Interactional Approach to Language: Supporting All Students to Engage in Equitable Sensemaking in Science

Emily Miller, University of Wisconsin-Madison, eclyman@wisc.edu
Emily Reigh, Stanford University, evreigh@stanford.edu

Abstract: English Learners (ELs) simultaneously develop science understanding and acquire English as they engage in sensemaking in their classroom community. Yet, ELs are often positioned as lacking language, which excludes them from knowledge-building activity. In this paper, we introduce an *interactional approach* to language that positions all students as capable of leveraging their existing language resources to engage in science learning.

Introduction

The *Framework for K-12 Science Education* calls for students to engage in scientific practices (e.g. engaging in argumentation, constructing an explanation) to support their understanding of key science ideas and concepts (National Research Council, 2012). Science practices are *language-rich* and afford English language learners (ELs) the opportunity to simultaneously make sense of natural phenomena and develop their proficiency in English (Quinn, Lee, & Valdes, 2013). The *Framework* promotes a vision of equity in science in which the ideas of all students, including ELs, are valued for the purpose of building shared knowledge. However, ELs are often viewed as lacking the language resources to participate in rigorous forms of classroom learning, such as engaging in scientific practices through discourse (Snell & Lefstein, 2018). We argue that a shift in the approach to language in the science classroom can support the equitable participation of ELs and also enrich the group's sensemaking.

Equitable sensemaking and language

We draw from Fitzgerald and Palinscar (2019), who describe *sensemaking* as the process of using observations and experiences to explain complex phenomena. When engaging in sensemaking, students are "active, self-conscious, motivated, and purposeful in the world" (p. 2). Although sensemaking ultimately results in the construction of individual mental models, it is fundamentally a social process; the activity takes place in cultural and historical contexts in which we interact with others. Based on this conceptualization, we define scientific sensemaking as the dialogic activity of searching for meaning and coherence in the natural world using scientific ideas and practices. We use "dialogic" in the Bakhtinian sense to indicate that multiple perspectives and types of discourse are present in the conversation, each of which allows for new understandings (1981). Thus, sensemaking is more meaningful when diverse perspectives and language practices are represented

Yet, science classrooms often eschew genuine dialogue and instead privilege accounts that align with scientific canon. Students from non-dominant backgrounds, such as ELs, may find that their ways of knowing and speaking are not recognized in the classroom. *Epistemic exclusion* is the hindering of "one's ability to persuasively utilize collective epistemic resources in order to participate in knowledge production and, if required, the revision of those same resources" (Dotson, 2014, p. 115). In science dialogue, epistemic resources include individual contributions, the coordination of different contributions, and the shared meanings used to understand individual experiences. In *equitable sensemaking*, all students in the classroom have access to using and shaping these shared epistemic resources. Although the *Framework* calls for shifting participation structures towards equitable sensemaking, it does not describe a progression for such a change. In fact, by prescribing the key ideas and practices that students are expected to develop, the *Framework* may inadvertently contribute to the continued epistemic exclusion of historically marginalized students (Miller et al., 2019).

We argue that shifting the approach to language in the science classroom can support ELs' participation in sensemaking. Common language supports prescribe the specific types of language that ELs are expected to produce (e.g., word walls, sentence starters, picture dictionaries). This approach can contribute to epistemic exclusion in several ways. First, ELs are framed from a deficit perspective as lacking the language needed to participate. Second, ELs may be discouraged from contributing any ideas that do not use the prescribed language. Third, all students may be deprived of the opportunity to contribute to the development of epistemic or linguistic resources that result in shared understandings. Fourth, these scaffolds draw attention away from the support that may be needed for students to comprehend and engage with one another's ideas. In the next section, we suggest an alternative approach to language that addresses these limitations.

An interactional approach to language

We draw from van Lier's (2006) model of language that focuses on how linguistic resources within the community are mobilized in interaction. van Lier views language within the context of multimodal communicative events in

which individuals utilize social and material "affordances" for meaning making. Affordances might include ways of speaking, established relationships between individuals, or physical objects. van Lier describes language acquisition as learning to perceive affordances in an environment and leverage them within interactions. From this point of view, what constitutes useful language cannot be prescribed in advance; it is determined by making sense of the social and epistemic activity in the classroom and then soliciting the resources necessary to participate. From this view, ELs may add resources to the interaction, including other languages they speak (e.g. Spanish) or other forms of communication, which increases the total number of available social and linguistic resources available for meaning making (Ortega, 2019).

To give an example, imagine that students are generating a conceptual model of erosion. Typical language supports might include a list of components to include in the model, a word bank of terms to describe their interrelationships, and sentence frames to verbalize thoughts to their partner. In contrast, in the interactional approach, ELs and other students would work collaboratively towards a local, contextualized language goal. Each student is expected to understand and build on their partner's ideas about erosion using all available resources, including the visual model, physical materials such as sand and a water table, gestures, and other language resources (e.g., everyday language, formal language, Spanish). If students can comprehend, explain, and evaluate the other person's thinking, then explain why they agree or disagree, they have realized the language and content goals of the lesson.

This approach disrupts who gets to traditionally be heard (English speakers) and who is traditionally the audience (ELs). If creating shared meaning is the measure of competency, both interlocutors must seek out and draw from available resources. Rather than provide students with language that they are perceived to lack, this approach supports students to creatively leverage their existing resources to co-construct meaning through interactions. Through practice, all students will become more adept at this process and their language repertoires will grow as they respond to the discourses of their partner and develop shared scientific meanings.

Conclusion and implications

When ELs are epistemically excluded, they lose the opportunity to use language to engage in scientific sensemaking and the classroom community misses the chance to consider diverse ideas. Considering linguistic proficiency in terms of successful communicative interactions may allow participation structures to shift to more effectively include ELs in sensemaking. ELs may become idea generators, and their English fluent peers may acquire resources to consider diverse ideas. As students engage in this work, ELs and English fluent students may develop unexpected and innovative language resources to support their mutual communication. In this view of proficiency, all students are learning the dynamic and complex process of making sense of others' ideas. This involves a more significant level of challenge for English fluent students than is typically seen in heterogeneous classrooms. In order to support this process, teachers may encourage students to draw from linguistic, social, and material resources to persist in making meaning together. In conclusion, the interactional approach to language supports equitable sensemaking by providing more students with opportunities to engage in scientific practices.

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Acknowledgements

This project was funded by Lucas Education Research.