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CONTINUING TEACHER EDUCATION COURSES OF COMPUTATIONAL RESOURCES IN THE TEACHING OF MATHEMATICS AND PHYSICS: CREATION, APPLICATION AND STUDY

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ABSTRACT: Research indicates that the use of the computer can become an ally in the cognitive development of students, allowing them new ways of thinking and acting. However, this potential has not yet been fully integrated into everyday Brazilian school practice. Considering this context, we aimed to investigate how continuing teacher education courses, involving the use of computational resources in the processes of teaching and learning of Mathematics and Physics can impact the pedagogical practice of teachers. We have developed and are executing two projects with interconnected actions, allowing the oriented work with several teachers and international collaborators. The main objective is the inclusion of computational resources in the processes of teaching and learning. The main expected results is that the actions developed will stimulate and encourage more teachers to use technology in their classrooms, allowing students to experience new experiences in Mathematics and Physics.

Key words: Computational resources continuing education, teaching

INTRODUCTION

The impact and advance of digital technologies are increasingly affecting all aspects of lives of the people. This leads to transformations on the social, economic and technological areas resulting in the need of new forms of teaching and learning in the field of education. In order to meet new demands, educational institutions have sought to integrate technological resources in the practice of teachers. However, only the presence of technological resources in teaching practice is not a guarantee to a higher quality in education, because the simple use of these resources can serve as camouflage for a teaching based on mere reception and reproduction of information. The incorporation of these resources in the school context requires study regarding the use of these tools as mediation between the individual and the knowledge. According to Sangari (2007):

... it is up to the educator to contribute to the education of this generation mediated by information and communication technologies, increasing the dynamism and interactivity in educational processes, creating methodologies that enable the development of epistemological curiosity of our students, in order to promote skills that prepare them for a world of constant and rapid change. (p.20, our translation)

It is noted that students are increasingly involved with technology, have curiosity and are in daily contact with them. In this sense, it calls for the teacher to use these resources in their pedagogical practice. For Bortolotti (2008), "the presence of technology in the classroom, especially with regard to the use of computers, requires new attitudes across the teaching and learning process of the educational institutions and teachers" (p. 9, our translation). Regarding the interaction of teachers with technological resources, Richt (2010) indicates that:

The introduction of changes in the educational scenario reinforces the need for coordination between teacher education programs and initiatives that propose the use of technology in the processes of teaching and learning. To this end, professionals of education need to interact with these resources, exploring them in a critical and investigative way, reflecting about the use of these in the classroom, and thus to develop a review about the

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mutability of knowledge concerning technologies and pedagogical changes raised by this dynamics. (p. 73, our translation)

For the use of technology in the processes of teaching and learning, Demo (2009) points that teachers need to be more careful, because it is not possible to do a renovated school with traditional teachers. He says that nothing new will happen with students if teachers do not know how to learn with technology, so it is crucial to prepare them for this task. The author comments that the teacher, to continue learning, can transform your classroom into a laboratory or in a context that challenges him to develop new ways of teaching and learning. In this sense, the author warns:

Most probably the final diploma will end, entering in its place something temporary. The increasingly frantic race by professionals aiming update academic qualifications proves that their diplomas dried.

It may be possible to keep the door always open for the reconstruction of the diploma, within the idea that it is essential to become a lifetime member of the university community of learning. (DEMO, 2009, p. 73, our translation)

In this context, professionals working in the area of education, even if they have already attended initial education, they will need continuing teacher education. It should be emphasized that continuing education are all actions taken by teachers to improve their teaching, such as lectures, workshops, short courses and / or moments of reflection. Regarding the continuing education of teachers, Ferreira (2009) points that this is a field often researched in academia, however there is a large gap between the aim of the training offered to teachers and what are their true needs. Nóvoa (2014) points that for such continuing education to be organized around concrete and specific situations, that promote the desire to find a solution to solve them and stresses the importance of knowledge beyond theory and practice. The author indicates the search for a knowledge that is relevant and not just a practical application of any theory, and suggests designing their continuing education in a professional commitment environment, providing attention to changes in work routines, personal, collective or organizational.

