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A Research Based Learning Environment's appropriation, as a context for atypical professional development in ICT integration in the classroom.

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Abstract

It is well known that meaningful ICT implementation in the classroom is still a challenge. In this article we present an atypical process of professional development for promoting deeper ICT integration in the classrooms: working in a small group setting to adapt Research Based Learning Environments (RBLE) that are designed in a different national context. The participation of teachers and researchers in the group, the access to the authors of the RBLE and the choice of staying as faithful as possible to the initial form and content even against the grain of local educational culture were features that promoted learning for the participants. Thus adaptation of foreign Research Based Learning Environments in ICT should not only be seen from the point of view of importing learning resources but also as a means, under special conditions, to promote professional development.

Key words: Research Based Learning Environments, ICT integration, Professional Development

Introduction

Concerns are often voiced in the literature about the limits of ICT implementation in classrooms since, even when teachers embrace technology, their current practices become an obstacle towards achieving the potential that technology can offer (Cuban, 2001; Eteokleous, 2008; Player-Koro, 2012). Different kinds of barriers obstructing high quality ICT implementations have been pointed out (Bekcer, 2000; Ertmer 1999; Ertmer 2005) and among those teacher beliefs about teaching and learning have been singled out as both important and difficult to address (Ertmer, 2005).

A similar concern about the recalcitrance of teachers' practices and their ability to affect the enacted curriculum finds its way in literature that examines efforts to disseminate research based learning environments (RBLE) in broader contexts. The danger exists that in the way, between the initial curricular proposal and its final implementation in the classroom, serious alterations have as a consequence that some primary concerns of the initial designs are "forgotten" along the way (Brown & Campione, 1996). However it is also proclaimed that the adaptation of the Research Based Curriculum materials is unavoidable, since it is both common experience and a result of research that teachers modify instructional activities influenced by "students' needs, students' goals, teachers' goals, local constraints, and teacher's pedagogical values" (Squire et al., 2003).

Although the main concern of the RBLE literature adaptation focuses on achieving the efficient adaptation of an RBLE to the new context, the same literature offers indications of the connection between RBLE adaptation and teacher Professional Development. First, it has

been proposed that a way around "fatal" curricular alterations can be the use of Educative Curricula (Ball & Cohen, 1996; Schneider, Krajcik & Marx, 2013), that is curricula that support teacher learning as well as student learning. Second, professional communities who are focused on improving teachers' practice have been proposed (Thomas et al., 1998) as mediums of RBLE adaptation.

In the current research we explore the same relation along the reverse direction: we concentrate on using a specific process of RBLE appropriation as a means of professional development in ICT integration. This process is characterized by three main features. The first one is the small group setting and in particular the composition of the working group (WG) by both researchers and teachers who had previously worked together, creating curricular material according to the Participatory Design paradigm (Kensing, Blomberg, 1998). The second is that the RBLE that was the object of the adaptation process was produced by a foreign research team (it is described in what follows as a Foreign Research Based Learning Environment or FRBLE). Therefore, the object of this particular WG was in various ways "foreign" both for teachers and researchers. In this respect the task was homogenizing the group. The third is that, taking the lead from translation theory in literature, as explicated below, we tried to create conditions that would be maximally conducive to the promotion of learning in the WG.

Adapting a learning environment created in a foreign context into one's own context is similar to translating a text from one literature into another. Translation theorists consider the source artifact as part of a system of other artifacts in the source culture. During translation the source artifact is translated to the target artifact which has to become embedded in a system in the target culture (Even-Zohar, 1990). Moreover translation is a process which includes different moves (Steiner, 1998). After the first moves that refer to been attracted by and then aggressively approaching the artifact there comes the third move where "there are innumerable shadings of assimilation and placement of the newly acquired ranging from the complete domestication... to the permanent strangeness and marginality of an artifact such as Nabokov's "English language" *Onegin*" (Steiner, 1998: 314-315). It is this process of "permanent strangeness and marginality" that the WG tried to profit from and explore its consequences and thus the WG decided to appropriate the FRBLE staying as faithful as possible to both the form and the content of the initial FRBLE and to record its responses during the process.

