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Gamified Learning as a Tool for Enhancing Financial Literacy among Diverse Age Groups

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ABSTRACT

In today's world, being financially aware is no longer a luxury—it's a necessity. Yet, many people, especially younger individuals, still struggle to grasp basic financial concepts. This research presents a financial literacy platform designed to make learning about money simple, accessible, and engaging. The platform offers age-specific learning modules, with curated content for users under 18 and over 18. It also features a chatbot powered by natural language processing (NLP) to help users quickly understand financial terms. Built using Next.js, the platform delivers a smooth user experience while incorporating a gamified approach to make learning about finances more enjoyable. Our goal is to not just educate users but also empower them to make confident and informed financial decisions in their daily lives.

Keywords: Financial literacy, NLP, Gamified learning, Budget planner, interactive learning modules, dashboard visualization.

INTRODUCTION

Financial literacy plays a crucial role in shaping an individual's quality of life. From managing daily expenses to planning long-term goals like buying a home or retiring comfortably, understanding how money works is essential. Yet, despite its importance, financial education is often overlooked in traditional schooling systems. Many people enter adulthood without ever learning how to budget, save, or invest, which can lead to poor financial decisions, debt, and instability. This knowledge gap is especially evident among teenagers and young adults who are expected to make critical financial choices early in life without any formal guidance.

To address this challenge, we have developed a financial literacy platform aimed at making financial education more accessible, engaging, and age-appropriate. Our primary goal is to help users build a strong foundation in personal finance by teaching them the fundamental concepts they need for financial stability. We believe that financial knowledge should not be reserved for a select few or delivered in overly complex ways. Instead, it should be practical, understandable, and even enjoyable.

Recognizing that financial learning needs vary across age groups, our platform is divided into two categories: one for users under the age of 18 and another for users over 18. For younger users, the content is presented through simplified explanations, interactive activities, and relatable scenarios that align with their everyday experiences. For adults, the platform covers more advanced topics such as credit scores, taxes, loans, and investments, delivered through concise lessons and real-world examples.

To enhance accessibility and learning efficiency, we integrated a chatbot powered by natural language processing (NLP). This chatbot acts as a personal financial assistant, allowing users to look up financial terms or ask questions in plain language and receive quick, easy-to-understand summaries. This feature is especially useful for those who may feel overwhelmed by technical jargon or who need quick clarifications while exploring the learning modules.

The platform is built using Next.js, a powerful React-based framework that ensures fast performance and a smooth user experience. To keep learners motivated, we adopted a gamified approach where users can track their progress, earn rewards, and complete challenges as they navigate through the content. This element of play not only makes the learning process more enjoyable but also increases retention and encourages continued engagement.

In summary, this research presents a modern solution to a long-standing problem: the lack of practical financial education. By combining age-specific content, conversational AI, and interactive design, our platform empowers individuals to take control of their financial future—one lesson at a time.

LITERATURE REVIEW:

1) Priya Maury, Poorva Ghatkar, Mitali Rane, and Sanika Bhosale authored a case study titled, "Budget Tracker App [2024]." This research presents a mobile application designed to help users manage finances by tracking income, expenses, and spending patterns. The study addresses the inefficiencies of traditional paper-based financial tracking methods by offering a digital solution with user-friendly interfaces and intuitive features. Key components include expense categorization, budget strategizing with visual representations, a pre-established category library with customization options, and financial goal-setting capabilities. The application utilizes Android Studio with a two-tier architecture comprising a database layer and user interface. The researchers found that both students and working professionals struggle with tracking expenses and often cannot account for where their money goes. Limitations include the reliance on manual data entry, dependency on user discipline, limited financial institution integration, privacy concerns, and challenges with cash transactions. Future development opportunities include AI and machine learning integration for predictive analysis, enhanced mobile integration for real-time updates, and economic trends analysis with offline capabilities for areas with limited connectivity.
2) Supawich Panich, Pratchayapong Yasri, and Chalita Toopsuwan authored a research paper titled, “Development of Game-Based Learning on Personal Income Tax Literacy and Mathematical Decision-Making for Strategic Tax Planning [2024].” This study introduces Tax Master, a board game aimed at improving tax literacy and financial decision-making skills through engaging, real-world scenarios. Addressing the disconnect between abstract math education and real-life financial applications, the game is designed to teach personal income tax concepts, including deductions, allowances, and investment strategies under Thai tax law. The game adopts a dual-phase format—foundational and competitive—allowing players to take on roles such as freelancers or employees,

encountering financial events via themed cards. It incorporates cognitive, psychomotor, and affective learning domains to promote holistic understanding. Developed to align with modern STEM and financial literacy goals, Tax Master offers immersive gameplay that enhances critical thinking, encourages strategic planning, and fosters positive attitudes toward taxes. The game's design integrates tactile tools, facilitator support, and real-time calculations to simulate practical tax planning. The study emphasizes the potential of game-based learning to transform tax education, making it interactive, relatable, and effective for learners of all ages.

