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DevCollective: A Collaborative Learning and Mentorship Platform for College Students

Piyush Kanaojiya
Dept. of Computer Science & Engg. G. H. Raisoni College of Engg. & Mgmt. Nagpur, India

Piyush Ingle
Dept. of Computer Science & Engg. G.H. Raisoni College of Engg. & Mgmt. Nagpur, India

Raj Saoji
Dept. of Computer Science & Engg. G.H. Raisoni College of Engg. & Mgmt. Nagpur, India

Pooja Lichade
Dept. of Computer Science & Engg. G. H. Raisoni College of Engg. & Mgmt. Nagpur, India

Hemlata Kosare
Guide, Dept. of CSE
G.H. Raisoni College of Engg. & Mgmt. Nagpur, India

Abstract - Engineering students often struggle to acquire industry-relevant experience, not because of a lack of resources, but because resources exist in scattered mediums. Mentorships can be hard to come by while the classroom can also fail to match current workplace expectations. Tools such as WhatsApp groups and shared drives help students share information, but offer little in the way of collaborative technical learning and individual mentorship. This paper introduces DevCollective, a collaborative learning and mentorship platform for engineering colleges, designed to bring together students, seniors, mentors, alumni, and faculty in a single college focused space for skill development and placements. While considering resumes and skill assessments for the development of learning roadmaps, DevCollective recommends mentors for the student and outlines the reasoning behind each suggestion. In addition to a personalized and real-time mentorship experience, DevCollective's Reputation Point (REP) system, supported by badges and leaderboards, works to reward valuable contributions to the platform and motivate continued engagement. Unlike other tools, DevCollective does not offer the same experience to all learners, but instead thinks about the institution's curriculum, placement timelines, and peer experience to suggest learning and mentorship. The combination of personal learning guidance, mentorship, and community participation can encourage students to strengthen their confidence, technical abilities, and approach their preparation for placements in a more focused manner.

Keywords— Artificial Intelligence, Collaborative Learning, Engineering Education, Mentorship, Personalized Learning, Placement Readiness.

I. INTRODUCTION

Engineering is a key aspect of students' careers. They will want to gain practical experience, technical knowledge, communication skills and advice so they can become up to industry standards. However, students can struggle to get the correct skills due to having lots of resources.

Most students within a college will use some form of mentoring to help them with their studies. This can be senior students, teachers, online tutorials, social media pages and documents. However, finding the right sources can be hard. Finding good mentors and the right projects can be an issue which means that students feel like they are not gaining the right knowledge due to not having the right guidance.

There are online learning tools available but there are general collaboration tools which can cause an issue. There may not be one central area for students to talk about technical issues, get mentorship from experienced individuals, work on projects and get ready for their placements. DevCollective wants to provide a platform for students within the college to connect with a range of individuals. The main goal is to create an integrated learning tool with academic interaction. This will help students connect with senior students, alumni, mentors and teaching staff. Using AI will provide a personal learning tool for each student. This will be personalised to their skills, interests and learning requirements. Mentoring will be more structured and the correct information from both students and mentors will be gathered. This will help students identify what areas they need to improve on.

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A reputation section has been added. Reputation points (REP) can be awarded to students with badges and leaderboards. This will show how much value they have contributed. Encouraging students to get more involved with the learning community.

This has been designed with the understanding that students will have different requirements depending on the year they are in. Junior students may need help with basic programming and technical knowledge whilst senior students may need help with their projects, practise interviews, improving their resume and getting mentorship with their career. DevCollective aims to help.

The main goal of this project is to provide a structured system for students to learn, get mentorship, work together and get ready for their placements. This can help bridge the gap between academic learning and industry by providing students with the knowledge and expertise in their college.

II. LITERATURE REVIEW / RELATED WORK

Research in higher education increasingly examines how artificial intelligence, collaborative software, educational chatbots, and gamification can support students. These approaches have been applied to individual learning needs, student participation, academic assistance, and collaborative project work. Much of the existing work, however, addresses one part of the student experience at a time rather than bringing these functions together for a particular college community. Albalawi [1] introduced Smart Innovation Hub, an AI-enabled system that supports challenge-based innovation and matching students with capstone projects in higher education. The reported approach seeks to improve team formation,
the relevance of recommendations, workflow visibility, and collaboration. Its central concern, however, is coordinating innovation challenges and capstone projects. It does not address the wider combination of student mentorship, adaptive study plans, everyday technical discussion, and placement preparation considered in DevCollective. Kiryakova [2] described an administrative AI availability, consistency, and event-based communication. The insights from the research can be applied for building applications that involve a large number of users chatbot embedded in Moodle to help students handle academic and administrative tasks. Such assistance can make routine information easier to obtain and potentially reduce repeated queries to faculty and staff. Its role is nevertheless centered on navigating institutional processes. Takushima and Kakeshita [3] examined a chatbot using Retrieval-Augmented Generation (RAG) and lecture materials as its knowledge source. Students responded positively to its ability to answer course-related questions and assist with study, illustrating the value of retrieval-supported academic help. The study was primarily concerned with lecture content, however, rather than student networking, mentor discovery, or placement planning. Yin, Goh, and Hu [4] investigated chatbot-based formative feedback over time, finding improvements in aspects of student motivation and learning while also reporting reduced cognitive load. Their findings offer a reason to explore automated feedback, though the study itself does not investigate an integrated mentorship and peer-collaboration community.

