Chapter 13
Reimagining Chemistry by Engaging Students as Partners in Curriculum Development

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ABSTRACT

Chemistry educators train students to understand the world through the development of foundational knowledge and critical thinking skills. However, disciplinary norms often lead to instruction that is not inclusive and less effective, with little discussion about the role of chemistry in the world. To address this, chemistry education must adopt student-centered, equity-focused approaches, such as Culturally Sustaining Pedagogy (CSP) and Rightful Presence (RP), to foster a more inclusive learning

DOI: 10.4018/979-8-3373-5342-5.ch013

environment. Progress has been made towards achieving this goal by educators, often focused on designing new courses to address curricular gaps or integrating social justice themes into courses. This chapter presents a framework integrating CSP and RP for using student-instructor teams in course design. One such team designed and drove the implementation of a new upper-level chemistry course called Reimagining Chemistry at Brown University, in which students explore critical frameworks and are empowered as change agents to reimagine one aspect of chemistry in their local community.

WHAT IS OUR ROLE AS CHEMISTRY EDUCATORS?

Chemistry educators aim to help students understand the world by developing foundational chemistry knowledge and skills and a deep understanding of scientific practices, ultimately fostering the ability to ask questions and design experiments to solve critical problems facing the world. Effective chemistry education must also intentionally work to fortify students' sense of belonging (Edwards et al., 2022) and confidence in their ability to do chemistry, also known as self-efficacy (Cheung, 2015; Margolis & McCabe, 2004), which are key predictors of persistence in STEM (Hanauer et al., 2016). We further argue that instilling a sense of personal responsibility to use the chemical sciences to make the world a better place is also critical to modern chemistry education, which has been discussed more in K-12 than higher education (Garibay, 2015; Jegstad & Sinnes, 2015).

Unfortunately, many large introductory college courses are not instructed in a way that achieves these aims. A stereotypical large introductory chemistry course focused on content without context and facts over scientific inquiry does not provide students with an adequate chemistry education with respect to the goals above. Chemistry education must adopt equity and social justice-oriented pedagogical frameworks like Culturally Sustaining Pedagogy (CSP; (Alim et al., 2020)) and Rightful Presence (RP; (Calabrese Barton & Tan, 2020)) to effectively train the next generation of chemists to better the world around them. While total curricular overhaul is daunting and not always feasible because it would require buy-in from many stakeholders, individual courses aimed to reimagine chemistry education can be developed to take steps to address the gaps in STEM education. In this chapter we detail the design of one such course at Brown University by a student and instructor team, including how the course design process incorporated ideas from both CSP and RP frameworks throughout.