

Asset and Deficit Discourses of Student Ideas in Science Formative Assessment Co-design

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OVERVIEW: This study illuminates the ways in which asset- and deficit-based discourse about students' science ideas and abilities manifested in the process of formative assessment task co-design with high school teachers.

AUDIENCE: Administrators (K-12), Assessment developers, District science coordinators, Instructional designers, K-12 science teachers, Policymakers, Professional development providers, Science education leaders, Teacher educators

KEY POINTS

- Teachers overwhelmingly engaged in more deficit-based discourse about students' ideas and abilities than asset-based discourse. Common teacher deficit-oriented discourse about students' ideas focused on their inability to learn the natural selection concepts, misconceptions related to their prior knowledge, the lack of inherent motivation, and the 'problem' of their multilingual resources.
- Facilitators' talk overwhelmingly represented asset-based discourse, particularly focused on anticipating and exploring students' prior knowledge.
- Facilitators' increased asset-based discourse across the year-long PLC tended to align with their noticing of and revoicing of teachers' continued deficit-based talk.
- Teachers tended to increase their asset-based discourse about students' ideas and abilities over the course of the study - although deficit-based discourse about students' prior knowledge and linguistic resources remained.
- Tools and professional development practices, such as exploring student work and anticipating student responses to concrete formative assessment tasks, seemed to support teachers in taking more asset-based framings of learners.

INTRODUCTION: Current NGSS science framework documents set an ambitious goal of broadening participation in science learning for *all* students. Meeting this vision involves supporting teachers to make meaningful connections with the cultural and linguistic resources their students bring to school through developing pedagogies and assessments that frame these resources as assets important to learning. Unfortunately, progress in broadening access to and participation in science learning and assessment is often hindered when culturally and linguistically heterogeneous students as well as differently abled students are 'othered' in school settings. This particularly tends to happen within assessment systems that focus on identifying underperforming students or those who might benefit from remediation. In this manuscript, we present a qualitative case study of one community of high school science teachers who participated in a year-long professional learning focused on formative assessment co-design related to natural selection. We explore the following research question: *How do asset- and deficit-based discourses about students' science ideas and abilities surface in the process of formative assessment task co-design?*

FINDINGS: Findings show that the process of formative assessment co-design surfaced both deficit- and asset-based statements about students' science ideas and abilities. Teachers were more likely to share deficit-based statements across phases of the formative assessment co-design cycle as compared to facilitators, whose statements were more asset-based. At the same time, our analysis suggests that teachers were more likely to share asset-based framings of students' science ideas when practicing for and reflecting on enactment of formative assessment tasks. Findings suggest that the participation structures of the formative assessment co-design cycle-including

looking at student work - supported more asset-based talk turns from teachers over the course of the study.

Teachers' deficit-based talk about students' prior knowledge and linguistic resources tended to persist across phases of the formative assessment co-design cycle, even when the overall number of asset-based framing of student learning increased. Teachers' deficit-based framings about students' prior knowledge tended to focus specifically on lack of school-based and general prior knowledge as well as students' supposedly deeply held misconceptions about science. Teachers' deficit-based framings about students' linguistic resources often conflated multilingual students' ability to learn about natural selection with a lack of English language proficiency. This manuscript also highlights one specific instance toward the end of the study where a teacher pushed back against a fellow teachers' deficit-oriented talk about his multilingual students by encouraging him to look at what learning multilingual students did demonstrate on their short constructed response formative assessment instead of focusing only on what was missing or 'incorrect.'

TAKEAWAYS: First, we encourage *professional development providers* to embed tools and practices, such as those in the formative assessment co-design cycle, to support teachers in taking asset-based framings of students. Second, we encourage *science teacher educators* to explicitly embed opportunities for teachers to reflect on their potentially unexamined deficit-oriented discourses about students, especially linguistically minoritized students. Third, we encourage *policy makers* to consider how the structure of larger assessment systems may unintentionally set-up teachers to focus on 'gaps,' underperformance, and students in need of remediation that further marginalize students rather than promote equitable science assessment and learning opportunities.