

# SkillSwap- peer to peer Learning

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**Abstract—** The increasing demand for accessible and affordable learning platforms has led to the development of innovative knowledge-sharing systems. This paper presents SkillSwap, a web-based peer learning platform designed to facilitate reciprocal skill exchange between users. The system integrates artificial intelligence-based recommendation techniques, competency-based skill validation, and real-time collaborative tools to enhance the learning experience. Users register their expertise, upload resumes for automated skill extraction, and complete assessment tests to verify their competencies. Based on user profiles, skill requirements, and assessment scores, the proposed bidirectional matching algorithm identifies compatible learning partners and recommends optimal skill exchange opportunities. The platform also supports live interactive sessions through video conferencing, messaging, and collaborative whiteboards, enabling effective peer-to-peer learning. Security mechanisms such as encrypted authentication, secure data storage, and role-based access control ensure the protection of user information. The SkillSwap system demonstrates the potential of combining collaborative learning models with intelligent matching algorithms to build a scalable and community-driven learning environment.

**Index Terms:** Skill Exchange, Peer-to-Peer Learning, Collaborative Learning, Recommendation Systems, Skill Matching Algorithm, Online Learning Platforms, Artificial Intelligence, Real-Time Communication, Knowledge Sharing.

## I. INTRODUCTION

SkillSwap is a peer-to-peer learning platform designed for students to exchange skills without using money. It works on a time-banking model where users teach what they know and learn what they need in return. By using web technologies and real-time communication tools, SkillSwap helps students connect, share knowledge, and build a collaborative learning

The platform promotes self-learning, teamwork, and equal access to skill development among university students. SkillSwap operates on the principle of a time-banking system, where users

can teach a skill they possess —such as coding, graphic design, or public speaking—and, in return, learn another skill from their peers without any monetary exchange. This system not only democratizes learning but also encourages collaboration, community building, and self-improvement.

Ultimately, the platform aims to evolve into a comprehensive digital learning ecosystem that encourages peer-to-peer collaboration, strengthens interpersonal connections, and nurtures a culture of continuous learning within academic institutions. Through SkillSwap, education becomes more interactive, democratic, and community-driven. The system is designed as a modular web application consisting of multiple functional components, including authentication, user profiles, resume parsing, skill assessment, AI-based matching, feedback systems, real-time communication, and virtual teaching sessions. These modules work together to provide a secure, interactive, and scalable environment for collaborative learning.

A key innovation of the SkillSwap platform is its Bidirectional Skill Matching Engine, which uses a structured algorithmic approach to connect users with compatible learning partners. The engine evaluates multiple factors such as skill verification tests, learning goals, skill level compatibility, availability overlap, and reputation scores to generate a compatibility score for each potential match. By prioritizing mutual skill exchange and verified expertise, the system ensures high-quality and meaningful peer learning interactions.

Through the integration of intelligent matching algorithms, real-time communication tools, and collaborative learning features, SkillSwap aims to create a dynamic digital environment where students can expand their knowledge, improve practical skills, and build a community-driven learning network. Unlike conventional e-learning platforms, SkillSwap emphasizes reciprocal

learning, where users contribute knowledge in one area while gaining expertise in another.

## II. LITERATURE SURVEY

The rapid expansion of digital learning platforms has transformed the way students acquire knowledge and develop professional skills. Various online learning systems such as Coursera, Udemy, and edX provide structured courses delivered by professional instructors. These platforms offer high-quality content and certifications; however, they generally follow a one-directional learning model where knowledge flows from instructor to learner. This approach often limits peer interaction and collaborative knowledge exchange among students.

Several studies have explored peer-to-peer (P2P) learning models, where learners actively participate in both teaching and learning roles. Research on collaborative learning environments shows that peer interaction enhances knowledge retention, problem-solving abilities, and communication skills among students. Platforms that support peer-based learning encourage active engagement and foster community-driven knowledge sharing.

Previous work titled “Building a Peer-to-Peer Learning Platform for University Students Using WebRTC” proposed a system that enables real-time communication between learners using WebRTC technology. The study highlighted the benefits of direct interaction between students through video calls, screen sharing, and collaborative tools. However, the system primarily focused on communication infrastructure and lacked an intelligent matching mechanism to efficiently connect learners with suitable partners.

Another important development in educational technology is the integration of Artificial Intelligence (AI) to improve personalization and recommendation systems. Modern learning platforms use AI algorithms to analyze user preferences, performance data, and behavioral patterns to suggest relevant courses or learning resources. While these systems improve content recommendations, they typically do not focus on mutual skill exchange between users.

Additionally, some knowledge-sharing communities such as Stack Overflow and GitHub allow

developers to share knowledge and collaborate on projects. Although these platforms encourage knowledge sharing, they are not specifically designed for structured peer-to-peer teaching sessions or skill exchange.

Based on the limitations of existing systems, there is a need for a platform that combines peer-to-peer learning, skill verification, intelligent partner matching, and real-time collaboration tools. The proposed SkillSwap platform addresses these challenges by introducing a bidirectional skill exchange model supported by a custom algorithmic matching engine. This approach ensures that users are paired with compatible learning partners based on skill levels, goals, availability, and reputation, thereby improving the efficiency and quality of peer-based learning interactions.

## III. PROPOSED SYSTEM

The proposed system, SkillSwap, is a peer-to-peer learning platform that enables students to exchange skills through a time-banking model instead of monetary transactions. Each student can act as both a learner and a tutor, teaching the skills they possess and learning new ones from their peers. This creates a balanced, collaborative, and ecosystem for knowledge exchange.

