Equity, Diversity and Inclusion
in STEM
teaching with Kudu

Kudu is committed to promoting the best teaching practices in Science, Technology, Engineering, and Mathematics (STEM) with the goals of equity, diversity and inclusion. This is a short summary of our recommendations for using Kudu tools in the classroom.

Academic Belonging: **Fostering the students' sense of belonging and their ability to see themselves in the discipline we are teaching through visual representation, examples, and cultural references.**

Underrepresented minority (URM) students often find it difficult to picture themselves succeeding in STEM disciplines because most of their instructors look and speak differently. Adrienne Rich's quote sums it up:

"When someone with the authority of a teacher, say, describes the world and you are not in it, there is a moment of psychic disequilibrium, as if you looked into a mirror and saw nothing."
                                                        – Adrienne Rich, "Blood, Bread, and Poetry"

While a diverse body of instructors is the ultimate albeit remote solution, Kudu pre-lecture videos offer a short-term remedy. For example, pre-lecture videos provided with Kudu Physics courses are hosted by Dr. Shini Somara. She is a very successful Ph.D. scientist from a Sri Lanka family, who serves as a role model for STEM students. Animations used in Kudu videos engage the students with a broad range of analogies and examples, featuring characters of diverse backgrounds.

In addition to the pre-lecture videos included with the Kudu courses, instructors can include YouTube videos featuring examples and cultural references from a broad range of videos available on the internet. In most cases, *fair use* doctrine allows instructors to add videos not owned or licensed by Kudu to their individual courses, greatly enhancing the visual representation of the subject they teach.

Active learning and peer instruction benefit all students and helps eliminate the learning outcomes gap for URM

There is strong evidence that active learning is superior to lecture-based approaches in STEM education. Importantly, active learning helps eliminate the gap in learning outcomes for women

and minority students, thereby promoting equity in the classroom. An often-quoted statement by the co-chair of the US National Academies Scientific Teaching Alliance Clarissa Dirks states: "At this point it is unethical to teach any other way." [M. M. Waldrop, *"Why we are teaching science wrong, and how to make it right"*, Nature (2015) 523, 272]

Kudu provides a free-of-charge "clicker" included with its free-of-charge platform as well as the premium courses. This eliminates the need for paid add-on products, such as iClicker and TopHat.

Engaging the students in active learning using the Kudu tools provides the URM students with a structured framework for getting better integrated with the rest of the student body. When the instructor asks the students to work on an in-class assignment in groups during part of the lecture (in-person, or in remote break-out rooms), the URM students engage with their peers and benefit from the interactions and the peer instruction.

Transparency helps eliminate implicit bias

Clear and transparent information about the expectations, grading rubrics, and the relative impact of various modes of evaluation helps eliminate the implicit bias and improve the student-instructor trust.

Kudu makes all the student scores (homework assignments, in-class clicker activities, exams, etc.) available in one place, so that the students can evaluate their progress and the likely final grade based on their current standing and expected performance.

It is also recommended to avoid curving the grades, which might create the unfortunate perception that a student can succeed only if some other students fail. Here is a typical example of the grade assignment strategy which is transparent enough for the students and wich creates a friendly environment for peer instruction:

> ***A sample Syllabus***
> *The final grade will be based on the weighted average with a "safety net". This way, a student can never get a lower grade than that given by a "curve", but it is possible to get a higher grade based on absolute performance:*
>
> | A+ | > 98 % of the total score | or | top 2% of class (whichever gives higher grade) |
> | A | 94-98% of total score | or | 3-10% of class   (whichever gives higher grade) |
> | A- | 90-93% of total score | or | 11-30% of class (whichever gives higher grade) |
> | B+ | 86-89% of total score | or | 31-40% of class (whichever gives higher grade) |
> | ... | | | |
> | D- | 50-55% of total score | or | 95-98% of class (whichever gives higher grade) |
> | F | otherwise | | |

Summary of using Kudu to advance EDI in STEM:

- engage the students with pre-lecture videos
- Include additional videos from YouTube to enhance visual representation of the discipline and to cultivate the feeling of belonging among the students
- use the lecture time freed up with the help of pre-lecture videos to engage the students in active learning and peer instruction in small groups (in person or online) during the class
- make the grading scheme transparent to eliminate implicit bias and help the students use their Kudu scores to evaluate their performance and expectations for the final grade

Additional resources

Katherine W. Phillips, *How Diversity Makes Us Smarter*, Scientific American (2014)

University of Michigan Inclusive Teaching Resources & Strategies

Waldrop, M. Mitchell, *Why we are teaching science wrong, and how to make it right*. Nature. 523 (7560): 272–274 (2015) doi:10.1038/523272a

Lindsay Wheeler, *Diversity And Inclusive Teaching Practices In STEM*