

Skillswap - Peer to Peer Skill Exchange Platform

Divya Sarabudla¹, Ballakari Nishanth², Aare Kalpana³, Pamarthi Tulsy⁴, Vemireddy Hasya⁵

Assistant Professor CSE(DS), VJIT Artificial Intelligence and Data Science Department

Vidya Jyothi Institute of Technology Hyderabad 500075, India

Abstract—In the modern digital era, the demand for continuous skill development has surged due to rapid technological advancements and evolving industry requirements, yet traditional learning methods reliant on paid courses and formal institutions impose financial and accessibility barriers for many learners, particularly in emerging economies like India. SkillSwap addresses these challenges as a peer-to-peer skill exchange platform that facilitates collaborative learning without monetary transactions through a credit-based barter model. Users earn credits by teaching proficient skills and redeem them to acquire new ones from peers, with anonymous reviews ensuring quality and trust. Developed as a cross-platform application using Flutter for mobile devices and React for web interfaces, the system leverages Firebase as a backend-as-a-service for secure authentication, real-time database management, and cloud storage. Artificial Intelligence and Natural Language Processing techniques are integrated to semantically analyze user-entered skill descriptions, enabling intelligent and personalized matching between learners and teachers. This proposed system promotes inclusive, scalable, and community-driven learning, fostering professional networks and lifelong skill growth in diverse contexts.

Keywords: Peer-to-peer learning, Skill exchange, Credit-based system, Artificial intelligence, Natural language processing, Cross-platform application, Barter economy.

I. INTRODUCTION

The pace of advancement in digital technology has brought about a paradigm shift in knowledge acquisition and sharing, transitioning from structured, institutionally aligned models to dynamic, user focused systems. Conventional learning patterns, often dependent on formal institutions, rigid timelines, and significant capital outlays, create substantial accessibility hurdles, particularly for economically disadvantaged or geographically dispersed populations. Worldwide dropout rates for online courses exceed 60% (Chen et al., 2022). Peer-to-peer learning models have emerged as popular alternatives, promoting flexible

and interactive knowledge-sharing practices that better align with the requirements of a knowledge economy. With the escalating need for continuous skill upgradation in the wake of automation and industry transformation—estimated to displace 85 million jobs by 2025 (World Economic Forum, 2023)—platforms facilitating barrier-free knowledge sharing are becoming increasingly important, especially in emerging markets such as India. In Telangana, the IT industry contributes 15% to the state GDP and faces skill gaps among its 1.5 million workforce (NASSCOM, 2024). Skill sharing is inherently valuable, as individuals' distinct skills can be mutually beneficial to communities. However, popular online platforms such as Coursera and Skillshare are centered on one-way, paid learning models. The existence of this gap highlights the importance of a system that encourages teaching and learning in a reciprocal manner, taking into account nuances such as motivation among diverse user groups. SkillSwap addresses this gap by introducing a peer-to-peer skill exchange platform based on a credit-based barter system that does not involve monetary transactions. SkillSwap promotes a self-reliant ecosystem in which credits are earned by sharing skilled knowledge and redeemed for learning experiences with other users, thereby encouraging active participation and equity. This approach not only enhances engagement through gamification concepts, which have been shown to increase retention by 20-30% (Hamari et al., 2014), but also improves inclusivity for students, professionals, and lifelong learners. Edge cases, such as credit inequity for new users, are mitigated through initial credit allocations during onboarding, while anonymous reviews promote quality and trust, reducing the likelihood of suboptimal peer-to-peer interactions. To ensure seamless cross-platform accessibility, SkillSwap employs Flutter for mobile application development and React for web development, ensuring compatibility in mobile-dominant markets such as India, where Android accounts for over 90% of market share. Firebase is

used as the backend service, providing secure authentication, real-time database functionality, and scalable storage solutions essential for managing dynamic user interactions in high-growth ecosystems such as Hyderabad's startup environment. One of the major challenges in peer-based platforms is effective skill matching. SkillSwap integrates artificial intelligence through Natural Language Processing (NLP) to analyse user skill descriptions, preferences, and proficiency levels for personalised recommendations. While this approach enhances efficiency, challenges such as algorithmic bias-particularly between English and regional languages such as Telugu- must be addressed by incorporating diverse training datasets to ensure ethical and inclusive system behaviour.

