Thesis Project Portfolio

Systems Engineering and Embodied AI for Financial Literacy Social Robots
(Technical Report)

Financial Literacy as the Future and its Socioeconomic Inequalities
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The development of a financial literacy education curriculum is an innovation relatively new in the public education system. Based on a 2022 survey conducted by the National Endowment for Financial Education, eight in ten (80%) of U.S. adults claim that they wish they were required to complete a semester or year-long course in personal finance during high school (NEFE, 2022). While states begin mandating a personal finance curriculum, school boards, and researchers continue to examine the best way to teach these subjects. Teacher-led lectures, worksheets, free online websites and tools, robotics, etc. are all potential learning sources currently being studied for effectiveness. This portfolio will examine two main topics: the viability of utilizing AI robotics for teaching financial literacy and the inequalities that arise in the ability to gain a financial education in the U.S. AI robots in education is still a relatively new and unexplored field that this portfolio intends to tap into. However, inequalities in financial education typically have to deal with demographic and socioeconomic status within households that limit the student's ability to access certain resources or have a foundation of knowledge in certain topics. Thus, the relationship between the technical and STS portion of this portfolio lies in the potential disadvantages that the technical tools may put on underprivileged students.

The technical project studies the efficacy and feasibility of utilizing AI robotics to teach young students financial literacy. More specifically, the technical portion of this portfolio includes an experiment at a local Charlottesville school, Greer Elementary School. Two fourth-grade classrooms were studied: the control group was given a financial worksheet, and the experimental group went through the same lesson plan being proctored by an AI robot. This experiment aimed to study the efficacy of the embodied AI system, the robustness and feasibility of the product, and the level of student enjoyment for each teaching method. Due to the increase

in popularity of artificial intelligence and robot use, this research acts as a good starting point for larger studies.

The STS portion of this portfolio dives deeper into why inequalities in financial literacy exist across the U.S. and potential solutions to this divide. Within the last decade, financial education has become increasingly important due to an increase in options for saving plans, bank loans, credit cards, etc., and major decisions such as retirement plans being pushed to the individual level (OECD, 2006). As the stress on financial education increases, so does the inequality due to demographic and socioeconomic status. The research question analyzed throughout this paper is what solutions to financial ineducation are being explored and accepted by social groups in the U.S.? Specifically, the social construction of technology (SCOT) framework is utilized to understand the relevant social groups being impacted (the financially illiterate communities) and those attempting to make the changes (school systems, nonprofits/entrepreneurs, and financial institutions). The solutions being researched in this portion of the portfolio are in-class financial courses, free online learning tools, and subsidized financial services.

Researching the technical and STS portions of this portfolio simultaneously stressed the idea that for every technical advancement, there are social implications that must be considered. In order to be engineers innovating, we need to understand that there are marginalized groups that may be affected by the outcome and must always be considered. The SCOT theorem provides a structure that does an excellent job of considering all relevant social groups that help promote new technologies. In this portfolio, readers will learn about new artificial intelligence innovations that may disrupt the financial education market and about the disadvantaged groups that may need alternative inventions to promote equitable access to such education.

References

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