CodeHub Empowering Student Projects Through Collaboration

Prof. Parag S. Mohod (Project Guide)[1], Ms. Sanika P. Gole[2], Ms. Dhanashree A. Alhat[3], Mr. Fardeen A. Khan[4], Mr. Tushar C. Agarkar[5]

Dept. Of Information Technology, Prof Ram Meghe College of Engineering and Management, Badnera, Amravati, Maharashtra India, 444701Sant Gadge Baba Amravati university, Amravati, Maharashtra

DOI: https://dx.doi.org/10.51584/IJRIAS.2026.110200128

Received: 26 February 2026; Accepted: 03 March 2026; Published: 19 March 2026

ABSTRACT

In academic programs, especially for students pursuing a degree, projects are essential because they serve as a vital bridge between theoretical knowledge and practical application. It offers students the chance to take on real world problems, which develops their creativity, critical thinking, and problem-solving skills. Centralized platforms revolutionize project-based learning by connecting students and faculty, streamlining management, and fostering innovation. The existing systems provide several features such as task assignment, document sharing, and communication tools. While they facilitate some level of collaboration, these platforms often lack comprehensive functionalities for diverse project exploration, real-time progress tracking, and efficient project allocation. These platforms predominantly rely on traditional methods, often failing to adequately promote student-faculty collaboration and efficient project management. Very often the project management systems in the institute require a lot of paperwork, unable to efficiently track progress of project development and it is a time-consuming process. This platform emerges as an innovative solution to address multiple deficiencies faced by existing systems by providing a comprehensive project management system by fostering collaboration between students and faculty, offering remote accessibility, offering advanced project management tools, and enhancing user engagement through responsive design. It is providing features such as group formation, project tracking, ratings and feedback from faculties. Hence, project hub 's main goal is to transform an institution's project management system by establishing a creative and cooperative environment that improves the educational experience for faculties and students at educational institutions.

Keywords: Project management, project collaboration, workflow management, project coordination, project planning

INTRODUCTION

In today’s digital era, collaboration and teamwork have become essential skills for software development and related fields. While coding is often seen as an individual activity, real-world software projects require multiple developers to work together, share knowledge, and build solutions collectively. For college students, engaging in collaborative coding not only improves technical proficiency but also nurtures communication, problem solving, and project management skills that are crucial in professional environments.

However, existing platforms such as GitHub, VS Code Live Share, and Jupyter Hub, though powerful, are primarily designed for industry professionals. They often lack academic-specific features such as structured project monitoring, faculty evaluation, contribution tracking, and peer learning mechanisms. This creates a gap between classroom learning and industry practices, leaving students without an integrated environment that aligns with both educational goals and real-world development standards.

To bridge this gap, the proposed Collaborative Coding Platform for College Students aims to provide a unified, cloud-based environment where students can write, debug, and manage code collaboratively in real time. The platform will integrate project management tools, structured peer review systems, and faculty dashboards, ensuring that collaboration is both effective and academically meaningful. By combining coding, teamwork, and evaluation under a single system, this platform will prepare students for industry challenges while enhancing their academic learning experience.

LITERATURE REVIEW

1. **J. Smith, A. Kumar, and L. Wong (2018)**, in their work **"Web-based Project Management Systems for SMEs,"** proposed a framework tailored for small and medium enterprises that integrates communication tools with automated task handling. Their system focuses on improving transparency and resource utilization through a centralized web interface. While effective for general business workflows, it lacks specialized modules for academic tracking. **ProjectSync** builds upon this by adopting similar automation features but tailors them specifically for the student-supervisor relationship, adding milestone-specific tracking that general SME tools often overlook.
2. **R. Chen and Y. Zhao (2019)**, in **"Vue3.0 Framework Project Management System,"** presented a lightweight, modular system designed for real-time updates and high-speed user interactions. Their methodology emphasizes a seamless UI/UX using modern front-end frameworks. However, the study focuses primarily on the technical stack rather than the underlying management logic. **ProjectSync** leverages a similar modern modular architecture but extends the functionality by integrating deeper administrative oversight and document versioning, ensuring the system is robust enough for long-term academic projects.
3. **S. Davis and P. Nair (2017)**, in **"Project Management Information Systems (PMIS) Studies,"** investigated how the automation of planning, scheduling, and reporting improves role clarity in IT projects. Their research demonstrated that a well-structured PMIS significantly reduces management overhead. While their model is highly efficient for corporate IT environments, it remains high-level. **ProjectSync** refines this PMIS approach by implementing more granular, student-centric reporting tools and real-time feedback loops that cater to educational progress rather than just corporate deliverables.
4. **H. Liu, M. Zhang, and C. Xu (2020)**, in **"WebUPMS – Web-based Undergraduate Project Management System,"** introduced a custom database-driven solution designed specifically for academic settings. The system addresses scalability and student accessibility for final-year projects. Although it solves the accessibility issue, it lacks modern collaborative social features. **ProjectSync** enhances this academic model by integrating realtime communication and collaborative dashboards, moving beyond a simple database entry system to a dynamic workspace.
5. **T. Garcia and N. Patel (2021)**, in **"Node.js Project Management & Evaluation Platform,"** developed a social-oriented platform for students that features milestone tracking, real-time grading, and peer ranking. This approach successfully increases student motivation through gamification and visibility. **ProjectSync** adopts these real-time evaluation concepts but places a heavier emphasis on the formal supervision process and secure document storage, ensuring that the social aspect does not compromise the academic integrity of the evaluation.
6. **F. Oliveira and K. Johnson (2019)**, in **"Adaptive Supervision with Moodle,"** proposed an integration with the Moodle LMS to provide flexible, personalized academic guidance for final-year students. While the integration with existing LMS platforms is convenient, it can be limited by the rigid structure of the parent software. **ProjectSync** provides a standalone, dedicated environment that offers greater flexibility in workflow customization and specific project-tracking features that are often unavailable in generic learning management systems.

