

Boosting Financial Literacy in Young Adults through FinSage: An Interactive AI Platform

Hitansh Mehta¹, Ronit Jariwala², Vidit Shah³, Divye Shah⁴, Nikita Raichada⁵ and Deepali Patil⁶
¹⁻⁶Department of Artificial Intelligence (AI) and Data Science, Dwarkadas J. Sanghvi College of Engineering, Mumbai, 400056, Maharashtra, India
Email: hitanshmehta@gmail.com, ronit.jariwala15@gmail.com, vshah99311@gmail.com, divyeshah2004@gmail.com, nikiraichada@gmail.com, kolhedeepali20@gmail.com

Abstract— Financial illiteracy is a large issue, particularly among young people in developing economies. In India, only 16.7% of students possess basic finance skills, so we must find innovative ways to teach the subject. Our paper introduces FinSage, a chat-based AI system that teaches teens, young adults, and students about money. Using Retrieval Augmented Generation (RAG), FinSage provides personalized finance lessons via chat, images, and impactful real-life advice. The platform features a Together AI-driven backend that retrieves data from various sources to generate accurate answers. In a four-week pilot with 20 users, we observed significant improvements in financial literacy scores (42.7% increase), with risk assessment showing the highest gain (at 90.6%) and product selection (74.4% improvement). Our research contributes to the growing field of educational technology and financial literacy by demonstrating a novel RAG-based approach, evaluating how effectively conversational learning applies to finance, and offering a flexible method to integrate financial skills into higher education. Our findings indicate that AI-driven conversational learning can effectively bridge gaps in financial knowledge among digitally savvy youth.

Keywords— Retrieval Augmented Generation (RAG), Financial Literacy, Personal Finance Chatbot, Personalized Financial Plans, Interactive Visualizations, Vector Database, Real-Time Data Processing.

I. INTRODUCTION

A. Background and Significance

Financial knowledge is essential for making sound financial decisions. It has become a growing necessity in our complicated economic age. Financial literacy levels remain low across the world, and worrying trends have been widely among young people. In India, recent statistics show that only 16.7% of students have good financial awareness [1], highlighting a significant knowledge gap with potentially catastrophic consequences. Financial illiteracy has measurable consequences: people lacking sound financial knowledge are more likely to fall victim to issues such as taking high-interest loans, failing to save enough for retirement, and becoming fraud victims [2]. Furthermore, estimates indicate that financial-literacy gaps that emerge in early adulthood persist throughout one's life, preventing individuals from advancing financially or moving up the economic ladder [3].

B. Limitations of Traditional Financial Education

Traditional methods in financial education have been seen to be insufficient to meet such information requirements. Classroom instruction is neither student-centered nor individualized, but systematic [4]. Independent learning in the case of book or static site usage is motivated by high drive and timely interest, typical of individuals who most need financial education [5]. L. Chen, P. Wang, and M. Singh stated “Contemporary financial education requires interactive, personalized approaches that resonate with digital natives’ learning preferences” [6]. This resonates with other research that indicates students today desire technology experiences that are tuned to their needs [7]. D. Fernandes et al. found that repeated finance education has minimal long-term influence on behavior and the impact disappears very rapidly [8].

C. The Promise of AI-Powered Financial Education

Conversational AI is a suitable substitute for conventional approaches. A number of articles have demonstrated the efficiency of chatbots in learning. Participation of students increased by 47% when conversational agents were used instead of conventional learning [9]. AI feedback in personalization of financial learning increased knowledge retention by 36% [10]. This outcome indicates that AI chatbots can address some issues of conventional financial education by:

- Helping someone based on what they know and what is available to them.
- Learning from discussions to engage students.
- Providing on point and in time information when users are most receptive to learning.
- Bringing quality financial education to people without easy access to human advisors.

