Abstract

Introductory computer science courses often emphasize individual work, discouraging potentially harming collaboration and student persistence. In contrast, social theory links student success to learning engagement. This community paper framework based on social presents a learning and teaching methodologies to guide the design of tools that build stronger learning networks. Using a learner-centered design, it focuses on scaffolding social learning, enhancing peer collaboration, and improving learning outcomes through:

- 1) structured community activities.
- 2) motivation-boosting techniques
- 3) gamified features that foster both competition and connection.

Goals

The goal of this software is to facilitate and encourage the growth of the below aspects of learning.

- **Motivation:** Providing students with challenges and a social aspects help to greatly increase their motivation to learn.
- **Gamification:** The gamification of learning can be seen to greatly increase student engagement.
- **Community:** Providing a scaffold for users to communicate with each other in a constructive environment.

File Edit Selection View Go Run CODING HUB: GU CODING HUB! **Offensive Cybersecurity**

Forums + General Chat Homework chat Challenges Leaderboard Challenge 1 Challenge 2 Challenge 3 Challenge 4 Challenge 5 ⊗ 1 ∆ 1 ⊙ 4



Fig 2: To the left we have the student profile, which displays their points, badges they have earned and their overall points for their profile. It also shows previous challenges they have completed and the overall score.

Motivation & Background

Intro CS courses traditionally emphasize individual work, often discouraging **1.** Usability Studies: Currently, this semester we are working on conducting usability testing, this is to collaboration and affecting student persistence (Hundhausen et al., 2008; Rosson ensure that the interface is properly tweaked and tailored to make the user feel engaged and interested. Fig 6: Output from "btop" a common server monitoring Fig 5: Nodejs server logs et al., 2011). This contrasts with social learning theory, which links student success **2.** Iterative Testing and Feedback: Subject the prototype to multiple rounds of testing and user feedback tool to community involvement (Astin, 1999; Kolb & Kolb, 2005). Research shows to ensure that the design principles are not only theoretically sound but also practically effective. This current collaboration tools fail to meet students' needs (Ying & Boyer, 2020), References could involve usability testing, A/B testing, and user acceptance testing. leading many to rely on external apps like Discord or Slack, which may hinder 3. LLM related tutor / users: The use of modified LLM chatbots into the software where students can effective collaboration and learning. To combat this, we want to create a prompt the AI with questions or general curiosities. This tutor could be tailored to student needs. [1] Olivares, D., Hundhausen, C., Ray, N., 2021. Designing IDE Interventions to Promote Social Interaction and Improved collaborative environment built directly into Visual Studio Code, a very common Programming Outcomes in Early Computing Courses. ACM Transactions on Computing Education (TOCE). **4. Web Deployment:** The deployment of the software to the Visual Studio Code extensions store, and the https://doi.org/10.1145/3453165 tool for Undergraduate CS students. act of setting up webservers to handle the incoming user requests. This would allow for a "live test" with [2] Hundhausen, C.D., Narayanan, N.H., Crosby, M.E., 2008. Exploring studio-based instructional models for computing education, in: Proceedings of the 39th SIGCSE Technical Symposium on Computer Science Education, SIGCSE '08. Association for real users, and we can then see how they feel about the overall interface and its devices. The plan is to Further, A 2020 study analyzing student-used Computing Machinery, New York, NY, USA, pp. 392–396. https://doi.org/10.1145/1352135.1352271 deploy using Docker, likely to a Linux server. [3] Carter, A.S., Hundhausen, C.D., Adesope, O., 2017. Blending Measures of Programming and Social Behavior into Predictive



collaboration tools (Ying and Boyer, 2020) concluded that current collaboration tools widely utilized by students are not meeting students' current needs. This highlights another barrier to collaboration and community building in novice computer science student learning environments.

VS Code as Community: The Coding Social Hub for Peer Engagement and Collaboration

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Fig 1: The Home Page is designed with a clean and visually appealing layout, showcasing a sidebar on the left, similar to how lays out its discord different formats. This will provide the user with familiar layout very experience and allow them to quickly make selections.

To the right we have an example chat, several students discussing class logistics and one student reaching out about one of the challenges.

Fig 3: Shows the coding challenge to the left, and the group chat in the center. These challenges are supposed to be easy, so students can complete them in "byte sized" chunks.

Next Steps





School of Engineering & Applied Science

We have two monkeys, a and b, and the parameter and bSmile indicate if each is smiling. We are in trou they are both smiling or if neither of them is smiling. F

Current Contributions

This research project is iterative software design project, and it has been an ongoing project for multiple years now. All the work is done by the volunteer research assistant Charles Bennington and Professor Olivares.

coding-hub (Private

JavaScript Updated 12 minutes ago

The server runs on a node.js backend, with MongoDB as the storage for the project. The projects low fidelity prototype was designed in Balsamiq. The project is mostly composed of TypeScript, JavaScript, HTML, and CSS. The coding challenges are heavily inspired from a (older) site called "codingbat.com". The UI has been fully integrated with the Visual Studio Code UI and supports different color themes. This semester, we will conduct several usability tests involving two user groups: first/second-year students, and third/fourth-year students majoring in computer science or a closely related field.



Fig 4: Shows the evolution of our interface, with the initial design on the left, and the current design on the right

During the year we also conducted testing involving AI LLM chatbots, building and running a Local LLM on one of our machines, using a technology called LM studio. Though this testing we learned that LLM's consume a large quantity of server resources and were difficult to control. Meaning the AI would frequently ignore instructions and give students incorrect answers.

There was also some preliminary testing for the use of a Linux server style web deployment, the use of Ubuntu for web server deployment, as well as the Preplanning of several CI/CD(Continuous integration/ Continuous development) workflows and pipelines.



Models of Student Achievement in Early Computing Courses. ACM Transactions on Computing Education 17, 1–20. [4] Rosson, M.B., Carroll, J.M., Sinha, H., 2011. Orientation of Undergraduates Toward Careers in the Computer and Information Sciences: Gender, Self-Efficacy and Social Support. ACM Trans. Comput. Educ. 11, 14:1-14:23. https://doi.org/10.1145/2037276.2037278

[5] Astin, A.W., 1999. Student involvement: A developmental theory for higher education. Journal of College Student Development 40, 518–529

[6] Ying, K.M., Boyer, K.E., 2020. Understanding Students' Needs for Better Collaborative Coding Tools, in: Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems, CHI EA '20. Association for Computing Machinery, New York, NY, USA, pp. 1–8. https://doi.org/10.1145/3334480.3383068