Method

The research reported here was possible thanks to the authors' participation in the European collaboration project "Digital Support for Inquiry, Collaboration, and Reflection on Socio-scientific Debates" (CoReflect, www.coreflect.org). During this project the participating mixed teams of researchers and teachers had to design and implement inquiry learning environments centered around socioscientific issues. The environments were supported by STOCHASMOS (www.stochasmos.org), an authoring tool for the creation of web-based learning environments supporting students' scientific reasoning through scientifically authentic investigations. Part of the project work included the translation and adaptation of each learning environment in a different language and educational system and its subsequent implementation and assessment (Kyza et al., 2014).

Participants and setting

The participants in this research were two researchers a primary school teacher and a primary school teacher consultant. They comprised the WG. They also interacted with the foreign Working Group (FWG) who authored the FRBLE.

The process of adaptation included the following phases:

1. The WG interacted with the FWG about the FRBLE while the FWG was designing it. Before the full FRBLE was available to the WG there have being two face to face meetings as part of the Coreflect collaboration meetings. Notes were taken during these meetings and e-mail exchanged after the meetings.
2. The WG got the STOCHASMOS implementation and the teacher guide for the FRBLE. The WG collected questions from all its members to be addressed to the FRBLE. These were sent to the FWG and feedback was got.
3. Subsequently there was a virtual meeting of the WG (since one member was located at a distant place) in which the main open issues were discussed and the decisions were taken about the final form of the adapted environment. This meeting was recorded.
4. Once the translated and adapted FRBLE was ready the FRBLE was implemented in a 5th grade classroom and was assessed using the tools provided by the FRBLE and student interviews. Then after the implementation the members of the WG exchanged mails referring to their experience from the implementation.

Research Questions

Being faithful to its decision to stay as close as possible to both the form and the content of the initial FRBLE, the WG followed the FRBLE specifications even when these directions were causing concerns to its members. The WG recorded the intergroup interactions with the authors of the FRBLE and the intragroup interactions of the WG during this adaptation process. It was expected that these conditions

- a) would be maximally conducive in motivating the WG to be attentive to the goals of the FRBLE and to embed them in the teacher-student interaction.
- b) would be maximally conducive to the WG's sensitive monitoring of the FRBLE implementation in the classroom

The research questions that we posed were:

Will this context make the participants of the WG sensitive to issues related to the implementation of inquiry environments supported by ICT in the WG's local context that were previously invisible to the WG members?

Will this context open new directions of inquiry related to ICT implementation for the WG members?

Data sources and analysis

Each phase provided relevant data: notes, e-mails, questions addressed to the FRBLE, the recording of the virtual meeting. Most of the data, except from the questions in Phase 2, where examined by two researchers-authors of this article, in order to specify themes of concern for the WG members. These themes were then organized in broader categories that were mutually agreed after discussion.

The questions of Phase 2 were categorized according to what was the main request (clarification, context, suggestions of change) addressed to the FWG.

The FRBLE

The FRBLE (Van der Meij et al., 2011) was designed within the paradigm of Learning by Design and was addressed to 5th and 6th grade students. It consisted of 8 two-period lessons. The students had a mission: to construct a prototype of a house in the moon. The students were guided towards categorizing the challenges they had to face and were scaffolded towards organizing and transforming their knowledge and towards following a principled design process. During these lessons the students were searching in the STOCHASMOS data base, constructing 3-D artifacts, negotiating over resources, reflecting on the process and content of the lesson. Each lesson followed a similar sequence creating thus gradually a script that the students could expect in subsequent lessons.

Results

Phase 1: Concerns emerging in the WG and FWG interaction before the FRLBE material was available

The information about the FRLBE ensured that no hard constraints of the Greek educational context were trespassed. At this stage most “foreign” aspects of the FRLBE were experienced as quite attractive: a learning by design activity which had also a significant part of hands on construction work and was using new didactical techniques. The fact that the national culture of the FRLBE group was strong on engineering and design and that the FRLBE group in particular had experience with this type of design increased the credibility of the expected FRLBE. Concerns however were voiced over what was perceived as too ambitious conceptual goals. Within the context of the target culture educational paradigm, which is dominated by conceptual change goals, the FRBLE conceptual goals could not fit in 8 two term periods.