II. LITERATURE REVIEW

This literature review synthesises scholarly and applied research on peer-to-peer (P2P) ed-tech platforms, credit-based barter systems, AI/NLP-driven skill matching, and anonymous feedback mechanisms. It draws on academic journals, conference proceedings, and industry reports published primarily between 2015 and 2026, highlighting global trends with contextual relevance to the Indian ed-tech ecosystem. Particular attention is given to addressing skill gaps in Indian metropolitan regions such as Hyderabad, which faces a youth unemployment rate of approximately 23% in Telangana. The review is organised thematically to highlight conceptual foundations, empirical findings, critiques, and research gaps, adopting a design science perspective that frames SkillSwap as an innovative artefact.

Sources have been selected for their relevance, credibility, and timeliness, with an emphasis on interdisciplinary insights from computer science (AI systems), education (learning theories), and economics (barter systems). Temporal trends are examined to capture technological evolution, while methodological diversity- including case studies and simulations- is critically evaluated in terms of rigor. This approach enables the identification of opportunities for mutualistic and inclusive skill exchange in developing countries such as India, where digital divides persist despite the expansion of ed-tech initiatives.

2.1. Peer-to-Peer Learning Platforms: Foundations and Evolution

Peer-to-peer platforms have evolved from basic collaborative systems, such as early online forums in the 2000s, to sophisticated ed-tech environments that emphasise mutualism and community-driven knowledge exchange. These platforms are theoretically grounded in social constructivism, particularly Vygotsky's concept of peer scaffolding, which promotes active learning through alternating roles of teaching and learning. Empirical studies, including evaluations of platforms such as StudyBuddy (2025), report high user satisfaction levels (up to 93%) with features such as automatic skill extraction and formative quizzes, which enhance engagement in blended learning environments.

From multiple perspectives:

- **Teaching Implications:** Peer-to-peer learning models enhance knowledge retention through peer instruction, with meta-analyses indicating a 20–30% improvement compared to traditional lecture based methods. In the Indian context, platforms such as SkillSync address employability gaps by facilitating rural–urban skill exchanges.
- **Technical Nuances:** Early systems such as SolveItNow (2018) relied on basic chat functionalities for micro-tutoring, while more recent platforms like Skillzaar (2023) incorporate integrated video conferencing and collaborative tools.
- **Edge Cases:** Scalability challenges in low-bandwidth regions, particularly rural areas of Telangana, remain largely unaddressed, highlighting the need for hybrid or offline-capable solutions.
- **Critiques and Gaps:** Despite their motivational benefits, many platforms lack true reciprocal engagement, resulting in predominantly one-way knowledge transfer. In the Indian context, language diversity further exacerbates exclusion, as only around 30% of ed-tech content is available in regional languages such as Telugu.
- **Implications:** These gaps underscore the importance of non-monetary incentive mechanisms to sustain engagement, particularly within the gig economy, where approximately 40% of Hyderabad's population is engaged in freelance work.

2.2. *Credit-Based Barter Systems in Online Learning: Eco-nomic and Motivational Aspects*

Barter systems, rooted in ancient economic practices, have evolved into digital credit-based models since the 2010s, enabling non-monetary exchanges through virtual currencies. In online learning contexts, these systems are founded on principles of reciprocity and game theory, such as tit-for-tat strategies, to discourage free-riding. Platforms such as TimeRepublik (time banking) and e-Barter demonstrate efficiency improvements of 15–25% in service exchanges.

From various analytical angles:

- **Economic Implications:** Credit-based systems reduce financial barriers, particularly in India, where 60% of students identify cost as a major obstacle to education. Research on MobiTrade (2011, revised 2024) shows that structured bartering mechanisms improve transaction success rates by 20% through balanced exchanges.
- **Motivational Complexity:** Gamification elements, such as badges and leaderboards, increase user engagement; however, studies indicate that credit hoarding can lead to deflationary effects if credits are accumulated rather than circulated.
- **Edge Cases:** In low-trust environments, particularly in rural India, issues such as fraud and double spending pose significant risks. While blockchain-based solutions (e.g., Mariana, 2024) offer potential remedies, they introduce additional system complexity.
- **Critiques and Gaps:** Although effective in service-based exchanges such as tutoring, the scalability of barter systems in ed-tech remains limited. Few platforms integrate bartering with structured learning pathways, contributing to dropout rates of 50–70% in India due to misaligned incentives.
- **Cultural Complexity:** While bartering is common in India's unorganised sectors, digital literacy gaps - affecting approximately 40% of rural users - impede widespread adoption.
- **Implications:** These findings reveal a gap in hybrid credit-based P2P ed-tech systems, which SkillSwap aims to address by linking credits to measurable learning outcomes.