Dai et al. [5] studied an online project-based learning platform that incorporated generative AI and examined how undergraduate students worked with it. Their findings discuss changes in learning behavior, engagement, and learning effectiveness. The system is not presented as a college-specific network that also combines mentor discovery, peer learning, and placement support. Suria, Suyoto, and Pranowo [6] evaluated an AI-supported role-playing environment integrated into Moodle. Their work shows the ways in which generative AI and engaging gamified activities can affect motivation, engagement, and cognitive load among the participants. It also shows the value of creating tasks that promote participation while reducing an unnecessary cognitive load on the students. Activities powered by AI and instant feedback can encourage collaborative learning, but the Moodle-based solution described in [6] fails to bring mentorship, evolving learning paths, reputation building and readiness to placements into a separate college platform. Moreover, real-time communication is of great importance for such interactions. Lasocha and Badurowicz. [7] conducted a comparison between using WebSockets and HTTP and concluded that the former is more appropriate for high-frequency, low-latency message passing. The observation can be used in contexts where communication channels need to be established for holding discussions, managing projects in real-time, and other similar needs. Iovescu and Tudose [8]

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communicating and sharing data in real-time. This requirement can also be added to the list of expected results for the DevCollective project. The idea of using gamification to increase engagement levels was also examined by Yusoff et al. [9], who proposed a conceptual framework for selecting the relevant mechanisms for use in an online course. The study provides a list of possible solutions, including rewards, trophies, badges, skill points, peer assessment, and social features. The insights from the study can be used in the selection of the engagement mechanisms for DevCollective, as well as the design of its system features. The existing solutions to the problem under the consideration are primarily aimed at providing the basic collaborative tasks, including project management or document editing. Nevertheless, they are deficient in terms of offering the adequate communication and collaboration mechanisms to address the needs of the engineering college community. To resolve the identified issue, it is plausible to integrate the system with the reputation points, badges, levels, and leaderboards to reinforce the motivation by acknowledging the users' activity and contributions. In his research, Biswal et al. [10] examined the phenomenon of peer learning and its influence on students' performance and achievement in college. They identified the concepts of peer learning, motivation, and performance and analyzed the relationship between them. The authors also noted the potential of peer learning to create a positive atmosphere, provide support and guidance, and give access to a broader knowledge base. This information can be used to create a college-level social network, where students can ask for help and share their expertise. As can be seen from the research, AI chatbots, generative AI features, gamification elements, real-time collaboration, and peer-to-peer learning opportunities can be implemented in a college-level social network application. The discussed articles also demonstrate the importance of combining these tools. Across the existing literature, these capabilities generally appear as separate services or within narrowly defined educational systems. The reviewed approaches do not discuss the complete combination proposed here: AI-assisted mentor recommendations, adaptable roadmaps, resume- based skill analysis, platform-specific RAG support, live collaboration, described the system requirements for real-time collaborative applications and examined the interactions between the clientand server, scalability, contribution tracking, project guidance, and placement-related activities for one college community. DevCollective builds on these earlier findings by placing the different functions in one college-centered environment. The design also enhances mentor and learning recommendations: students should be able to see why a person or learning path was recommended, rather than receiving recommendations without any explanation. This is intended to increase confidence in the system's guidance.

III. PROBLEM STATEMENT

Across the existing literature, these capabilities generally appear as separate services or within narrowly defined educational systems. The reviewed approaches do not discuss the complete combination proposed here: AI-assisted mentor recommendations, adaptable roadmaps, resume-based skill analysis, platform-pecific RAG support, live colla boration, contribution tracking, project guidance, and placement-related activities for one college community. DevCollective builds on these earlier findings by placing the different functions in one college-centered environment. The design also enhances mentor and learning recommendations: students should be able to see why a person or learning path was recommended, rather than receiving recommendations without any explanation. This is intended to increase confidence in the system's guidance. learning paths, identify suitable mentors, enable technical collaboration, and support students as they work on projects and approach recruitment. DevCollective addresses this gap by consolidating those capabilities in an environment informed by institutional needs, with recommendation explanations intended to make the guidance easier to understand and assess.

