Learning with Interactive Virtual Math: an exploratory study in the classroom

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INTERACTIVE VIRTUAL MATH

Study

Tool Features

Aim and Research Questions

Interactive Virtual Math is a digital tool for learning graphs from dynamical events at high school (14-17 years old students) and to explore the use of new technologies in classroom. The project started in 2016 as a proof of concept in which a prototype tool was developed and tried out (Palha and Koopman, 2016). The aim of this study is to explore the use of the prototype version in the classroom.

• How did the students experience and learn about graphical representations with the prototype tool?
• How did the teachers integrate the tool, and in particular, the logbook in their lessons and used it in the classroom?

Theoretical background

Conventional curricula have not been effective in learning to construct graphs by dynamical events (Carlson, Larsen, & Leitzel, 2003). Learners should be helped to focus on quantities and generalizations about relationships, connections between situations, and dynamic phenomena (Thompson, 2011; Ellis, 2007). Digital tools can be valuable to achieve these aims. Tools that include Educational Data Mining (or learning analytics) also have the possibility to generate new understandings of how students learn and how to adapt our environments to those new understandings (Berland, Baker, & Bikakis, 2014).

Students’ visualization of dynamic events

Self-construction

Students must draw a graph that describes the relationship between two variables in the dynamic event and explain it in words

Comparison

The student gets a second assignment with a cylinder-bottle and can compare the graphs and explanations of the two situations

Help 3D animation

The student visualizes the increasing height of the water in the bowl

Help interactive animation

The student connects the graphical representation to the context representation. A Cartesian coordinate system in the plane and the bowl appear next to each other.

Flow

The student can go through the tool at his own pace and several times. He select help

Reward

The student gets the corresponding form of the bowl

Logbook for teachers

The logbook allows teachers to get real-time assessment on the classroom and individual progress of the students.

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Method

Four invited teachers with varied teaching experience (TE) used the tool with one class

Measurements

Data collected in May 2017, Amsterdam

Students and Teachers’ questionnaires were about IT-15 questions: MC and open

Lessons' observations

Prototype task

Example student work logbook (in Dutch)

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References


Development team (AUAS & UvA)