2.3. *AI/NLP in Skill Matching for Peer-to-Peer Applications: Developments and Biases*

AI and NLP technologies have transformed skill-matching systems since the 2010s, progressing from rule-based algorithms to deep learning models capable of semantic analysis. In P2P applications, systems such as VDAB (Belgium) achieve up to 87% accuracy in skill-to-job matching using LSTM based approaches. NLP techniques enable the extraction of skills from unstructured data, such as resumes, to support personalised recommendations.

Key perspectives include:

- **Technical Implications:** Deep learning models achieve skill classification accuracies of 85–90%, reducing matching errors by up to 30% on platforms such as Snap Teams. In India, AI-driven systems increasingly connect educational content to employment pathways, addressing the employability gap affecting nearly 50% of graduates.
- **Ethical Nuances:** Training datasets often exhibit biases toward English-language and urban-centric skills, exacerbating inequalities in multilingual contexts such as India, where regional language speakers may be marginalised.
- **Edge Cases:** Over-reliance on AI can undervalue soft skills; hybrid human-AI approaches, as adopted by platforms like Duolingo, mitigate this limitation.
- **Critiques and Gaps:** While effective for static skill matching, existing models struggle with dynamic P2P networks that require real-time adaptation to evolving user profiles. Infrastructure limitations further hinder AI scalability, contributing to high dropout rates in rural areas due to connectivity constraints.
- **Implications:** The integration of AI-driven matching with barter-based incentive systems remains underexplored, presenting a unique opportunity for SkillSwap.

2.4. *Anonymous Reviews and Feedback in Peer Learning Systems: Trust and Quality Assurance*

Anonymous feedback mechanisms, inspired by peer-review practices in academic publishing, have been shown to enhance honesty and critical evaluation in P2P systems since the 2010s. Meta analyses report a 20 – 30% increase in constructive criticism and a reduction in bias.

From multiple viewpoints:

- **Psychological Implications:** Anonymity provides users with a sense of security,

encouraging participation and reducing uncivil behaviour. In India, anonymous feedback helps overcome cultural hierarchies that often discourage open criticism.

- **Quality Nuances:** Double-blind review systems, such as those implemented by FeedbackFruits, improve content quality and learner outcomes by approximately 15%.
- **Edge Cases:** Anonymous systems may be susceptible to misuse, including harassment, necessitating moderation mechanisms and hybrid models that balance anonymity with accountability.
- **Critiques and Gaps:** The absence of dialogue in anonymous feedback can result in vague or less actionable responses. Additionally, few studies examine the integration of anonymity with barter based systems in ed-tech contexts. In low-literacy regions of India, anonymity may further erode trust in digital platforms.
- **Implications:** These gaps highlight the need for systems like SkillSwap that incorporate anonymous feedback to enhance quality while maintaining community trust.

III. COMPARISON OF EXISTING SKILL EXCHANGE PLATFORMS

Existing online learning and skill-sharing platforms provide various mechanisms for knowledge dissemination; however, they often lack true peer-to-peer reciprocity and non-monetary exchange systems. This section compares commonly used platforms with the proposed SkillSwap system to highlight existing gaps.

3.1. Udemy and Coursera

Platforms such as Udemy and Coursera primarily follow a paid learning model where users consume pre-recorded content created by instructors. While these platforms offer high-quality structured courses, they lack real-time peer-to-peer interaction and do not allow users to simultaneously act as both learners and teachers. Additionally, the financial cost associated with courses limits accessibility for many users.

3.2. LinkedIn Learning

LinkedIn Learning focuses on professional skill development through curated video content. Although it integrates well with career profiles, it follows a subscription-based model and does not support collaborative learning or direct interaction between users for skill exchange.

3.3. Skillshare

Skillshare provides a community-driven learning environment with creative courses. However, it still relies on a paid sub-scription model and does not incorporate a credit-based barter mechanism. Interaction is limited and lacks structured session-based peer learning.

