

**Prospectus**

**A Financial Literacy AI-Enabled Voice Assistant System for Educational Use**

(Technical Topic)

**An Actor-Network Theory Analysis of the Financial Literacy Gap in the U.S.**

(STS Topic)

By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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## **Introduction**

One of the most important skills in life is the ability to manage our personal finances and make informed financial decisions, yet financial literacy is an area of weakness for many. In fact, studies show that only 57% of adults in the United States are considered financially literate (Klapper, et al., 2015), proving that a very large percentage of Americans from various demographics and backgrounds do not have the basic financial and economic knowledge to financially sustain themselves in the long-run. While the term “financial literacy” has no formal definition, a national field study about the financial literacy education in the US provides a definition:

Personal financial literacy is the ability to read, analyze, manage, and communicate about the personal financial conditions that affect material well-being. It includes the ability to discern financial choices, discuss money and financial issues without (or despite) discomfort, plan for the future, and respond competently to life events that affect everyday financial decisions, including events in the general economy (Vitt, 2000).

With the ever growing and complicated nature of the American financial system, the need for a call to action in order to improve the national financial literacy levels is more imperative than ever. If nothing is done to improve the financial literacy rates in the US, the majority of Americans will continue to struggle with managing their money, which is crucial to ensure financial stability and wellbeing for many. In addition, taking these steps in the right direction to improve financial literacy will be helping to set future generations up for success by laying out a supportive foundation of knowledge.

One of the most effective ways to master a skill is by learning and building the foundations of knowledge from a young age. Therefore, improving the personal finance and economics curriculums in schools, as well as making resources more accessible for students of all ages is the key to ensure that students will be confident in their financial literacy, especially when they become financially independent and transition into adulthood. To offer a technical solution to this problem, my team and I will be designing a virtual voice assistant prototype and generating corresponding lesson plans with an aim to improve the financial literacy of K-12 students.

As we progress through this project, it is evident that there are also social, political, and economic factors that play a role in American financial literacy levels. There are prominent financial literacy gaps between different racial and gender groups in the US (Angrisani et al., 2020). Such gaps are most likely caused by systemic inequalities that create barriers for these marginalized groups, like unequal access to opportunities and financial resources (Anong, 2016; Porto, 2016). These gaps today are also a result of political and social injustices that have occurred throughout US history. Identifying the reasons behind this are necessary in the progression towards financial equality, inclusion, and economic well being.

Both technical and social aspects of this problem must be addressed in order to successfully improve American financial literacy levels. In this prospectus, I detail the steps my team will take to design a virtual voice assistant with generated lesson plan content for K-12 students, along with our strategies regarding the design process, prototyping, and cloud platform implementation. Additionally, I will use actor-network theory as a framework to determine what actors, human and non-human, play significant roles as determinants for financial literacy, and why the system in place continues to result in such disparity among marginalized groups.

## Technical Problem

Financial literacy is crucial for saving money, avoiding debt, establishing strong credit, and many other skills that ensure the economic well being of consumers. One of the best ways to tackle financial illiteracy is to ensure that students are taught the foundational knowledge at a young age, with more complex and advanced material being taught in increments as they progress through the years as students. Personal finance and economics classes are offered in most high schools; however, only 21 states require high school students to take a personal finance class before they graduate (Carrns, 2020), and these classes are seldom taught in middle and elementary school. Even high schools struggle to find teachers and resources to adequately prepare their students, since a large percentage of American adults themselves lack a sufficient level of financial understanding. Without this basic knowledge and skill set, students will be more prone to making irresponsible financial decisions, which could result in serious consequences like unpaid debt, bankruptcies, and foreclosures (Pollack et al., 2011). Implementing accessible learning tools like a virtual voice assistant that will walk students through various lesson plans to achieve higher financial literacy will not only help to introduce these important skills to students at a young age, but also will allow them to practice applying these concepts outside of the classroom. This will gradually build their knowledge at a more natural pace so that they have time to fully grasp the material. If students begin slowly practicing their financial literacy skills in Kindergarten and build off of their foundational knowledge each year at a reasonable pace, they will be well prepared to tackle more advanced concepts in high school and will be able to graduate with a much higher level of financial literacy, setting them up for economic success in the future. I have outlined below my team's approach to designing a virtual voice assistant prototype, as well as how we plan to generate lesson plan content and

