Assessing Student Learning

Competency Description

Assessing student learning outcomes is critical to teaching as it informs the instructor if any learning is actually happening in the classroom. Designing effective assessments allows instructors to directly monitor whether intellectual insights and desired learning outcomes are achieved in students. Moreover, instructors can 1) evaluate how students use their current knowledge 2) characterize the change in student knowledge over time, and 3) modify instructional material and/or speed to improve student learning.
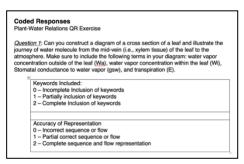
Competency Development

I was selected to be a FAST fellow in 2023-2024, which gave me opportunities to enhance my proficiency in assessing student learning. During this year-long fellowship, **I designed and executed a teaching-as-research project** that allowed me to assess student learning. Specific to the development of this competency, I engaged in the following during my teaching-as-research project…
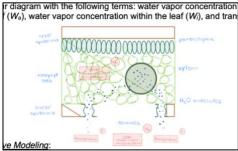
1) *Reading Understanding by Design*: Assessment in this book is defined as a tool that allows instructors to determine the extent to which the desired outcome (i.e., student understanding) has been achieved. Moreover, these assessments should provide students with opportunities for feedback and improvement in a formative sense (rather than summative).

2) *Invoking Bloom's Taxonomy in Assessment Design:* As a part of my Teaching-as-Learning project, I created three in-class exercises for an undergraduate Plant Physiology course where I used *Bloom* verbs (i.e., action verbs that indicate cognitive activity) in the question design.

3) *Coding and Analyzing Assessment Questions*: In addition to the question design, I coded responses to each question to extract numerical/categorical information from student answer(s) for subsequent analysis.

To further enhance my proficiency in assessing student learning, I attended a workshop by Diane Ebert-May on *Assessing What's Important: Creating Assessments That Show How Students Use Their Knowledge*. During the workshop, we spent time thinking about the question… "What would we like our students to _know_ and _be able to do_ with the instruction they receive in our course curriculum?". During the workshop, I…

1) *Revised Existing Assessments using Three-Dimensional Learning Assessment Protocol (3D-LAP):* As a part of the workshop, I learned how to transform assessments to make student thinking more visible (and therefore measurable) using 3D-LAP. Using 3D-LAP it helped me to align assessments with learning objectives (established in Backward Design).

Artifact	

Artifact 1. An example of a coded response for a quantitative reasoning exercise developed for the TAR project during the FAST fellowship (2023-2024) is a student response to the same question.

Artifact Rationale

To create a successful student assessment, it is essential to design assessments that allow instructors to monitor how students utilize their knowledge. Instructors can achieve this by incorporating Bloom's verbs into their assessments, creating measurable performance-based questions, and coding responses to questions with intention. For my teaching-as-research project, I developed three assessments that demonstrate my competency in designing assessments and evaluating student learning.

Interpretation / Reflection

I improved my competency in assessing student learning through the development and execution of my Teaching-as-Research project. In this project, I determined the impact of an instructor-led quantitative reasoning intervention on students' quantitative ability and confidence. During this year-long project, I spent the Fall semester designing the project/assessments and getting IRB approval. I spent the Spring semester deploying the project in an upper-level Plant Physiology classroom, analyzing the assessments, and presenting my findings to my peers. My reflections for each semester are below:

Fall 2023: I spend the majority of this semester discovering various assessment strategies/protocols, reading/learning about backward design with my FAST cohort, and invoking Bloom's Taxonomy and different frameworks, such as three-dimensional learning and biological systems thinking when designing assessments. Much of the knowledge base I developed for assessment design was during the journal clubs or guest lectures during our weekly FAST meetings. This period was pivotal for me because I did not know how to write assessments, much less how to design a teaching intervention. These readings and discussions brought me up to speed on current assessment design practices, which were valuable when creating my assessments.

Additionally, I submitted this project to the IRB before getting approval, as all of the data I planned to assess was from human subjects. As a plant scientist, this was my first time filing paperwork through the IRB and going through the approval process. Altogether, this was an excellent opportunity to learn how to do this. I plan to continue to do educational research in my future position (and submit many more projects to the IRB). Getting this experience now with the mentorship I received as a FAST fellow was highly beneficial.

<u>Spring 2024</u>: I spent the majority of this semester working with Berkley Walker (PLB415 instructor) to characterize ~23 students' quantitative reasoning ability and confidence using the assessments designed in the previous semester. Analyzing both ability and confidence data allowed me to assess whether desired learning outcomes are being achieved in students (i.e., is quantitative reasoning improved after an instructor-led intervention?). Learning how to code responses to the ability and confidence questions and analyze this data was beneficial, as I expect to continue doing this type of educational research in the future.

I feel that I have improved my ability to assess student learning primarily through this educational research project I conducted as a FAST fellow. As I go forward in my career in teaching, I hope to continually improve my ability to assess students in my classroom.