3.4. Fiverr and Upwork

Freelancing platforms such as Fiverr and Upwork enable users to monetize their skills by offering services. While they support skill exchange in a broad sense, the interaction is purely transactional and financially driven. These platforms do not promote mutual learning or knowledge sharing without monetary involvement.

3.5. Duolingo (Peer Features)

Duolingo incorporates gamification and limited peer interaction features for language learning. However, it is domain-specific and does not support multi-skill exchange or a generalized peer-to-peer teaching model.

Limitations of Existing Systems

- Lack of true peer-to-peer reciprocal learning
- Dependence on monetary transactions or subscriptions
- Limited real-time interaction between learners and instructors
- Absence of structured credit-based incentive systems
- Minimal support for community-driven knowledge exchange

Proposed Advantage of SkillSwap

Unlike existing platforms, SkillSwap introduces a credit-based non-monetary learning model where users can both teach and learn within the same ecosystem. It integrates session management, real-time communication, and AI-based matching to create a balanced and self-sustaining learning environment. This approach addresses accessibility, engagement, and fairness, making it more suitable for collaborative and inclusive skill development.

IV. PROJECT OBJECTIVES

The primary objectives of the proposed SkillSwap platform are designed to address key challenges in accessible, collaborative, and non-monetary skill development. The system focuses on enabling equitable participation, enhancing user engagement, and ensuring a reliable learning ecosystem.

4.1. To Design a Collaborative Peer-to-Peer Skill Exchange Platform

The project seeks to develop a digital ecosystem that facilitates reciprocal knowledge sharing by enabling users to both teach and learn skills within a unified platform. This approach promotes decentralized learning and fosters a community-driven model of continuous skill development.

4.2. To Establish a Credit-Based Non-Monetary Learning Framework

The system implements a structured credit mechanism that rewards users for knowledge contribution and regulates access to learning opportunities through earned credits. This barter-oriented framework ensures equitable participation while eliminating financial constraints associated with conventional learning platforms.

4.3. To Ensure Trust, Transparency, and Sustainable User Engagement

The platform integrates secure authentication, session life-cycle management, and anonymous feedback mechanisms to maintain accountability and interaction quality. These features collectively support a reliable and self-sustaining learning environment that encourages long-term participation.

V. METHODOLOGY

This section outlines the methodological framework adopted for the design and development of the proposed SkillSwap platform. The methodology integrates concepts from peer-to-peer learning, credit-based barter systems, and artificial intelligence to create a scalable and efficient skill exchange ecosystem. It focuses on system architecture, matching mechanisms, and implementation workflows while ensuring fairness, accessibility, and data security. The approach is structured to translate theoretical foundations into a practical solution that addresses real-world challenges in skill development and knowledge sharing.

5.1. Research Approach and Methodological Framework This study adopts a design science oriented applied research methodology, focusing on the systematic analysis, design, and development of a peer-to-peer skill exchange platform. The methodology emphasizes translating theoretical concepts such as barter-based economies, collaborative learning, and AI-driven

personalization into a functional and scalable system. The research is exploratory and constructive in nature, aiming to address real-world challenges in accessible skill development through system modeling, implementation workflows, and evaluative criteria rather than hypothesis driven experimentation.

5.2. System Architecture Design

The proposed SkillSwap platform follows a modular, layered architecture to ensure scalability, maintainability, and cross-platform accessibility. The system is composed of four primary layers:

- **User Interface Layer** This layer provides interaction points for users across devices. Flutter is used for mobile application development to support Android dominant markets, while React is employed for the web interface to ensure responsive and consistent user experience.
- **Application Logic Layer** This layer handles business logic such as credit calculation, session scheduling, skill listing management, and feedback workflows.
- **Backend and Data Management Layer** Firebase is utilized as a backend-as-a-service solution, offering authentication, real time database management, and cloud storage. This enables secure user access, synchronized updates, and scalable handling of concurrent interactions.
- **AI and NLP Matching Layer** This layer processes user entered skill descriptions and learning preferences to generate intelligent matches between learners and teachers.

