OBJECT CONCEPTION FOR KIDS – AN UPGRADE OF THREE SERIOUS GAMES

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RESEARCH CONTEXT
This research project began in 2015 with a collaboration between HEP-VD – Art and technology, research and teaching department, Media and technology – and HE-Arc, HES-SO – Image processing & Computer graphics group. From a first platform including five prototypes we developed three new serious games (SGs) in 2017 focused on object-creation activity: from computer-based virtual conceptualization to real world object generation using for instance 3D printer.

This SGs platform has an original approach as it addresses several types of end users – i.e. children from 8 to 13 as well as teachers – and is a very promising tool also for pedagogy staff since it enables to collect data on the creative process. Through the different game levels, children learn to implement skills in an interactive context, i.e. mathematical and basic skills in science and technology, digital skill, learning to learn, social abilities. During phase alpha, the SGs were tested on two children groups children (8-9 and 12-13 years old) and we collected the notes from 70 professors in continued training within the PIRACEF program.

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SCIENTIFIC CONTEXT
The SGs we began to build were created to help all children develop their decision-making abilities. We focused on some specific executive functions, especially important in the primary school creative and manual activities. The idea that SGs can train executive functions is not new and several games were created for this task. However, most of them were designed for disabled or brain-damaged people (game: Reset, 2013, Brain game Brian) with positive effects on patients with ADHD or neuronal damages. Our hypothesis is that SGs could also help children with no specific brain disorder to develop their executive functions in an educational context. The functions we focused on are:

- inhibitory control: capacity to override a stimulus in order to choose another behaviour;
- cognitive flexibility: ability to change mental activity from one cognitive task to another;
- planning: ability to plan successive and complex tasks;
- divided attention: ability to realize simultaneous actions;
- working memory: remembering recently learned elements and reusing them in another context.

GAME DESCRIPTION
The main game objectives concern the object-creation activity and we have not yet focused on the manual phase (i.e. object production). We rather aim at developing children abilities to conceptualize (2D and 3D) objects through different activities. Each game proposes some activities linked with executive functions and object conceptualization training. One action type consists in observing and manipulating virtual objects. Others, more complex, concern problem solving. Some games especially
train cognitive flexibility by changing the demanded tasks. Other construction-based games, exert planning. The research was developed along two axes: a programming research on video game creation and the research question “how to introduce activities and exercises into SGs that can develop children abilities to design objects?”

THE COLLECTED DATA

Another objective is to provide teachers with a tool to understand better children progress in these activities so as to offer more differentiation in the pupils learning processes [5]. The collected data can help teachers identifying the pupils learning difficulties and adapting their lessons to the children real needs. Therefore, it is necessary to match the game results and process with defined parameters. A table of specification (TOS) was used to indicate the player’s mastery levels evolution. To confirm this table, we worked with different specialists at HEP-VD.

NEXT RESEARCH STEPS

The next research tasks will be about skill transfer from SG to real object production. Do these games, based on executive functions such as training and learning, help children improve their abilities in conceptualizing 3D objects? Are skill transfers possible in real object conception? This project main future challenges will be to develop the platform with more SGs and several game levels and test these improvements on a wider scale so as to gather more data and check our hypothesis.

REFERENCES