A Visual Narrative for Teaching Social Routines: Animations for Young Learners with Autism

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ABSTRACT
This study investigates the design structure of an online social educational program, for young learners with autism. Prior investigations of learner requirements and child/user roles have provided a representation of the user profile for the child learner with special needs. Online lesson interfaces are evaluated by tutors in special needs schools. Social skill story themes have been decided upon and implemented into animated online lessons. The accompaniment of computer-based vocabulary and word-based quizzes, adopts the Discrete Trial Instruction (DTI) method of learning reinforcement. This may lead to added retention of information and increased improvement in the transfer of knowledge. It is concluded that further computer-based implementation of reinforcers, such as the inclusion of flash games and audio, should be incorporated to motivate learning.

INTRODUCTION
This body of work documents the screen design and prototyping of multimedia-based instruction to teach social skills to young learners with autism. Investigations during requirements analysis and conceptual design modelling phases have provided a framework for the development of the prototype. The key element within the prototype is the creation of animated computer generated 'social story™' lessons to teach social skills to young learners with autism. Social stories™ are educationally based tools, which are principally used to prepare a child for an upcoming event or to educate the learner in social skills [12]. In order for the story to have a positive impact on the child's behaviour, it must be introduced as part of the child's everyday routine. Social stories are already commonly used for instruction in paper and video format [14]. Even though a previous study has been adapted to teach learners through a computer-based means [4], there is a gap in research, on the design approach to online animations for special education.

Understanding User Requirements
This project focuses on a 'user – centred' approach throughout the design process, in that the learner and the tutor are included throughout each phase of development. It is necessary to understand the role of the user in order to build a complete profile model of the child learner [2, 3]. This study will adapt the four roles of children during technology development i.e. design partner, informant, tester and user as described by Druin [2]. Modifications will be made to these roles to accommodate to the perspective of the child with autism. The W3C Web Accessibility Guidelines and standards shall be implemented throughout the advancement of the prototype [13]. Since Nielsen's [9] children and web usability report concluded that inconsistent and vague navigational menus, complex vocabulary and lack of apparent clickable areas can lead to unconstructive web usability for children, this prototype aspires to overcome these drawbacks in its design. High abandonment rates were found if children came across lengthy scrollbars, so a safe area will be included which will circumvent unnecessary scrolling. Although current WAI guidelines and HCI principles [10, 11] have established a solid structure in respect of content accessibility and navigational methods for users with auditory and visual impairments, there is scope to suggest that these guidelines can be developed further to meet the needs of learners with cognitive impairments. These guidelines will be explored further and solutions shall be proposed in respect of the learner with autism.

USABILITY METHODOLOGY APPROACH
Mayhew's [8] usability engineering lifecycle has been modified to provide for different elements throughout the development of the prototype. Prior to commencement of design, user profiling and task analysis were conducted by the researcher, to understand how the learners currently interact with software and computers. The researcher spent time in classrooms of local special needs schools, observing the day-to-day routine of the children. Informal interviews were conducted with tutors in the schools. The tutors demonstrated current software available to them, and the current problems and benefits were discussed. Findings from this fieldwork have provided information for the conceptual design models and screen design prototyping phases [15].