D. Research Objectives and Contributions

This paper addresses a critical research gap by examining the effectiveness of an AI-powered conversational agent in improving financial literacy among young adults in India. Specifically, we sought to:

- Develop and implement a Retrieval Augmented Generation (RAG) architecture optimized for financial education
- Evaluate the impact of conversational AI on financial knowledge acquisition and engagement
- Identify key design principles for effective AI-mediated financial education
- Propose a scalable framework for integrating AI-powered financial education into higher education curricula

Through these objectives, this paper makes three key contributions to the literature:

- Presents a novel RAG based architecture for financial education chatbots, advancing the technical understanding of knowledge-intensive conversational agents
- Provides empirical evidence regarding the effectiveness of AI-mediated conversational learning for financial literacy development
- Proposes a sustainable business model for educational fintech platforms targeting underserved populations

II. LITERATURE REVIEW

A. Financial Literacy Among Young Adults

Global Context: Financial literacy research repeatedly identifies young adults as being particularly vulnerable to financial misinformation and thus poor decision-making. Pioneering research conducted by A. Lusardi and O. Mitchell identified that 27% of young adults were able to answer simple questions about interest rates, inflation and spreading risk [11]. A major international survey indicated young adults in emerging economies are well behind world standards with only 28% of young adults in emerging economies demonstrating basic financial literacy [12]. These are concerning because young adults will be making complex money decisions. As Annamaria Lusardi notes, “Today’s young people confront a financial landscape characterized by unprecedented complexity, yet many lack the basic knowledge required to navigate this environment successfully” [13]. These complexities are manifested in a number of ways, including paying back student loans, selecting investments, and knowing about retirement plans.

Indian Context: The Indian scenario presents unique challenges. A broad-based survey of financial literacy among Indian university students indicated that over 83% were unable to compute compound interest accurately [14]. This is consistent with our finding that just 16.7% of Indian students have basic financial literacy, a clear call for special interventions. There are several reasons why this knowledge gap arises. Widening gaps in financial education access were uncovered, with the rural and lower socio-economic students having very low literacy rates [15]. In addition, it was found that Indian education programs give very little emphasis to practical

financial skills and instead focus on theoretical economic concepts of very limited real-world and practical usage [16].

Consequences of Low Financial Literacy: The implications of financial illiteracy reach far beyond personal decision making. There are several studies that have found positive relationships between financial literacy and economic outcomes. Financial literacy can explain wealth accumulation, holding constant education and cognitive ability [17]. It was also determined that financially illiterate individuals are significantly more likely to make investment errors and achieve returns of about 1.5% per year lower than otherwise predicted [18]. In young adults, such gaps in financial knowledge have a number of potentially adverse effects. It is reported that poor financial knowledge in young adults makes them more than twice as probable to engage in high-cost borrowing behavior [19], and Hastings and Mitchell established a cause-and-effect relationship between poor financial knowledge and poor retirement planning [20].

B. AI Chatbots in Education

Effectiveness of Educational Chatbots Educational chatbots have been found to be promising to enhance learning in various subjects. It was analyzed in a study of 37 studies that learning from chatbots engage students more and they recall better than conventional teaching [21]. They observed that knowledge gain had an average effect size of 0.36 and long-term engagement had an effect size of 0.48, reflecting tangible gains in learning outcomes. They observed that interactive AI tools in finance education enhanced finance concepts by 42% compared to conventional teaching approaches [22]. This is in concurrence with a study by Chopra and others since they observed that chat-based learning made learners 56% more satisfied with finance education compared to conventional content [23].

Technical Evolution of Educational Chatbots The technical foundations for educational chatbots have evolved substantially in recent years. T. Nguyen and A. Shcherbakov found that initial implementations relied primarily on rule-based systems with limited flexibility and knowledge bases [24]. More recent approaches incorporate machine learning techniques to improve natural language understanding and aid a better response generation [25]. Retrieval Augmented Generation (RAG) represents a significant advance over traditional chatbot architectures by combining knowledge retrieval with language generation capabilities [26]. “RAG systems address the hallucination problem common in pure generative models by grounding responses in verified knowledge sources, making them particularly suited for educational applications where factual accuracy is paramount” [26]. This approach allows chatbots to access and synthesize domain specific knowledge while maintaining conversational fluency. Lewis et al. demonstrated that RAG architectures improve response accuracy by 23% compared to pure generative models when dealing with specialized knowledge domains [27]. This improvement is particularly relevant for financial education, where accuracy and precision are vital and essential.