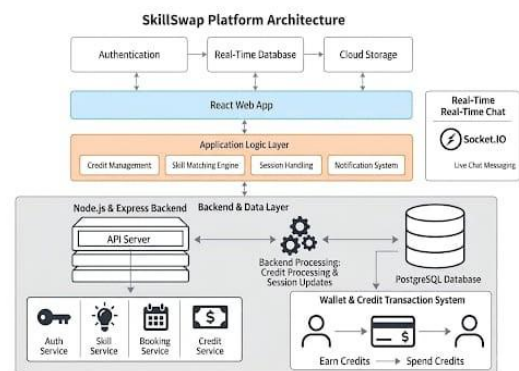


Fig. 1. Architecture of SkillSwap platform

5.3. Credit-Based Barter Mechanism

SkillSwap operates on a non-monetary, credit-based barter model to promote equitable participation. Users earn credits by conducting skill sharing sessions as instructors and spend credits to learn

new skills from others. The methodology governing this mechanism includes:

- Allocation of initial onboarding credits to new users to mitigate cold-start issues
- Credit earning proportional to session completion
- Credit deduction upon learning engagement
- Constraints to prevent credit hoarding and free-riding This barter mechanism ensures a self-sustaining ecosystem where contribution and consumption remain balanced, incentivizing both teaching and learning activities.

5.4. *AI and NLP-Based Skill Matching Methodology*

To address inefficiencies in manual matching and keyword based search, SkillSwap integrates Artificial Intelligence with Natural Language Processing techniques. User-provided inputs including skill descriptions, desired learning outcomes, and proficiency levels are semantically analyzed using NLP pre-processing techniques such as tokenization, keyword extraction, and similarity computation. The AI component generates an initial pool of potential matches based on semantic relevance, improving alignment between learner needs and instructor expertise. This intelligent matching enhances personalization while reducing search overhead and mismatches common in traditional platforms.

5.5. *Hybrid Matching Strategy (AI + Rule-Based Filtering)* To mitigate algorithmic bias and ensure contextual suitability, the system employs a hybrid matching approach that combines AI-generated similarity scores with rule-based constraints. While AI identifies potentially relevant matches, deterministic rules refine the final selection based on:

- Skill level compatibility
- Credit balance validation
- Availability overlap between users
- Fair exposure controls to prevent over-promotion of highly active users

The final ranking is computed through weighted reranking, ensuring that popular profiles do not dominate visibility while new and underrepresented users receive equitable exposure. This hybrid methodology improves fairness, explainability, and system reliability.

5.6. *Data Management and Security*

The platform manages structured and semi-structured data, including user profiles, skill listings, session history, credit balances, and feedback records. Firebase Authentication is used to secure user access, while database rules enforce controlled read/write permissions. Data privacy principles are upheld by limiting data access to authorized components and minimizing unnecessary data retention.

5.7. *Anonymous Review and Feedback Mechanism*

To ensure quality assurance and trust, SkillSwap incorporates an anonymous feedback system. After each skill exchange session, participants submit ratings and qualitative feedback without identity disclosure. This encourages honest evaluation, reduces social pressure, and improves the reliability of reputation metrics. Feedback data is further utilized to influence future matching and visibility.

5.8. *Implementation Workflow*

The operational workflow of the system follows these sequential stages:

- User registration and authentication
- Skill listing and discovery
- AI-driven match generation
- Rule-based filtering and re-ranking
- Session scheduling and execution
- Credit transaction processing
- Anonymous feedback submission

This workflow ensures smooth interaction between system components while maintaining logical consistency and transactional integrity.

5.9. *Evaluation Criteria*

Although large-scale deployment is beyond the scope of this study, system effectiveness is evaluated using qualitative and functional criteria, including matching relevance, engagement levels inferred from credit circulation, system scalability, and inclusivity of non-monetary access. These criteria provide a foundational framework for future empirical evaluation.

5.10. *Ethical Considerations and Constraints*

The methodology acknowledges ethical considerations such as data privacy, algorithmic bias, and accessibility limitations. Potential biases arising from language and regional diversity are

recognized, with future enhancements proposed to include multilingual NLP support and adaptive learning mechanisms. System constraints include dependency on internet connectivity and platform literacy, particularly in rural contexts.

VI. PRELIMINARY DATA ANALYSIS

The preliminary data analysis focuses on understanding user requirements, system feasibility, and expected interaction patterns for the proposed SkillSwap platform. The analysis is primarily qualitative in nature and is based on observations of existing platforms, user behavior trends, and identified gaps in current learning systems.

6.1. User Needs Analysis

It is observed that a significant number of users possess skills but lack accessible platforms to share knowledge without financial barriers. Users prefer flexible learning environments where they can both teach and learn based on their availability and interests.

