Curriculum Development of Math 114: Calculus

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Introduction

Throughout the course of the Fall 2021 semester, data was collected on students enrolled in Math 114 on their online homework (WeBWorK) and students' assessment (quizzes/exams) scores. After each assessment was taken, data was collected to analyze the relationship between students' WeBWorK and assessment data. Specifically focusing in on using correlations to identify relationships between the two variables.

Abstract

The main purpose of the research project was to analyze the course data focusing on relationships between students' WeBWorK and assessment data.

Research Question

What are the relationships between student results on WeBWorK problems sets and problems on mathematics assessments?

Design of Study

- *Participants*

Students enrolled and participated in Math 114 (calculus) course had been selected for the study. Total number of participants was 65 students. Additionally, student identifiers had been removed.

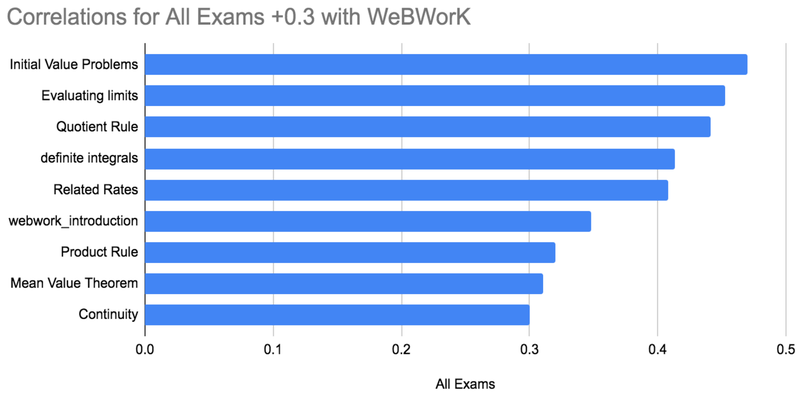
- *Procedure*

Google spreadsheets was used to combine all the students' WeBWorK data and assessment data together to analyze the relationship between the two variables. Each assessment was contained in its own spreadsheet with the corresponding week of WeBWorK completion. Each sheet contained all participants, mathematical course data components (total 33), assessment scores, averages among assessment, correlation section (correlation equation with students' assessment scores and WeBWorK) and WeBWorK data. The WeBWorK data contained students' percent scores with the mathematical component within the WeBWorK problem sets, scores without nevers, average number of tries, and total number of tries for each mathematical component. Additionally, a summary sheet was developed to track the progression along with an all exams, all quizzes, and total scores (both exams and quizzes combined) sheets as well.

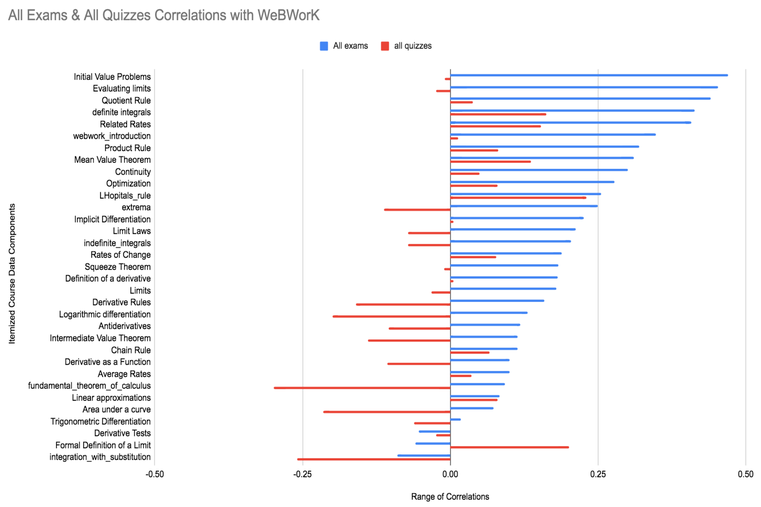
Key

- Scores without nevers: Only scores of students who attempted WeBWorK. Not involving data on students who have not attempted WeBWorK.
- All exams: Four exams over the course of the semester scored with WeBWorK correlations.
- All quizzes: Seven quizzes over the course of the semester scored with WeBWorK correlations.

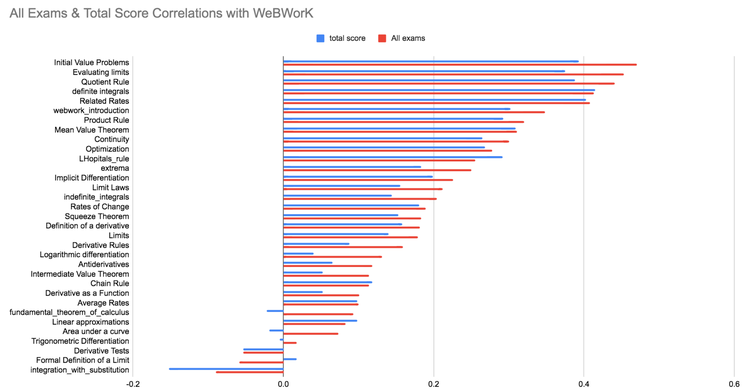
Results



When analyzing the relationship of all exams (total of four) with students' WeBWorK, nine of the course data components showed the strongest correlation (+0.3) among the other twenty-four components with students' WeBWorK. The components below 0.3, could be further examined and possibly adjusting/changing to help increase of the relationship among the two variables.



When analyzing the relationship of all exams (total of four) and all quizzes (total of seven) with students' WeBWorK, thirty of the course components represented a positive correlation with students' WeBWorK for all exams. However, about half of all quizzes represented a positive correlation (0-0.25) and while half represented a negative correlation (-0.3-0) among the thirty-three course data components with students' WeBWorK. Important to note, for all exams students took them individually while students completed quizzes in a group-based assessment. Correlations with group quizzes indicate more negative correlations and weaker correlations than with exams. These results may be due to the group aspect of quizzes where weaker students (low WeBWorK) rely on stronger students (high WeBWorK) for better scores on quizzes. This may suggest a change in quiz format towards a hybrid model with group and individual components



When analyzing the relationship of all exams (total of four) and total score (total of eleven) with students' WeBWorK, majority course data components represented a positive correlation with students' WeBWorK. However, a few course data components for both all exams and total score represented a negative correlation with students' WeBWorK. Important to note, total score encompasses all exams and all quizzes. Based on the correlation graph, did the exams influence the positive correlations developed for total score with students' WeBWorK?

Takeaways

- *Data*

Data collection is important for professions, specifically focusing on teachers. By collecting data on students, can lead to creating meaningful learning and practice to strengthen their understanding. With the data collection, can help teachers make informed decisions for their current and future courses. By collecting data can help make decisions on questions such as "is it worth it for my students to engage in and invest into?"

- *Suggestions*

-Find resources and practices (online, tools, etc.) for students to engage in such as WeBWorK to strengthen students understanding of the components.
-Additionally, viewing hybrid approach to quizzes instead of group approach based on data.

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