IV. PROPOSED METHODOLOGY

DevCollective platform is proposed for learning and mentoring which is conceived keeping in view the needs of methodology comprises individualized learning, recommendations of mentors, cooperative activity, placement in a focused on the institution. Its design is modular

A.User and Profile Management

The process starts with making profiles for students, older people, people who give advice, graduates and teachers. Each students profile will have details about their school background skills, in technology what they like to study the projects they

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have finished and what they want to do in their job Information on areas of expertise, relevant experience, and guidance offerings will be included for mentors. These shared profile data will form the basis for suggesting learning experiences and identifying mentor-mentee matches.

B. Resume Analysis and Skill Verification

In order to determine a student's entry-level competencies, the system will analyze resume information and short skills verification assessments. Both the resume and assessment will be considered in determining student capabilities. The system will also track knowledge sharing, mentoring activities, and collaborative achievements in order to reward engagement through badges and leaderboards. This gamification feature is designed to promote student engagement and encourage a culture of technical guidance within the institution, rather than focusing on individual accomplishments. personal networks, leaving some students without established professional connections. Resume information provides one perspective on a student's technical abilities, completed projects, and previous work experiences; an assessment provides another data point in determining a student's readiness for specific learning experiences. Collectively, they can help the system Collectively, they can help the system identify the most relevant recommendations and support an open, equitable learning environment for technical development within the college.

C. Adaptive Learning Roadmap

DevCollective will utilize the data on the student's expertise and test results to devise a learning road map. The suggested plan will account for a student's level of expertise and the areas that may pique their interest. It will not be a fixed, rigid, monolithic plan as it would be at the beginning of the session; rather, as the learner interacts with the recommended exercises and takes further tests, the road map will update itself based on the user's performance and progress.

D. AI-Based Mentor Matching

The mentor recommendation feature is intended to identify the most relevant seniors, mentors, alumni, or faculty based on a student's area of interest, current skill set/needs, and the And suggests that the elements including the profile information, verification of skills, learning services, communication features, and resources for progression could be assembled into a personalized guidance system instead of being separate components. mentor's expertise, as well as availability. The rationale for a recommendation will be evident, so that a student can evaluate if a given mentor recommendation is a good fit for him/her.

the system will feature AI-assisted aptitude test practice, resume review, and mock interviews. In terms of mock interviews, both HR and technical interview practices will be considered. Speech recognition and computer-vision-based testing are also potential avenues for activity analysis and feedback, rather than discussed here as proven methodologies.

E. Collaborative Learning and Community Interaction

DevCollective will also feature a communal aspect for technical discussion, networking, and collaboration among students.

It also gives students a more direct way to approach seniors and other experienced community members, whose practical experience can be valuable when deciding how to solve a problem or develop a project. Real-time communication is intended to make ongoing discussions and joint work more convenient. Bringing these interactions together may reduce dependence on scattered groups and make helpful conversations easier to discover and continue.

F. Platform-Scoped AI Chatbot

The proposed AI chatbot uses Retrieval-Augmented Generation (RAG) to respond to questions using information drawn from the platform. Rather than relying only on a general response, it first retrieves relevant material from accessible institutional and community resources, then uses that context to form an answer. This design aims to raise the relevance of the assistance to the as they move closer to practical projects and professional opportunities.

G. Gamification and Reputation System

DevCollective has implemented a Reputation Point (REP) system to incentivize students to participate in the community. Thus, their REP-score can be increased through active participation and engagement. The reputation points can be used to demonstrate one’s continuous involvement and the impact they have within the college community. This is meant to reward those who are constantly participating and mentoring in the community and encourage students to engage with peers in a peer-learning environment.

Project development and placement preparation will be aspects of the system. When it comes to project development the system can suggest project ideas based on student interests and current skill levels then break the project into steps for the student to.