3) Hanfang Chen, Niankun Wei, Leyao Wang, Wael Fawzy Mohamed Mobarak, Marwan Ali Albahar, and Zafer Ahmed Shaikh, in their 2024 IEEE Access publication titled " The Role of Blockchain in Finance Beyond Cryptocurrency: Trust, Data Management, and Automation" explore how blockchain technology extends beyond cryptocurrencies to revolutionize financial systems. The paper focuses on three core areas—trust, data governance, and automation—by analyzing the technical foundations of blockchain, including distributed ledgers, smart contracts, and consensus mechanisms. It highlights how these components address persistent challenges like data integrity, compliance, and operational inefficiencies in the financial sector. The study emphasizes blockchain's ability to enhance transparency through immutable audit trails, secure data via decentralized storage, and automate workflows using smart contracts. A two-tier blockchain architecture is proposed to support both national and international financial operations while ensuring adherence to standards like GDPR and PCI-DSS. While acknowledging the technology's promise, the authors also point out ongoing limitations such as scalability, interoperability, and future threats like quantum computing, ultimately advocating for blockchain's broader adoption to modernize and secure financial ecosystems.

4) Yanyu Zhuang and Hua Wei authored a research paper titled "Design of a Personal Credit Risk Prediction Model and Legal Prevention of Financial Risks" (2024), published in IEEE Access. This study addresses the growing demand for personal credit by developing an advanced risk assessment system to mitigate non-performing loans (NPLs) in banking institutions. The research tackles data imbalance in credit datasets using a Generative Adversarial Network (GAN) for oversampling, specifically the Wasserstein GAN with Gradient Penalty (WGAN-GP), to generate realistic default samples. These are combined with the Light Gradient Boosting Machine (LightGBM) ensemble model to create a robust credit risk prediction framework. Experiments on public (KEEL) and real-world financial datasets demonstrate the model's superior performance, achieving 86.7% classification accuracy and strong metrics (AUC: 0.86, KS: 0.87). Key findings include: (1) WGAN-GP outperforms traditional oversampling methods like Random Over-Sampling (ROS); (2) LightGBM-GAN excels in predictive stability and interpretability, identifying critical features (e.g., Annuity_credit_per, Days_birth); and (3) The model aids financial institutions in reducing NPL risks while complying with regulations. Limitations include dataset scope and interpretability challenges, prompting future work on broader validation and expert integration. This research contributes to financial risk management by merging generative AI with ensemble learning, offering a scalable solution for credit assessment.