METHODOLOGY

We built our coding platform using a cloud-based approach. This approach lets us easily add features fix issues and make sure lots of people can use it at the same time.

Our platform has key parts:

* A coding area where people can work together and write code in different programming languages

* Tools to help manage projects, including setting tasks and deadlines

* A way for people to review and give feedback on each other's work

* A dashboard for teachers to track student progress

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue II February 2026

* A secure way to log in with roles for students, teachers and administrators

When building the platform, we focused on letting multiple people work together in real-time. We used technologies like WebSocket and WebRTC to make this happen. We also used a version control system based on git to keep track of changes to the code.

The platform has to-use interfaces, for both students and teachers. We deployed it on a cloud service called render, which lets us easily update the platform and add features. This way we can make sure the platform keeps working and can handle lots of users.

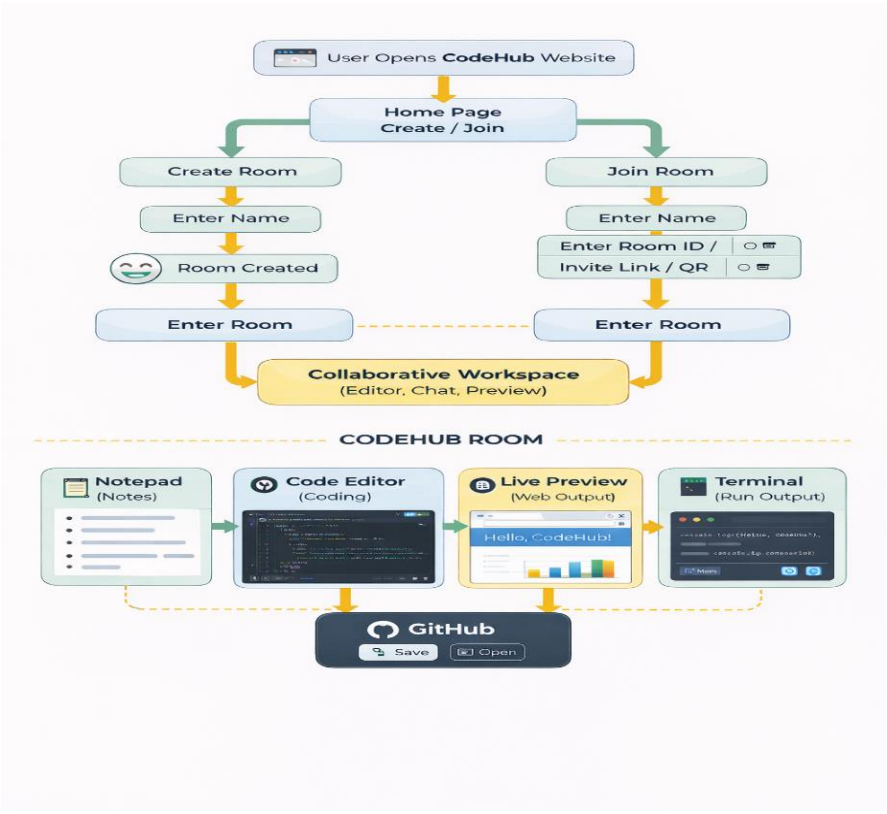
Implementation Details

The Collaborative Coding Platform leverages a robust technical stack designed for real-time synchronization, secure execution, and seamless user interaction. At its core, the system utilizes WebSocket technology to facilitate instantaneous change broadcasting, ensuring that code modifications are propagated across all participants with minimal latency. To manage the complexities of concurrent editing, the platform employs Operational Transformation (OT) algorithms. This mechanism reconciles simultaneous contributions in real time, preserving the individual intent of each developer and preventing data overwriting, thereby maintaining a consistent state across all distributed clients.

