Promoting Inclusive Teaching Strategies

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Why Use Inclusive Teaching Strategies?

- Inclusive teaching strategies are beneficial for all students and their learning.
- It has been well-documented that women and other minority groups continue to be a small minority in engineering majors at the undergraduate level. A National Science Foundation Report observes that "there is the possibility that the curriculum itself is a barrier to underrepresented groups" [6].
- Increasing the participation and success of all students is critical to the field of engineering for several reasons[11]:
  - Maintaining the current engineering workforce will become more difficult if all segments of the population are not invited to participate and persist in engineering
  - A team of problem solvers with cognitively diverse approaches to a problem will outperform a team of the cognitively best problem solvers[7]
  - Diversity and inclusion brings increased creativity, better problem-solving abilities, and thus better products. This results in increased profitability.
- Targeted programs such as Women in Engineering (WiE), Minority Engineering Program (MEP) may foster a supportive environment but they do not directly influence the college culture and institutional structure as a whole and students may still face difficult or disparate environments in classroom settings and beyond where they interact with majority students[2].

Actionable Strategies

Traditional Strategies	Inclusive Strategies	Comments
Theory taught in isolation	Theory is presented in applied contexts; social and environmental implications are canvassed and debated when possible	Many students, especially women, prefer theory presented in context, and in particular to understand the social relevance[4]
Students are expected to have knowledge which is not formally taught in the prerequisite courses	Instructor surveys students about their prior knowledge to leverage these experiences (both formal and informal) in their explanation of course content[8]	Students typically have different prior knowledge and experiences with technology and science[12]
Conventional construction of the history of technology which highlights white male heroes of invention and innovation	Instructor integrates diversity in technological development and innovation (Ada Lovelace, Albert Diaz, Ynes Mexia, Alice Ball, Mary Golda Ross, etc)	Women and under-represented minority students may feel alienated, excluded and may have low self-efficacy without appropriate role models[12]
Instructor calling on the same few people in class	Instructor allows students to participate in different ways (think, pair, share; individual classroom clickers; etc)	Not all students want to respond spontaneously or verbally[11]
Instructor ignores physical and cognitive abilities when choosing course materials and activities	Instructor is deliberate in choosing course materials and activities with a range of student physical and cognitive abilities	Students can be at a disadvantage and thus discouraged if they can't participate in course activities[12]
Roles of student team members are assigned randomly	Roles of the team are rotated and monitored to assure that each student fills each role for a variety of tasks.	Rotating roles allow *all* students develop a range of skills and further their self-efficacy in engineering
Instructor engages students by only using PowerPoint lectures	Instructor presents course material in a variety of modalities (readings, diagrams, lectures, podcasts)	Students learn in a variety of ways[3]

Traditional Strategies	Inclusive Strategies	Comments
Students choose their own teams	Instructor assigns teams that help leverage diversity and avoid isolating students from underrepresented identities.[8] Groups should contain a critical mass or at least more than one person of the minority gender or race.	When students chose own teams, they tend to choose others that they know and are like themselves. This often leads to the exclusion of certain populations of students[9]
Students are put in teams without consideration of how they will learn to work with one another	Students develop teamwork skills by spending time at the beginning of the team project learning about their respective strengths, goals, and anticipated contributions[8]	Without the time for intentional teamwork development, students fall back on prior experiences with teams, which may not align with best practices.
Instructor generalizes students' achievements (eg "all engineering students should be good at 3D visualization")	Instructor emphasizes that achievement on tests and assignments reflects effort and commitment rather than intrinsic ability	It is important for retention to counteract stereotype threat (the risk of confirming a negative stereotype about one's group)[10]
Instructor assumes students have abundant financial resources when choosing course materials	Instructor is deliberate choosing course materials with a range of students' financial resources in mind	Students can be at a disadvantage and thus discouraged if they can't purchase the course materials[12]
Instructor gives students assignments with no written corollary	Instructor explicitly communicates the purpose, task and grading criteria for each assignment.[8]	Increasing assignment transparency by precisely telling students what you asking them to do and why benefits all students but especially those who are first generation and underrepresented minorities[8]

Resources:

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8. Pinder-Grover, T (2019, April 10). Engineering Inclusive Classrooms Cultivating a Positive Climate [ASEE Webinar]
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11. Tanner, K. D. (2013). Structure matters: twenty-one teaching strategies to promote student engagement and cultivate classroom equity.CBE—Life Sciences Education,12(3), 322-331.
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