“How do they define “misconceptions”? Indeed it is impressive and interesting that students work quite a lot without working with what we traditionally call misconceptions in the areas examined! “ (researcher, e-mail comment)

Phase2: Questions addressed by the WG to the FWG once the FRLBE material (implementation in STOCHASMOS and Teacher Guide) were available

Upon receiving the full FRLBE curriculum materials the members of the WG commented on an important difference in the assumptions between the WG and the FWG group: The WG assumed that the STOCHASMOS digital environment would carry the weight of bringing in new information producing cognitive conflict towards the change of misconceptions. Gradually the WG realized that the FWG group was interested mainly in supporting students towards reorganizing knowledge that the students already had, for the most part, so that this knowledge would be applicable to practical problem solving. Since the WG was till then committed in a conceptualization of science learning dominated by the concept of misconceptions there were emotions of unease among the WG participants. However the WG stood firm on the initial decision to implement FRLBE as faithfully as possible to the specifications provided. 49 questions were collected and addressed to the FWG group. Table 1 shows the questions categorized in groups.

Table1: Categorization of questions addressed to the FWG by the WG.

Type of question (#of questions)	Examples
Requests for Clarification: (24)	Do we have a mapping between the questions in the knowledge questionnaire and goals?

of the goals of the FRLBE and the connection between goals and assessment tools (8) or of the specific ways that didactical methods are to be implemented (16)	Are 10 minutes (sometimes 5 minutes) enough for the presentation of ideas and for critical exchanges?
Questions about the source context: (16) How did specific directions for the teacher and the students played out in reality on the FRLBE context (9) Exploration of cultural differences between the WG and the FWG broader culture that might be relevant to the implementation (7)	Did the issue of air leaks and air pressure immerge at all? How familiar are children in your country with water recycling, water conservation etc?
Indirect (reasoned) pleas for change through (5) Additional content (rational: provision for unintended directions that student investigation could take) (3) Variations in the schedule provided by the teacher guide asking whether in that case the fidelity to the designers intentions would be trespassed. (2)	The phases of the moon do not appear at all in the content. How come? Is it OK if in the case there is no collaboration among schools we do two classes per week?
Questions about the rational behind didactic methods proposed in the teacher guide (4)	In many instances you not only ask for information/knowledge from the students but also their feelings, their evaluation. Please comment on this choice

The majority of the questions (28 questions: first and last category) are indicative of the WGs purpose to stay faithful to the FWG's design principles. These are questions that promote a deeper understanding of the FRBLE and its rational and therefore are conducive to an implementation that can follow the details of the FWG's intentions.

The questions in the other categories express the WGs desire to understand the grounding of the FWG design in the FWG's context. These questions addressed aspects of general culture (e.g. student experience with negotiations through family life and school life) school culture (e.g. what is discussed publicly and what is not discussed publicly in schools) and teacher culture (e.g. the degree of detail that is expected from a teacher guide). They also addressed specific instances of the design asking concrete details about the way it would run in a Dutch school. Therefore the prospect of implementing the FRBLE created appropriate grounding for the meaningful exploration of education in the collaborating country.

Phase 3: the virtual WG meeting

During this discussion there emerged both points of interest and excitement referring to new learning opportunities for the participants and points of concern.

Points of interest that were voiced were the existence of educational goals that were not well represented in the Greek curriculum (e.g. Learning to negotiate about limited resources), the new didactical approaches (e.g. Learning by Design) and the new didactical techniques (e.g. silent writing, scaffolding questions tailored for learning by design, the use of STOCHASMOS)

The points of concern that were voiced in the virtual meeting focused on educational goals, students' responses to limited new content, possible blocks of the lesson (see Table 2).

Table 2: Concerns voiced in the virtual WG meeting

Concerns	Questions that express the concerns
Concerns about the educational goals of the FRBLE	Is the FRBLE lowering the standards of a good science lesson because it was not concentrating on misconceptions? (In the FRBLE design there was limited new knowledge).
Concerns about students' possible responses to an environment organized around limited new content	Will the students feel uneasy with so little content knowledge provided? Will the students lose motivation and feign that the task is impossible since not enough content was provided? Since there is too little content, what will happen if students start to ask difficult questions that are going beyond the knowledge presented in the teacher guide and are potentially difficult for the teachers themselves?
Concerns about possible obstacles that would block the flow of the lesson	Since the design has a repetitive structure, will students be bored? Since there is both a theoretical section and a construction section in the same 90minutes period, will the students ask critical questions that the teachers will be obliged to side step in order to move on with the construction phase of the activity? Is the FRBLE design taking for granted cultural knowledge that is not available to Greek students?