In this context, to insert a new tool in the classroom implies pedagogical changes, changes regarding the vision of teaching, which should be studied and considered by teachers. Thus, some questions may be considered: How to effectively integrate the computer in the processes of teaching and learning? What aspects should be considered when choosing a computer application? What software explore in pedagogical practice? How to prepare teaching activities using technological resources? What activities can be explored using these tools? How to organize the computer lab? These and other questions arise for teachers. These are the questions that permeate the investigations of the authors of this work. The authors are professors of Centro Universitário UNIVATES, located in the south of Brazil. The authors also compose a research group with more members: professors, students of scientific initiations, volunteers, students enrolled in the Post Graduate Program in Exact Sciences and teachers. The aim of the research group is to provide contributions to answer the questions above applied in the area of exact sciences, more precisely in the teaching of Mathematics and Physics. For this purpose, the group has already published works, and the progress culminated in the creation of continuing education courses. Their applications are related by Quartieri, Dullius and Bergmann (2013a), and Quartieri, Dullius and Bergmann (2013b) in two participations of conferences in the area, and insights on the results are related by Dullius, Quartieri, Bergmann and Faccio (2012) in other conference.

Currently, the Brazilian government initiated a series of actions in the education. Some of them contemplate proposals with grants for those that are considered relevant for the actual processes of teaching and learning. Currently our group has four projects granted, and two of them are related directly with the subject of this work. In the following sections their methodology and expected results will be related, as well as the progress of the works.

METHODS

In this section it will be described a resume of the methodologies of two researches: Work I and Work II. Both works have qualitative and quantitative approaches and they were idealized to have participation of teachers of basic education. They will be the subjects of the new continuing teacher education courses and the performers of the new practices on the classroom. The research are based to be centered in students and in teachers, so it is natural to expected regular participation of teachers.

Work I

The principal aim of the first work is to study the possibilities of utilizing computational resources in the processes of teaching and learning of Mathematics and Physics in the Brazilian school. More specifically, there is a government strategy to integrate tablets in basic education, so this research is polarized to study tablets as a tool in the pedagogical practice.

The methodology consists to promote meetings with teachers of basic education that are motivated to think and study the use of computational resources in classroom. The meetings will consist of discussions about the possibilities of the use of tablets and software and to create pedagogical activities for the practical intervention in the classroom. During the process, the authors will be constantly evaluating the proposal, the impact in the pedagogical practice of teachers, as well as the difficulties faced by the teachers. The authors pretend to investigate these subjects via interviews, reports and recordings of the interventions.

Work II

The second work consists in exchange international pedagogic experience by collaborating with research groups from outside Brazil. The main proposal of this work is to become familiarized with different views of education, more specifically in how digital technologies are used to contribute in the processes of teaching and learning of Mathematics and Physics. This research was proposed in conjunct with a Portuguese professors group from Universidade do Algarve. Since in the past there were some opportunities to meet them and their subjects of study were connected with the work of the authors of this paper, this union naturally emerged

The first action consists of a work mission of the Brazilian and Portuguese professors in schools of basic education in Algarve to a process for acquiring data that encompasses the following activities: observations of how classroom are conducted by Portuguese teachers, interview with teachers and distinct members that participates in continuing teacher education courses, interviews with students of the investigated classes, case studies and documental data of the investigation realized by the Portuguese professors. All this steps are to be repeated in Brazil with the Portuguese group. The visit in Portugal is directed to acquire knowledge about the reality of the integration of digital technologies in the classroom in this country, to experiment new pedagogical practices situations and to connect and apply useful ideas in the Brazilian research studies to create contributions in teaching innovations.

EXPECTED RESULTS

It is plausible to assume that the first work will originate rich discussions with the teachers, making possible the creation of several technical productions aimed at how to use tablets in the teaching of specific subjects of Mathematics and Physics. Once they are produced, their union may become a book that will be distributed in schools of the authors neighborhood educational institution and also an e-book to maximize its reach. Besides that, the meetings will provide foundations for the creation of a continuing teacher education courses in digital technologies for teachers of basic education that can be offered to qualify their practice.

The second work have potential to expand and confront the authors view of education. Knowing different realities and performing research with different cultures are a promising way to provide deep changes in the understanding of how people can learn. Since the authors will be in loco with the Portuguese collaborators, in both countries, some possibilities naturally rise: the mutual aggregation of important aspects of the distinct processes of teaching and learning, description and understanding of interconnections between the two educational views, interpretation of a different perspective of observation from distinct cultures and the production of pedagogical materials based in the previous points aimed to innovate and challenge teachers in a positive way to provoke them to search qualification in this area.

CONCLUSION

Both works walk side by side, and their main objectives share important aspects. At the end of the two researches, the authors believe that the studies with the teachers, the international collaboration and the new pedagogical materials will have the potential to qualify the exploration of computational resources in the processes of teaching and learning, as well as to report the advantages and disadvantages and problems regarding the use of these materials. Furthermore the authors expect that the participant teachers of the research feel safe, challenged and motivated to utilize computational resources in their classroom as an auxiliary tool in their

pedagogical practice, providing to the students a new experience of learning in Mathematics and Physics, motivating them to an active participation in this process.

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