Standards Based Grading in Upper-level Statistics Courses

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Meeting Standards: Adept—Advanced—Proficient—

—Progressing—Beginning—Not Shown **:Not Yet**

Invitation for Equity and Inclusion

At a recent conference on mastery based grading, a concern was shared that the terminology “mastery” could be and has been problematic for students as it evokes parallels to Master-Slave dynamic of racism.

As a community, we are actively searching out alternative names for grading systems such as the one I describe here. Proposed names include Standards Based Grading, Growth Grading, and Achievement Grading. I invite participants to not only share their ideas for alternative names but to think critically about their own grading systems and terms for see if there might be equity and inclusion issues. I have opted to alter my word choice to “Standards Based Grading” for this poster.

Approach to Grading

Standards Based Grading (SBG) refers to an expansive collection of grading systems that are hallmarked by three key features:

1. A list of clear learning objectives and/or standards.
2. Assessment focus on how responses reflect those objectives.
3. Growth is what matters (Campbell et al., 2020).

Learning Objectives

One of the most challenging aspects of SBG is writing your learning objectives. Too vague and they won’t be useful to you or your students; too narrow and you’ll end up with hundreds which limit opportunities to show growth over the semester.

Learning Objectives need to be balanced across the knowledge dimension (factual, conceptual, procedural, and metacognition) as well as cognitive processes dimension (remember, recall/apply procedure, understand, apply understanding, analyze, evaluate, and create) (Anderson & Krathwohl, 2001; Tallman et al., 2016).

Assessment Focuses On Outcomes/Objectives

Rather than trying to decide how many points to assign, we focus on how the response reflects the learning objective(s) associated with the prompt. Developing rubrics associated with each learning objective helps save faculty time (select the most appropriate category) and provides students with meaningful feedback (Anglin et al., 2008). My rubric levels form the upper banner of this poster.

Growth Matters

SBG systems incorporate a growth mindset (Dweck, 2008) by allowing students multiple opportunities to meet/surpass the standards for each objective. These opportunities can be through multiple attempts on each assessment and/or the repeated assessment of an outcome in different ways. Such a grading system can support students in developing a sense that learning is not instantaneous and that mistakes are powerful (Prasad, 2020).

Final course grades depend upon how many objectives the students meet/surpass minimal standards on rather than how many points they amass.

References

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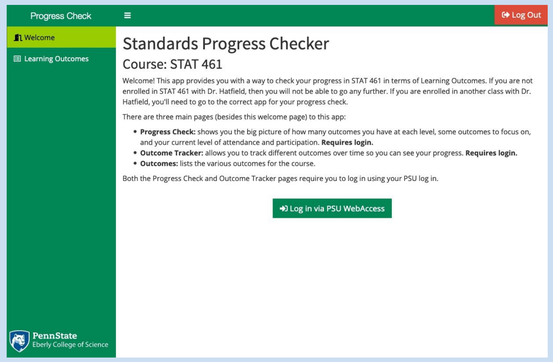

