Implementing Mastery-Based Education Within an Adaptive Instructional Tool

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Mastery-based learning refers to a form of instruction in which a student's progression is dependent on demonstrating mastery of the material through successful completion of tasks or assessments [Arlin84]. While mastery-based learning has many potential benefits, actually implementing a mastery-based approach within a course is challenging. In my courses, I use an adaptive instructional tool called Smart Sparrow[1] to both deliver instruction and perform formative assessments that allow students to demonstrate mastery.

One obvious challenge of mastery-based learning is that some students will master material more quickly than others. In a traditional approach to classroom education, it can be difficult to accommodate different learning speeds, and it is almost inevitable that class moves too slowly for some students and too quickly for others. Delivering instruction through Smart Sparrow allows each student to take in the material at their own pace. Each Smart Sparrow module includes both text and video instruction, which students can view as many times as they need.

A second challenge to implementing mastery-based learning is the need to generate and administer as many unique formative assessment tasks, with appropriate feedback, as necessary until a student demonstrates mastery of a topic. Adaptive instructional tools like Knewton[2] can provide a nearly limitless number of questions, but only within a limited set of topics. Adaptive instructional tools like Smart Sparrow, which allow a teacher to author unique content can only offer as many questions as the teacher provides.

Our approach is to integrate JavaScript web apps within Smart Sparrow modules that randomly generate unique questions based on templates provided by the instructor. Each template can also include feedback appropriate to the question that was asked. What the student experiences within the Smart Sparrow module is a formative assessment that they must pass before being able to progress to new material.

To date, we have developed JavaScript web apps for a senior-level course on Artificial Intelligence. Additional modules are planned for this course and for a course on Programming Language Concepts.

References

Arlin, Marshall. "Time, equality, and mastery learning." *Review of Educational Research* 54.1 (1984): 65-86.

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[1] https://www.smartsparrow.com/

[2] https://www.knewton.com/