

Financial Literacy Virtual Voice Assistant for Students

(Technical Report)

The Sociotechnical Risk of Teaching Financial Literature

(STS Report)

A Thesis Prospectus
In STS 4500

Presented to The Faculty of the
School of Engineering and Applied Science
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Bachelor of Science in Systems Engineering

By:

Vineeth Sai Thota

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Technical Team Members:

Candace Miu, Jesilyn Gorpunthal, Niels van Beek, Matthew Thompson

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.

Advisors:

Sean Ferguson, Department of Engineering and Society

Tariq Iqbal, Department of Engineering Systems and Environment

Introduction

Providing education in financial literacy is an underappreciated responsibility to our youth. Without proper financial literature, we have witnessed student debt increase from \$9,250 to \$19,200 from 1997 to 2007. (Lusardi) Financial literature has not always been on the forefront of school's curriculum as only 25 states in the United States have implemented personal finance education to their curriculum. (Csreinicke) We must learn the reasons why this topic is important, why it must be taught regularly, and how it can benefit students in the long run. There are issues, resistance, and stigmatism toward divisive subjects such money, politics, and power in the educational system. Students enter the school system at a young age striving for perfect grades on assignments and tests, but are not well equipped to handle saving accounts, invest in the stock market, or contribute to an Individual Retirement Account (IRA) after graduating high school. Financial literature is defined as "the ability to make informed judgements and to make effective decisions regarding the use and management of money." (Springer) A staggering 76% of millennials lack basic financial knowledge, in addition to student debt rising (Kadlec D, 2014). Our University of Virginia capstone group strives to address this epidemic by investigating students' needs and requirements for greater access towards financial literacy and investing the right resources for a solid future.

Our capstone team, partnering with MITRE, is tasked with the project of creating, developing, and deploying a financial literacy virtual voice assistant for students in kindergarten to 12th grade. Depending on the state provided benchmarks and proper material, we will be tasked in creating lesson plans that are appropriate and age relevant. These lesson plans will be relative to financial literature with progressive additions as students pass each grade. Our team will be meeting weekly working towards the purpose of contributing an easily accessible,

efficient voice assistant that can provide lessons on financial literacy. My responsibilities include researching and analyzing data on conversations from users, developing an overall timeline using a Gantt Chart, utilizing Amazon Web Services, and researching deeper into financial literature. I will also brainstorm conversational instances to mimic user stories that will be evident in the classroom. The team will figure out a plan that culminates the research and data to assist students in educating themselves with financial knowledge. Overall, we will identify challenges, design a call flow diagram, use a Cloud Service Provider, and validate a proof-of-concept system.

The focus of my STS research will be tailored towards the risks and standards involved with implementing education technology with financial literature in classrooms in elementary, middle, and high schools. Technology could be perceived as double-edged sword and occasionally more money causes more problems. This dynamic will be investigated especially when students originate from different backgrounds, socioeconomic situations, and demographics. The growing resistance of losing privacy and personal information with Artificial Intelligence and Machine Learning products could sway parents, teachers, and administrators away and could lead to social conflicts in and outside of the classroom. A few questions to analyze is: How will education technology be incorporated into classes that do not have access to basic resources? How will these financial literacy programs and conversations address diversity? How will financial literacy programs be monitored for student development? The possible socio-technical risk of educating students with financial literature and technology will be investigated with factors such as family income, race, religion, and class demographics considered.

Technical Topic

The topic and subject of money is everywhere in the 21st century. From Wall Street to Robinhood, the conversation and production around finances is growing at a rapid rate. The need

for a financial literacy virtual voice assistant is essential in the classroom as it will help foster a new, advanced education-tech curriculum, teach viable long term financial habits, and potentially decrease violence, poverty, and crime. (Strege, D.) Numerous subjects such as economics, social studies, and others have touched on financial literature, but the daily ins and outs of spending, saving, and earning money must be addressed. Effects of financial literacy problems include problems with debt, less likely to participate in the stock market, less likely to accumulate wealth, and less likely to plan for retirement. (Wiley Library)

The University of Virginia capstone group, sponsored with MITRE, will be tasked in researching and configuring a voice assistant model that can address financial literacy questions, comments, and concerns in the classroom. MITRE has provided several examples of conversational voice flow diagrams which will be essential in replicating dialogue within student groups (2017 National Standards Book). Our components of research will include creating functional user stories, understanding needs and requirements of teachers, applying human centered design techniques, and learning the role of cloud service providers in our project.

