Engaging First-Generation Students in Chemistry: Resilient and Inclusive Approaches in Higher Education

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Historically underserved students, such as first-generation college students and BIPOC (Black, Indigenous, People of Color) students, in STEM education, often lose interest in STEM fields due to barriers like isolation, inadequate preparation, and prejudice in STEM programs. Social psychology and sociology offer approaches to addressing these challenges. Social psychology typically focuses on individual-level factors such as student engagement, belonging, and achievement, while sociology emphasizes the broader, systemic forces, such as race, gender, and class inequalities that affect STEM education. To address these issues, focusing on "meso-level" interventions, which operate between individual and macro-level (structural) factors, can be a useful solution. These interventions, particularly in faculty and peer instructor development, can help reduce inequalities by addressing both the systemic influences and individual experiences in STEM education. This is especially true in college education of Chemistry, one of the most challenging science subjects for many STEM students. Inclusive pedagogy, which encourages instructors to reflect on the historical and sociological influences on teaching, is a key tool for faculty development because they facilitate a supportive, inclusive environment for minoritized and First-Generation students. Resilient and inclusive interventions and approaches of faculty can interrupt the cycle of inequality in chemistry education, improving student achievement and ultimately influencing broader systemic change. They include multiple aspects such as effectively engaging students and incorporate inclusive practices. For online chemistry education, it is critical to show students the enthusiasm of the faculty considering that there is less face-to-face interpersonal communication.

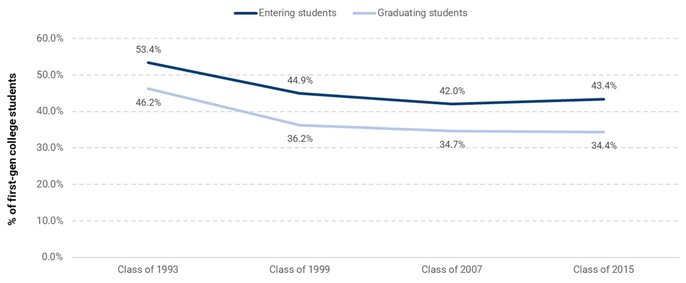
First Generation Students

Importance of college education and challenges they face

In 2020, 54% of undergraduate students nationwide are first generation students.

- It is a milestone for the individuals and their families as it gives the opportunity of paving the way for future generations in their families.
- Researchers have reported obstacles they face in college education such as feelings of isolation, stress in course preparation, and anxiety in financial situation and future career.
- Another challenge is the achievement gap versus continuing-generation peers
- They also face social challenges, like increased work and family responsibilities
- It's critical to create a person-centered culture which values and recognizes individuals and their potential to facilitate their college education and prepare them for their future career.

Proportion of college students that is first-generation



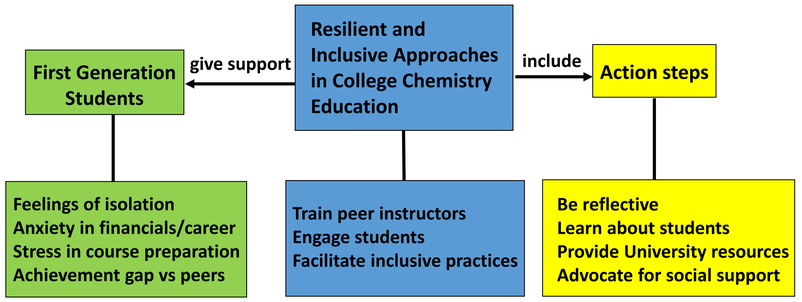
Source: Author's calculations using the Beginning Postsecondary Students Longitudinal Survey conducted by the National Center for Education Statistics.

Resilient and Inclusive Approaches

Train Peer Instructors

An effective way to reduce the sense of hierarchy

- Interactions with peer instructors, instead of with a faculty, can lead to productive learning outcomes because students feel more relatable and approachable, and less intimidated.



- Another advantage of peer instructors is that they can guide the peer students in discussing course experiences, obstacles, and the approaches they used to overcome challenges when taking the same courses before.
- It helps the peer students and peer instructors grow at the same time, enhancing their growth mindset and thus make them more resilient to challenges in college life.

Engaging Students

An approach to make students enhance their growth mindset

- When instructors connect the course contents to future careers, it promotes understanding and make students realize the importance of the courses.
- It's critical that instructors point out the strengths of students to make them feel capable and confident. This in turn makes students more interested and enthusiastic about course contents, creating a positive loop.
- Providing meaningful and timely feedback is also important. Not only giving a grade but also pointing out why it is right or wrong consolidates students' comprehension of the course materials, promoting communication and engagement.

Facilitate Inclusive Practices

A critical way to make students feel involved and improved

- Developing a steady and positive relationship with students matters. This trust makes students know that when they need help, the instructors are willing and will help them.
- Instructors can use immediacy to shorten the distance between teachers and students. For example, talking about the course contents in a humorous way, self-disclose the challenges the instructor experienced during college education, and giving compliments can positively engage students.
- Being approachable is critical. For instance, telling students that any question is a wonderful question and that they are very welcome to talk with the instructor makes students more willing to communicate.
- The instructors' altitudes have a great impact on students. It's important to stay positive and give encouraging words, especially when students show the signs of stress and anxiety.

Action Steps

Some detailed actions for instructors

- It's critical that the instructors are reflective.
- Learning about students in terms of their races, education background, majors, interests and strengths is a good way to tailor the teaching contents and teaching styles.
- Provide university resources, such as referrals to tutoring or counseling services, when appropriate.

References

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