Equity in Science Education

ABOUT CONNECTED COLLECTIONS

Connected Collections are meant to support professional learning conversations about a particular topic, in this case Equity in Science Education. A Collection consists of 4-6 research briefs, short synopses of recent research published in peer-reviewed journals, each addressing some key aspect of practice related to the educational equity. The Collection also provides a set of overarching discussion prompts as well as links to other relevant resources.

Overview

Educational systems struggle to support equitable opportunities to learn science, as evidenced by persistently lower levels of advanced science studies and STEM career choices by youth from low-income communities. This collection will help you to define what equity in science education means and looks like in your local context. The collection starts with the assumption that supporting equity requires more than simply providing equal access. As Nasir et al. explain, equity is "not about offering or producing sameness," but about ensuring that all young people can "live the richest life possible and reach their full academic potential." Supporting equity in science education means providing learning experiences that are meaningful for all students. Equity does not mean simply inviting all students to participate in activities that have historically been meaningful only to some.

Learning Goals

The persistent problem we explore in this collection is a need to reframe what equity means and looks like in science learning. The first brief helps to define equity. The brief argues that because learning strategies vary across cultures, equity in education demands that children be supported to fully exercise their cultural resources (values, patterns of interaction, relevant knowledge and skills from home) in order to fully participate in learning. The next three briefs provide concrete cases that illustrate how educators can design for equity, and promote student identification with science, by connecting learning experiences to students' interests and prior experiences. The first case describes how equity-oriented science teaching acknowledges learners' cultural practices in meaning-making processes. The second case illustrates how linguistically and artifact-rich learning environments can enrich possibilities for learning. The third case demonstrates how drawing on students' community knowledge can expand science learning. Finally, the last brief explores professional development that helps educators integrate culturally relevant pedagogy into science teaching.

Research about EQUITY IN SCIENCE EDUCATION

(Visit the links below to see a two-page brief of each summarized research article.)

1 Learning as a Cultural Process

To create more equitable learning opportunities for students from marginalized communities, educators can design learning experiences that help young people connect their everyday interests and knowledge to academic content. The authors synthesize research on how students use sophisticated math in everyday practices like playing basketball or dominoes, and selling candy. Then they explain how learning improves when varied student life experiences are made relevant in informal and formal learning environments.

http://www.exploratorium.edu/sites/default/files/pdfs/brief_LearningCulturalProcess.pdf

2 Relating Culture to Prior Knowledge

This paper's findings illustrate the claim that young people's prior knowledge cannot be separated from the cultural context in which it is situated. Using detailed examples from a longitudinal ethnographic study of 13 children, the authors argue that in order to understand young peoples' interests and activities we need to understand the social and cultural systems in which their thinking is embedded.

http://www.exploratorium.edu/sites/default/files/pdfs/brief_RelatingCulture.pdf

3 Rethinking Learning with Hybrid Language Practices

Within learning environments, children' talk can often be seen as disruptive or off task. However, Gutierrez and colleagues reframe the ways children's talk is often a sense- making opportunity. In this work, we learn that teachers can engage children' talk and linguistic practices to deepen learning and broaden participation. This article explores how teachers can arrange learning so that students can use local knowledge and make meaning in ways that can connect to the official curriculum in unexpected ways.

http://www.exploratorium.edu/sites/default/files/pdfs/brief_RethinkingLearning.pdf

4 Jointly Negotiated Research in a Community-Based Setting

In this study, the authors describe a conceptual framework for culturally based ways of knowing, and provide a brief description of their efforts to use this framework to design a community based summer science program with a Native American tribe. To address the call to attract culturally diverse students to STEM fields, the authors advocate supporting students in their navigation of multiple and perhaps conflicting epistemologies, and using the students' community as a resource to be leveraged, rather than overriding their personal epistemologies with canonical science. The authors also provide examples of how they drew on Native students' knowledge and community practices to impact student learning.

http://www.exploratorium.edu/sites/default/files/pdfs/brief_CommunityBasedSetting.pdf

5 Guiding Educators to Implement Culturally Relevant Science

This article reports on a case study of two middle school science teachers, Mr. Roberts and Mrs. Fields, who took part in professional development designed to help them enact culturally relevant pedagogy in their classrooms. The intervention was structured around a transformative professional development (TPD) framework based on Gloria Ladson-Billings' (1995) definition of culturally relevant pedagogy. Both teachers successfully implemented culturally relevant pedagogy. Johnson observed changes not only in their ideas about pedagogy and students but also in their classrooms. The long-term and community-oriented aspects of the TPD framework seemed to play a vital role in supporting these changes.

http://www.exploratorium.edu/sites/default/files/pdfs/brief_GuidingEducators.pdf

WHAT DO YOU THINK?

What stood out to you about the authors' definitions of equity? How might this contrast with other definitions?

How do the cases reveal why it is important for science learning to relate to experiences that students have beyond the immediate learning environment?

In your programs, how can educators leverage students' home and community experiences to enhance science learning?

RELATED RESOURCES

The LIFE / Center for Multicultural Education Diversity Presentations & Report
http://life-slc.org/panel

Learning Science in Informal Environments Chapter 7: Diversity and Equity
http://www.nap.edu/openbook.php?record_id=12190&page=209

How can we promote equity in science education?
http://stemteachingtools.org/brief/15

Implementing Meaningful STEM Education with Indigenous Students & Families
http://stemteachingtools.org/brief/11

Engaging English learners in the science and engineering practices
http://stemteachingtools.org/brief/27