Thesis Project Portfolio

A Children's Game to Improve Spelling - SpellCheck

(Technical Report)

How can technology best serve teachers?
(STS Research Paper)

An Undergraduate Thesis

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Table of Contents

Sociotechnical Synthesis

Ever since the pandemic started, I have been questioning the areas it may have the biggest impact on. As an engineering student at the University of Virginia, the foremost sector I came up with was the educational sector. Particularly, I was interested in how emerging digital tools and e-platforms, which have been widely used during the COVID-19 epidemic, could impact teachers, students, and institutions, and whether implementation of such digital technologies will result in positive outcomes or not. After doing extensive research, I and my team decided to focus on the gamification part of the learning. A recent study found that learning English spelling through a game is more effective than learning English spelling from a traditional classroom setting, as students were able to remember the English spelling is easier and found the gamified version very useful. By exploring various benefits, such as reducing student anxiety to learning new languages, provision of immediate feedback, modification of a student's learning level, and creation of a stress-free environment, we decided to build an educational device named "Spell Check" that will enhance the learning experience.

My technical research part was SpellCheck, an educational device that facilitates learning in youth ages 5 to 7. Specifically, this interactive educational tool will help children practice how to spell the name of an object that appears on a screen. The device displays an image of an object on the LCD, the child places individual letters into their respective slots in the device, and the spelling is verified through the arrangement of letters in the slots. LCD will then verify the child's attempt to spell the word, by either highlighting the word in green and moving to the next word or highlighting the mistake and prompting the student to try again. This project seeks to apply computer engineering principles, including the use of an embedded system such as the

MSP432, power supplies, and a limited mechanical interface, to demonstrate the effectiveness of interactive learning and instantaneous feedback in youth education.

Our group also consulted with two professors from the UVA School of Education and Human Development who specialize in Elementary Education: Professor Lysandra Cook and Professor Tisha Hayes. With decades of experience working with our target age range, both professors noted that many current teaching tools are cost effective. However, all of these tools require some type of instructor intervention, which can be time consuming if there is a high student-to-teacher ratio. The professors emphasized that a teaching device that students can operate independently to reinforce previously learned topics, such as ours, would be especially valuable. Additionally, the ability for the teachers to input their own curriculum of words would greatly support their teaching.

For the STS part, I examined how technology can help to enhance student learning and encourage collaboration between instructors and students. For the analysis part, I firstly used the SCOT framework, where I delved into the various stakeholders of the issue and researched what kind of role, benefits, and concerns they might have. Then, I took advantage of the technology acceptance model (TAM) model to identify teachers' attitudes and confidence in adjusting to the digital tools during the class period. By using both frameworks and scrutinizing relevant data, I concluded that the technologies not only help to elevate their academic performance, but also reduce teachers' workload.

I realized that my capstone project can be useful in the future as the issue of quality education through emerging technologies will always be around the corner. Future analysis needs to be conducted as the team sought advice from professors from the UVA School of

Education and Human Development in order to garner feedback and improvements of our system for practical use in the classroom environment.