5) Raj Thakare and colleagues authored a research paper titled, "Expense Tracker Application using Naive Bayes [2023]." This study introduces an Android-based expense tracker application that employs the Naive Bayes algorithm for automated expense tracking and classification. Developed using Kotlin and XML in Android Studio, the application offers both manual expense entry and automatic detection of bank SMS messages. The system extracts relevant transaction information using supervised machine learning to classify messages as "Bank SMS" or "Normal SMS." Key features include visual representation of expenses through pie charts for multiple time frames (weekly, monthly, yearly), goal setting, and user authentication. The application utilizes Firebase as an online database to ensure data persistence even if uninstalled. The study demonstrates how machine learning integration can enhance financial management by automating expense categorization and providing comprehensive spending insights. Limitations include the dependence on SMS-based banking notifications. The research contributes to understanding how AI can improve personal finance applications by reducing manual data entry and enabling more informed financial decision-making.
6) Wasan Uthaileang and Supaporn Kiattisin authored a research paper titled, “Developing the Capability of Digital Financial Literacy in Developing Countries: A Case of Online Loans for Small Entrepreneurs [2023].” This study investigates how digital financial literacy (DFL) and motivational factors influence the financial capabilities of small entrepreneurs in Thailand, focusing on the use of online loans. Using the I-Change Model and Knowledge-Attitude-Behavior (KAB) theory, the research examines the role of knowledge, attitudes, and self-efficacy in shaping digital financial skills. Structural equation modeling (SEM) and path analysis were applied to data from 400 small entrepreneurs, confirming that DFL positively affects attitudes and self-efficacy (H1a, H1b), which in turn improve financial skills (H2, H3) and overall digital financial capability (H4). The study underscores the importance of government policies and training programs in fostering DFL, particularly in the post-COVID-19 era where digital financial tools have become essential. However, limitations include its focus on Thailand and the exclusion of broader behavioral factors. The research provides valuable insights into how motivational and educational efforts can enhance digital financial adoption in developing countries.
7) Alberic Aptatio Astri and Lindrianasari authored a research paper titled "Sampatti Personal Financial Management Application Development Integrated with Indonesian Stock Market Data [2023]." This study addresses the need for personal financial management (PFM) tools that incorporate investment tracking, particularly for younger Indonesians who dominate stock investments (81.64% under age 40). The researchers developed a web-based application called Sampatti using Agile methodology that enables users to record income, expenses, and investments while integrating with Indonesian stock market data. The system consists of a MariaDB database with four key entities (Investment, Account, Transaction, Category), a Django-based backend API, and a Vue 3/Nuxt frontend interface. Key features include transaction tracking, investment monitoring, account management, and comprehensive dashboard visualizations showing net worth and spending patterns by category. The application was designed for simplicity while maintaining robust functionality, allowing users to host it personally for financial management. However,

the researchers note limitations requiring further research to assess acceptance, usability, and benefits, with potential for future development into a Progressive Web App with real-time market data integration.

8) Virgie Liza Mamauag and Maricris Usita authored a research paper titled "Financial Literacy Web-based Learning Application Tool for Students of Higher Education Institutions [2022]." This study developed and evaluated a web-based learning tool to improve financial literacy among higher education students. The research used experimental methods focused on system development processes, collecting data from 145 respondents to evaluate the application. The web platform includes four major components: Lessons, Videos, Activities, and Information covering financial literacy education, money management, saving, spending, and investing. Website evaluation using the Website Evaluation Questionnaire (WEQ) framework assessed eight criteria: ease of use, hyperlinks, structure, relevance, comprehension, completeness, layout, and search options. Results showed the website exceeded expectations with an overall mean rating of 4.07, with relevance scoring highest (4.40). The researchers concluded that financial literacy education is critical for students to make sound financial decisions, and the developed web application serves as an effective educational tool. They recommended its implementation at Occidental Mindoro State College and potential extension to out-of-school youth and high school students.

9) A 2022 study published in IEEE Access presents a detailed examination of ethical concerns surrounding the use of machine learning in the fintech sector. The research introduces a framework that connects traditional financial ethics—such as fairness, confidentiality, diligence, and integrity—with internationally recognized AI ethics principles. It draws connections between financial integrity and the transparency and explainability of ML models, as well as between fairness in finance and human-centered AI values. The study identifies twelve pressing ethical challenges in fintech, including biased decision-making, model opacity, unfair lending practices, conflicts in automated advisory systems, and privacy concerns. Through the use of tools like SHAP and Microsoft's Responsible AI Widgets, the authors demonstrate these concerns via a credit card approval scenario, analyzing how variables like prior defaults, income, and existing debt shape outcomes. The proposed framework emphasizes reducing algorithmic bias, improving transparency, safeguarding user data, and promoting responsible human-AI collaboration to establish trust and accountability in technology-driven financial services.

10) Dr. Shaili Gala, in her 2022 study titled "Financial Literacy Among the Youth: The First Step to Financial Independence," explores the state of financial literacy among individuals aged 18 to 30 within the Mumbai Metropolitan Region, based on insights gathered from 205 participants. The research delves into levels of awareness, prevalent misconceptions, and the perceived importance of financial literacy. While many respondents demonstrated a solid grasp of theoretical concepts, practical financial decision-making remained a challenge. The study also reveals gender-based differences in saving behavior, with women facing more challenges in maintaining savings. Younger participants (aged 18–21) were more prone to misconceptions about investment strategies compared to their older peers. Although most participants acknowledged the value of financial literacy as an essential life skill, they struggled with day-to-day banking

activities and understanding investment tools. The research points to a significant gap in formal financial education in India and urges educational institutions and policymakers to introduce more structured programs aimed at fostering saving habits and money management skills among the youth. However, the findings are primarily reflective of individuals within the Mumbai Metropolitan Region, which may limit broader generalization.

