Supporting multilingual students’ engagement in science practices: A case for fostering translanguaging science classrooms

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Introduction & Purpose

- The Next Generation Science Standards (NGSS States, 2013) emphasize students engaging in practices that are authentic to and common amongst the sciences to figure out their own understanding of the natural world (Osborne, 2014).
- Integrating science practices in classroom instruction has the potential to make learning spaces more equitable if an expansive view of scientific sensemaking is adopted, one that reflects the wide ranging meaning-making resources students use to communicate and make sense of core science ideas (Bang et al., 2017).
- Science practices are inherently language-intensive (Lee et al., 2013), a rigor augmented by two additional factors: The complex analytic tasks students carry out when using science practices often occur in real-time (González-Howard et al., 2017).
- Students frequently engage in multiple practices simultaneously (Osborne, 2014).
- Given these language demands, it is imperative to focus on the science learning experiences of multilingual students; these students typically have teachers who have not received training around science practices (Osborne, 2014), or the ways language is central to scientific sensemaking (Lee et al., 2013).
- The purpose of this work is to (a) provide a comprehensive synthesis of the literature regarding multilingual students’ experiences with science practices; which in turn is used to (b) offer concrete directions for future research in order to expand views around what is recognized and valued as scientific sensemaking repertoires.

Who are Multilingual Students?

- The term “multilingual” was intentionally chosen because it is asset-oriented and reflects our dispositions toward equity and justice (González-Howard & Suárez, 2021).
- Specifically, it positions these students’ as growing their semiotic repertoire from languages, race, ethnicity, socioeconomic and family backgrounds, schooling experiences, generational status in this country, and type of services received for English language development at school (e.g., ESL, ELL, bilingual) (NCES, 2013).
- Multilingual students - which make up nearly 10% of the total US student population (NCES, 2013) - are an extremely diverse group that vary across many factors including (but not limited to): the languages that they know and use (and proficiency in these languages); race, ethnicity, socioeconomic and family backgrounds, schooling experiences, generational status in this country, and type of services received for English language development at school (e.g., ESL, ELL, bilingual) (NCES, 2013).

Figure 1. Methods for Literature Review.

- Studies across explanation, modeling, and argumentation highlight the affordance of sensemaking activities occurring in smaller group structures (Swanson et al., 2014), incorporating English language scaffolds (González-Howard et al., 2017), and with students being encouraged to use all their communicative resources to mediate collaboration and meaning making (Suárez, 2020).
- However, contradictions emerged around teachers’ instruction (e.g., some language supports can constrain students’ construction of explanations; Rodríguez-Mojica, 2019).

Figure 2. Trends in Topics of Research Inquiry.

- Most studies focused on a single science practice (namely: explanation, argumentation, or modeling) (e.g., Wu et al., 2019; Larsson & Jakobsson, 2020, Suárez, 2020).
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- How students choose to engage in science practices is greatly determined by classroom norms; often explicitly and implicitly reinforced by teachers (Suárez, 2020).

Figure 3. Themes for Scientific Sensemaking
- How students choose to engage in science practices is greatly determined by classroom norms; often explicitly and implicitly reinforced by teachers (Suárez, 2020).

Directions for Future Research

- Multilingual students have historically received unequal and inadequate instruction in science (NASEM, 2018), an issue that is compounded by two related factors: Dominant views around language and its role in science - these views tend to focus on, and privilege, productive (writing, speaking) and receptive (reading, listening) linguistic skills, and consider non-linguistic forms of communication - like gestures, graphs, and drawings - as rudimentary and/or supplementary (González-Howard & Suárez, 2021).
- Certain approaches to doing science and expressing scientific knowledge are privileged over other approaches (Bang et al., 2017).
- To have a truly expansive view of how language is used for scientific sensemaking, attention should be given to how multilingual students engage in translanguaging when using science practices to figure out natural phenomena.

Select References