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Connecting Student Grades to Concepts

Creating an academic curriculum can be difficult and can always be improved upon. Students' grades vary across classrooms, taught material, and assessments. Can students' scores give any information on how a class should be structured? There may be connections between two or more assessments that are not seen by the professor. Rather than only relying on our perception of class material, data from an actual class may assist in developing a greater class structure for future classes.

Concept Knowledge Calculator is a program written primarily in Java with an overall goal to look at a student's progress and pinpoint what topics they are excelling in and which they are struggling in. My contribution to this program added a feature that can assess a class as a whole and connect multiple assessments to a greater concept within the course, as well as inform the user how strong this relation is. Providing a Sakai gradebook file with a sufficient amount of students and assessments can carry out this process. If a user has a structure already created, an additional file could be provided and Concept Knowledge Calculator will use this structure and the student grades to determine how strong these given relations are. These two processes were not built entirely in Java. R is a programming language specialized in working with groups of data and running statistical functions which are built right into the language. A library, RCaller, allows for R integration within Java. From a file of assessment scores, a list of student names and grades are converted into a matrix, run through an algorithm that determines how many concepts should be created for the assessments to connect to is, and then is sent to R. From there, statistical functions are run and a structure is created, or the structure the user provided is given the strengths of these connections. A graph of the structure is also given.

By using this program, we can better understand how assessments in our classes are related to each other. For example, a professor may believe that a set of assessments are related to a certain concept, however, when run through Concept Knowledge Calculator, the results show a very weak relation between the concept and one of the assessments. This does not necessarily mean the given connection was incorrect, but this does provide insight on the topic and may help the professor understand what concepts are impacted by which assessments based on real data.