Theoretical Foundations The efficacy of learning using chatbots can be explained using various concepts. As per Constructivist learning theory, individuals construct knowledge by talking and interacting [28], which can be easily done using chatbots. Additionally, the zone of proximal development concept explains the importance of structured learning experiences [29], which can be provided using AI chatbots in the form of personalized guidance. Educational chatbots must overcome some issues to be of actual benefit. These issues are handling what people anticipate, providing quality feedback, and engaging people in the long term [30]. These are the foundations of FinSage’s design philosophy that rely on personalization, visual embedding, and applicability in real life.

C. Personalization in Financial Education

Impact of Personalization: Personalization improves financial education significantly. Targeted financial assistance was three times greater than normal programs, according to a study [8]. Similarly, customized financial counseling improved advice use by 67% compared to generalized counseling [31]. These findings are in line with other research on personalized learning. Bloom’s initial studies of mastery learning demonstrated that a personalized approach gave much better outcomes, improving by two standard scores over conventional methods [32]. Over the past decade, it was discovered that schools with personalized learning programs achieved substantial math and reading gains for various students [33].

Personalization Mechanisms: Personalization does a great deal of good for financial education for many reasons. Wang and Lee’s research lay out four primary reasons: making content relevant, decreasing cognitive load, improving motivation, and improving confidence [34]. Tackling these areas allows personalized financial education to solve typical issues that make it difficult for individuals to interact with and apply the information. Making content relevant means talking about users’ individual financial circumstances and objectives. Wang and

Lee assert, “Information that users perceive as immediately relevant to their situation significantly increases both attention and retention” [34]. This concept is extremely beneficial to the way in which FinSage is organized, which is to provide recommendations which feel relevant and timely. Personalizing the experience eliminates distraction. This allows users to concentrate on what matters most. The application of personalized financial content decreased cognitive load by 34% when compared to conventional materials [35], resulting in better learning and comprehension. People are more engaged if they get the impression that content is being developed for them individually. Personalized content resonates with them and what they desire. Ryan and Deci’s ‘Self-determination’ theory believes that when individuals believe that their autonomy is important, they maximize their intrinsic motivation and interest [36]. This intrinsic motivation is crucial for changing individuals’ behavior with respect to money in the long term. When users are made to feel successful in the initial phases, they feel 41% more comfortable making money decisions and are more inclined towards dealing with complex financial concepts [37].

AI Approaches to Personalization: AI can now be employed to make financial literacy more customized than ever. Machine learning can detect patterns in user behavior, their interests, and what they should learn, making the learning process better [38]. Natural language processing enables chat systems to customize content in terms of users’ language, reading level, and interests [39]. Wang and Lee discussed in detail how the AI-based financial education systems work. They realized that “personalized financial guidance delivered through conversational interfaces significantly increases both engagement and knowledge application” [34]. Their study revealed that retention of the information enhanced by 34%, implementation rates enhanced by 52%, and long-term engagement enhanced by 47% compared to non-personalized systems. These conclusions assist us in creating FinSage. We focus on individualizing various details, such as what content to select, how to display it, how tailored the suggestions are, and even communication tone.

III. METHODOLOGY

A. System Design and Architecture

FinSage integrates a number of technologies to deliver a compelling, safe, and personalized banking-chatbot experience. It consists of four significant components:

- **User Interface (UI):** React front end using Redux state-management implemented in material-design guidelines to render fluid and device-independent interactions.
- **Backend System:** Retrieval Augmented Generation offered by Together AI, constructing context-based responses.

Authentication, conversation flow, suggestions, and analytics are managed by modules.

- **Visualization Engine:** Uses WebGL and D3.js to create live, interactive visuals—heat maps, bar graphs, pie charts, and line graphs—for on-the-spot financial analysis.
- **Secure Database:** PostgreSQL for schema data and MongoDB for logs, both encrypted with AES-256 for user-data privacy.