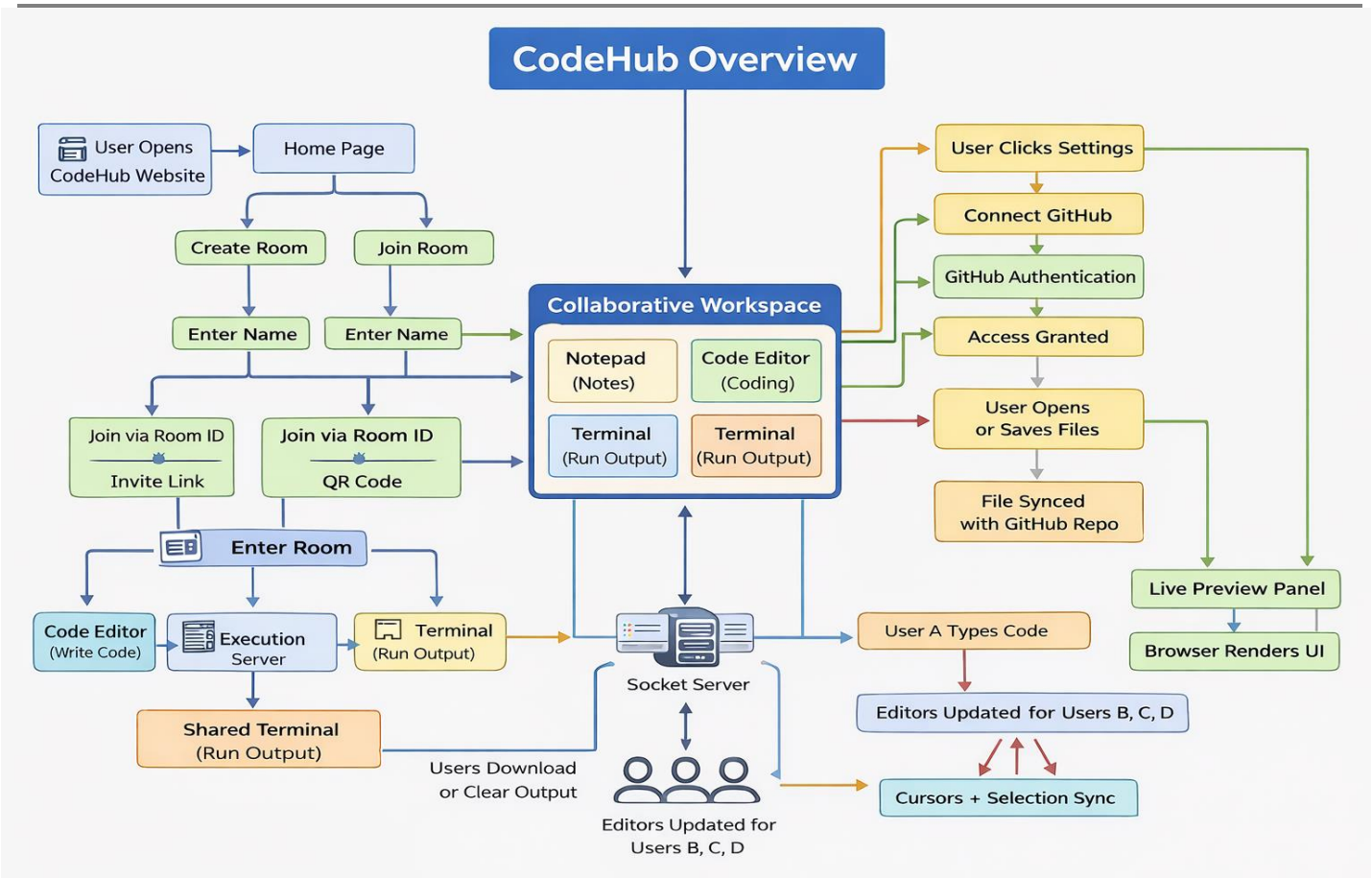
User engagement and coordination are further enhanced through a WebRTC-based presence system. Supported by a dedicated signalling server, this framework provides real-time typing indicators and idle status updates, allowing team members to monitor active contributions and optimize collaborative efforts. To ensure a safe development environment, the platform integrates Docker containers for code execution. This containerization strategy provides strict process isolation, allowing users to compile and debug multiple programming languages—including Python, JavaScript, and C++ —within a secure sandbox that prevents cross-session interference or malicious system access.