EXISTING SOLUTIONS:

There are several platforms and tools available today that aim to improve financial literacy. Websites like Investopedia, Khan Academy, and government-backed initiatives offer free resources, videos, and articles to help users understand financial concepts. Mobile apps like Mint, YNAB (You Need A Budget), and GoodBudget also contribute by helping users manage their money practically. Some educational institutions have started incorporating financial education modules into their curriculum, and online courses on platforms like Coursera and Udemy provide structured learning paths. These resources have certainly played an important role in making financial knowledge more accessible.

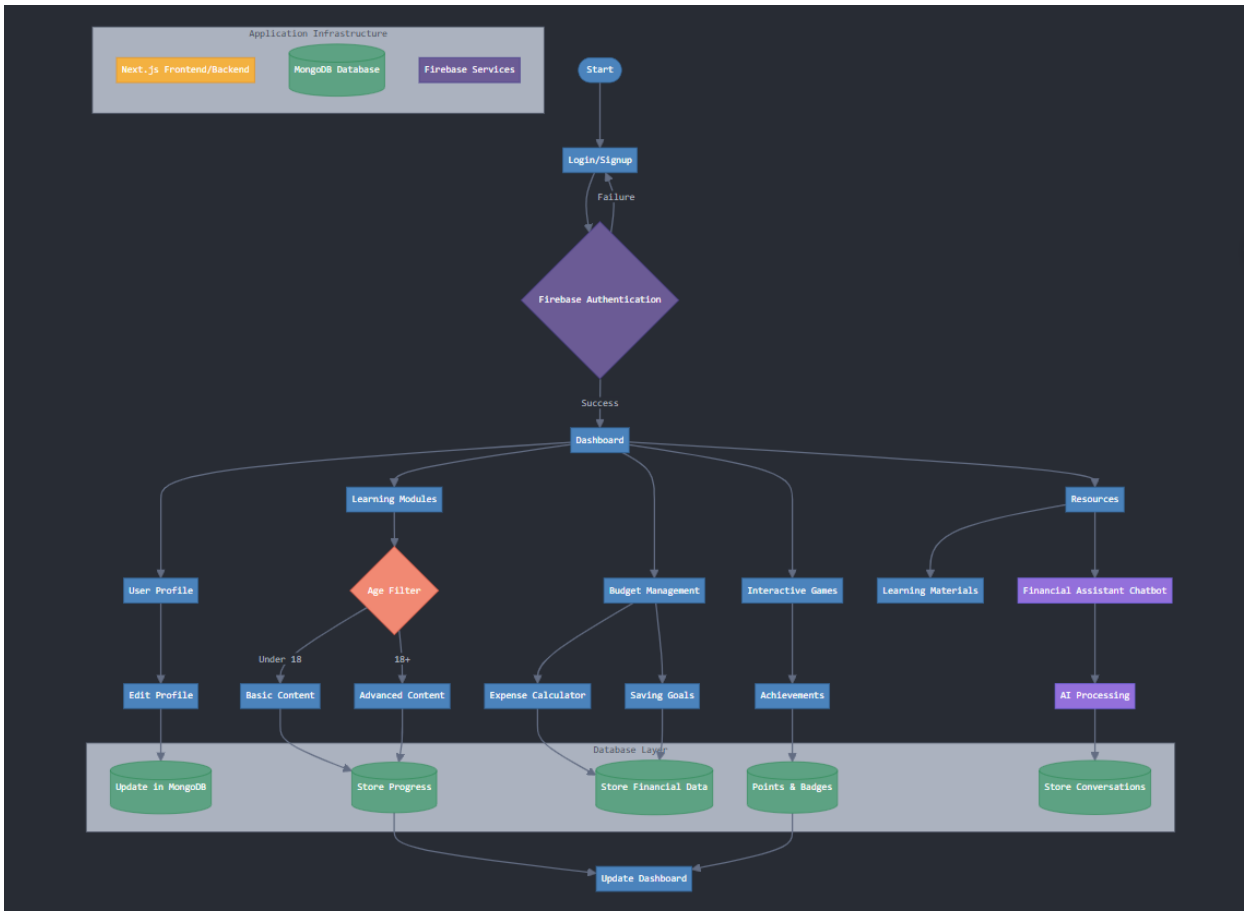
While these existing solutions provide valuable content, many of them are either too technical, too passive, or not designed with engagement in mind—especially for younger audiences. Most platforms rely heavily on reading-based or video content, which can feel overwhelming or boring to users with short attention spans or no prior knowledge. Few are tailored for different age groups, and very few offer real-time support through interactive tools like chatbots. Additionally, the lack of gamification in most of these tools makes it harder to keep users consistently motivated. As a result, many people abandon their learning journey halfway or fail to retain key financial concepts that are critical for day-to-day life

