

Project Proposal – Teacher Dashboard for C2STEM

Caitlin Snyder

GitHub Link

<https://github.com/snyderc6/TeacherDashboard>

Description

In this project I will be creating a teacher dashboard for C2STEM with the eventual goal of helping teachers interact effectively with their students as they work on modeling tasks. The final dashboard will include basic statistics of students' progress, actions and assessment scores for each module. Along with this, teachers will be able to select different features that they find important and will be able to cluster students. The dashboard will include data visualization features to help them understand and compare clusters. Teachers will also be able to use their knowledge about student's performance levels to evaluate clusters by selecting specific students. After selecting a student or students, the dashboard will update the different data visualization features accordingly.

Background

C2STEM is a computational modeling environment that was created to help students learn physics and CT (Computational Thinking) simultaneously. Students have been shown to benefit from working in this environment and have shown learning gains in both CT and physics. While this system benefits the students and researchers, it is difficult for teachers to gain insights into how students are learning and where they might need help. Currently, there are no tools to help teachers proactively engage with their students as they work in computational modeling environments like C2STEM. This project will greatly enhance the teacher's role in such systems and will hopefully lead to even higher benefits for the students.

Data

The data used for this project will be from approximately 480 students who worked on C2STEM. I will start by working with a small subset of the students at the beginning of the project and hopefully expand to all of them if all goes well. This data will include log files that contain all the different actions students have made on the system such as dragging a block or opening up the table tool. The data from the log files must be parsed and some of the non-interesting actions removed from consideration. I will also be using data from imbedded assessments that the students complete while working in the environment. These are quiz-like forms that the students complete as they are creating a computational model. Since these contain questions that are both multiple choice and fill in the blank, I will create a grading rubric and score the assessments accordingly. Finally, the students take a pre-test before working in the environment so that we can get a baseline for their prior CT and physics

knowledge. This pre-test will be scored according to a rubric as well and each question will be labeled as CT or physics.

Baseline

For my baseline I will implement the data visualization tool, Clustervision (Kwon et al., 2018). I will not be implementing all five features of the tool but have narrowed it down to a ranked list of clustering results, a 2D projection and parallel trends. I decided to not include the cluster detail or data point distribution features since the use of this will be aimed at teachers who may not be familiar with the finer points of clustering. Following this same simplifying logic, I will be choosing one dimensionality reduction technique instead of allowing the user to choose between multiple ones.

Schedule

Baseline	
Week 1 (1/28 – 2/3)	Finish all data cleaning & abstraction
	Lit review of related work
Week 2 (2/4 – 2/10)	Play around with libraries (d3, React, Stardust) and decide on which one to use
	Implement the ranked list of clustering results
Week 3 (2/11 – 2/17)	Baseline Updates (Mon)
Week 4 (2/18 – 2/24)	Implement the 2D projection feature
	Implement the parallel trends feature
Project Updates	
Week 5 (2/25 – 3/3)	Baseline due (Mon)
	Implement the visualization of basic statistics
Week 5 (3/4 – 3/10)	Start implementation of feature selection
Week 6 (3/11 – 3/17)	Implement feature selection
Week 7 (3/18 – 3/24)	Project Update 1 (Wed)
Week 7 (3/25 – 3/31)	Implement the following of student(s) across all features
	Review the usability in terms of a teacher – is there anything that must be changed to make it more understandable?
Week 8 (4/1 – 4/7)	Project Update 2 (Wed)
	Update any necessary components
Project Submission	
Week 9 (4/8 – 4/14)	Review and make any final changes
	Create final presentation
	Write paper
Week 10 (4/15 – 4/21)	Maybe Project Presentation (Wed)
Week 11 (4/22 – 4/26)	Maybe Project Presentation (Mon)
	Final Submission