Security is integrated into the platform's foundational layers through a multi-faceted approach. Authentication and session integrity are managed via JSON Web Tokens (JWT), ensuring that only authorized users can access collaborative sessions. Furthermore, all data transit is secured using HTTPS encryption to prevent interception, while WebRTC interactions benefit from end-to-end encryption. Collectively, these protocols establish a resilient environment that prioritizes data privacy, system performance, and a fluid user experience.

Block Diagram



ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue II February 2026

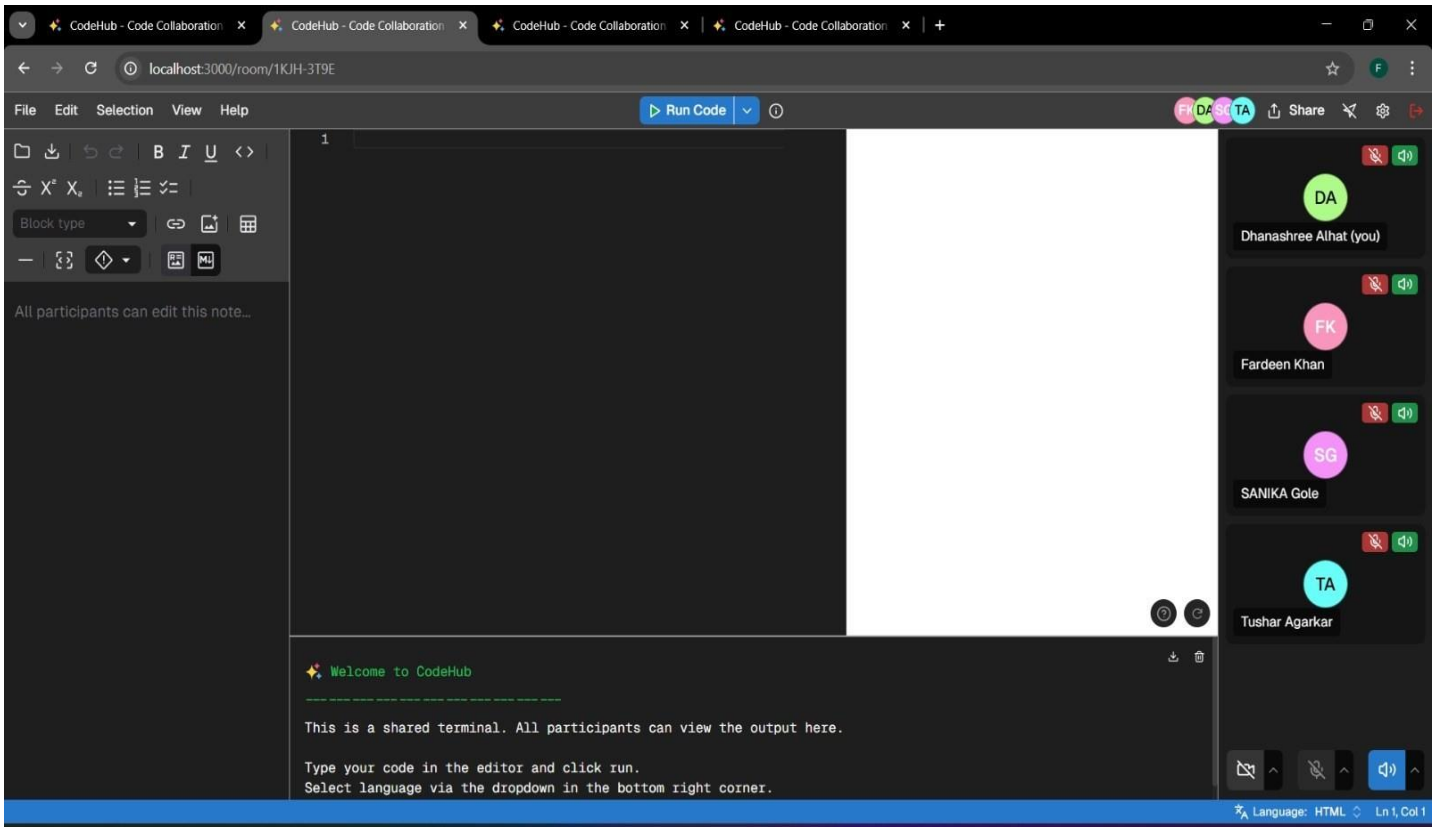


RESULT AND DISCUSSION

Create Room:

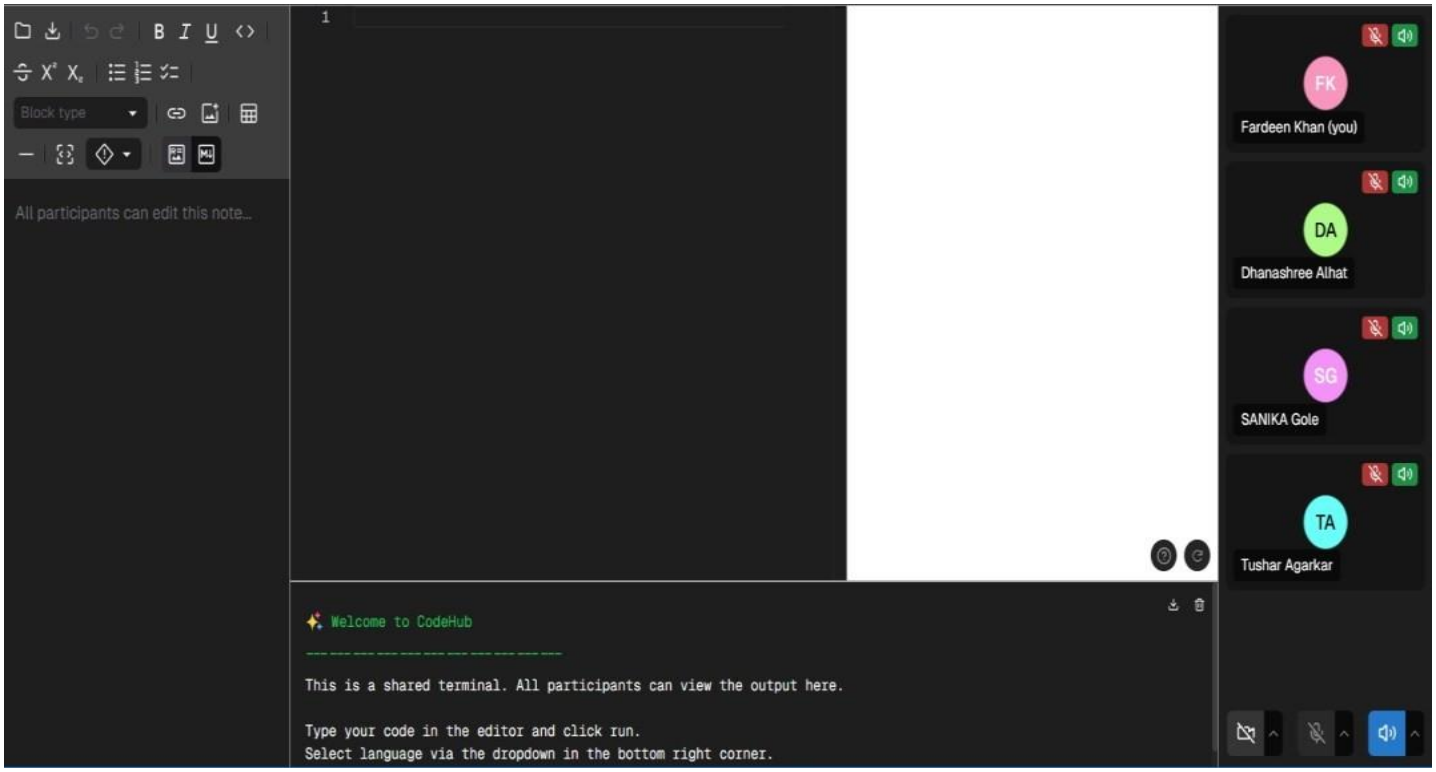
a] Login Room:

b] Code Editor:



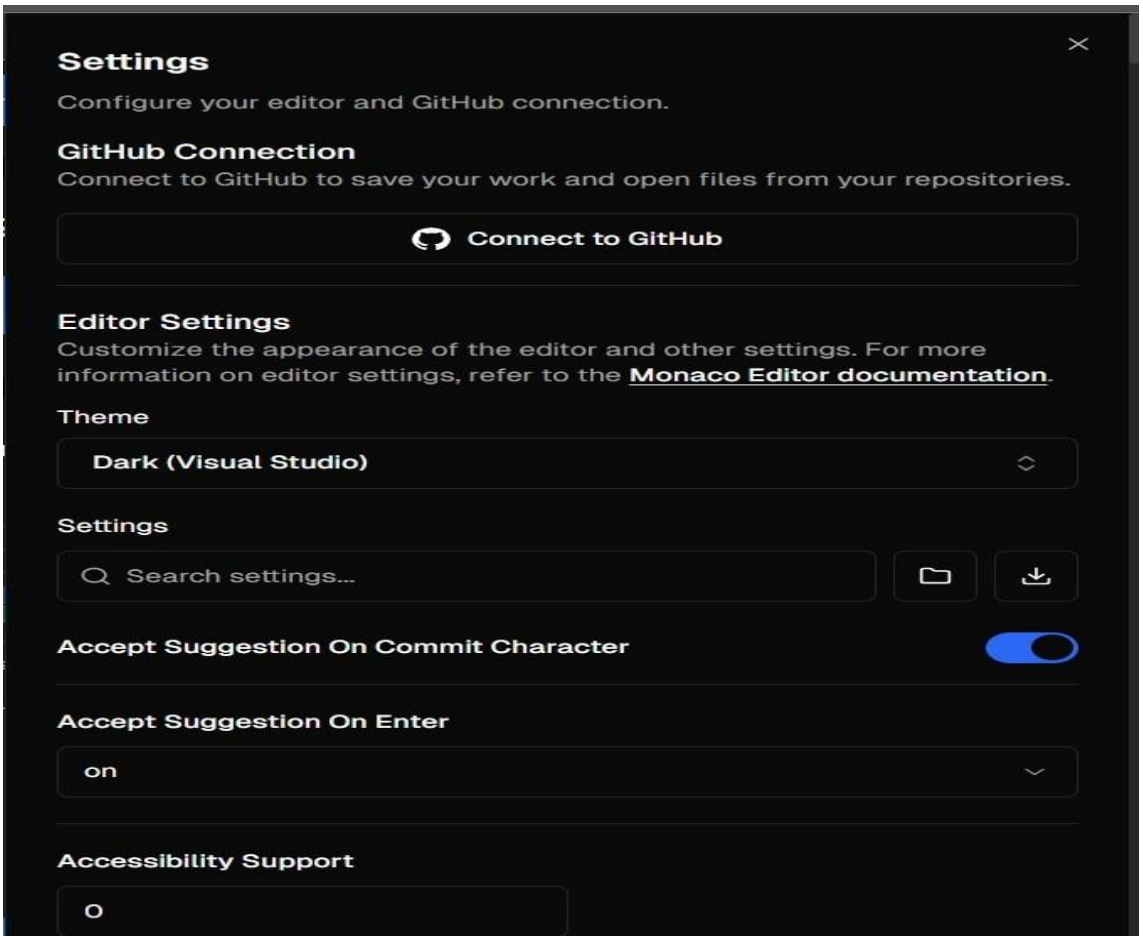
c] Code Execution:

d] Shared Terminal:

