“SPELLCHECK”: AUTONOMOUS EDUCATIONAL SPELLING AID

DIGITAL TECHNOLOGY DESIGN FOR PROMOTING SELF-REGULATING LEARNING IN STUDENTS WITH LEARNING DISABILITIES

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Computer Engineering

By

Justin Guo

May 9, 2022

SOCIOTECHNICAL SYNTHESIS

The modern digital revolution has resulted in technological solutions in countless interdisciplinary fields, and education is no exception. The technical project involved prototyping a digital educational tool designed to teach children how to spell English words by displaying images and prompting users to spell them out. The goal was to design an alternative learning solution for children and young students to accommodate those who need more resources to successful in academia. However, technological solutions are affected by not only the people that use it but also the way it is used. The STS project analyzes relevant social groups to examine the adoption and implementation of educational digital tools for promoting self-regulated learning behaviors in students with learning disabilities. The two projects attempt to examine the features that enable technology use in classroom environments. The technical project provides insight into the technical and design challenges that impede the integration of digital technology into educational practice, and the STS project creates a design methodology for digital tools to promote self-regulating learning in children with learning disabilities.

Access to teacher instruction is limited for a limited resource for students, but spelling is an area of study that could be practiced with technological instruction instead. The technical project therefore focused on developing an autonomous educational digital game to avoid the need for teacher or parent oversight. It combined a software-controlled spelling game with a physical interface using letter blocks. The intent was for students to receive positive feedback from the game while also improving motor function at the same time.

The digital tool was made by combining an LCD display, a microcontroller, and a 3D printed panel to accept the letter blocks as input. The project was able to read letters from the panel, display the game state on the LCD, and switch out images to continue to game. It was

demoed at a capstone fair to educators and professors, and it finished in the after the prototyping phase.

The STS project used the Social Construction of Technology framework by Pinch and Bijker to connect the relationships between relevant social groups and the introduction of new educational digital technologies. By analyzing case studies of technology in education, recorded teacher testimonials, and past literature on self-regulated learning behaviors, the STS project explored the influence of different social groups on the integration and use of educational digital tools. The STS project analyzed the efficacy of educational technology in promoting self-regulated learning in students with learning disabilities as well as the factors that affect its implementation into classroom curriculum practice.

Students with learning disabilities often share the common experience of repeated academic failures, which lowers their efficacy to reach their own goals. While educational technology can improve early academic skills like reading comprehension and spelling, the perceived benefit of the technology by students and teachers also plays a large role in the effectiveness of the solution. Furthermore, a culture of fake solutionism regarding technology is pervasive in the educational field, and technology adoption in school systems incentivizes digital tool manufacturers to focus on making profit rather than to solve problems. Additionally, the educational standards and regulatory bodies examined specified that technology use should be accessible and applicable to all students, including those who have learning disabilities, which shifts the responsibility of specifically addressing for these students onto the manufacturers.

The technical project presented a proof-of-concept prototyped digital tool aimed to be acceptable toward multiple social groups involving implementing educational technology into

practice. However, the STS project explored the notion that relevant social groups often have conflicting interests in mind.

TABLE OF CONTENTS