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H. Project and Placement Preparation

follow. Working on projects and interacting with students can contribute to the REP part of the system. For placement preparation the system will have AI help with practice for aptitude tests, review of resumes and simulated interviews. Regarding interviews both HR interviews and technical interviews will be considered. Speech recognition and computer vision, for analyzing activities and giving feedback are also ways to improve the system even though they are not discussed here as established methods

I. Overall Workflow

The overall system flow will start with the creation of the student profile. After analyzing the resume data, strengths, weaknesses, and the learning interests, the system will recommend the learning roadmap and the suitable mentors. Then the learner will be able to manage the suggested activities, connect with the technical community and participate in mentoring activities. The students will affect further recommendations and continue the cycle, building their technical competencies, project experience, and networks of professionals. Closer to graduation, the system will shift the focus to the placement preparation activities, including the mock aptitude tests, resume building advice, and interview training. In this way, the methodology will create a flow from the personalized learning, through the mentoring and engagement into the community, RAG-assisted learning, reputation building, project building, and the readiness to placements within one system. The system's main benefit is the concept of engaging the learners in the cycle of the development from the basics to the advanced skills within the same system. Students will be able to build the technical base, participate in the community activities, and consult with mentors

V. SYSTEM ARCHITECTURE

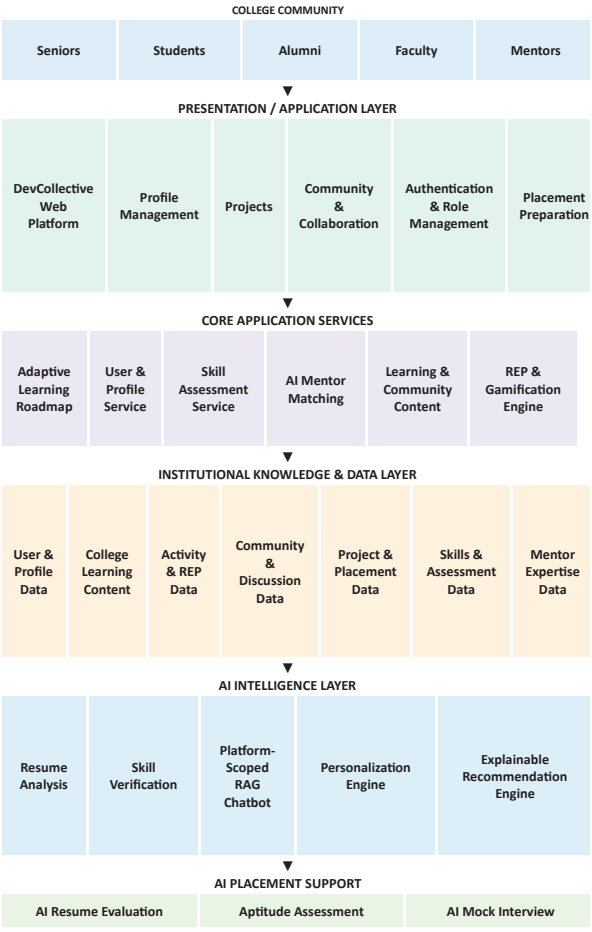


Fig 1.1 System architecture of Dev collective

VI. IMPLEMENTATION



Fig 2.1 First Interface of Dev collective

Landing page 1

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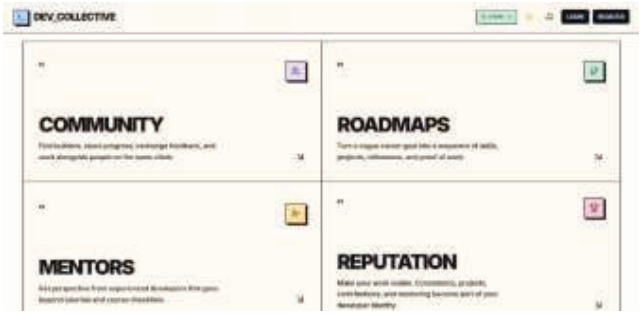


Fig 2.2 discovery panel

Landing page 2

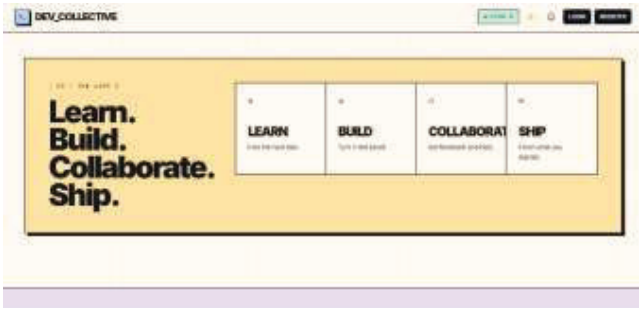


Fig 2.3 Landing page 3



Fig 2.4 Student profile



Fig 2.5 Chatting / message section

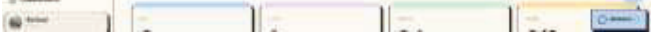


Fig 2.6 Student dashboard



Fig 2.7 Community section



Fig 2.8 Levelwise learning



Fig 2.9 Mentor section

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VII. FEATURE COMPARISON GRAPH