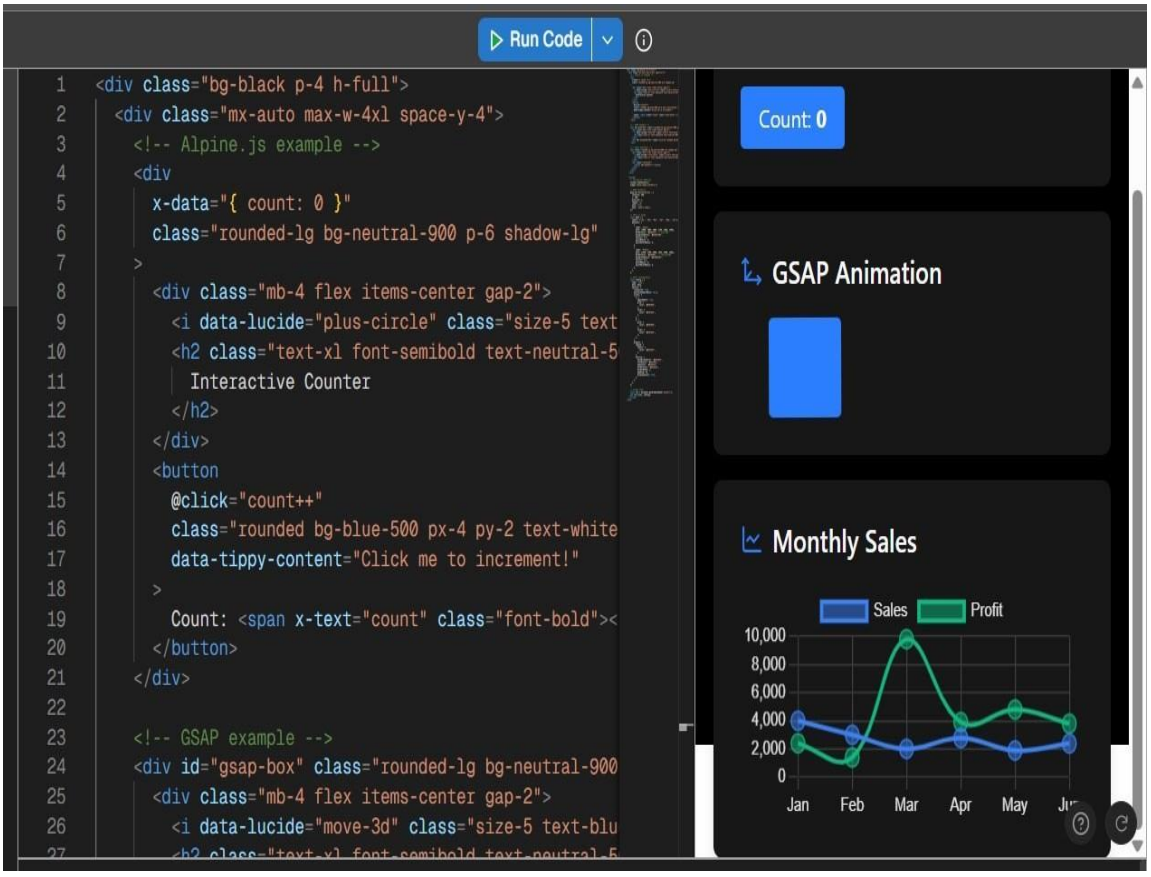


ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue II February 2026

e] GitHub Connection:



f] Live Preview:



ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue II February 2026

g] Notepad:

When we compare project management systems to the CodeHub platform, we can see that CodeHub is a lot better in many ways. Traditional systems used in schools are often very slow and complicated because they use a lot of paperwork and manual tracking. This makes them take a long time and be prone to errors. They also do not help students and teachers work together well.

Teachers are usually only involved at times when they review the projects, while students have a hard time working together and talking to each other because they do not have the right tools.

CodeHub is different. It is a system that is online and has many advanced features like real-time collaboration and automatic project tracking. Students can easily form groups, give each other tasks, and see how everything is going. Teachers can also see how the projects are going at all times. Can give feedback and grades. CodeHub can be used from anywhere and on any device, which is a big improvement over traditional systems that require you to be in a certain place.

CodeHub is also very secure. Can handle a lot of users. It uses authentication and encryption to make sure all the data is safe. The system is also very easy to use and looks very modern, which makes people want to use it.

To sum it up, CodeHub is a lot better than project management systems because it reduces paperwork, lets people track progress in real time, and helps students and teachers work together. It makes learning through projects more fun and cooperative. Uses the latest technology, which makes the whole experience of learning better. CodeHub really makes project-based learning innovative and cooperative. The CodeHub platform is very good at fixing the problems of project management systems. The CodeHub platform makes it easier for students and teachers to work together on projects.

CONCLUSION

The Collaborative Coding Platform is designed to bridge the gap between academia and industry by providing an integrated environment for coding, learning, and collaboration. It combines features such as real-time coding,

project management, peer review, and faculty evaluation into a single unified system. This platform not only facilitates teamwork among students and developers but also enhances learning through continuous feedback and performance assessment, creating a seamless connection between educational objectives and industry practices.

ACKNOWLEDGE

We want to say thank you to everyone who helped us finish the CodeHub project. We are talking about the Code Hub project. First, we want to thank our teachers who guided us and gave us advice. They told us what we were doing right and what we were doing wrong, which really helped us with the CodeHub project. The CodeHub project is very important to us. Their help and knowledge gave us a base to build the CodeHub project, which helps people learn by doing things.

We also want to thank the school for giving us what we needed to make the CodeHub project work. We are talking about the CodeHub project again. We are thankful to the students and teachers who tried out the Code Hub project. Told us what they thought. This really helped us make the CodeHub project better and make sure it is good for people who are learning.

We want to thank our friends and team members who worked with us on the CodeHub project. They worked hard and were very creative, which really helped us when we had problems with the CodeHub project. The CodeHub project is a success because everyone worked together and was committed to making it new and exciting. The CodeHub project also helps people work together and learn from each other in school.

Future Scope

The future of CodeHub is really exciting. CodeHub can be used in different areas where people need to work together on code and manage projects. For example, CodeHub can help teams work together from different locations. This means that people in parts of the world can work together easily.

CodeHub can also be used for interviews where people must write code. This will give companies a way to test the skills of people who want to work for them.

In schools, CodeHub can help teachers show students how to code in an interactive way. Students can even code at the same time as their teacher. CodeHub can also be used for group projects and coding competitions where people must work to solve problems quickly.

CodeHub is not just for schools. It can also be used by people who work on their own or with a partner. It gives them a reliable way to work together from different locations. Many people can benefit from using Code Hub, including schools, companies that make software, and even government agencies.