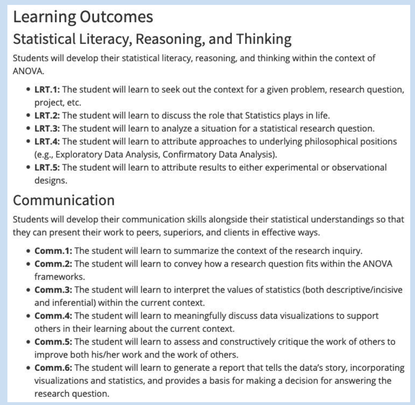

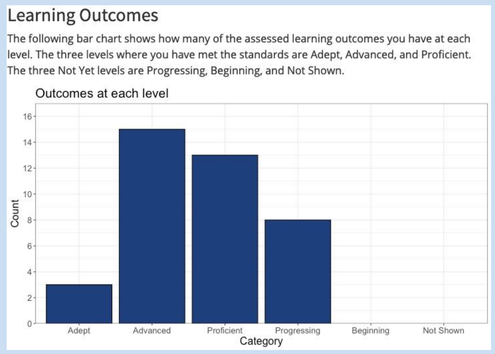

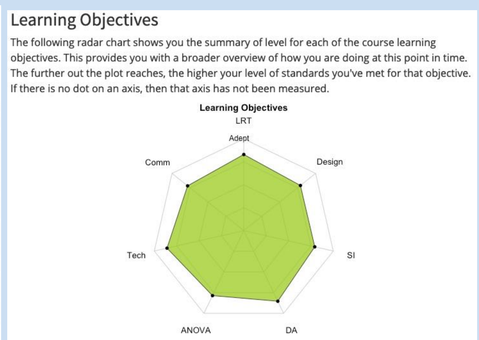

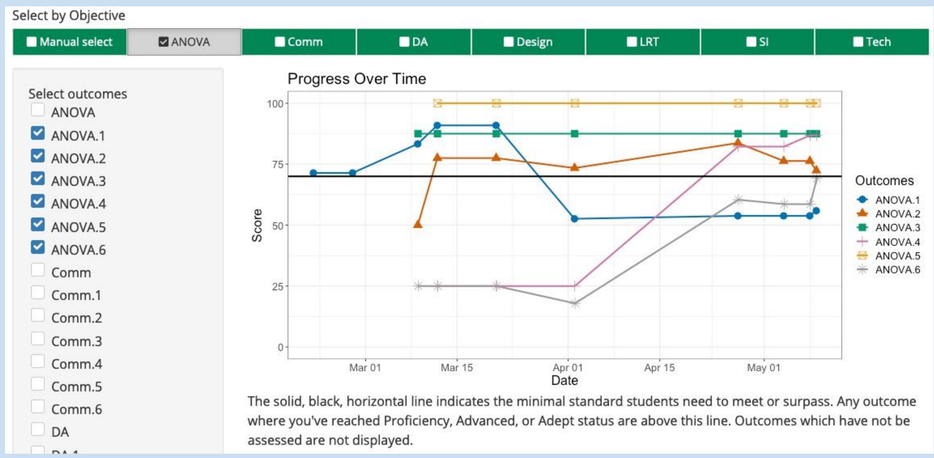

Student Response

Students appreciated the effort I put into to providing them with a tool to help them see how they were doing in the course. During a reflection assignment at the end of the semester, several students made explicit usage of the app by taking screenshots of the time series plot to include as part of their responses. One student shared the following response which is emblematic of the shifts SBG support students in making:

“One of the biggest changes I made in my habits this semester was the amount of effort I put into my work, and my shift in focus from striving for an A to striving to improve and learn the material to the best of my ability. Yes I still monitored the scores I received on my tests and homework's, but I checked them to see in what areas I can improve.”

Progress Checker Shiny App

I got the idea for building a progress app from Bezick and Smith (2020) who had built a dashboard using Shiny. The Progress Checker app allows students to:

- See how they are currently doing on learning outcomes via a bar chart
- See how they are currently doing on learning objectives via a radar chart
- Check their running attendance and participation
- Track individual learning outcomes over the entire semester via a time series plot
- Look through the list of learning objectives and outcomes.

I’ve built the app following the principles in Hatfield & Carey (2021). A public version (will require you to add in security changes to fully work) is available at https://github.com/neilhatfield/StandardsGradingProgressChecker.

Security Measures

Given that what I’m sharing with students is protected under the Family Educational Rights and Privacy Act (FERPA), I needed to take a series of security precautions that are baked into the design of the Shiny app:

- Data are encrypted with AES via SHA256 in Cipher Block Chain mode Using .Renviron to store certain credentialing information
- App lives on a server that requires connection from on campus or through the university’s VPN
- Students log into the app via the university’s Single Sign On systems
- Only approved users can then trigger the reveal of data.

A special thanks to Robert Carey for his programing assistance.

MyOpenMath

MyOpenMath (MOM) is an online course management system that was built with mathematics and other quantitative fields in mind (Lippman, 2020). The rendering and display of mathematics is baked right into the fiber of the system. MyOpenMath is a free, Open Education Resource implementation of the iMathAS system and can be integrated with other learning managements systems such as Canvas, Blackboard, and Moodle. You can learn more about MyOpenMath at https://www.myopenmath.com.

Assessments

The nature of MOM allows you to use questions contributed by other users as is or as templates for your own version as well as authoring your own questions. There are currently ~12,000 questions categorized as Statistics in MOM. In addition to traditional assessments, there are video-cued and Live Poll (think in-class clicker questions) assessment styles.

Learning Outcomes and Objectives

MOM has a built-in learning outcomes and objectives system. You write your own outcomes and objectives and then attach outcomes to assessment items. The system will then automatically track students’ performances throughout the semester.

Rubrics

You can create rubrics in MOM which you can create which provide feedback to students.

Partial Credit and Feedback Macros

MOM has macros which allow you examine students’ answers to provide targeted feedback as well as partial credit.

Randomizers

MOM has an array of randomizers which you can build into question, as well as randomizing orders of questions in assignments, or even pick a certain number of questions of a pool within an assignment.