through (a) looking at examples of iTILT learning materials (http://www.itilt.eu/teaching-materials), (b) reading the iTILT training manual (http://www.itilt.eu/itilt-training-handbook) with more tips and ideas on how to use the IWB in language classes, (c) discussing the criteria for IWB materials design from the iTILT training manual (e.g. a task-based, communicative approach to IWB use (iTILT Training Manual, 2011, p 14)) and (d) a references list with links to more IWB materials as well as Ayre's 2010 European Schoolnet publication (Ayre, 2010).

2.4.1. IWB modules

For the project the participating pre-service teachers had to produce 18 IWB modules: three for each of the four skills (reading, writing, listening and speaking), three modules for grammar and three for vocabulary. A module is a set of IWB activities or exercises related to a given topic (e.g. speaking about the weather, use of prepositions). Each exercise starts off with a description of the activity and information on the target language, the CEFR proficiency level, the learning objective(s) and the intended age group. The next slide contains the activity itself, supporting a communicative and interactive approach to language teaching and boasting authentic content as well as a variety of IWB software features.

2.4.2. Reflective practice

As part of their teacher training at Antwerp University, pre-service teachers learn to reflect autonomously on their own teaching practice (Kolb, 1984; Korthagen, 1993, 2005). The project operationalised two reflective

instruments: logs and peer reviews. The participants had to keep a learning log on didactic and pedagogical aspects, linguistic challenges, target language use, technical issues, time management and the use of source materials. They also had to peer-review each other's products. This, again, had them reflect on quality standards and on the opportunities and challenges (pre-service) teachers are faced with when designing IWB materials. All peer reviews were sent to the respective designers, after which they could finalise their products.

3. Data analysis

For analysis purposes the project's basic data, viz. the IWB teaching modules, can be supplemented with the logs and the peer reviews, since all of these products contain information on the quality and on prevailing quality standards of linguistic accuracy in teaching aids. In this section, we explain how we analysed these data in order to get a clearer view of the learning process of pre-service teachers as far as linguistic quality is concerned. The findings resulting from this analysis are described in section 4.

The 234 **IWB modules** that were developed within the project have been analysed from a didactic and linguistic point of view. In this article, we focus on the linguistic characteristics. They belong, as our analysis shows, to four linguistic domains: morphology, syntax, lexis and orthography. All linguistic tokens were collected in a database.

The project resulted in 13 **logs** that were subsequently searched for reflections on all matters linguistic. The overall learning log analysis yielded eight categories, one of which is "Linguistic challenges: formulation of instructions". As with the logs, the project's 26 **peer reviews** were scrutinised for remarks on materials design and teaching aid quality. The analysis distinguishes between positive elements and elements for improvement. This second category includes negative elements, elements deserving particular attention and suggestions for improvement.

4. Findings

This section discusses the findings of the project. Section 4.1 deals with the linguistic analysis of the IWB modules and section 4.2 with the results of the analysis of the logs and the peer reviews.

4.1. Analysis of the IWB modules

In order to guarantee linguistic quality of IWB modules, linguistic accuracy was one obvious criterion. Since attention was also drawn to the value of a communicative approach for exemplary IWB practice, incorporating activating and interactive language teaching, this linguistic aspect was something participants had to concern themselves with. Language importance was even stressed to such an extent that all finished modules were returned, after revision by the project leaders, for thorough linguistic editing.

In our analysis, language use was looked at both in the task overviews and in the actual exercise(s) being shown in class. It soon became clear that both parts contain a considerable amount of flaws, in spite of the high level of attention being paid to language during the project. This multitude of language errors (n=201) from a setting where non-native speakers had produced material in three different foreign languages on a variety of subjects (four skills, grammar, and vocabulary) nevertheless allowed for a classification into the four main error categories already specified: morphology, syntax, lexis and orthography. In addition, some universal principles come to light.

Table2: The four principal domains of language errors present in IWB materials

Morphology	
Verb flexion	*s'épanouie (s'épanouit)*

Determiner and pronominal flexion	*à les élèves (aux), diejenige Wörter (diejenigen), Chaque groupe présente leur dialogue (son)*
Adverb flexion	*vivir sana (sano)*
Syntax	
Syntax and case	*fragt einen Schüler, um nach vorne zu kommen (fragt einen Schüler, nach …)*
Agreement	*les autres images sont pris (prises)*
Lexis	
Function words (preposition, conjunction)	*Cliquez le globe (sur le globe)*
Content words (noun, adjective, verb)	*en les traînant dans la boîte (en les déplaçant), nach Mexiko gehen (reisen, …) (see Figure 3)*
Gender	*le final (la finale), der Fahrrad (das), seinen Wahl (seine) (see Figure 2)*
Lexical error/mistake	*imágines (imágenes), winnen (gewinnen)*
Orthography	
Capitals	*en Français (français)*
Idiosyncratic diacritics/ characters	*batiment (bâtiment), futból (fútbol), Fussball (Fußball)*
Comma usage (German)	*schreiben was die … (schreiben, was …)*

