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Smart Skill Hub: An AI-Driven Framework for Skill Gap Analysis, Personalized Learning Recommendations, and Career Development

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Abstract- Smart Skill Hub is a technology-enabled platform proposed to improve skill development by connecting students' academic knowledge with the practical competencies expected by industries. The system is designed to evaluate learners' current abilities, recognize areas that require improvement, and guide them toward suitable learning opportunities according to their individual interests and professional objectives. It addresses a broad range of competencies, including technical knowledge, communication, teamwork, critical thinking, problem-solving, and digital proficiency, which contribute to career growth and workplace readiness. The platform brings together digital educational resources, skill evaluation activities, interactive learning modules, and practical projects to support a learner-centred educational environment. Assessments such as quizzes, task-based exercises, and performance reviews can help learners monitor their development and identify areas that need additional attention. Using the identified competency gaps as a basis, the system aims to suggest relevant courses, study materials, and structured learning paths. This approach encourages active participation, continuous improvement, and the practical application of acquired knowledge rather than depending entirely on theoretical instruction.

Smart Skill Hub is also intended to strengthen employability by helping learners develop the capabilities required for changing professional environments. Its modular design provides opportunities for future expansion through industry-oriented training, certification support, expert mentorship, and partnerships with organizations. The proposed platform offers a structured approach to personalized skill development and career preparation, with the objective of making learning more relevant to individual goals and evolving workforce expectations.

Keywords— Smart Skill Hub, Skill Assessment, Competency Gap Identification, Personalized Learning Path, Intelligent Recommendation System, Career Readiness, Professional Skill Development.

I. INTRODUCTION

The rapid development of digital technologies and the continuous transformation of the employment sector have increased the importance of practical skills alongside academic qualifications. Students often acquire theoretical knowledge through formal education, but they may need additional technical abilities, communication skills, problem-solving capabilities, and practical experience to meet workplace expectations. Differences between the competencies developed through education and those required by employers can create challenges for students entering the professional world. Therefore, an effective approach to identifying skill deficiencies and guiding learners toward relevant development opportunities is essential.

Smart Skill Hub is proposed as a technology-based platform that supports learners in improving their competencies and preparing for future career opportunities. The system focuses on understanding individual skill levels, identifying areas that require improvement, and connecting learners with appropriate educational resources. Unlike a learning approach in which all students follow the same content, the proposed platform aims to provide learning suggestions according to individual abilities, interests, and career objectives. This helps learners concentrate on the competencies that are most relevant to their personal and professional development.

The proposed framework incorporates skill profiling, competency assessment, learning resource recommendations, and progress monitoring into a unified learning environment. Learners can identify their existing strengths, evaluate their knowledge through assessments, and recognize the skills they need to develop further. Based on the assessment results and defined career goals, the platform can guide users toward relevant courses, study materials, and practical learning activities. These features are intended to encourage independent learning, improve engagement, and support the continuous development of technical and interpersonal skills.
Artificial intelligence and machine learning can further enhance personalized learning by supporting the analysis of learner information and the selection of relevant educational resources. When implemented, these techniques can help identify patterns in learning progress and improve the relevance of recommendations. The platform can also incorporate practical exercises, project-based activities, and feedback mechanisms to help learners apply theoretical knowledge to real-world situations. However, the effectiveness of these features depends on the quality of the available data, the recommendation approach, and the accuracy of the assessment process.

Another important objective of Smart Skill Hub is to improve career readiness by helping learners understand the relationship between their current capabilities and their desired professional roles. Regular progress tracking allows users to review their development and identify areas that require further attention. The framework can also be extended to include mentorship, certification opportunities, industry-oriented training, and collaboration with organizations. Such enhancements could create stronger connections between educational institutions, learners, and employers.

The main objective of this project is to design and develop a structured skill development platform that supports skill assessment, gap identification, personalized learning recommendations, and career preparation. By bringing these functions together, Smart Skill Hub aims to provide a more organized and goal-oriented learning experience. The proposed system seeks to help students and other learners develop relevant competencies, improve their professional confidence, and prepare for the changing demands of the modern workplace.

The remainder of this paper presents the proposed system architecture, the methodology used for skill assessment and learning recommendations, the implementation of the platform, and the testing and evaluation process. The final sections discuss the outcomes, limitations, and possible directions for future development.

II. LITERATURE SURVEY

Digital learning platforms combine academic learning, technical skill development, and career preparation. Smart Skill Hub integrates technical quizzes, resume building, AI-based interview preparation, programming interview practice, and semester-wise study notes to support students in their academic and professional development.

A. Technical Quizzes

Online quizzes help students assess their technical knowledge, identify learning gaps, and revise important concepts. Smart Skill Hub organizes quizzes by subject and topic to support regular practice and performance evaluation.

