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Exploring an approach based on digital games for teaching programming concepts to young children

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Abstract

The inclusion of programming topics in the initial grades of school gives rise to debates about the best ways to teach these contents. Programmable toys, activities with physical materials and various games are some of the resources available. Amongst those, digital games possess important elements for learning programming, such as incremental challenges, personalised immediate feedback, and visualisation of the consequences of errors. In this work, we explore the results of an experience based on digital games for teaching programming concepts to young children. Our aim was to investigate how such concepts are presented in the games' interface and what is the impact of the interaction elements on children's comprehension. This work took place in Informatics classes of a Brazilian school, with 42 students aged 5 to 7 years. Data were collected through participant observation, and semi-structured and unstructured interviews, focusing on the main difficulties faced by the children when interacting with the games. Topics, skills and competences were considered according to the syllabus proposed by Computing at School, and encompassed sequences of instructions, repetition loops and conditionals. Results indicate a satisfactory understanding of sequences of instructions and conditionals, but also show challenges with respect to graphical symbols, text and interaction elements identified as hard to understand for the children, making the support of an adult fundamental. Another critical point was the comprehension of the concept of repetition, which made the use of complementary approaches necessary, in particular unplugged playful activities. This shows that despite the increasing number of available digital games that involve programming basics, good solutions for conveying the main concepts to young children have not yet been found, demanding further investigation, possibly towards structured hybrid approaches combining digital games and unplugged activities.

Keywords: digital games; young children; programming; child-game interaction.

1. Introduction

The discussion about teaching Computer Science topics to all is not new. In the mid-sixties, the first Turing Award winner declared that everyone should learn how to program [1]. Visual programming languages such as LOGO and Scratch, and the cards, ropes and crayons of the Computer Science Unplugged initiative have made the way for teaching Computational Thinking in elementary education for years now.

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