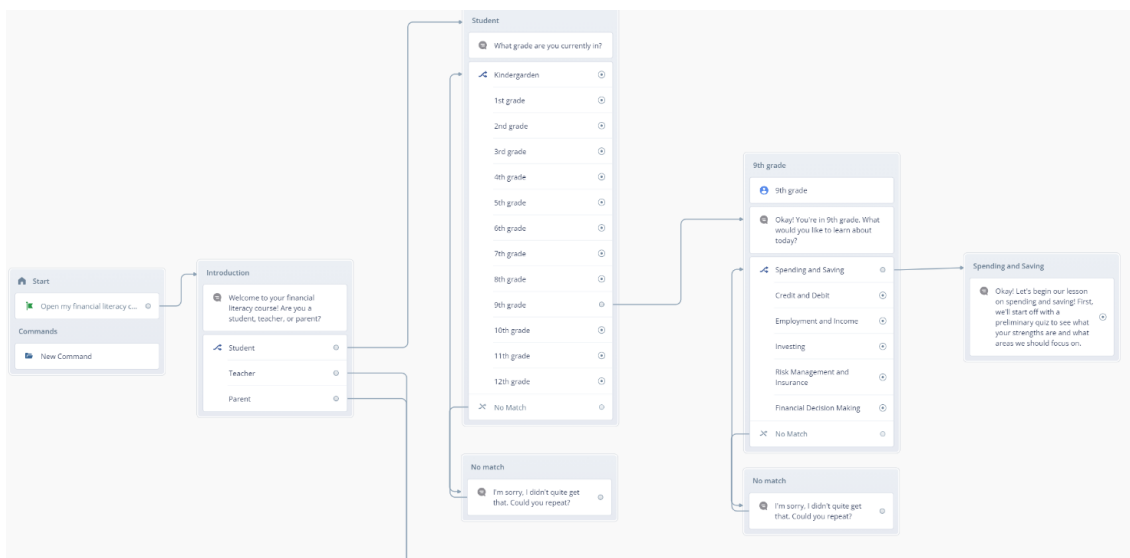
implement the prototype onto a platform of our choice. The virtual voice assistant will improve financial literacy by offering short but effective lessons that will cover all topics deemed necessary by the national standards, while maintaining a realistic rate of progression. The voice-only feature of the assistant will also minimize screen time for students.

The first step is to familiarize ourselves with the three main parts of the project: personal finance and economics lesson plans, virtual voice assistants, and cloud platforms. We spent some time reviewing existing literature to learn about the current situation of financial literacy and the national standards, virtual voice assistants and how they are best designed, and different public cloud platforms that we will use to implement our prototype. Through our research about the system design and flow of voice assistants, we learned how to design good conversational interaction flows, as well as practices to avoid. For example, it is important to move forward and always prompt the user to the next step by focusing on the range of responses they can easily give. This can be done by giving them short worded options to respond in the beginning. We also learned to use a circular approach so that users have the option to backtrack and change their path or give a different response (Mowat, 2020).

For the second component of this project, generating the lesson plans, we studied the national standards for financial literacy at each grade level and what the benchmarks are for different categories of personal finance and economics. This will help us create lesson plans for each required topic at each grade level so that each lesson plan will be tailored to the students' expected level and personal progress. The goal is for students to be able to call the voice assistant at any time and begin or resume their lessons with their progress being saved. Students will be given the option to choose which unit they want to work on, and each lesson about a particular

topic will be designed to be no more than 15 minutes in order to keep the students engaged and avoid burnout from too much information.

For the logistics behind the voice assistant, three different user groups will be created: students, teachers, parents. Each user group will have access to different functions within the system, with a number verification code to verify that they are actually a part of that user group. We have begun creating conversational flow diagrams to simulate the interactions between the user and the voice assistant, making sure to finetune details such as tone, pauses, and inflections; these all make a difference when it comes to keeping the user engaged and making the experience more enjoyable.