B. Resume Builder

Resume-building tools help students present their education, skills, projects, and achievements professionally. Smart Skill Hub provides structured fields and templates to simplify resume creation and improve career preparation.

C. AI-Based Interview Preparation

AI-based interview systems can provide practice questions, evaluate responses, and offer feedback. Smart Skill Hub supports technical and HR interview practice to help students improve their confidence, communication, and interview performance.

D. Programming Interview Preparation

Programming interview preparation develops coding skills, logical thinking, and problem-solving abilities. AI-based tools can provide coding questions and feedback on solutions. Smart Skill Hub supports practice in C, Java, Python, data structures, and algorithms to help students prepare for technical interviews.

E. Semester-Wise Study Notes

Digital study materials help students understand subjects and prepare for examinations. Smart Skill Hub organizes notes by semester, subject, and unit, making learning resources easier to access and revise.

F. AI, NLP, and Recommendation Systems

Artificial Intelligence (AI) and Natural Language Processing (NLP) support personalized learning, resume analysis, and automated feedback. Recommendation systems suggest relevant courses and learning materials based on student needs. However, these features are often provided through separate platforms rather than a single integrated system.

G. Research Gap and Proposed Approach

Existing platforms often separate quizzes, resume creation, interview practice, and study materials. Smart Skill Hub addresses this gap by integrating these features into one platform. The proposed system aims to provide organized learning resources, programming practice, and career preparation while supporting students' overall skill development.

III. METHODOLOGY

The proposed Smart Skill Hub system follows a structured methodology to combine academic learning, technical skill assessment, and placement preparation in a single platform. The development process includes requirement analysis, system architecture design, module development, data management, testing, and evaluation.

A. Requirement Analysis

The initial stage identifies the learning and career preparation needs of students. The major requirements include technical quizzes, resume generation, programming interview practice, AI-based interview preparation, and semester-wise study materials. These requirements guide the selection of suitable technologies and system functions.

B. System Architecture

The platform follows a modular architecture in which individual components perform specific tasks while operating as part of a unified system. The frontend provides user interaction, the backend processes requests, and the database stores relevant information. This design simplifies maintenance and supports future feature expansion.

C. User Interface Development

The user interface is developed using HTML, CSS, and JavaScript to provide accessible navigation and responsive page layouts. Separate sections are provided for quizzes, resumes, programming practice, interview preparation, and study notes to improve usability.

D. Technical Quiz Module

The quiz module presents questions based on subjects and technical topics. Students submit their answers and receive results according to the implemented evaluation logic. This module supports knowledge revision and helps learners identify topics that require further practice.

E. Resume Generation Module

The resume module collects details such as educational qualifications, technical skills, projects, certifications, and achievements. The information is arranged into a structured format that students can use to prepare professional resumes for internship and employment applications.

F. Programming Interview Preparation

This module supports programming practice using languages such as C, Java, and Python. Questions can cover programming fundamentals, object-oriented programming, data structures, algorithms, and problem-solving. Students can practise solutions and review their answers to strengthen coding skills and prepare for technical interviews.

G. AI-Based Interview Preparation

The interview preparation module supports practice for technical and human resource (HR) interviews. Where AI functionality is implemented, suitable techniques can be used to analyse responses and provide feedback on answer relevance, clarity, and technical accuracy. This helps students recognize areas for improvement and practise interview communication.

H. Semester-Wise Study Materials

Study materials are categorized according to semester, subject, and unit. This arrangement allows students to locate relevant notes efficiently and use them for regular revision and examination preparation. The module also provides a centralized location for academic resources.

I. Data Management and Integration

The backend and database manage relevant user information, quiz results, and learning resources according to the system requirements. The individual modules are connected through common navigation and data-handling mechanisms, providing a consistent experience across the platform.

J. Testing and Evaluation

Functional testing is performed to verify registration, navigation, quiz evaluation, resume generation, resource access, and module integration. Usability checks help identify interface difficulties, while test results are used to correct errors and improve system reliability.

K. Deployment and Maintenance

After testing, the application can be deployed in a suitable environment for student access. Maintenance activities include correcting identified defects, updating study materials, improving existing features, and adding new learning resources based on user requirements.

L. Methodology Outcome

The methodology provides a systematic approach to developing Smart Skill Hub as an integrated academic and career preparation platform. By combining learning resources, technical assessments, programming practice, and interview preparation, the system aims to make student development more organized and accessible.

IV. EXISTING SYSTEM

The existing system uses different online applications to support students in learning, skill assessment, and placement preparation. Although these tools offer useful services, students may need to access several platforms to meet their academic and professional needs.

A. Academic Learning Resources

Students use educational websites to access subject materials, tutorials, and examination notes. Finding resources organized according to their semester and syllabus can sometimes be difficult.