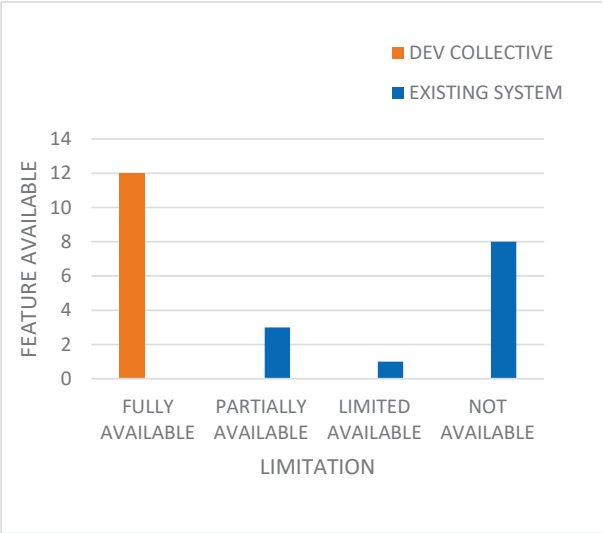


Fig 3.1 Features Availability Comparison Graph

Feature	Existing	DevCollective
AI Mentor	Partial	✓
Roadmaps	Limited	✓
REP System	✗	✓
Community	✗	✓
Mentor Directory	✗	✓
Resume Analyzer	✗	✓
Project Recommendation	Partial	✓
Build in Public	✗	✓
Hackathons	✗	✓
Leaderboards	✗	✓
Peer Collaboration	Partial	✓
Skill Gap Analysis	✗	✓
Badges	Partial	✓
Career Guidance	✗	✓
Realtime Notification	✗	✓

Comparative Analysis and Discussion :

A comparison was carried out between existing learning and collaboration tools and DevCollective. Table I shows how the features of each compare to help promote academic learning, mentorship, technical collaboration and prepare for placements. Existing platforms offer some of these features, such as some type of mentoring, learning pathways, recommendation systems and working with peers. However, these features will not be offered fully or could be quite limited. Most generic platforms will not offer all these features.

DevCollective will overcome these issues by offering multiple features within the platform. It will have an AI based mentoring recommendation system, learning pathway, mentor directory, resume analyser and identify areas where students can improve their technical skills. It will also have engagement features such as peer collaboration, recommendation system and build in public. This will help students to work with others and share their work.

An important feature within the platform will be the engagement features. Students will gain Reputation Points (REP), badges and leaderboards. This will motivate them to contribute to the platform. Hackathons, career advice and real time notifications will help students to work collaboratively and prepare for placements.

Overall it can be seen that DevCollective will offer more features than existing platforms. The platform will not just be used for online learning but will provide academic support, mentoring, practical project working and career preparation.

VIII. RESULTS

Many tools are available to aid student learning and mentoring within this platform.

Students can understand their skills using the resume analysis and skills verification tool. Students can find members they need using the recommend mentors tool. This has not been trialled so we do not know if they will receive accurate and correct recommendations.

This chatbot is a Retrieval Augmented Generation so students will receive useful answers. Students will have easy access to academic resources.

Students can gain Reputation Points (REP) for contributing to the platform. Students will be motivated to share their knowledge due to receiving badges and leaderboards.

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more structured approach to building these skills. Further, it may also assist colleges in developing stronger technical communities in which students learn from one another and make more informed decisions regarding placements. These benefits are goals of the proposed system and will require evaluation in an educational setting.

X. FUTURE SCOPE

There are several directions in which the design of DevCollective could be developed. One improvement would be to refine learning recommendations based on students continued progress, assessment performance and completed activities. By ensuring the reliability of the feedback over time the roadmap could show the new skills acquired and the various areas of difficulty rather than just what is known when the student registers. Mentor recommendations could also be more specific by taking in account the various technical specialties, experience levels, interests, availability and the type of assistance requested. The RAG-based chatbot could be supported by a series of verified college resources such as course materials, project documentation and placement guidance to ensure that their responses are relevant in more situations. AI-assisted mock interviews are another area of future work. Improved speech-processing techniques and computer-vision methods could be explored to give detailed feedback on the interview performance if the assessment is appropriate and the privacy is protected. The project recommendation feature could also leverage the students interests and technical experience to suggest ideas and then organize each selected project into practical milestones to make it easier to track progress. Further development could bring in colleges. Over time, the model could also expand beyond a collaboration tools, reputation features and analytics, to students and colleges. Over time the model could also go beyond an institution. In such a version each participating college could have their own.

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