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Electronic spreadsheet: Building knowledge for social practices

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Abstract

For this, we draw general objective to evaluate the use of spread sheets in the school environment as a teaching resource to assist in the understanding of basic mathematical concepts of the curriculum of school education related financial mathematics. The technique for data collection was participant observation, combined with an open questionnaire applied to high school students of a public school in the city of Jaraguá do Sul, Santa Catarina. In this study, we concluded that the use of the spread sheet in the teaching and learning of mathematical content is effective, since the student builds knowledge in a dynamic mode, contextualized through educational activities involving financial mathematical content.

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1. Introduction

This work is a contribution to the use of computing resources in the school world, considering that the social changes along the history of mankind are linked to the development of science and technology. Gradually, but in a modest way, these technologies were settling in school environment through administrative routines, settling also in classroom as an additional educational resource for the construction of knowledge. It was then the guiding question: how to use electronic spreadsheets in the teaching and learning process of financial mathematics in mathematics classes?

We list as main objective to evaluate the use of spreadsheet as a teaching resource to assist in understanding of basic mathematical concepts of curricular matrix of school education related to financial mathematic. To achieve the specific goals we show the evolution of computing in society routines, as well as spreadsheets; articulate the technical and scientific language with basic math content of curricular matrix; we propose educational activities that were performed with the use of spreadsheets focusing on financial mathematic teaching; as well as evaluate the effectiveness of using spreadsheets for understanding financial mathematical concepts from the statement of high school students of a public school who participated in the activities proposed. According Rosa and Viali (2008, p. 185) "The spreadsheet was the application of information technology chosen for being investigated by authors like Flores, Viali and others who recommend its use as an effective resource to assist the construction of mathematical concepts."

The teachers are still tied to strictly traditional forms of teaching practice transmitted by training courses, hindering the expansion of ways of interaction, cooperation and collaboration in times and spaces beyond the real (BRAZIL, 2010b). Thus the teaching in school environment can not just stick to one process, just as the juxtaposition of fragmented and disjointed phases, but interact with the social needs and working through the contents of curricular matrix with teaching resources available in environment school (ARAÚJO et al., 2005), considering that learning occurs in the interaction between teacher, student, content, and teaching resources allocated in this interaction. On one side the Law of Guidelines and Bases - LDB (BRAZIL, 2010a) agreed that the student interaction with content should result on the development of skills and competencies to articulate various academic knowledge in a web of continuous learning that leverage knowledge and do. On the other hand, the proposed guidelines for the training of basic education teachers (BRAZIL, 2010b), emphasizes the use of digital technologies which sets up a tremendous resource for basic education and should have the same importance for training courses for teachers.

Information technology has been an important resource for many social routines. Also it should be noted the efforts of many researchers and studies for that area would be developed effectively as we know it today. For the teacher who wishes to

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encompass historical information in their classes, in this work we present a broad historical overview of computer science, programming languages and electronic spreadsheet.

The pedagogical practice can also use this feature critically and creatively, in combination with the contents of curricular matrix in all subject areas. Seeking to encourage the use of digital technologies in school environment, this dissertation articulate some basic mathematical content with activities using electronic spreadsheets as a teaching resource.

2. Methodology

The realization of didactic activities began with students presenting them to your spread sheet and basic resources needed for the development of planned activities. The concepts of financial mathematics had already been worked out at class in traditional way, with pencil, paper and didactic books.

Initially, on transporting some mathematical formulas for the virtual environment of electronic spread sheet, most students had difficulties on the process, not knowing a few commands and their functions in the spread sheet needed for mathematical formulas worked in the classroom. By being familiar with these commands and their functions they could apply this knowledge to others problems situations with others mathematical content. We take also to remind students that mathematical concepts may be different when applied to financial mathematics.

3. Results

In the proposed activities, the students were able to see the connection between mathematics and computer science as evidenced by their comments on the proposed activities, indicating that, when using electronic spread sheets in mathematical activities, classes become more interesting as they may interact with digital technologies. In this context, the student can use the knowledge acquired in class in different spaces of their everyday school life.

According to students' account, when working with electronic spread sheets, have the opportunity to learn in a new way, thus improving the quality of teaching and learning. In teacher, student and construction of knowledge interaction all learn, exchange experiences and seek ^{alternative} ways of learning due to the diversification of teaching resources which are given as opportunities by the virtual environment, in this case, the electronic spread sheets.

By working with the content potentiation math, we found a miscalculation that initially thinks as bug in the particular software. We tested other spread sheets and found that the bug is widespread, i.e., both spread sheets platform free (Open Calc) as the platform owner (Microsoft Excel) have the same miscalculation.

Observe the calculations proposed in the didactic book (DL):

$$\begin{array}{lll} \text{a) } (-2)^3 = (-2) \cdot (-2) \cdot (-2) = -8 & \text{c) } (-2)^2 = (-2) \cdot (-2) = 4 & \text{e) } (-2)^0 = 1 \\ \text{b) } -2^3 = -2 \cdot 2 \cdot 2 = -8 & \text{d) } -2^2 = -2 \cdot 2 = -4 & \text{f) } -2^0 = -1 \end{array}$$

In building the syntax noted in the spread sheet:

- a) When typing in the spread sheet the syntax = -2³ → - 2², the result appears as 4 and not -4 as it should be.
- b) When typing in the spread sheet the syntax = (-2²) → (-2)², the result appears as 4 and not -4 as it should be.

We call the attention of the academic community and education professionals to that point, since in working mathematical logic reasoning of the equation, the result will be different in the electronic spread sheet. Using spread sheets with students, we found that the classes become more enjoyable because they feel motivated to use digital technologies, as reported by Borba and Penteadó (2001) in their research.

Nevertheless, we see a dichotomy in the words of some students regarding the use of digital technologies, when report that despite all get faster and easier with this feature, we must take care not to become slaves of these technologies. These sayings warn the accommodation of some individuals in not practice schemes and mental elaborations needed for the development of logical reasoning and problem solving, becoming dependent of these technologies in a mechanical way. On the other hand, this practice awakens in the student a desire to learn more about these features for many different applications outside of school too.

4. Conclusions

Using the electronic spread sheet in this research work, we gave as opportunity the simulation of mathematical activities with immediate results, leading the student to the analysis of these results through the application of mathematical concepts. These experiences lead us to the challenge of teaching and learning on a technological resource in vogue and mainly of interest to students, which we saw in the words of the individuals who took part in this research. Nevertheless, it is noted that the change in teaching and learning process and education in general, does not depend on the used technology, but how these technologies are used and joints and elaborations made with them on teacher, content and student interaction, because the effectiveness of this process depends on the manner of participation of the individuals involved and not just the technologies used. In this sense, the greatest challenge is for the teacher to articulate pedagogical resources in the interaction between subjects, the knowledge area and the contents of curricular matrix.

We note that 90% of students who performed the activities suggested in this study reported that the use of spread sheets contributed to the learning of mathematical content. In the account of students we could see that the implementation of the

framework and activities of the didactic book for the virtual world of electronic spread sheets aided the construction of knowledge, because was used a different way of learning the same content, i.e., changed the way of learn, but not the contents.

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