B. Online Assessment Systems

Quiz platforms help students test their knowledge through objective questions and coding exercises. However, some platforms offer limited connections between test results and personalized learning activities.

C. Resume Preparation Tools

Existing resume tools provide templates for creating professional resumes. Students may still need guidance to select relevant skills, describe projects, and present their achievements effectively.

D. Programming Practice Platforms

Coding websites provide programming problems and exercises to improve logical thinking and problem-solving skills. However, academic notes, resume creation, and interview preparation may require separate applications.

E. Interview Preparation Methods

Students prepare for technical and HR interviews using question banks, tutorials, and mock interviews. Individualized feedback and continuous performance tracking may not be available in every tool.

F. Limitations of the Existing System

The major limitations include:

- Learning resources are spread across multiple applications.
- Personalized guidance may be insufficient.
- Academic learning and placement preparation are often disconnected.
- Students may find it difficult to monitor their overall progress.
- Switching between different tools can increase preparation time.

G. Summary

The existing system offers useful resources but may not provide a complete learning and placement preparation environment. Smart Skill Hub aims to overcome this limitation by integrating quizzes, resume building, programming practice, interview preparation, and semester-wise notes into a single platform.

V. PROPOSED SYSTEM

Smart Skill Hub is a web-based platform designed to combine academic learning, technical skill development, and placement preparation. It provides students with a centralized environment to practise programming, build resumes, prepare for interviews, and access semester-wise study materials.

A. Key Components

1. **Learning Roadmap:** Organizes learning activities according to students' skills and career goals.
2. **Progress Tracking:** Displays learning progress and quiz performance.
3. **Resume Builder:** Helps students prepare professional resumes using their educational details, skills, and projects.
4. **Programming Practice:** Supports coding practice in C, Java, and Python.
5. **Interview Preparation:** Provides technical and HR interview questions for practice.
6. **Academic Resources:** Organizes study notes by semester, subject, and unit.

B. AI-Driven Features

- **Personalized Recommendations:** Suggests relevant learning materials based on student needs.
- **Adaptive Learning**: Adjusts learning activities according to performance, where implemented.
- **Resume Analysis:** Uses NLP techniques to identify relevant skills and improve resume content, where supported.
- **Performance Prediction**: Analyzes available learning data to identify possible performance trends.
- **Automated Feedback**: Provides feedback on interview responses or assessments when AI evaluation is implemented.

C. System Benefits

- **Centralized Access:** Combines academic and career preparation tools in one platform.
- **Time Efficiency:** Reduces the need to switch between multiple applications.
- **Skill Development:** Encourages regular coding practice and technical revision.
- Career Readiness: Supports resume creation and interview preparation.
- **Easy Accessibility:** Organizes study resources for convenient access.
- **Future Scalability:** Allows additional learning and career features to be integrated.

D. Summary

Smart Skill Hub aims to connect academic learning with professional development through an integrated platform. Its key components and AI-supported features are intended to improve learning organization, technical preparation, and student employability.

VI. ADVANTAGES

The Smart Skill Hub platform offers the following advantages:

1. **Centralized Learning:** Combines quizzes, study notes, resume building, and interview preparation in one platform.
2. **Improved Technical Skills:** Encourages regular programming practice and technical knowledge assessment.
3. **Personalized Learning:** Supports learning recommendations based on student needs, where implemented.
4. **Easy Resume Creation:** Helps students organize their educational details, skills, projects, and certifications.
5. **Interview Readiness**: Provides opportunities to practise technical and HR interview questions.
6. **Time Saving:** Reduces the effort required to search across multiple learning platforms.
7. **Academic Support:** Organizes study materials by semester, subject, and unit.
8. **Progress Monitoring:** Helps students review quiz scores and learning progress.
9. **User-Friendly Interface**: Provides organized navigation to access different modules.
10. **Future Expansion:** Supports the addition of new features as student requirements evolve.

VII. CONCLUSION

Smart Skill Hub presents an integrated approach to student learning by bringing academic resources and placement preparation activities into a common web-based environment. The platform combines technical quizzes, resume preparation, programming practice, interview training, and semester-wise study materials to address different student requirements. Its modular structure allows these functions to be accessed through a single application rather than managed through separate tools.

The proposed system is intended to help students strengthen technical knowledge, organize their academic resources, and prepare for recruitment processes.

AI-supported functions, when implemented and evaluated, can further assist with learning recommendations and interview feedback. Future development may include GitHub activity analysis, personalized learning paths, academic progress prediction, and performance analytics. Further evaluation through functional tests, usability studies, and learner performance measurements will be necessary to determine the system's effectiveness. Overall, Smart Skill Hub provides a foundation for connecting academic learning with practical skill development and career preparation.

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