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A Book Review of Erin Marie Furtak's *Formative Assessment for 3D Science Learning: Supporting Ambitious and Equitable Instruction*

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BOOK INFORMATION

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Book Review

Formative Assessment for 3D Science Learning: Supporting Ambitious and Equitable Instruction, by Erin Marie Furtak, a former high school science teacher who now studies how science educators can improve their instructional practice through the use of formative assessment, presents an up-to-date look at how K-12 science educators can use formative assessments in their classrooms to provide educational equity and justice within the context of three-dimensional science learning experiences. Throughout the book, Furtak uses the concept of a "formative assessment activity system," which she has adapted from Engeström (1987, 2001) and Gee (2008) in which instruction and assessment, particularly formative assessment, take place. This formative assessment activity system is one that "encompasses tasks, processes, and more" that are utilized in a science classroom that work together to lead to the desired outcome of supporting and advancing students' science learning (p. 23-24). Furtak's stated goal is to "integrate research…to provide evidence for different approaches, as well as rich examples…that weave together literatures to push the conversation in science formative assessment to a new place" (p. xvii). The book is divided into three parts: framing, design and enactment within classrooms, and professional learning.

Part one of the book, Framing, contains three chapters that examine formative assessment in its past, present, and potentially future forms. Furtak invites us to "broaden our view" of formative assessments as they are traditionally used in science classrooms. She argues that we can utilize formative assessment systems to provide equity and justice for all students by shifting the focus from simply the tasks themselves, and students' immediate interactions with them, to a more holistic view that allows for more interactions, multiple voices, and the historicity of the activity or task as experienced by the students. By taking the wider view, the goal of science instruction can shift from just content knowledge to students engaging in the practices of science, which would allow formative assessments to usher in educational equity and justice as students can share their science knowledge using a variety of methods.

Part two of the book, Tasks and Practices, contain four chapters that break down four steps leading to a successful formative activity system (phenomena selection, the tasks themselves,

classroom enactment, and feedback). She walks through how a classroom educator can begin the process of shifting their formative assessment focus from gathering data on the accumulation of knowledge to pushing students to further their science understanding more deeply. When the four steps are implemented, students are provided the opportunities to engage in the science practices. These chapters include a plethora of examples of formative assessment tasks that teachers have implemented in their classrooms as part of Furtak's research. Part three, Beyond the Classroom, contains three chapters that provide insight into how professional teams can begin designing and using their own formative assessments. This includes how to use the data gathered, along with the learning progressions either from the *Next Generation Science Standards* (NGSS) or curricular materials, to advise the classroom system.

The book does an excellent job outlining current research on science learning and teaching in the wake of the adoption of the NGSS (and the ongoing efforts to implement its vision), while still remaining accessible to a practitioner audience. Whether a classroom teacher, non-educator, or administrator reads this book, the research basis of the book is clear, but not overwhelming. That research base lays the foundation for the practical pieces that follow. As a K-12 science educator who has struggled to shift my instructional practice to align with the vision of the NGSS, I appreciated this book and its evidence-based examples that were from classrooms around the United States. Furtak's proposal to shift our assessment focus from the accumulation of knowledge by students (focusing on the NGSS Disciplinary Core Ideas) to providing them opportunities to demonstrate their proficiency of Science and Engineering Practices is, in my mind, the missing piece needed to make the final leap to a classroom that is daily working toward the vision of the NGSS. The information and ideas presented by Furtak are almost immediately usable, which is a welcome sight for the ever-stressed science educator.

One of the themes throughout Furtak's book is the claim that rethinking our approach to formative assessment in science will provide for a more equitable and just science education for all. I find this claim compelling and very well supported throughout the book. By providing students with tasks that are related to phenomenon that they might already have some experience with, all students are provided a means to begin with some of their own ideas. As tasks are developed and implemented, students are given the opportunity to convey their understanding along the way in whatever means they find most beneficial. Implementing a formative assessment system as Furtak describes, and some recently published curricula include, ensures that all students regardless of their background, have access in a way that likely does not exist in more traditional assessment systems.

I see this book as being appropriate for both an in-service teacher audience and a pre-service teacher audience. For in-service teachers working to implement the NGSS in their own classrooms, this book offers plenty of text with which we could reflect on, and even critique, our own practice. Changing long-established practices is no easy task and Furtak provides a pathway to at least begin having those conversations with colleagues. Pre-service teachers can also benefit from this book as part of their teacher preparation program. As they are learning about the NGSS and the vision laid out in the *Framework*, this book can offer them a foundation to begin considering how they will work to assess student science understanding in their own classrooms in the future. If they entered the profession with a vision for how they would like to assess science learning, hopefully they would be less likely to not fall into the way things have always been done.

As a K-12 science educator, I know that we engage in our practice within the confines of an educational system that does not seem quite ready to let go of the ways of the past, including the century-old practice of assigning grades. And while Furtak does a remarkable job of outlining the research and rationale behind the necessity of a pedagogical shift, I was hoping to get more of a sense of how this translates to the nitty-gritty of determining student understanding that could translate to a grade. Yet a discussion of how formative assessments and their proper implementation fit into the larger mechanism of a school's or classroom's grading scheme, if at all, seems necessary for teachers

to begin altering long-established practices. A welcome addition to the book would be more connections to the messier side of implementation, specifically grades and how this works with students who are not used to these types of assessment.

Overall, Furtak presents a well-researched and supported argument for revamping our ideas of formative assessments and how they can provide an equitable and just science learning experience for all students. *Formative Assessment for 3D Science Learning* is a readable and valuable resource for educators looking for research-based strategies on NGSS implementation, as well as examples of what science educators around the United States have done in the decade since the release of NGSS. Furtak hopes that the book "allows us to step back to view the larger systems influencing what is possible in assessment, as well as mechanisms to both interrogate and change the current state of practice" (p. 179). I believe that she has provided a resource for classroom educators that can be the impetus for exactly that.

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