Serious Games and Services for Wellbeing and Health

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***Abstract*—This special track presents two papers focusing on conveying knowledge, adapting content, and achieving intended learning goals using digital platforms. The contributions take the perspectives of teaching complex mathematical content to visually impaired user, and of preparing young children for the MRI-scanning procedure. The understanding of the different target group's needs, and how these needs could be addressed by digital solutions are addressed.**

Keywords-digital learning; educational software; braille digital plattforms; design for children, gamification.

I. INTRODUCTION

What we see, touch, and hear, influences our mental images, and our mental images influences the perception of the environment [1]. Visually impaired people create, to a great extent, their mental models of the world based on touch and hearing [2]. All of us, base our mental models on existing knowledge, and with respect to young children, this framework might differ from an adult´s view of a phenomena in the world. Therefore, designing digital services for different target groups demand insights about the specific target group's presuppositions and ways of interpreting the world.

Much of the research regarding blindness has focused on the relation between vision and touch [3][4]. However, there is a need for a broader multimodal approach to create a larger flexibility [2], and to adapt to how our cognition works and to how we create mental models of the world.

With respect to child users, interfaces and interaction needs to be intuitive [5] and adapted to the child's reading skills and to his/her understanding of the world. An application should be able to use without instructions, or guidance should be given until the intended task is understood [5]. One way of addressing the way a child can take in knowledge about the world is by giving instructions in speech with corresponding pictures. Animations can also help the users to both remember and understand the instructions [5].

A common important challenge when designing educational software is to understand and adapt the learning context and the content towards the needs of the user group at hand.

II. ADAPTING THE LEARNING CONTEXT TOWARDS THE USER GROUP

A. Design of interfaces for people with blindness and low vision: Designing the complete learning environment for Braille users studying mathematics

Digital platforms are not automatically accessible for people with blindness and low vision; it must be designed for multimodality, both regarding the architecture and the interface. This paper [6] focuses on complex content such as mathematics and how it could be accessible for Braille readers. The aim of this paper is to highlight and to discuss what is required from digital platforms to support mathematic Braille. The situation for Braille users learning mathematics is not at all very satisfactory. When using the ASCIIMath format in digital reading and writing, Braille users practice a format not in use by teachers or sighted peers. The aim with this paper is to identify the functionality and the technical infrastructure needed to make the design of a truly usable learning environment possible.

B. The COSMO@Home Application – Iterative Development and Implementation of the Learning Goals

This work [7] describes the design journey in the development of an edutainment application for children. The aim of the application was to prepare children for an MRI scan. The COSMO@Home mobile application is based on a number of learning goals that are conveyed by a set of mini-games aimed at teaching and preparing children for the magnetic resonance imaging (MRI) scanning procedure. Each mini-game addresses one or more of the learning goals identified by the project as being important to prepare children for the procedure. The learning goals were: 1) Learn about the MRI procedure, 2) Familiarization with MRI sounds, 3) Familiarization with the size of the MRI scanner, 4) Practice the timings, 5) Practice lying still, 6) Learn about accessories such as earplugs and head coil, and 7) Understand that metal is not allowed in the MRI room. During the iterative development, initial tests to explore the general concept were conducted with children without a

planned MRI scan and outside the hospital. In a second phase, more complete versions of the prototype were tested with children at the hospital. During the last phase, the application was tested in a real context with children in their homes. The main outcome of the iterative development and the testing was an application that, overall, seemed to convey the learning goals. However, the tests also revealed challenges in addressing the most important learning goal of lying still.

III. CONCLUSION

The emphasis of both contributions in this special track is on the importance of gaining a deeper understanding of the learning contexts in relationship to needs within the intended user groups. In many teaching situations there are already methods and techniques to spread knowledge about a certain topic. When making the material digital, a further layer is added, which needs a mapping between successful learning techniques and the intended digital environment. Further, there is also a need to adapt the content based on kind of content and the intended learning goals. There are also a variety of individual needs within the different target groups. These need to be accommodated for, and at the same time the services developed have to be general enough to be commercially viable.

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