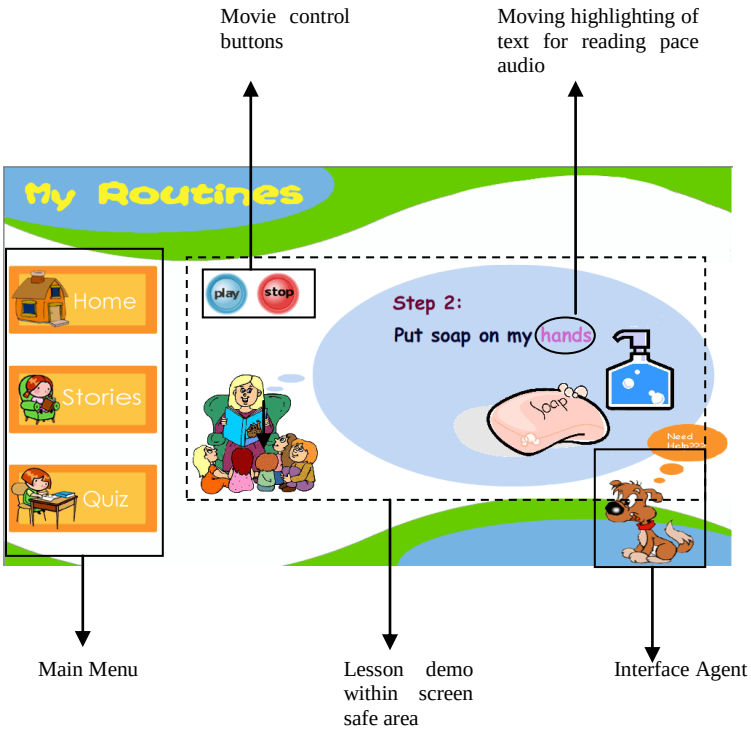

Figure 1. Lesson Interface for hand washing lesson

Conceptual Model Design

Children's popular online educational websites and software were reviewed prior to design. Imaging editing tools and online graphic and font repository archives were used to create a computer-generated representation of the design sketches. Paper-based storyboards of two themes, representing the design of the lesson interface and overall prototype, were presented to the tutors for evaluation. Figure 1 represents the interface, agreed upon with tutors, to be developed into the main computer-based prototype.

Screen Design Standards and Prototyping

The interface represented in Figure 1 was redeveloped for an online presence using software and multimedia application tools. As recommended by Lynch and Horton [6], the screen safe area is developed spanning a total of width 760 px * height 410 px, in order to present full text to the learner within the screen and to prevent unnecessary scrolling. Donker and Reitsma [1] suggest that each individual button should measure width 27px * height 27 px. In our application, the button measurement is much larger (width 216px * height 106px), in order to receive a more accurate response from the user with special needs. The buttons are developed to a maximum size to cater for the learner with motor difficulties, who may require the additional assistance of a touchscreen monitor for input.

Two lesson themes were agreed upon previously with tutors i.e., 'hand washing' and 'turn taking', to be developed into web-based lessons. All steps within the lesson are refined to a maximum of three sentences per screen to prevent overloading the learner with text. Voice-overs are included to cater for learners with visual impairments or reading difficulties, with the text changing colour in time with the spoken word. Following the tutors' advice, the lesson is controlled with two buttons labeled 'play' and 'stop'. The child can stop the movie if s/he wishes to spend additional time viewing a task. As further advised by the tutors, the researcher has developed the text using the font face Comic Sans of size 14px. This font typeface has already proven successful during the implementation of the Picture Exchange Communication System (PECS) method within the classroom. Previous research in the field of dyslexia has also demonstrated favourable results with the implementation of sans serif fonts, similar to Comic Sans [7].

MOTIVATIONAL ANIMATIONS

Present investigations are currently reviewing the positive impact of computer-based reinforcers as a motivational tool for learning. Reinforcers are a method included within the educational framework for learners with autism, known as Discrete Trial Instruction (DTI). Reinforcers are types of rewards used to reinforce correct behaviours or to congratulate a child who has learnt a new skill [5].

It has been shown that reinforcers, provided at variable times, give rise to a greater effort from a child to complete a

task, as the child is uncertain of when to expect the reinforcer. Research findings from a previous software study, TeachTown, also developed for young learners with autism, found that learners demonstrated increased enthusiasm to complete lessons, provided they had access to miniature games on completion of the lesson [16].

Recent findings, observed during fieldwork, suggest that children are attracted to colourful graphics which provide an instant effect upon a single click, such as morphing or unusual sound effects [15]. The researcher is currently developing diminutive games, which can facilitate drag-and-drop actions via the touchscreen. These short games should provide the instant feedback so appreciated by the young learner.

CONCLUSION

Conceptual model and screen design evaluations with tutors have provided positive feedback in relation to interface design, lesson design and navigational capabilities. User profiling and children's roles will continue to be investigated during the successive phases of Mayhew's Usability Engineering Lifecycle [8].

The inclusion of classical music, such as that of Mozart, is considered to have a calming effect on young children with autism. This shall be explored in the development of later phases.

The prototype will be further enhanced by the inclusion of a quiz subdivision, in order to reinforce learning and assist in the generalization of skills for the learner. As proposed by the tutors, word and vocabulary games based on the lesson themes shall also be created. This may support further advancement of verbal skills while still enhancing social skills, through the use of this online tool.

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