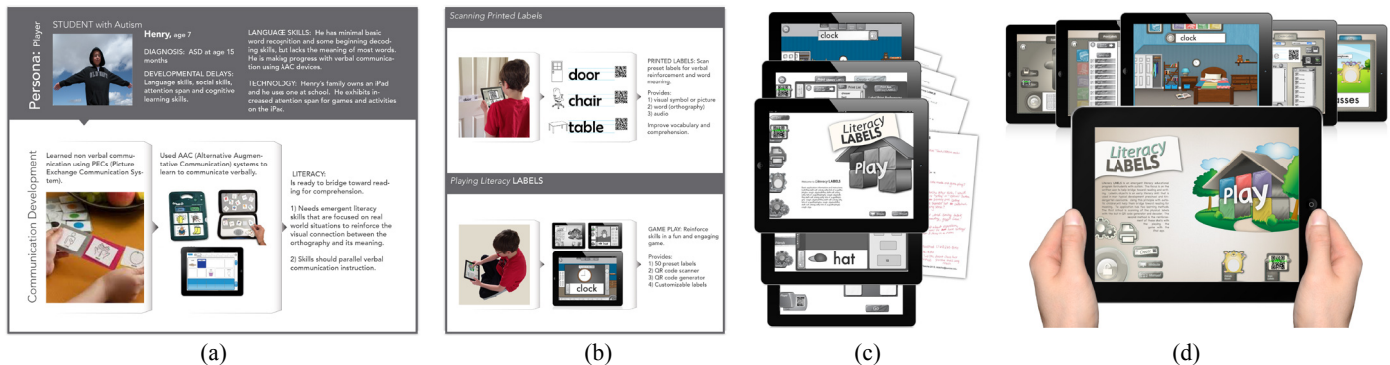# Literacy LABELS: Emergent Literacy Application Design for Children with Autism

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Figure 1: *(a) The user persona explains the autistic learner. (b) The two learning methods are scanning QR codes on labels and reinforcing skills by playing the game. (c) Sample of the mock-up and formative evaluation feedback. (d) Illustration of the final design and graphics.*

1 Introduction

We introduce the design and development of the iPad application, Literacy LABELS, which aims to help children with Autism Spectrum Disorders (ASD) develop the early literacy skills necessary to bridge toward reading and writing. There is a common thread among children with ASD to use decoding skills to read. This ability can even occur before they develop functional verbal communication. Yet, these children struggle with reading for meaning and lack the ability to comprehend text. (Randi, Newman, and Grigorenko 2010) This application is our effort on improving this situation. Labeling is used in many typical development preschool and kindergarten classrooms to help non-readers connect the orthography and the meaning of the word by placing a label on the actual object. Literacy LABELS was designed for the iPad to help children with ASD develop the skills necessary to read for meaning by using this emergent literacy skill.

Keywords: Autism Spectrum Disorders, emergent literacy, iPad, application design.

2 Research and Design

We started from reviewing literature to understand the cognitive deficiencies associated with ASD and determining instructional needs and target zones for instruction. The cognitive deficits revealed an interruption in the ability to process information. Autism makes attention and perception difficult to achieve and directly affects learning. (Rasche and Qian 2012) We chose to use the iPad for instruction because it helps to focus attention and increase time on task to enhance learning. (Putnam and Chong 2008)

Our main design goal is to help children with ASD to read for meaning. The focus of labeling actual objects in context using an environment where many of the objects were readily understood was important. With this in mind, we decided to design the application for the home environment. Figure 1(a) demonstrates a persona of the initial targeted audience of children with ASD. After reviewing the design mockup with professionals, we realized that it could actually be built as an inclusive design that fits the widest possible audience - children with varying types of learning disabilities and typical development preschoolers.

Figure 1(b) shows the two instructional methods in Literacy LABELS. The first method is the novel approach of using the iPad camera as a scanner to allow for a visual and audio response for all the printed labels. By interpreting the context of the actual objects, it is easier for the children to build up the understanding of the text meaning. The second method is playing the game to reinforce the skill being taught with the direct instruction of the physical labels. We propose that the combination of using these two learning methods will help to strengthen the association between the orthography and the object.

Usability considerations for the interface had to meet the nature of our user group. For example, we placed teacher controls in a secure locked location to prevent the child from selecting these buttons. Another adjustment was to lock the screen while the prompt is being read to discourage the child from randomly making selections before hearing the instructions.

As displayed in Figure 1(c), we created a mockup of the system and conducted a series of formative evaluations with facilitators at Purdue University's Speech Clinic. Based on the results, we made changes and refined the application's structural design and graphics as illustrated in Figure 1(d).

Our prototype of the QR code decoder and one room of the application are ready for a summative evaluation with the user groups. As part of the iterative process, we will revise the system after the evaluation and then release it for final coding.

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