What a Tangible Digital Installation for Museums Can Offer to Autistic Children and Their Teachers

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ABSTRACT

This study is a cooperation between the authors and a teacher who works with pupils affected by autism spectrum disorders (9-12 years old) in a primary Danish school. The aim was assess the benefits of game-based learning with respect to teachers’ main challenges: facilitating the discussion of curricular subjects and enabling learning through conceptual thinking and social interaction. An existing digital and tangible installation called MicroCulture, originally created by the authors to bridge history learning across museums and schools was re-contextualised and placed at the school’s disposal, in a three weeks study involving 15 pupils. Data was gathered unobtrusively, with qualitative methods. Through mediated play and teacher’s facilitation, children occasionally engaged in interactions leading to conceptual thinking, cooperation, and forms of role play. The authors present both problems and positive experiences the pupils and teachers had in playing at MicroCulture; the findings allowed us to outline guidelines for developing similar installations.

KEYWORDS

Autism, Digital Games Based Learning, Facilitation, History, Role Play

INTRODUCTION AND MOTIVATION

An increasing number of studies has been dedicated to the design and evaluation of digital technologies targeted at supporting children affected by autism spectrum disorders (ASD for short) (Aresti-Bartolome and Garcia-Zapirain 2014). Differently from previous studies, which focus on supporting children in developing their skills in literacy and social interaction (Ploog et al 2013), this paper discusses how technology can help teachers covering specific subjects, e.g. history. This particular study emerged from the interest expressed by a primary school teacher from Aadal school...
in Denmark, who works with classes of children affected by ASD. Her concern was to find proper support to help her pupils dealing with conceptual thinking and with the content of the subjects of their school curriculum.

The adopted technology is called MicroCulture, a tangible, interactive installation created prior to this study, aiming at bridging learning of history across museums and schools (Marchetti 2013). MicroCulture is a digital simulation of urban development, seen as a social process that is mapped on tangible interaction. In order to cover children’s multiple play modalities and support their interaction with guides and teachers, MicroCulture offers exploratory gameplay, with no predefined final goal and no score.

Previous work with MicroCulture (Marchetti 2013, Marchetti and Valente 2013) showed how children without autism, visiting a Viking museum in Ribe (Denmark), could engage in social interactions and role play; in those evaluations adults (the museum guides) supported the children in understanding the technical functionality of MicroCulture and its historical meaning. A similar situation was setup for the two weeks evaluation conducted at Aadal school, where the teachers were given full control on the MicroCulture installation. In this way we could evaluate if the technology was usable for the teachers from a technical and pedagogical perspective, while evaluating how MicroCulture affected children’s social interaction and their learning.

The rest of the paper presents related work (section 2), then the evaluation and the methods adopted in the collection and analysis of data (section 3). Section 4 contains a discussion of the findings, and the last section reports our conclusions.

RELATED WORK

An increasing number of studies have been dedicated to the design of technologies targeted at children affected by ASD. At the same time an increasing number of children are diagnosed with ASD, partly because of a greater awareness and better diagnostic practices emerged about the condition, and partly because of a constant redefinition of what autism means (Aresti-Bartolome and Garcia-Zapirain 2014, Tartaro and Cassell 2007). In general different forms of autism can be found, which can affect individuals in different ways and more or less severely. However, all forms of autism hinder individuals in communicating and identifying emotions in others, causing difficulties in developing relationships and in playing with peers (Ploog et al 2013). At the same time ASD are also related to difficulties in using imagination and in developing creativity, leading affected individuals to repetitive behaviours (Aresti-Bartolome and Garcia-Zapirain 2014). According to some studies there is a risk that digital technologies might reinforce the typical behaviours of autistic children, contributing to their social isolation and to their repetitive behaviour. Authors showing a more positive attitude (Aresti-Bartolome and Garcia-Zapirain 2014, Tartaro and Cassell 2007) argue that properly developed and contextualised technologies can instead support children in compensating for their difficulties, so that they can practice their social and learning skills with less effort and prepare to better face real life situations.

The technologies developed to support children affected by ASD focus on their weaknesses and/or strength, to help them gaining skills in social interaction, communication, literacy, and creativity. For example, a study conducted by Madsen et al (2008) specifically targets social interaction skills and presents Emotion Bubbles, a mobile application to help autistic children in processing the facial expressions of their friends and their own, in real time. Based on recognition of movements of the head and the face, Emotion Bubbles can infer six states of mind, such as: “agreeing, concentrating, disagreeing, interested, thinking and confused” (Madsen et al 2013, p. 3). The first three are associated to positive emotions as they indicate that a conversation is proceeding, the last three could be a sign that the speaker might “want to reiterate or rephrase a previous point in order to make sure the listener understands” (Madsen et al 2013, p. 3). Each of the six states was assigned a colored bubble, and its intensity is measured numerically and mapped on the radius of the bubble. According to the authors, testing with Emotion Bubbles revealed that the interface effectively supported children in becoming
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