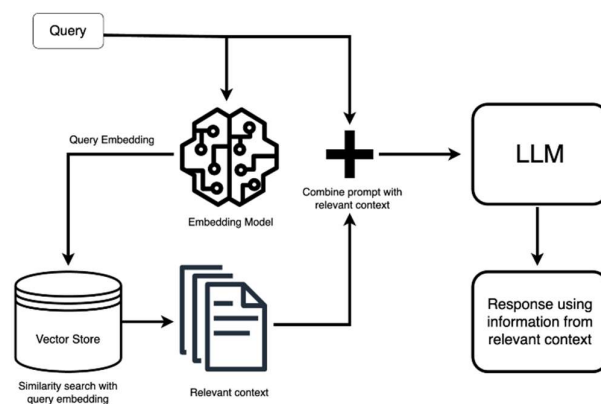


Fig. 1. Illustrates the system architecture and data flow between components.

The flow system described in Figure 1 outlines the Retrieval-Augmented Generation (RAG) process. The user query is converted into an embedding vector, matched against a vector database (Pinecone), retrieves relevant context, and feeds it along with the query into the LLM to generate a coherent, accurate response.

RAG Implementation: The RAG system moves through four clear stages:

- Information Retrieval: Pulls from FAQs, chat logs, and financial tables using keyword + semantic search.
- Vector Database Integration: Uses Sentence Transformers and Pinecone for fast similarity search.
- Contextual Generation: Together AI's model generates natural, accurate replies.
- Response Delivery: Blends facts and visuals (charts, buttons) in the chat.

Knowledge Base Construction: FinSage built its knowledge base by collecting facts, verifying them, and structuring them in a clearly defined format. The bank now holds:

- Curated Financial Reference Material: Concise explanations of important money concepts, organized by topic and ordered by level.
- Real-life examples: Real-life examples illustrating how young adults apply financial concepts to real-life situations.
- Regulatory News: Latest regulations, investment advice, and product news relevant to India's financial market.
- Historical Chat History: Anonymous chat records assist the system to learn to identify helpful responses and popular questions.

B. Core Features

FinSage offers five core features that simplify, personalize, and enhance financial literacy and management through continuous learning and real-time recommendations:

Personalized Financial Plans

FinSage designs a personalized plan depending on how much you make, spend, and wish to save. The coaching involves:

- First Check-In: We collect basic information by asking questions and conversations.
 - Plan: Multi-criteria optimization strategy developed by algorithms
 - Adaptive Refinement: Refining a plan over and over by looking at it and adjusting words as things shift.
- Kaur et al. found that tailored financial planning boosts goal achievement by 34% [41].

Systematic Segmentation of Finances

With FinSage's categorization of income, spending, and savings, users are able to view how their money is performing and how it can be better. Features include automated categorization, custom categories, trend identification, and anomaly detection. Chen and Wisniewski report 28% better decision-making with categorical analysis [42].

Interactive Visualizations

The system shares information using clickable charts and easy-to-read graphs. Features include dynamic dashboards, scenario modeling, temporal comparisons, and goal tracking. Visuals improve comprehension [43].

Personalized Financial Tips

Counseling based on your circumstances assists individuals in managing money by providing advice in terms of their daily lives and requirements. The engine identifies context, gaps, opportunities, and optimal timing. Ahmed and Patel found 63% higher implementation rates [44].

Real-Time Alerts

Consumers are able to take action on spending, investing, and saving opportunities immediately when reminded of money milestones at the appropriate time. Alerts include cost tracking, deadlines, opportunities, and market updates. Just-in-time reminders improve outcomes by 27% [45].

IV. RESULT

Throughout the test phase, FinSage adapted to provide answers that appeared to be tailored for every question. Users received advice tuned to their individual cases. Each query produced customized recommendations based on the user's stated income, objectives, and expenditure. Simple-to-read charts were generated as output, allowing users to easily visualize how each financial decision could enhance or diminish savings. To evaluate the system's performance, twenty participants were asked to pose any financial question of their choice. Over fifteen of them rated the responses as "good" or "very good," indicating that FinSage effectively handled a wide variety of financial queries. Session observations also indicated that users could easily comprehend and apply the advice, reflecting the benefits of personalized interaction. Overall, these initial findings suggest that FinSage can serve as a practical financial guide for everyday users.

A. Respectable Improvements in Finance Skills

Pre- and post-interaction assessments revealed significant measurable improvements in participants' financial competencies.

