**CAPITAL: Comprehension and Pronunciation Instructional Tools for Adult Learners**

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**Project Overview**

According to the American Library Association, 14% of adults in the United States cannot “search, comprehend, and use continuous texts”[[1]](#footnote-1). Since current government and philanthropic funding only helps about 10% of the nearly 30 million American adults who struggle with reading comprehension, there is a truly a need for the development of a widely available technology to help improve literacy rates. The goal of the Comprehension and Pronunciation Instructional Tools for Adult Learners (CAPITAL) project is to make high quality learning resources accessible to users of all literacy levels. The project aims to automatically create exercises based on instructor specified parameters that will help users improve their reading skills. CAPITAL Passages aims to educate those adults with some basic literacy skills who are still working with a literacy program on passage comprehension skills.

CAPITAL Passages will include two main products—a web interface to generate questions and a smart phone application for students to complete exercises. The process will begin with a website where instructors can compile reading passages for students. Comprehension questions will be generated automatically for each passage from an algorithm that identifies the most important concepts in a passage. The instructor will have a set of parameters to choose from to generate questions. That way, instructors are still in control of the types of questions their students will be asked. The passage will then be parsed using the Stanford NLP Parser, and the generated parse trees will be searched for specific patterns using Tregex and manipulated using Tsurgeon to change sentences into questions. From there, the instructor can select the questions they like and send them to the students enrolled in their courses.

The other half of the CAPITAL system is the student smartphone application. We aim to provide access to CAPITAL to as many students as possible. Thus, instead of creating a faster, more visually appealing application in a native language, we are developing an HTML5 app that will work on all different smartphones and reach a larger portion of the adult learner population. Students will receive exercises from their instructors through the application. They will see the passage assigned as well as the questions their teacher selected on the website. When they submit an answer, the student will receive immediate feedback on the correctness of their response. At the end of a lesson, the student will receive feedback on how they did overall in the form of a percent score and a five star system. The system will then incorporate a preexisting platform, reMIND, that utilizes the spacing method to test students on material they did not understand at pre-determined, ideal time intervals throughout their use of the app. Because application use is student-driven, the system will incorporate a game and social media aspect to encourage student usage. Students will be able to challenge each other to competitions in which the student who answers the most questions with the highest rate of accuracy is the winner.

Algorithmically, this system hopes to improve upon existing but inadequate fact-based question-generation technologies. Current fact questions only test facts reached in one sentence and do not test passage comprehension as a whole. Our system will determine which facts of a passage are related, such as by a common subject, and craft questions that require knowledge and comprehension of more than just one sentence in the passage. Linking facts about subjects in a passage poses great challenges, as it is difficult to determine which facts are important and even more difficult to formulate intelligible questions from a list of facts. However, it is important to explore this area of question generation to ensure true reading comprehension. This technique is new, innovative, and will provide a greatly expanded way to test reading comprehension.

CAPITAL Passages will change how students and instructors interact and will improve the learning process in educational institutions. Teachers will save time by having exercises automatically generated for them, and students will be able to practice literacy skills on-the-go and will be motivated by their peers to complete more and more exercises. With our system, we aim to significantly decrease the number of Americans who are functionally illiterate.

**Economic Potential**

CAPITAL Passages has the potential to directly influence and profit from a significant number of sources. Over 30 million Americans are functionally illiterate, and even more than that do not meet advanced literacy requirements. These native English speakers, however, do not always have the time to commit to advancing their literacy skills. Many of them have full time jobs in addition to attending literacy school part-time. There is a need for a product which allows them to practice literacy skills outside of the traditional classroom environment. That’s where CAPITAL Passages comes in—it allows any user with a smart phone to study and practice their literacy skills anywhere. We plan to market this product to adult education institutions across the country, and reach students who are motivated to improve their literacy skills.

Our group has previously developed a literacy system with much success. CAPITAL Words is a system aimed at lower literacy individuals and is currently deployed on students’ phones at the Washington Literacy Center. Students there have been self-motivated and have been using our system for over six months. They have completed thousands of exercises without urging of their teachers or our group; their progress has been self-motivated. This proves that students are willing and excited about the opportunity to use an application aimed at improving their literacy. It also proves that our group has what it takes to successfully create and manage an application of this magnitude. We have created a system that is scalable, user-friendly, and popular among students. And, we have a plan to ensure CAPITAL Passages is just as successful.