Irrespective of the target language and of the communicative or didactic purpose of a certain text, the same kinds of errors occur. The nature of language errors (and in only one category also of mistakes due to inattention) can be seen in the overviews (Table 2 and 3). Their quantitative analysis reveals that most errors belong to the domains of the lexicon and of syntax. Looked at the languages separately, again the same proportions become apparent: vocabulary is responsible for the bulk of language errors, followed by syntax and orthography almost on a par (especially in German and to a lesser degree in Spanish). For that reason the selection presented in Table 3 zooms in on vocabulary and syntax errors.

On average, an equal share of errors was present in the IWB modules for German and French classes: approximately 15 errors were made by each participant for German L2 teaching and 13 errors were counted per participant for French. Spanish IWB teaching aids display a higher linguistic quality with an average of 9 errors per participant. This score, however, has been positively affected by two trainee teachers with an apparent flawless command of Spanish.

It is interesting to see that these aspiring language teachers, for whom their subjects constitute the object of their own learning, succeed in coping with the substantial morphologic workload that languages such as French, German and Spanish impose on learners and speakers. It seems to have been easier for participants to monitor flexion than to avoid lexical or syntactic pitfalls. As opposed to getting one's flexion in order, paying attention to vocabulary is a piece of advice that is many times more feasible for materials developers to successfully act on.

Table 3: Examples from the two domains with highest scores of language errors.

Lexis	
Function words	*es mejor comenzar a estudiar en tiempo (a tiempo; en cliquant chaque objet (sur chaque objet); passt am besten beim Buch (… zum Buch); wenn er sie zum ersten Mal sah (als er sie …)*
Content words	*en aquel entonces (en aquel momento); en bougeant le chariot (pousser le chariot); stellen Sie das Fragment wieder dar (… wieder her); welche Lieder gehören welcher Musikart (… gehören zu welcher Musikart)*
Gender	*ponen los imágenes en el orden correcto (las imágenes); la Great Peninsular Railway; un interview (une interview); einen Fragment (ein Fragment); die du-Person soll seine Träume (… soll ihre Träume)*
Lexical	*utilisar (utilizar); au minimuns 5 (minimum); font partis du (parti); le marquer (marqueur); diesen Bilder (diesen*

error/mistake	*Bildern); diskuttieren (diskutieren)*
Syntax	
Syntax and case	*los alumnos ven en la pantalla diferentes mapas (ven diferentes mapas en la pantalla); pueden escuchar de cada momento un fragmento de audio (escuchar un fragmento de audio en cada momento); les élèves doivent à chaque fois dire ce qu'ils pensent que c'est (A chaque fois les élèves...); les élèves utilisent ces prépositions aussi en décrivant leur chambre (utilisent les mêmes prépositions pour); Gedicht an einer Ihrer Körperteile (Gedicht an eine ...); sagt sie, dass es einen Zustand ist (... es ein Zustand ist)*
Agreement	*estas tres actividades son prohibidos (prohibidas); la anchura (...) debe estar comprendido (comprendida); un des plus grand cimetière (grands cimetières); le professeur racontera l'histoire du film ou les élèves peuvent regarder le film (raconte)*

A second general conclusion is that, rather fortunately perhaps, most language errors occur in the introductory descriptions accompanying each IWB module, and not in the exercises themselves. Because these instruction texts do not belong to the actual teaching material being used and/or shown in class, this finding somehow alleviates the problem of linguistic accuracy in self-made IWB modules for foreign language teaching.

Only a quarter of all erroneous language occurs in the IWB exercises. Regrettably, some of these errors are language items that were reused from the task overview, for instance in instructions. An explanation for the low amount of errors in exercises might be the fact that designing materials that exploit the visual and aural possibilities of the medium to the full automatically reduces the amount of (written) language. Exercises consequently boast a wealth of visual stimuli making textual or linguistic support superfluous. Those language elements that do occur, e.g. in reading tasks or gap exercises, are very often taken from an existing task or, in the best possible scenario, from authentic language material.

4.2. Analysis of logs and peer reviews

Since there were no stringent format requirements for the logs, some of the participants limited their texts to a rather short, concise report (500 words) while others reported in detail on their experiences (more than 2500 words). Some trainee teachers mainly described their learning process; others also included reflections on elements they discovered while writing a peer review. All remarks were attributed to eight categories. Table 4 provides an overview, distinguishing between positive, negative and neutral (i.e. descriptive) statements.

