

IITG Project Outcomes Form - Update Outcomes

Name of person reporting outcomes

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IITG Project Title

2016-Stony Brook-Chan-"Lab-in-a-Cube" Hands-On Lab Learning with an Automatic Feedback

Access Keywords: Enrollment, Diversity, Capacity, Affordability

Despite of the increasing demand of online education, online STEM's education is still limited by the lack of realistic lab experience. Visually, virtual lab has become more and more realistic nowadays; however, many crucial lab components such as tactile skills, decision-making for preparation and execution of the lab are still missing. Tactile skill such as pipetting up and dispensing an accurate volume of chemicals without introducing unnecessary air bubbles cannot be practiced online currently. Existing virtual labs only allow simulation of the process with computer mouse clicking. Also, to familiarize students with the sequential steps in a protocol, current virtual labs only require user to click through the steps without any active decision made by the users. Hence, using the concept of "gamification", our proposed solution addresses these two issues by adding a hardware component that can interact with a software to provide feedback and suggestion to users. Similar to video game playing, users can find out how well they perform via the feedback and suggestions in the software without any actual expensive equipment. Our "Lab-in-a-Cube" hardware will act as a remote controller that incorporate key shapes and buttons of real lab tools (e.g., micropipette, pipette guns, flasks and timers) to allow students gain realistic hands-on experience even at the comfort of their own home.

Completion Keywords: Completion, Persistence, Transfer, Retention

Notably, many lab classes that are mandatory for many majors are always full and have waitlist (e.g., courses designated as a High Demand/Controlled Access (HD/CA)). Students who failed some of these lab courses are given lower priority to retake these courses. Hence, helping students to pass these lab courses will prevent them from having to retake the class and delaying their graduation.

Success Keywords: Applied Learning, Student Supports, Financial Literacy, Career Success

Improve students' hands-on laboratory skill through the use of our "Lab-in-a-Cube" hardware tool that interacts with a computer software. It can be used in the classroom to provide feedback for students' individual performance even in a big class when instructor-to-student ratio is low, and it can also be used as a tool that allows for online learning of these tactile skills using our custom-designed "Lab-in-Cube" hardware instead of the actual expensive lab tools or equipment.

Any additional resources or updates you wish to share?

Biomedical Engineering Professor Wins SUNY Funding to Enhance Virtual Labs

<http://www.stonybrook.edu/happenings/facultystaff/suny-iitg-funding-virtual-lab/>

<http://research.stonybrook.edu/news/biomedical-engineering-professor-wins-suny-funding-enhance-virtual-labs>

<https://www.suny.edu/suny-news/press-releases/july-2016/7-27-16/bluetooth-enabled-stethoscope-lab-in-a-cube-virtual-learning-communities-among-iitg-award-winners.html>

<http://www.albertoacereda.org/2016/08/16/biomedical-engineering-professor-wins-suny-funding-to-enhance-virtual-labs/>