Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.38317

The "Vision and Change in the Geosciences" initiatives for geoscience education reform, and its implications for undergraduate and graduate geochemistry education

JEFFREY G RYAN[1], SHARON MOSHER[2] AND CHRISTOPHER KEANE[3]

[1]University of South Florida
[2]University of Texas at Austin
[3]American Geosciences Institute

The National Science Foundation-funded Vision and Change in the Geosciences projects ("Future of Undergraduate Geoscience Education: 2013-2021; "*Improving Geoscience Graduate Student Preparedness for the Future Workforce"*: 2018-2023) supported a decade-long conversation on improving geoscience education in the US at the Bachelors, Masters, and Doctoral levels. Some 1300 geoscientists, including teaching faculty, Chairs, Deans and other academic leaders; and employers representing a broad range of employment sectors in the earth, ocean and atmospheric sciences participated in these projects at sponsored meetings and workshops, and as respondents to project surveys.

US geoscience faculty and employers came to a consensus on the core concepts, skills and competencies that Bachelor's level geoscientists should develop during their degrees. Some of these (e.g., Earth systems thinking, field skills) are geoscience-specific, while others (e.g., quantitative, computational, and data analysis skills; communication, cross-disciplinary teamwork, project management), are broader scientific and professional skills that are often poorly aligned with the instruction typical in geoscience degree programs. Meeting these same professional competencies at higher levels of accomplishment was seen as critical for MS and Ph.D. graduates in the earth, oceans and atmospheric sciences, along with the need for graduate students to develop adaptable skillsets and a growth-oriented, entrepreneurial mindset so as to be able to find success in the varied types of non-academic positions that are arising within a rapidly changing geoscience employment landscape.

The Vision and Change projects highlighted misalignments between the academic preparation of geoscientists and the professional needs of the geoscience workforce, especially as regards the ability of recent graduates to independently initiate and pursue investigations and communicate their findings effectively to non-technical audiences. Academic programs need to find ways to adapt to the rapid changes in geoscience professions, in particular as regards "big data" analytics, machine learning, and artificial intelligence, all insignificant a decade ago but now impacting geochemistry and all other fields. Programs also need to help students become intentional about their educations so they can develop their technical and professional skills in areas beyond what their coursework and research activities might support, toward their desired professional ambitions and career trajectories.