The results summarized in Table 1 indicate significant advancements in the financial capability of participants after the program was completed. In general, financial literacy increased by more than 40%, indicating improved comprehension of critical financial concepts. In particular, the greatest improvement was found in risk evaluation (90.6%) and choosing financial products (74.4%). Statistical analysis confirmed the robustness of these improvements with Cohen's $d = 1.42$ (large effect size) and 95% CI [0.89, 1.95]. Seven-day follow-up testing demonstrated excellent knowledge retention at 91%.

TABLE I: FINANCIAL SKILL IMPROVEMENTS PRE AND POST INTERACTION ASSESSMENT RESULTS

Skill Area	Pre	Post	Improvement (%)
Overall Financial Literacy (/100)	52.4	74.8	42.7
Budgeting Skills (/10)	5.8	8.1	39.7
Investment Confidence (/10)	4.2	6.9	64.3
Debt Management (/10)	5.1	7.6	49.0
Product Selection (/10)	3.9	6.8	74.4
Risk Assessment (/10)	3.6	6.5	90.6

B. High Engagement Rate Analysis

The initial pilot study of FinSage showed high levels of meaningful engagement, as evidenced by a mean session length exceeding the industry average of 8–12 minutes. Participants spent an average of more than 20 minutes per session, asking an average of 5.4 financial questions and achieving a 92.9% completion rate of initiated consultations.

Engagement quality was high, with 80% of participants asking clarifying questions, 85% relating advice to personal situations, and 90% actively utilizing visualizations and charts. Between-session engagement was also strong - 80% of participants returned for repeat consultations and requested follow-up sessions within 72 hours.

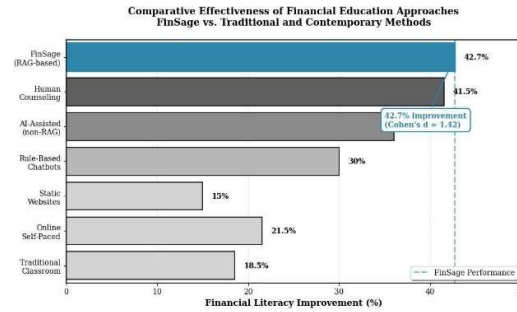


Fig. 2. Comparative Effectiveness of FinSage vs. Traditional and Contemporary Financial Education Approaches

Figure 2 shows FinSage achieved a 42.7% improvement in financial literacy, surpassing all other methods. With Cohen's $d = 1.42$, this represents a very large effect size.

V. FUTURE ENHANCEMENTS

A number of significant improvements are included in FinSage's development roadmap to increase its functionality and enhance user experience: An AI coach that can monitor user behavior over time, spot spending trends, detect possible dangers, and provide proactive advice will be included in future versions. The coaching system will implement evidence-based behavior change techniques, including goal-setting support, implementation intention formation, progress monitoring, barrier identification, and optional social reinforcement. According to research by Ma and Johnson, AI coaching increases adherence to financial behavior by 47% when compared to static advice [47].

VI. CONCLUSION

This study launched FinSage, a chatbot based on artificial intelligence to improve the financial literacy of Indian youth. With the use of the RAG technology, customized advice, and interactive visualizations, FinSage offers a

new model of financial education that avoids the limitations of traditional methods. Early results from the study indicate encouraging results in user engagement, satisfaction, and learning, and they are among the increasing evidence that conversational AI agents are able to effectively emulate financial literacy deficits, especially among digital natives. The key contributions of this research are:

- Technical innovation: RAG's design shows how it may be utilized successfully in learning systems that must be extremely accurate and appropriate in terms of context.
- Methodological approach: We utilize a combination of methods to evaluate the performance of AI-driven learning platforms and their effect on education.
- Design principles: Development identified the most crucial aspects of effective financial education to be personalization, graphics, daily life relevance and long-term engagement.
- Outcome: Our pilot test proves that FinSage is very efficient at boosting financial literacy. On average, users improved their score by 42.7%, and showed a significant growth in risk-assessment capability by as much as 90.6%.
- Significance: This research shows that AI conversational platforms can effectively close the widespread financial literacy gap for millions of young adults, a scale unachievable by traditional, resource-limited methods.

With increasingly complicated financial markets, there is a need for easy-to-understand and interactive financial literacy. Interactive conversational interfaces made possible by AI such as FinSage have promise for a scalable solution for meeting this need.

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