Since the limited content was such a point of concern for the WG, the WG went for a very minimal change, adding a tab in STOCHASMOS that could work as a security fuse. This tab had additional information that would not be accessible to the students. However if the teacher would feel really hard pressed by them he could make it available.

Since the meeting was recorded the researchers heard it again and extracted the main themes that emerged. These themes were further used to support continuing interaction in the WG by email, through a process of reflection and discussion on issues that are not usually obvious. During this discussion the assumption surfaced that students in school always need a lot of new information in order to perform well.

Phase 4: Assessment and Discussion in the WG after the implementation

Students enjoyed participating in the implementation of the design and expressed willingness to participate further in similar activities. Moreover, the implementation gave the opportunity for interesting discussions and debates among the students and there was definitely learning going on (assessed by the assessment instruments). It is however true that learning was not centred on the deep understanding of science concepts against prevailing misconceptions. Finally the additional tab, carrying extra information in STOCHASMOS, was never used.

This success was a source of reflection for the WG. First of all it challenged the expertise of both researchers and teachers to foresee the results of the implementation since most of the fears expressed were revealed as unfounded. Second it led to increased interest on the specifics of the FRBLE implementation in its native environment and on the characteristics of this environment.

Finally, during this final phase, the WG realized that in the Greek educational culture there is not much concern about how to organize better and more effectively the knowledge that students already have towards practical ends but on students being able to think critically and not be taken in by simple appearances.

Discussion

The combination of the data provided by the different sources reveals that this “adaptation with minimal change” exercise created a valuable educational opportunity for the participants in the WG. First they realized that content is indeed a main organizing factor in the Greek classroom and its minimizing has repercussions in raising anxiety about various other educational aspects: classroom management, teacher workload, student interest and initiative. Second they realized that educational goals that are closer to everyday efficiency than to the achievement of the esteemed knowledge of the discipline raise anxiety among teachers and researchers who are focused on the conceptual change paradigm. Kyza et al. (2014), working in a very similar context (being partners on the same project) report similar concerns being prevalent in the Cypriot educational system, leading in their case in changes of the learning environment they were adapting, in order to be implemented.

Although such themes may appear in the relevant national literature it is important for teacher professional development that in this setting they were accompanied with strong emotions of unease, with feeling the risk, with close monitoring of the consequences in the classroom.

The implementation has been a valuable educational experience for the WG in other ways as well. First it challenged the teachers’ and researchers’ “expertise about the students of their own culture”. The WG members realized that, when faced with new learning environments, teachers and researchers of one culture might not be considered automatically experts on “what works for our students”. Therefore it creates an important prior step for trying out with an open mind different FRBLEs. Second the participating teachers and researchers were motivated to learn further about the FWG educational culture with respect to: everyday knowledge, educational goals and educational practices.

Conclusions

The adaptation of a FRBLE is a process that can be used profitably in various ways. Kyza et al. (2014), working in a similar context, explored the possibility of principled adaptation while leaving more freedom for change, based on the interests of the target WG and the prevalent views of the target educational system. In this work, taking the lead from Translation Studies, we conceptualized a continuum of options for those participating in the process of adaptation, one of them being to “give the benefit of the doubt” and hold as close as possible to the initial design even at the expense of going against the grain of local educational culture. In this implementation of this approach to adaptation we documented the valuable educational experience that can thus be realized.

It may be reasonably argued that there are many drawbacks in the use of adaptation of an FRBLE, for reasons of Professional development in ICT integration in the classroom, in the way suggested here. The participation of researchers makes quite difficult the scaling up of this approach. Moreover, we just reported results for one such researcher-teacher collaboration and finally there is perhaps a sense of treason to the best interests of the local students since the local WG reservations may turn out to be well founded.

These are reasonable concerns. On the other hand though, current research in FRBLE’s adaptation (Kynigos & Psycharis, 2009; Kyza et al., 2014) can support a selection process of FRBLEs that can be efficient for small group learning and can present challenge and reflective potential for teachers who would work on their minimal adaptation and implementation. Furthermore researcher participation might be supported by on-line facilities.

We think that at this point our results are just indicative of a possible fruitful direction that the process of adapting FRBLEs could have.

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