In short, CodeHub is going to be a useful tool that helps people work together and come up with new ideas in education, business, and government. CodeHub will make it easier for people to work together on CodeHub and make things. CodeHub will be a place for people to work together on CodeHub projects.

REFERENCES

1. "Proceedings of the International Conference on Computer Science and Computational Intelligence (ICCSCI 2015)," Procedia Computer Science, vol. 59, 2015. [Online]. Available: http://creativecommons.org/licenses/bync-nd/4.0.
2. R. Chen and Y. Zhao, "W3a framework project management system," International Journal of Web Applications, 2019.
3. S. Davis and P. Nair, "Project management information systems: PMIS studies," Journal of IT Project Management, 2017.
4. F. Frößler, A Practice Theoretical Analysis of Real-Time Collaboration Technology: Skype and Sametime in Software Development Projects. Göttingen, Germany: Cuvillier, 2008.

5. T. Garcia and N. Patel, "Node.js project management and evaluation platform," International Journal of Computer Applications, 2021.
6. H. Bani-Salameh, C. Jeffery, Z. Al-Sharif, and I. Abu Doush, "Integrating collaborative program development and debugging within a virtual environment," in Proc. 14th Collaboration Researchers' International Workshop on Groupware (CRIWG 2008), vol. 5411, 2008, pp. 107–120.
7. H. Fan, C. Sun, and H. Shen, "ATCoPE: Any-time collaborative programming environment for seamless integration of real-time and non-real-time teamwork in software development," in Proc. 17th ACM Int. Conf. on Supporting Group Work (GROUP '12), 2012, pp. 107–116.
8. "Project Hub: Collaborative platform for students and faculties," 2024. [Online]. Available: https://www.researchgate.net/publication/380375772_Project_Hub_Collaborative_Platform_for_Student_and_ Faculties.
9. K. Riemer and F. Frößler, "Introducing real-time collaboration systems: Development of a conceptual scheme and research directions," Communications of the Association for Information Systems (CAIS), vol. 20, pp. 204– 225, 2007.
10. V. Kumar, A. Ranjan, and P. Singh, "Cloud-based collaborative coding platforms for educational institutions," International Journal of Computer Applications, vol. 185, no. 3, pp. 15–22, 2023.
11. L. C. L. Kats, R. G. Vogelij, K. T. Kalleberg, and E. Visser, "Software development environments on the web," in Proc. ACM Int. Symp. on New Ideas, New Paradigms, and Reflections on Programming and Software (Onward! '12), 2012, p. 99.
12. S. Li, L. Li, and W. Zhang, "WebUPMS: A web-based undergraduate project management system," in Proc. Int. Conf. on Wireless Communications, Networking and Mobile Computing (WiCOM), 2007. doi: 10.1109/WICOM.2007.789.
13. X. Li, J. Yang, and M. Chen, "Design of a project management system based on the Vue 3.0 framework," Journal of Physics: Conference Series, vol. 2188, no. 1, p. 012048, 2022. doi: 10.1088/17426596/2188/1/012048.
14. H. Liu, M. Zhang, and C. Xu, "Web-based undergraduate project management system," in Proc. Int. Conf. on E-Learning, 2020.
15. M. Doernhoefer, "Surfing the net for software engineering notes," ACM SIGSOFT Software Engineering Notes, vol. 24, no. 3, pp. 15–24, 1999.
16. M. Goldman, "Role-based interfaces for collaborative software development," in Proc. 24th Annu. ACM Symp. Adjunct on User Interface Software and Technology (UIST '11 Adjunct), 2011, p. 23.
17. M. Goldman, G. Little, and R. C. Miller, "Real-time collaborative coding in a web IDE," in Proc. 24th Annu. ACM Symp. on User Interface Software and Technology (UIST), 2011, pp. 155–164.
18. F. Oliveira and K. Johnson, "Adaptive supervision with Moodle," in Proc. Int. Conf. on Educational Technology, 2019.
19. M. Pannu, Q. Salih, C. Yuen, Z. H. Li, and E. Tanu, "Web-based project management systems for small to midsize businesses," in Proc. IEEE 9th Annu. Information Technology, Electronics and Mobile Communication Conf. (IEMCON), 2018, pp. 1233–1237. doi: 10.1109/IEMCON.2018.861506.
20. A. Retnowardhani and A. I. Suroso, "Effectiveness of project management information system (PMIS): A case study comparison," Procedia Computer Science, vol. 161, pp. 123–131, 2019. doi: 10.1016/j.procs.2019.11.106.
21. J. Smith, A. Kumar, and L. Wong, "Web-based project management systems for SMEs," in Proc. IEEE Int. Conf. on Information Management, Engineering and Communication (IEMCON), 2018.