PROPOSED SOLUTION:

To bridge the gap left by existing financial education tools, we propose an interactive financial literacy platform designed to make learning both accessible and engaging. Our solution focuses on simplifying key financial concepts and delivering them in a way that resonates with users of different age groups. The platform is divided into two learning tracks—one for users under 18 and another for users above 18—ensuring that the content is age-appropriate and relevant to each group's financial responsibilities. Built using Next.js for a smooth and responsive experience, the platform allows users to move through bite-sized lessons, complete mini-challenges, and track their progress in a gamified format that keeps motivation high.

What sets our platform apart is its use of natural language processing (NLP) to power an integrated chatbot. This chatbot acts as a real-time financial assistant, helping users understand financial terms and concepts in a conversational, easy-to-digest manner. Instead of having to search through dense articles or wait for classroom instruction, users can simply ask a question and receive an instant, beginner-friendly explanation. This immediate access to guidance enhances learning and reduces frustration. By combining structured lessons with conversational AI and gamification, our platform creates an environment where users can not only learn at their own pace but also enjoy the process of becoming financially informed.

SYSTEM ARCHITECTURE:



1) **Application Infrastructure**
   - Next.js for frontend/backend with MongoDB database
   - Firebase Services for authentication flow
2) **Entry Flow**
   - Login/Signup with Firebase Authentication
   - Successful auth redirects to Dashboard
3) **Dashboard Overview**
   - Central hub accessing:
   - Resources
   - Learning Modules
   - Budget Management
   - Interactive Games
4) **User Profile Management**
   - Profile viewing/editing with MongoDB storage
5) **Learning Modules**
   - Controlled by an Age Filter:
   - Users under 18 are served Basic Content
   - Users 18+ receive Advanced Content
   - Progress tracked and stored in MongoDB
6) **Budget Management**
   - Comprises:
   - Expense Calculator
   - Saving Goals
   - Financial inputs stored in MongoDB
   - Values contribute to dashboard updates
7) **Resources Section**
   - Educational materials with Financial Assistant Chatbot
8) **Gamification Elements**
   - Interactive games with achievements and rewards
9) **Data Management**
   - Secure storage of user progress and financial data

10) Chatbot assistant:

- The platform features a simple NLP-based chatbot that helps users understand financial terms by providing clear, beginner-friendly definitions. Built using a basic sentence transformer model, it matches user queries with relevant explanations from a predefined glossary. This allows users to ask about any financial term and receive quick, easy-to-understand responses, making the learning experience smoother and more accessible.

APPLICATIONS:

1. **Educational Institutions**

Schools and colleges can integrate the platform into their curriculum to introduce students to essential financial concepts early on. The age-based structure makes it easy for educators to assign appropriate lessons to different student groups, ensuring relevant learning without overwhelming them.

2. **Self-paced Learning for Individuals**

Young adults and working professionals can use the platform independently to strengthen their personal finance skills. Whether someone is trying to understand how to manage a salary, create a savings plan, or avoid debt, the platform serves as a beginner-friendly guide for real-world financial situations.

3. **Family-based Financial Education**

Parents can use the platform with their children to learn together and open up conversations about money at home. This encourages financial awareness as a family value and helps kids grow up with a stronger understanding of financial responsibility.

4. **Community Programs and NGOs**

Nonprofits and community centers that focus on financial literacy or economic empowerment can use the platform as part of their training sessions and workshops. It provides an accessible, interactive alternative to traditional printed materials or lectures.

5. **Support Tool for Educators and Mentors**

Teachers, trainers, and financial advisors can use the platform's modules and chatbot as supplemental tools to enhance their lessons. The chatbot can assist learners in real-time, providing simple explanations for complex topics when instructors aren't immediately available.

6. **Gamified Learning Environments**

Thanks to its engaging, challenge-based format, the platform fits well into gamified e-learning ecosystems where users are more motivated by achievements, progress tracking, and interactive feedback than by static reading or videos.