Table 4: Logs – Reflections according to category and quality.

	Negative (n= 111)	Neutral (n = 25)	Positive (n = 41)	**Total (n=177)**
Didactic and pedagogic aspects	21	3	4	**28**
Linguistic challenges	2	0	0	**2**
Link with audience and context	4	0	1	**5**
Technical issues	36	1	11	**48**
Time management	21	0	1	**22**
Use of sources	5	0	1	**6**
Visual attractiveness	7	2	0	**9**
Project issues (e.g. guidance)	13	6	18	**37**
Other	2	13	5	**20**

From the table it becomes apparent that technical issues as well as didactic and pedagogic issues related to both the project itself and to ICT-supported teaching constitute the lion's share of all recorded remarks. As to technical aspects, the trainee teachers had indeed never worked with IWB software before and it was actually one of the project objectives to learn to work with a medium requiring a certain amount of technical insight. The dominance of didactic and pedagogical reflections indicates that the pre-service teachers have become conscious of the role of IWBs in their future

functioning as language teachers and that they reflect on the usefulness of this medium to their own teaching objectives.

Despite the fact that we found a significant number of linguistic problems in our analysis (cf 4.1), these issues were rarely addressed in the logs. Only two trainee teachers discussed linguistic challenges in their (personal) diaries. One of them mentioned problems formulating adequate instructions and developing exercises in the target language. Punctuation seems to be difficult too. The other participant refers to a linguistic feature but links it immediately with her vision on foreign language teaching: "*For French, I think it is important that pupils learn to spell the words correctly. Therefore, exercises in which learners only have to write small text parts can be useful*." (trainee teacher i).

The same observation holds true for the peer reviews. More than half of the 1,043 topics discussed in the peer reviews concern positive remarks, largely about didactic concerns (e.g. "*This module has clear learning objectives: by doing this exercise they know how to order something in a restaurant, how to describe the preparation of a meal… Very motivating!*" - trainee teacher f) or about technical issues (e.g.: *"The drag and drop function was very well applied to the content of this exercise! Well done!"* - trainee teacher b). When negative comments are formulated, which is less often the case, they mostly contain hints for improving the teaching aid. In almost 25% of all cases the added value of the IWB as a teaching medium is being questioned (e.g. "*In my opinion this exercise could as well been done with a (normal) whiteboard.*" - trainee a).

Taking into account our linguistic analysis of the modules, it is remarkable that very few trainee teachers come up with remarks or suggestions concerning linguistic issues. Participants mention typing errors but almost never add suggestions on style or sentence structure. This observation might bear a relation to the fact that most language errors occur in

the introductory descriptions and not in the exercises themselves, which makes these mistakes less visible or problematic.

5. Concluding remarks

Thirteen pre-service teachers of German, French and Spanish at the University of Antwerp developed language teaching modules for the IWB. Their learning process was supported by the use of logs and peer reviews. Besides the creation of interactive modules, this project aimed at gaining a better idea of how to guide pre-service teachers in this design and development process. The article focussed on the subject-related, i.e. linguistic, quality of the design process, shedding some light on the participants' language proficiency. To this end, we analysed the modules as well as the logs and peer reviews resulting from the implemented reflective practice.

It was to be expected that in this project, involving the development of exercises for a new medium, a lot of attention would go to technical aspects. The logs and peer reviews demonstrate that pre-service teachers are concerned about layout, correct technical functioning and the integration of all the facilities offered by IWBs. For this reason, however, trainee teachers are in danger of paying more attention to the medium itself than to the quality of the exercises. Our analysis shows that the participants worry about didactic and pedagogical quality but far less about linguistic quality.

An in-depth analysis of the linguistic features of the IWB teaching aids developed within the scope of this project reveals serious linguistic shortcomings. The most prominent linguistic challenges trainee teachers are confronted with when designing IWB materials concern lexical and syntactic issues (RQ1). Taking an optimistic view of the matter, this implies that the partaking trainee teachers have overcome the morphologic burden languages

such as French, German and Spanish impose on their speakers. The downside is a still substantial presence of erroneous language, even after a redrafting process.

The results of the linguistic analysis of the modules form a striking contrast with the data collected by the logs and the peer reviews. These data indicate that trainee teachers rarely make reference to linguistic matters (RQ2). An explanation might be found in the fact that most errors occur in the introductory descriptions and not in the IWB exercises themselves.

Adopting a new medium, that requires from its user to be rather technically-minded as well, can detract attention from linguistic issues and language accuracy. Teachers should keep in mind that the wealth of information provided by and accessed through the IWB is of equal value to teaching content on paper. Linguistic flawlessness, therefore, is vital also when teaching in front of an IWB.

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