Book Review/Recension d'ouvrage

Science in the City: Culturally Relevant STEM Education
by Bryan A. Brown
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As educators we often underestimate the richness of our students' linguistic and cultural backgrounds in their learning. Each of our students comes from a deep socio-linguistic milieu that extends across their lives. In Bryan A. Brown's "Science in the City: Culturally Relevant STEM Education" he argues that the linguistic and cultural understanding that students bring into the classroom are especially relevant to their progress in science. Although this book emerged from an American context, it has many extensions for the Canadian educational landscape.

Canada prides itself as a multicultural country which is accepting of peoples of all ethnicities and linguistic backgrounds. However, it cannot be ignored that the education system privileges certain ways of knowing, speaking and understanding. Brown makes the argument that nowhere is this more evident than in science, because it requires both conceptual and language learning, whereby students must demonstrate both an understanding of concepts as well as be able to communicate using scientific language. Learning these parallel systems can be especially difficult for students from cultural and linguistic minority backgrounds and, in some cases, the challenge can alienate them from the subject altogether. Brown situates his case primarily within minority black and brown students in the United States. In Canada, this phenomenon can be observed in the underachievement in science (Canadian Council for Learning, 2007) and the underrepresentation in STEM careers of socio-economically disadvantaged first nations students (Aikenhead & Elliott, 2010).

In the first half of the book, Brown provides an overview of how the psychological, sociological, and linguistic histories of oppression have made their way into contemporary science classrooms. He begins by describing the generational educational dilemma. Readers are encouraged to view education along a timeline which shows that years of historical oppression have produced the current educational conditions which disadvantage certain groups along racial, linguistic and socio-economic boundaries. In Canada, generational trauma is a reality faced by many first nations students. The last residential school closed in 1996 and the implications of residential school policies and the associated family trauma continue to affect proceeding generations of first nations. Although Canada no longer operates residential schools and underwent a process of truth and reconciliation, a legacy of trauma persists in classrooms and affects first nations students' sense of belonging in academic spaces. Brown argues that linguistic racism still exists in schools and shows up in the ways cultural language practices can be viewed as deviant, deficient, and undesirable in the classroom. Inviting students to bring their rich cultural and linguistic understanding into the science classroom would empower them to engage more deeply with the content and encourage their academic identity.

As a field, science has developed a complex vocabulary, where the appropriate use of technical jargon and syntax are often used as gatekeepers for membership into the community. In order to be expedient, facing the pressures of time and curriculum, science teachers often expect students to immediately comprehend and produce scientific vocabulary. This practice privileges students who "know the answer" and excludes students who may have had less historical and familial access to the language of science. Brown proposes that by privileging certain linguistic systems over others, science teachers are ignoring the deep conceptual understandings that all students bring to science. Brown does not advocate for the exclusion of scientific vocabulary in classrooms, rather, he argues that science teachers need to start by accessing what students already know through their culture and experiences. This is particularly important for students from linguistic and cultural minority backgrounds, where taking into account students' cultural repertoires and ways of expressing knowledge will provide an access point into science learning.

In the second half of the book, Brown provides recommendations for practice and policy to improve the way cultural and linguistic minority students experience science. Language is intertwined with affect and the goal of Brown's pedagogical approach is to reduce the anxiety and affective responses to complex discourse by reducing initial cog-

nitive load. Brown advances the idea of disaggregate instruction wherein conceptual and language learning are treated as distinct elements of the curriculum. At the beginning of a concept, Brown recommends teachers allow students an opportunity to "encode" what they already know by using their own framework and language. Next teachers should explicitly teach vocabulary and orchestrate authentic experiences for students to express concepts using scientific vocabulary. Self-explanation is a valuable, underused strategy in classrooms and students who explain become students who learn using a dynamic set of cultural resources and modes of discourse. Using illustrative examples of his research, Brown conveys that these strategies will help ensure that all students see the value of science in their lives.

In the final chapters, Brown offers up the strengths and weaknesses of the current state of STEM education. His overview is largely based on the American context but there are some relevant points for Canadian educators. For instance, Brown contends that our teachers do not reflect the diversity of our students and that, in the very least, schools of education should explicitly prepare science teachers to value and understand the cultural benefits of all languages and dialects.

The 2015 publication of the final Truth and Reconciliation Commission report emphasized the need for the Canadian education system to value and include first nations forms of knowing and understanding (Truth and Reconciliation Commission of Canada, 2015). In recent years provinces have been making changes to curricula to include indigenous knowledge (Kim, 2015; Kim, Asghar & Jordan, 2017). This is a step in the right direction, but Brown's argument serves as a practical reminder that Canadian educators must go beyond solely altering content delivery to accommodate other cultural perspectives. Importantly, educators must make space for student voices and experiences in the classroom. Brown's book represents a universal call for educators to lift up the voices of linguistic and cultural minority students. Ultimately, giving all students the opportunity to use their rich linguistic and cultural knowledge in the science classroom will allow them to interact with the content in a meaningful way and provide a pathway for them to demonstrate their scientific intelligence.

References

Aikenhead, G.S. & Elliott, D. (2010). An emerging decolonized science education in Canada. *Canadian Journal of Science, Mathematics and Technology Journal, 10(4)*, 321- 338.

Canadian Council on Learning. (2007). *Lessons in learning: The cultural divide in science education for Aboriginal learners.* Retrieved from http://en.copian.ca/library/research/ccl/lessons_learning/cultural_divide/cultural_divide.pdf

Kim, E.-J. A. (2015). Neo-colonialism in our schools: Representations of indigenous perspectives in Ontario science curricula. *McGill Journal of Education / Revue des sciences de l'éducation de McGill, 50 (1),* 119–143.

Kim, E.-J.A., Asghar, A. & Jordan, S. (2017). A critical review of traditional ecological knowledge (TEK) in science education, *Canadian Journal of Science, Mathematics and Technology Education, 17(4),* 258 - 270.

Truth and Reconciliation Commission of Canada. (2015). *Final report of the Truth and Reconciliation Commission of Canada: Summary: Honouring the truth, reconciling for the future*. Winnipeg: Truth and Reconciliation Commission of Canada.