Before initiating a skill swap, users complete an online assessment to determine their proficiency level: Beginner, Intermediate, or Expert in the selected skill. Based on this assessment, the system's AI-driven matching algorithm pairs users with complementary skill levels and compatible learning goals. Additional parameters, such as ratings, availability, interests, and language preferences, further refine the matching process to ensure productive and secure exchanges.

SkillSwap incorporates real-time communication using WebRTC for live video or voice-based tutoring sessions. A feedback and rating mechanism allows users to evaluate each other after each session, contributing to a dynamic trust and reputation system that enhances platform credibility. Time spent teaching is converted into time credits, which can be used to learn other skills, thus maintaining a balanced exchange model.

## IV. IMPLEMENTATION

The SkillSwap platform is implemented using modern web technologies to ensure scalability, performance, and security.

#### 1. Frontend Implementation :-

The frontend is responsible for user interaction and interface design. It provides responsive web pages where users can access all system features. Key frontend functionalities include: User registration and login interface, Profile and skill management dashboard, Resume upload and parsing interface, Skill assessment test interface, Virtual teaching session interface.

#### 2. Backend Implementation :

The backend manages server side operations, business logic, and communication between system modules. Key backend responsibilities include: Processing authentication requests, Managing user profiles and skill data, Handling resume parsing and certification verification, Generating assessment tests, Executing the AI matching algorithm, Managing session scheduling and communication services. Backend services can be implemented using frameworks such as Node.js, Spring Boot, or Django.

#### 3. Matching Algorithm Implementation:

The Bidirectional Skill Swap Engine is implemented to ensure high-quality peer learning matches. The algorithm follows these steps: 1. Verify that users pass the skill assessment test with a minimum score of 10 out of 15. 2. Identify users offering skills that match another user's learning requirements. 3. Check whether a perfect bidirectional swap exists. 4. Calculate a compatibility score using the weighted scoring model. 5. Rank all potential partners based on their final compatibility scores. 6. Recommend the highest-ranking matches to users. 7. This approach ensures that the platform prioritizes mutual skill exchange rather than one-sided learning.

#### 4. Real-Time Communication Implementation:

These tools allow users to conduct interactive peer learning sessions similar to physical classrooms.

#### 5. Security Implementation

These mechanisms protect user information and maintain the integrity of the learning platform.

### V. LIMITATIONS

Although the SkillSwap platform provides an innovative peer-to-peer learning environment, certain limitations may affect its overall performance and usability.

1. Dependence on User Participation :- The effectiveness of the platform largely depends on the availability of active users. If there are fewer users offering certain skills, the system may struggle to find suitable matches.
2. Skill Verification Constraint :- The platform uses assessment tests to verify teaching ability. However, test scores may not always accurately represent a user's practical knowledge or teaching capability.
3. Limited Matching Accuracy in Early Stages :- Since the matching algorithm relies on user data such as reputation, feedback, and activity history, the accuracy of recommendations may be limited when the platform has a small user base or insufficient historical data.
4. Internet and Technical Requirements :- Real-time sessions such as video calls, screen sharing, and collaborative whiteboards require a stable internet connection. Users with slow or unstable networks may experience interruptions during learning sessions.
5. Scheduling Conflicts :- Even if users are compatible in terms of skills, differences in time zones or availability schedules may make it difficult to arrange sessions.
6. Quality Control of Peer Teaching :- As the platform relies on peer teaching rather than professional instructors, the quality of explanations and learning experiences may vary among users.
7. Security and Privacy Concerns :- Although authentication and security mechanisms are implemented, sharing personal data, resumes, and communication over the platform may raise privacy concerns if not managed properly.

### VI. CONCLUSION

The SkillSwap platform presents an innovative approach to peer-to-peer learning by enabling users to exchange skills without monetary transactions. The system is designed to create a collaborative environment where individuals can both teach and learn from one another based on their interests, expertise, and availability. By integrating modules such as authentication, resume parsing, skill assessment, real-time communication, and feedback systems, the platform provides a structured and interactive learning experience.

A key contribution of the proposed system is the Bidirectional Skill Matching Engine, which

intelligently connects users through a compatibility-based matching process. The algorithm evaluates factors such as skill verification, learning goals, schedule overlap, reputation scores, and skill level compatibility to ensure meaningful and mutually beneficial learning sessions.

Furthermore, the platform promotes community-driven knowledge sharing by encouraging users to actively participate in both teaching and learning roles. Features such as virtual teaching rooms, real-time messaging, and feedback mechanisms enhance collaboration and improve the overall learning experience.

In conclusion, SkillSwap demonstrates how peer-to-peer learning combined with intelligent matching algorithms can create an efficient and scalable knowledge-sharing ecosystem. The proposed system has the potential to support students and professionals in developing new skills, fostering collaboration, and building a strong learning community in the digital era.

In addition, the integration of real-time communication tools such as video sessions, messaging, and collaborative whiteboards enhances the learning experience by allowing users to interact directly and conduct practical teaching sessions. The feedback and rating system further improves platform reliability by encouraging accountability and maintaining the quality of peer teaching.

Overall, the SkillSwap platform demonstrates the potential of combining peer-to-peer learning models with intelligent matching algorithms to build a scalable and efficient knowledge-sharing system. By fostering collaboration and enabling mutual skill exchange, the proposed system can support students and professionals in improving their skills, building learning communities, and promoting continuous learning in the digital age.

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