Our team has worked to create a plan that will produce a virtual assistant prototype by April 2022. We meet weekly with our technical advisor plus project sponsor to address our progress and goals for each month. We have accomplished the task of researching financial literature to acclimate ourselves with the problem scope. We have learned which cloud service provider we hope to utilize, Amazon Web Services. These are the early stages of our project, but we hope to work with stakeholders that can impact the project.

As this is a human centered study, we will refer to the Institutional Research Board (IRB) for relevant guidance and proper compliance for ethical principles. Centered in Charlottesville,

there will be an opportunity to work and investigate the needs and requirements of Albemarle County schools, including the greater Charlottesville area. We plan to interview teachers, school administrators, and board representatives to understand the dynamics of the classroom in COVID-19 pandemic with remote and hybrid options.

We must consider the external limitations such as working directly with students without permission, interviewing school board officials, plus the price budget for the cloud service provider. There could also be forms and documents that require supervisor confirmation. If effective and accurate, our prototype virtual voice assistant will be available by April 2022. However, if the deliverables do not meet criteria or deadline, we plan to document our research and progress and provide recommendations to local schools on how to incorporate financial literature in a fair, equitable manner.

STS Topic

Despite classroom flexibility and diverse course options, financial literature has not received the proper attention in classrooms. Just six states require high school students to complete a semester-long, stand-alone personal finance course. (New York Times) According to a FINRA survey, only 34% of respondents were able to answer 80% of financial literacy questions. (Davis, B. 2021) However, the necessity and requirement to educate young students about this subject is vital for them to have a sustainable and a dependent life after school as financial literacy is a core component of what it means to be an active participant in our democracy.

The socio technical risks involved with not emphasizing financial literature in the classroom.

First off, not providing literacy is effectively preventing students and citizens from gaining power in the market and ensuring the people in power stay in power. This social construct could be displayed in political aspects of society where laws and mandates are issued to prevent lower income families and financially illiterate students from progressing in society. Without money or wealth, students might not have the resources to effectively lead and start and independent life. Another aspect, parents could be opposed to teaching money as it could risk social division and conflict within the classroom and reveal unfortunate realities that might lead to bias. Money reveals the “reality” of the situation which could be felt by embarrassment and insecurity. A recent study conducted by Ally Bank, revealed 70% of Americans think it's rude to talk about money. Low-income neighborhoods and communities experience social insecurities for necessities and this could create bigger gaps within the classroom. The resistance of parents might exceed monetary reasons. Race, gender, religion, demographic, and other factors might pose a problem as everyone endures different problems. Women are significantly less financially literate than men, which could lead to gender biases and male dominance (Lusardi A, Mitchell O S, Curto V, 2010). The risk of instructing money lessons might not be as inclusive. The commonplace for students is that they attend classroom instruction independent of their socioeconomic status and demographic. However, when money plays into the picture, politics could act as a factor which diminishes collaboration and unity between students. Without financial education, students could lack voter efficacy to change rules and policies that directly affect their livelihood. The technical risk aspect of incorporating a virtual voice assistant in the classroom can be invasive into privacy. Information security, password thefts, or cyber-attacks could increase due to student’s communicating with an Artificial Intelligence robot. Families do

not want the unnecessary risk associated with identity theft or fraud, so why openly speak about money in public settings such as classrooms?

However, the necessity for administering financial literacy courses in the classroom is essential. The main problem is that young students do not currently have the access to learn financial literacy effectively. There are subject tests, SAT, and ACT but it is time that colleges require mandated financial literacy courses. The data has shown that: (Rtsws, 2019)

1. Over 40% student loan borrowers are either not making payments or are late on payments.
2. According to the 2015 National Financial Capability Study, we found that 45% of individuals aged 18-34 had a student loan.
3. American financial literacy rates are declining. Americans have gotten worse answering 4 out of 5 questions by a FINRA survey in a period of 6 years.
4. 40% of Americans do not have enough cash to cover a \$400 emergency.

Financial literacy is a complex of knowledge and skills that make it possible for the population to understand and successfully organize their financial management and take responsible decisions. (Ali P, Anderson M, McRae C, Ramsey I, 2016) The risk of not acquiring the necessary financial skills could lead to unemployment, lack of stability, and no potential to grow in our rapidly developing democracy.