6.2. Platform Usage Patterns

Existing platforms indicate that users are more engaged when systems provide incentives such as rewards, recognition, or gamification. However, most platforms rely on monetary incentives rather than knowledge exchange.

6.3. Feasibility Analysis

The development of a peer-to-peer skill exchange system is technically feasible using modern web technologies such as React, Node.js, and cloud-based backend services. The integration of AI-based matching further enhances system efficiency and personalization.

6.4. Expected Data Flow

The system is expected to handle data such as user profiles, skill listings, session requests, credit transactions, and feedback records. These data elements are essential for maintaining system functionality and ensuring smooth interaction between users.

Key Observations

- Users prefer cost-effective or free learning platforms
- There is a lack of structured peer-to-peer learning systems
- Incentive-based engagement improves user participation
- Real-time interaction enhances learning effectiveness

This analysis supports the need for a credit-based, peer-driven platform like SkillSwap that addresses both accessibility and engagement challenges.

VII. STATEMENT OF LIMITATIONS

Despite the advantages of the proposed SkillSwap platform, certain limitations are identified within the scope of this study and implementation.

7.1. Technical Limitations

The system relies on stable internet connectivity for real-time communication and session management. In regions with low bandwidth or limited digital infrastructure, platform performance may be affected.

7.2. Data and Evaluation Constraints

The current analysis is primarily qualitative and does not include large-scale user data or real-world deployment testing. As a result, system performance metrics such as scalability and user retention are not empirically validated.

7.3. AI Model Limitations

The AI-based matching system may exhibit bias depending on the input data and language variations. It may not fully capture soft skills or contextual expertise without further enhancements.

7.4. User Adoption Challenges

Adoption of a credit-based barter system may require user awareness and behavioral adaptation, especially for users accustomed to traditional paid learning platforms.

7.5. Security and Privacy Constraints

While basic authentication and data protection mechanisms are implemented, advanced security measures such as end-to-end encryption and comprehensive threat mitigation are beyond the current scope.

7.6. System Scope Limitations

The platform currently focuses on core functionalities such as skill exchange, credit management, and messaging. Advanced features like video conferencing, mobile applications, and multilingual support are proposed for future development.

VIII. SUGGESTIONS

Based on the analysis and identified limitations, several improvements can be proposed to enhance the effectiveness, scalability, and usability of the SkillSwap platform.

8.1. Integration of Advanced AI Models

The current matching system can be improved by incorporating advanced machine learning models that consider user behavior, feedback patterns, and learning history. This would enhance recommendation accuracy and personalization.

8.2. Multilingual Support

To improve accessibility, especially in diverse regions like India, the platform should support multiple languages. This will help users from different linguistic backgrounds participate effectively.

8.3. Video Conferencing Integration

Integrating built-in video communication features will enhance real-time interaction between learners and instructors, making sessions more interactive and effective.

8.4. Mobile Application Development

Developing a dedicated mobile application using frameworks such as Flutter will improve accessibility and user engagement, particularly for users who primarily rely on smartphones.

8.5. Enhanced Security Mechanisms

Implementing advanced security features such as encrypted communication, secure authentication protocols, and data protection mechanisms will improve user trust and system reliability.

8.6. Gamification and Reward Systems

Introducing badges, leaderboards, and achievement systems can further motivate users to actively participate and contribute to the platform.

8.7. Scalability Improvements

Future development should focus on optimizing system performance to handle a large number of users and concurrent sessions efficiently.

These suggestions aim to transform SkillSwap into a more robust, inclusive, and scalable platform for peer-to-peer skill exchange.

IX. CONCLUSION

In conclusion, the proposed SkillSwap platform presents an innovative approach to peer-to-peer learning by integrating a credit-based barter system with modern web technologies and AI-driven matching mechanisms. The system addresses key limitations of existing platforms by enabling users to both teach and learn within a single ecosystem, thereby promoting collaborative and decentralized knowledge exchange. The implementation demonstrates the feasibility of creating a structured, non-monetary learning environment that encourages

user engagement, accessibility, and skill development. Features such as session management, credit transactions, and real-time communication contribute to building a dynamic and interactive platform. Although certain limitations exist, the proposed system lays a strong foundation for future enhancements, including advanced AI integration, multilingual support, and improved scalability. Overall, SkillSwap has the potential to bridge the gap between learners and peer mentors, fostering a sustainable and inclusive digital learning community.

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