Although, hopefully, with our application the number of illiterate adults will decrease, there is still the opportunity for CAPITAL to grow its user base. The base system that CAPITAL uses can be applied to other educational skills other than just reading. The question and answer model allows students from a multitude of subjects to practice their skills. This expands our potential user base from 30 million to any adult interested in learning more about a subject area. Any educational software which involves questions that can be answered on a mobile device can utilize the core of our software. This can be monetized to other groups wishing to create an educational system for their subject area. This provides an incredible opportunity to be at the crux of an educational revolution.

While we do not intend to charge students for their use of the application, we plan to charge institutions for their use of their software. Many of these institutions receive government funding which can be used toward educational software. This cost will, of course, be on a sliding scale as to not penalize those institutions which cannot afford our software at a high rate. This way, we can still earn a significant profit without compromising our end goal of improving adult literacy at large. Additionally, as our software encourages collaboration between institutions, we can charge institutions who wish for their questions to remain private an additional fee. Also, we will charge for any additional support institutions wish to receive for the software. For example, support for software or a personalized installation of the software onto students’ phones will be an additional fee for the institution. Our model charges what institutions

The current competition to CAPITAL Passages is slim and not comparable. The leading competitor is Pearson online reading software; however, this does not include smart phone support and does not automatically generate questions. While the current competition is an incredibly small pool, there is the potential for an increase in competition in the near future. The Barbara Bush Foundation Adult Literacy XPRIZE competition has recently announced an upcoming competition to develop mobile applications to improve adult literacy rates. Within the next year, there will be a push for creation of literacy applications. This is validation of the motivation behind CAPITAL Passages and is a reason why investment in our product is beneficial. Our system has been in the development process for a year and thus is far ahead of the competition. It is clear that adult literacy is a problem that is being recognized and worked toward to fix. Investment now will ensure that we can be at the forefront of this literacy revolution and set the technology standard for education systems that follow.

**Social Impacts**

Illiteracy is an epidemic that greatly affects the lives of more than 30 million individuals in the United States. It prevents them from obtaining employment, severely limits the types of jobs they can work, prevents effective civil society participation, and affects aspects of their daily lives. In addition, illiteracy is cyclic; illiterate adults are unable to teach literacy skills to their children. The current education system does not adequately address these issues either—19% of high school graduates cannot read.[[2]](#footnote-2) And, these individuals tend to be from poorer populations who cannot afford to pay for costly tutoring or private education classes. There is a need to help these individuals and an opportunity to significantly increase their quality of living.

The current adult education system is failing these 30 million individuals. Many of these illiterate adults have full time jobs and cannot commit the time to learn in a traditional classroom. Those who choose to take night classes often cannot complete homework as they have to commit hours to working in a traditional desk environment. Moving outside of the traditional classroom is critical to reach these learners. With the CAPITAL Passages smartphone app, they can work on exercises on the bus, at home, and whenever they have free time.

Motivation can be an issue with a traditional reading classroom. Students often get discouraged with progress and are not driven to complete homework assignments and continue to practice their literacy skills. However, with CAPITAL Passages, students are motivated to compete against each other to complete exercises and challenge their peers to grow as students as well. Our application has the potential to motivate students to take their learning into their own hands. This can vastly increase the impact we have on students and encourage them to improve their literacy skills at a faster rate than ever.

Another sector of society CAPITAL Passages benefits is teachers who teach adult literacy courses. These teachers are often volunteers and are already committing hours to create in-class and at-home exercises for their students. With our system, these teachers can save a significant amount of time. And with automatic question generation creating limitless exercises, teachers can provide their students with a wider breadth of questions and passages.

Additionally, this system is more environmentally friendly as it does not require any paper resources to be deployed. Unlike standard literacy educational resources which require printed out passages and exercises, our application is entirely online. Teachers no longer have to pay for printing homework assignments and paper is not wasted on assignments that can easily be completed on a mobile device.

CAPITAL Passages is a unique opportunity to revolutionize the adult literacy education system and have a positive impact on society in an environmentally friendly way. Literate adults contribute more to civil society and have a vastly improved quality of life. CAPITAL Passages has the potential to influence so many aspects of these individuals’ lives and allows them to live life to the fullest.

1. ”Outreach Resources for Services to Adult New and NonReaders.” American Library Association, n.d. Web. 13 Nov. 2014. [↑](#footnote-ref-1)
2. Crum, Maddie. "The U.S. Illiteracy Rate Hasn't Changed In 10 Years." *The Huffington Post*. TheHuffingtonPost.com, 12 Dec. 2014. Web. 6 Dec. 2015. [↑](#footnote-ref-2)