



Demo of VTutor for High-Impact Tutoring at Scale: A Real-Time Multi-Screen Tutor Support System with P2P Connections

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Abstract

Delivering high-impact tutoring at scale remains a persistent challenge in hybrid learning environments, where a single tutor supports multiple students working with educational technologies. Existing video conferencing tools are limited in their ability to provide real-time visibility and timely feedback across multiple learners simultaneously. We present *VTutor*, a web-based system designed to support real-time multi-student monitoring and adaptive feedback through peer-to-peer screen sharing and stylized virtual avatars. Tutors can view students' screens concurrently, detect off-task behavior, and intervene with spoken or animated prompts delivered by an on-screen avatar. *VTutor* enhances tutor awareness and responsiveness without increasing cognitive load, and operates fully in the browser for ease of deployment at scale. This demonstration showcases how *VTutor* enables scalable, real-time hybrid tutoring by allowing one tutor to manage and support multiple students concurrently. Attendees can experience both student and tutor roles and interact with the system live at the conference. The *VTutor* platform can be accessed at <https://ls2025.vtutor.ai>. The system demo video is at <https://ls2025.vtutor.ai/video>.

CCS Concepts

- Human-centered computing → Interactive systems and tools;
- Applied computing → Learning management systems.

Keywords

High-Impact Tutoring, Tutoring at Scale, Multi-Student Monitoring, Animated Pedagogical Agents, Virtual Avatars

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1 Introduction

High-impact tutoring has proven effective in enhancing student achievement and engagement across both K–12 and higher education settings [12, 16]. While personalized instruction is key to successful learning, scaling one-on-one or small-group tutoring remains a significant challenge in large classroom environments [6, 11].

Recent studies have explored how to scale one-on-one tutoring in hybrid learning environments to make high-impact tutoring more broadly accessible [7, 10, 15]. In these models, a single tutor supports multiple students via video conferencing tools like Zoom [10], while students engage with educational technologies. These platforms, along with their generated log data, provide learning analytics that help tutors identify which students may need support—such as those showing signs of disengagement or struggle [1, 2, 8].

However, conventional online learning platforms often limit direct interaction between tutors and students. Tutors must navigate multiple browser tabs or manually check in with students to identify who needs help. These inefficiencies hinder timely interventions, which are essential for maintaining motivation and reducing frustration [13, 14]. To address these issues, we introduce **VTutor**, a web-based system that unites:

- (1) **Real-time multi-student screen sharing** so a single tutor can observe and guide many students concurrently.
- (2) **Interactive avatar tutoring**, leveraging stylized virtual characters to deliver just-in-time feedback and maintain learner engagement with intelligence tutoring system.

Due to the page constraints for this demo paper, for the system implementation details, related literature works, and detail user flows, please refer to our L@S Work-in-Progress publication [5] and our previous works [3, 4, 9].

← Student Details

Anonymous
Status: Active (Screen Sharing)

Screen Share

Messages

Anonymous Teacher
It seems you are inactive for a while, what happened?
11:32 PM

Anonymous
I'm stuck... How to solve this?
11:32 PM

Anonymous Teacher
To solve for k, first try isolating k on one side of the equation.
11:35 PM

Anonymous
Got it! Thank you!
11:35 PM

Type a message...
Select animation feedback...
Send

Status: Active
Class: Grade 9 Class A
Last Tutor Interaction: 10 minutes ago

Figure 1: Tutor Dashboard and Messaging Interface for individual student. The tutor's view shows an “Anonymous” student currently screen-sharing IXL, where the student attempts a math problem. On the right, the tutor and student exchange messages in real-time; any tutor messages sent here are spoken aloud by the VTutor avatar on the student’s screen. The lower panels provide status information (e.g., last tutor interaction), letting the tutor quickly detect off-task behavior and intervene with targeted guidance.

The VTutor platform can be accessed at <https://ls2025.vtutor.ai>. The system demo video is at <https://ls2025.vtutor.ai/video>. Figure ?? illustrates the three main VTutor components: the VTutor Student Client, the Tutors Frontend Dashboard, and the Node.js Backend Server.

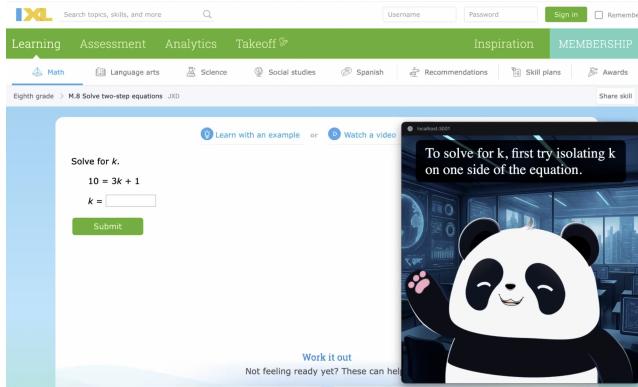


Figure 2: Student Interface During Tutoring Session. The student is solving an algebraic equation on IXL (“Solve for k”), while the VTutor avatar, an animated panda agent, waves and offers animated guidance in the lower-right corner. Students can also chat directly with tutors; messages from tutors are spoken aloud by the VTutor avatar.

Demonstration Setup Plan at the L@S Conference

We will bring laptops to the conference venue to support an interactive, hands-on demonstration of VTutor. During the demonstration, we will configure these laptops to simulate both student and tutor roles. Attendees will have the opportunity to experience VTutor from both perspectives. As students, they will share their screens and receive real-time, avatar-delivered feedback and guidance. As tutors, they will monitor multiple student feeds through the dashboard and send adaptive messages that appear as animated, spoken prompts on the student side.

In addition to the on-site devices, as the system is production ready, we will invite attendees to join the demo using their own laptops via a public URL, enabling a broader and more personalized engagement. Our team members will be present throughout the session to assist participants, answer technical questions, and collect informal feedback that will inform future iterations of the system.

We will set up the demo station adjacent to our poster display, allowing attendees to experience the system with context such as design elements and technical details on the poster, and provide feedback.

This live demonstration aims to showcase how VTutor enables scalable, real-time high-impact tutoring interactions for one tutor with multiple students, and to engage the learning science community in discussions around its usability and educational potential.

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