Conversation Flow Diagram for a Personal Finance Lesson

In order to collect feedback from our users about their experience with the voice assistant, we plan to contact the Institutional Review Board so that we can send out surveys to a group of students and parents who consent to testing out our prototype. The data collected from the surveys will help us analyze and identify how these students learn best, how they respond to different virtual conversations, how they feel about their level of financial literacy, their overall

experience with the virtual voice assistant, and if they have any suggested comments or areas that they feel need to be improved. Collecting real data from user groups via surveys and questionnaires will minimize the potential bias in our future design process and allow for users to participate in the process of creating this prototype, which is something that us as designers must always prioritize; we are designing for our users, not for ourselves.

This project is in collaboration with The MITRE Corporation and will be completed in a team of five students over the course of two semesters, with the help of a technical advisor, Professor Iqbal. The work regarding the design of the prototype, lesson content generation, and cloud implementation will all be worked on collaboratively or divided equally among the team members, along with weekly meetings with the technical advisor and monthly check-ins with representatives from MITRE to ensure the project runs smoothly.

### **STS Problem**

While it is universally understood that being financially literate is an incredibly important and advantageous skill, the concept of financial inclusion is still an area of concern that remains untackled in the US. Financial inclusion is defined as the access and availability of the formal financial system to all the sections of the society (Halдар et al., 2016). With an estimated 2.7 billion people that are financially excluded in the world (CGAP, 2009), further research and identification of the determinants causing these financial literacy gaps is needed more than ever. Currently, the US has launched some initiatives including the first ever national strategy to improve financial literacy, with a conceptual definition added three years after (U.S. Department of the Treasury, Office of Financial Education 2006). However, a formal measurement criteria has yet to be added, resulting in inconsistent guidelines for how to approach the goal of

improving financial literacy (Remund, 2010). With this level of confusion in just simply defining the concept of financial literacy, there are subsequently very few programs or initiatives that the US has created to specifically assist marginalized populations who are impacted by the financial literacy gap. Studies show that there is a clear financial literacy racial gap in the US, with lower test scores for minority groups like Hispanic, Black, and Native American test takers (Lusardi & Mitchell, 2011). A gender financial literacy gap is also evident; women do not score as well as men (Klapper et al., 2015). Until further research of the determinants of financial literacy is conducted, we lack the ability to understand what factors - social, political, or economical - contribute to these disparities. Identifying these factors is the first step in actually taking action to make a difference and better the economic wellbeing of those who are disadvantaged. Deeper analysis that connects these determinants and how they impact each marginalized group is needed in order to minimize the financial literacy gap and improve financial inclusion.

The thesis to be developed here proposes that it is possible and necessary to close the financial literacy gap in the US; this can be done by using a detailed approach that addresses and correlates factors from within and outside of the realm of financial literacy. To facilitate this process, we can use Actor-Network Theory, which breaks down the “black box” of complex systems by mapping out the relationships that make up the network and create science and technology (Cressman, 2009). By utilizing this framework, we can organize and identify the human and non-human factors that contribute to the American financial system, determinants that set financial literacy levels, demographics that statistically correlate with these findings, and systemic barriers that prevent these actors from accessing what they need in order to be successful in terms of financial literacy. To undertake this analysis, I will review the US National Strategy for Financial Literacy reports to assess the current policies, and I will also research for



studies that have collected data relating to financial literacy levels of marginalized groups, as well as interviews from impacted individuals themselves to get a firsthand understanding of their experiences with financial literacy in their education and throughout their lives thus far.

### **Conclusion**

The deliverable for the technical problem in this paper will be a prototype of a virtual voice assistant with full lesson plans for K-12 students that is implemented and tested on a cloud platform. The STS research project will deliver a better understanding for why certain marginalized populations in the US rank lower in regards to financial literacy, and what calls of action are needed to proactively close the financial literacy gap and ensure financial inclusion. To achieve this, the Actor-Network theory will be applied in order to analyze the human and non-human actors that form complex networks and contribute to the financial systems in place. The end product of the technical project will also address the broader socio-technical goal of improving financial literacy levels in the US by creating a tool that strives to help students of all ages and backgrounds learn more effectively. The combined results of both the technical and STS project aim to achieve financial inclusion, equality, and economic wellbeing for all.

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