LIMITATIONS

1. **Limited scope of financial topics at launch:** While the platform covers key financial concepts, advanced or niche areas (like taxation laws, business finance, or international investing) are not included in the initial version.
2. **Dependence on user motivation:** Since the platform is self-paced and online, its effectiveness largely depends on the user's willingness to actively engage with the content.
3. **Chatbot accuracy:** Although the chatbot is powered by NLP, its responses may sometimes lack depth or context, especially for complex financial queries, and should not be treated as professional advice.
4. **Language and accessibility barriers:** Currently, the platform is available only in English, which may limit access for non-English-speaking users or those with different literacy levels.
5. **Device and internet access:** Users need access to a digital device and a stable internet connection, which may not be available to everyone, especially in underserved communities.

CONCLUSION:

Financial literacy has become a core life skill, yet many people still lack access to practical financial

education. Our project aims to address this gap by creating a financial literacy platform that simplifies complex concepts into engaging, easy-to-understand lessons. By dividing content into two age categories—under 18 and above 18—we ensure that learners receive relevant, age-appropriate information they can actually apply in daily life. The platform integrates a chatbot powered by natural language processing to make learning feel more interactive and accessible. Users can ask financial questions in plain language and receive quick, simple explanations, removing the friction often associated with self-learning. This makes financial education less intimidating and more conversational, especially for beginners.

To bridge the gap between learning and real-life action, we also included a personalized budget planner. Users can input basic details like income, rent, and savings goals to receive a tailored monthly budget. This feature helps users apply what they learn right away, turning concepts like saving and expense tracking into everyday habits.

With its gamified design, the platform keeps users engaged and motivated through challenges and progress tracking. While there's room for future improvements—like wider topic coverage and multilingual support—the current version lays a strong foundation. Ultimately, we believe our platform can help build a more financially confident generation by making financial literacy both approachable and actionable.

REFERENCES

[1]. Priya Maury, Poorva Ghatkar, Mitali Rane, Sanika Bhosale, "Case Study on Budget Tracker App", International Journal of Research Publication and Reviews, Vol 5, no 2, pp 3539-3544 February 2024

[2]. S. Panich, P. Yasri, and C. Toopsuwan, "Development of Game-Based Learning on Personal Income Tax Literacy and Mathematical Decision-Making for Strategic Tax Planning," 2024 9th International STEM Education Conference (iSTEM-Ed), Bangkok, Thailand, 2024, pp. 979-8-3503-6597-9/24/$31.00. DOI: 10.1109/ISTEM-ED62750.2024.10663196.

[3]. Hanfang Chen, Niankun Wei, Leyao Wang, Wael Fawzy Mohamed Mobarak, Marwan Ali Albahar, Zafer Ahmed Shaikh, " The Role of Blockchain in Finance Beyond Cryptocurrency: Trust, Data Management and Automation" , 2024 IEEE Access publication

[4]. Yanyu Zhuang, Hua Wei, KoGuan School of Law, Shanghai Jiao Tong University, "Design of a Personal Credit Risk Prediction Model and Legal Prevention of Financial Risks", 2024 IEEE Access publication

[5]. Raj Thakare, Ninad Thakare, Raj Sangtani, Shubham Bondre, Amitkumar Manekar, "Expense Tracker Application using Naive Bayes", 2023 SSRG International Journal of Recent Engineering Science.

[6]. Wasan Uthaileang, Supaporn Kiattisin, "Developing the Capability of Digital Financial Literacy in Developing Countries: A Case of Online Loans for Small Entrepreneurs", Heliyon 9 (2023) e21961

[7]. Alberic Aptatio Astri, Lindrianasari, "Sampatti Personal Financial Management Application Development Integrated with Indonesian Stock Market Data.", 2023 International Conference on Information Management and Technology.

[8]. Virgie Liza Mamauag, Maricris Usita, "Financial Literacy Web-based Learning Application Tool for Students of Higher Education Institutions", Journal of Positive School 2022, Vol. 6, No. 3, 3472–3481

[9]. Maryan Rizinski, Hristijan Peshov, Kostadin Mishev, Lubomir T. Chitkushev Irena Vodenska, Dimitar Trajanov, "Ethically

Responsible Machine Learning in Fintech", 2022 IEEE Access

[10]. Dr. Shaili Gala[Assistant Professor], "Financial Literacy Among The Youth: The First Step To Financial Independence", 2022 International Journal of Creative Research Thoughts, ISSN:2320-2882