INSTRUMENTAL GENESIS OF THE DIGITAL EDUCATIONAL RESOURCE (DEG) ”FUNÇÃO RESGATE”

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Abstract

This work forms part of a larger research project aimed at describing and analyzing the instrumental genesis of mathematics and science teachers in relation to Digital Educational Resources (DER). Specifically, we focus on the DER named Função Resgate (Gomes et. al., 2022), a video game developed by the V-Lab-UFPE team in Brazil. This team has created a suite of DERs in mathematics and sciences to align with the National Common Curricular Base (BNCC). The DER is designed to assist students/players in developing specific skills, such as analyzing functions from their algebraic and graphical representations, and encouraging the use of the characteristic parameters of a given function.

Two fundamental aspects of the DER, and particularly of Função Resgate, are considered: the didactic aspects, which pertains to the game and its role in structuring teaching, and the characteristics of the DER as educational software. The research is theoretically grounded in the Instrumental Approach of Didactics (Rabardel, 1995), which was developed within the field of Professional Didactics (Pastré, Mayen, and Vergnaud, 2006). This approach is used to analyze and understand how an individual using an artifact in a work situation constructs a usage scheme (Vergnaud, 2013), such that the combination of artifact and scheme forms an instrument.

The research methodology comprises three stages: initially, a questionnaire is used to investigate how teachers impart the school knowledge associated with the resource. Subsequently, the teachers interact with the DER, after which a second questionnaire is administered to assess its potential, advantages, and disadvantages. At this stage, semi-structured interviews are also conducted with selected teachers to supplement the collected information. In the final stage, the teachers design a lesson incorporating the resource and implement it in the classroom. This phase involves documenting the process of lesson conception, its execution, and conducting an interview with the teacher before and after the resource is used. The results of the first two stages are presented here.

The study involved 36 practicing mathematics teachers from various provinces and regions

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of Argentina, who were intentionally selected. The questionnaires, designed and validated by Gazzola and Otero (2023), first explore which functions the teachers teach, how they do so, and what resources they use. The teachers then played the game, progressing through all levels, before answering the second questionnaire, which evaluates the DER and asks whether they would use it when teaching functions. To triangulate the data, four teachers were intentionally selected for semi-structured interviews, which focused on the following areas: the typical approach to teaching functions and the relevant knowledge; the potential use of the game for teaching functions and how knowledge is addressed in the DER; and the advantages and disadvantages of the game in relation to knowledge and its application in the classroom. The transcripts were generated using software and were subsequently reviewed by the researchers.

Preliminary Results

The findings highlight the relation between the conventional method of teaching functions and the teachers’ assessment of the Digital Educational Resource (DER) as a tool. The teaching of functions typically begins with the teacher’s explanations, followed by a sequence that involves defining from a formula, deriving a graphical representation, and identifying certain notable points that are ostensively justified from it. This approach appears to reduce mathematical knowledge to its predicative form, neglecting its operational aspects. This epistemological perspective, coupled with the entrenched method of teaching functions, leads to teachers expressing certain unfavourable views on the use of the DER as a teaching tool and the potential mathematical activities it could facilitate. Teachers exhibit reluctance and encounter difficulties in utilizing the DER, indicating they would only employ it for student exercises. This aligns with an ideology that implicitly contrasts mathematics with creativity, art, and the enjoyment of gameplay.

References


Keywords: Digital Educational Resource. Mathematics teachers. Algebraic and transcendental functions