The engagement of the public and environment of financial literature will be addressed with the promotion of education technology. There are many questions involved in students attempting to learn an under taught subject with the assistance of a voice assistant; Why is there stigma around financial literature? Why is it important to learn about financial literacy? How is financial literacy incorporated within classrooms of diversity? However, the need for

education technology in the classroom is advocated positively by teachers across the United States, as 92% of teachers said that the internet has a major impact on their ability to access content, resources, and materials. (Walden) A few benefits of education technology is it creates a more engaged environment, incorporates different learning styles, prepares children for the future, and improves collaboration.

Finances is a fluid subject, and many stakeholders have different roles and occupations when it comes to dealing with money. There are brokers, lenders, bank agents, insurance agents, real estate agents, hedge fund managers, and many more who deal and work with money constantly. The stock market is constantly changing up and down due to possible whispers, rumors, or fake news. The various stakeholders could also impact financial literature as students might not understand the complexities of economies at a macro and micro level. There is apprehension and hesitation towards teaching students about money possibly because the news today is filled with misinformation and outlandish advice. Facebook, Twitter, and Snapchat ultimately provide quick, catchy material which might not observe the entire context. The agendas of politicians and lawmakers can control how money is earned and taxed, which undermines empowerment for students. Teachers and administrators might reserve their energy and time to educate on a topic, where the outside world controls “the real strings.” Students are fostered and nurtured in a safe, learning environment from kindergarten through 12th grade which limits their global perspective on reality. Mortgages, loans, foreclosures, and bankruptcies are terms not widely administered by teachers within the classroom. Is it because teachers on average do not receive a fair compensation compared to other occupations? Do public occupations such as police officers, firefighters, or case workers, barely generate a lack of interest due to the money compensation? Discussions of money from all over the World must be

encouraged. Students should utilize the limitless resources available in their environment, whether it is websites like CNN or Yahoo Finance or apps like CNET or Robinhood. The multiple faceted environments create a bigger engagement of financial literature to be talked, discussed, and learned about. Policies, laws, or local mandates affect the way money is discussed which creates differences in the classrooms.

The research implies that financial literature could fracture classroom infrastructure with the social risks and public dynamics. Since the 2008 financial crisis, many Americans have been warned significantly about how money can dramatically affect one’s life. It is imperative to incorporate financial literature blended with technology into classrooms to foster lifelong learning which will allow students to succeed. Positively, there has been efforts with 48 states, including D.C., that support online learning opportunities that range from supplementing classroom instruction. (Education Gov)

Next Steps

The final completion of the technical project and STS prospectus will be done by May 2022. A table view of the timeline is presented below:

<i>Date</i>	<i>Capstone Item Accomplished</i>	<i>STS Item Accomplished</i>
October 2021	<ul style="list-style-type: none"> • Understand the topic of financial literature • Meet with group to discuss plan of action 	<ul style="list-style-type: none"> • Thesis statements • Draft prospectus • Peer review
November 2021	<ul style="list-style-type: none"> • Researching and creating user diagrams • Understanding needs and requirements of stakeholders 	<ul style="list-style-type: none"> • Final prospectus
December 2021	<ul style="list-style-type: none"> • Brainstorming conversational flow diagrams • Working with a Cloud Service Provider 	<ul style="list-style-type: none"> • Presentation of project
January 2022	<ul style="list-style-type: none"> • Diagramming model for financial literature voice assistant 	

February 2022	<ul style="list-style-type: none"> • Executing a prototype voice assistant • Submit Abstract to SIEDS (Systems Information Engineering Design Symposium) 	
March 2022	<ul style="list-style-type: none"> • Maintaining, validating, and fostering final product 	
April 2022	<ul style="list-style-type: none"> • Submit SIEDS paper, presentation, and poster 	<ul style="list-style-type: none"> • Submit Thesis portfolio
May 2022	<ul style="list-style-type: none"> • Submit technical report to sponsor • Present prototype model to team 	

My University of Virginia capstone team, under the guidance of MITRE, hopes to provide a deliverable by the end of this project to help students from kindergarten to 12th to acquire financial literacy skills. Our research and project implementation will go through several cycles before submission as we hope to process conversational flow diagrams, the student's requirements, and functionality of the system.

Throughout my STS research project, I desired to go deeper into how financial literature could be affected by other agents such as applications, policies, and humans, while the sociotechnical risk present with educating students regarding money. Regardless, I hope financial literacy is advocated more in classroom settings, and for the public to practice sustainable life skills.

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