Chapter 19
Metalogue: Critical Issues in Teaching Socio-scientific Issues

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Pedagogy for SSI

Brotman: Despite numerous links to complex SSI, the topic of reproduction has not been a frequent focus of SSI research. This chapter vividly illustrates the potential for topics related to reproduction to engage students in the kind of thinking promoted by the SSI movement. It was refreshing to see that students responded positively to the reproduction unit, and that it prompted them to become more aware of their own and others' beliefs, to more deeply understand these issues, to see these issues as personally relevant, and to reflect upon the interplay between science, society, and ethics. I would like to further explore the question of what aspects of this reproduction unit made it largely successful, as well as what recommendations for improving the unit the author and others might suggest. More specifically, I would like to raise questions about two aspects of the curriculum: the learning activities and the approach of the teacher.

The specific learning activities chosen to address reproduction issues (defining terms, oral presentations, whole-class discussion) raised several thoughts and questions for me. It was interesting to see how students' engagement and involvement in the discussions around the oral presentations improved over time. It seemed that this shift was partially related to an adjustment to a new kind of classroom culture, where open-ended discussion was expected as opposed to diligent note-taking, as well as to students' need for some time to get comfortable sharing beliefs and ideas about personal, contentious issues. I think these are both important issues for

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teachers of SSI to consider. However, I also wondered whether additional structures might have been built into the activities themselves to trigger more debate and discussion from the outset. For instance, could the specific requirements/directions for the oral presentations have been articulated so as to trigger debate and discussion more explicitly? Were there ways in which the teacher might have prepped students for the shift in classroom culture that addressing SSI often demands? What have we learned in relation to the benefits and drawbacks of these particular learning activities as ways to address SSI?

In terms of the approach of the teacher, I appreciated Vaille's highlighting of the importance of Lillian's "caring approach" as well as the need to establish a "safe and caring learning environment" when discussing sensitive issues such as these. What strategies or insights can we explicitly articulate from this chapter about how to go about doing this? How can we as a research and teacher education community better support teachers in developing this kind of caring approach and safe classroom environment?

Dawson: Jennie has raised some very good (and difficult) questions that have made me ponder what I learnt from this case study and what I have learnt since. In some ways I think that I am probably less certain about some aspects of teaching SSI than I was when I commenced research in this area. I have wondered whether more structure might have prompted students to engage in more debate and discussion. This would have required explicit intervention from me which was not the intent of the research. In conducting professional development more recently I have provided explicit lesson plans to teachers. Many teachers in these sessions have gone on to use the materials but for some the lessons became contrived and had limited effectiveness. Alternatively, some of the experienced teachers with whom I have worked chose not to use the materials and facilitated effective discussions.

In the case of this particular research, Lillian was very sensitive to the needs of her students. Her 16-year-old students were attending a conservative Catholic girls' school, and the topic of reproduction needed to be handled carefully. By keeping her activities relatively unstructured she was able to be responsive to their needs. The teacher was also finding her way. I think that if teachers need to take away anything from professional development on SSI it is to realize that it may be difficult and scary to change your teaching. Also, it may take longer to teach content. Students need to be receptive to change and a wide range of strategies; they need to be able to participate in group work and whole-class discussions. The type of SSI used needs to be in context. Finally, I think that the most important factor is the teacher!

Brotman: Vaille raises an important point about the possibility that lessons can become contrived and thus less effective with more structured plans, particularly those designed by others. And, it is interesting that Vaille found the less structured approach to make it possible for Lillian to respond to her students' needs. In my work, I have also observed the powerful impact and critical role of a good teacher, particularly one that develops trusting, caring relationships with students, as it seems Lillian did.

Mensah: I agree with the importance of teachers having some flexibility and less structure to teach, and how a "good teacher" is able to teach in ways that address the range of learning needs of her students. I also agree that good teachers should develop trusting, caring relationships with students. We cannot underestimate the significance of teacher-student relationships to promote an environment conducive to learning. However, I want to push the conversation in order to explore the role of the good teacher as social advocate. I mention this in the context of work that I do in preservice teacher education. I am also flexible in my teaching, accounting for the diversity of teacher candidates that enroll in my courses, and I develop trusting and caring relationships with them, yet I also assume the role of a social advocate trying to push my students' thinking beyond their current perspectives (Mensah 2009). I think Lillian attempted to do the same acting as "devil's advocate", yet the girls were slow to speak but quick to listen. As teachers, how do you move students from comfortable places of listening—where the girls were completely engaged in writing notes as they listened to oral presentations—to engage in difficult dialogues? I know these are high school girls, but I am also challenged to engage teacher candidates in difficult dialogues pertaining to education, and in my secondary biology methods course, the same for addressing SSI issues in biology. I know this is challenging for teachers, but I also believe that difficult dialogues within classrooms will mirror and prepare students and teachers for "adult" and real-world conversations and debates that are sure to arise regarding SSI. It seems that SSI issues and understanding the complexity that comes from learning about multiple perspectives warrants more in the role of the teacher to be a social advocate or devil's advocate. How might the teacher take up this role in the classroom and structure these moments in critical points in classroom conversation or debate?

Contexts for Teaching and Learning

Mensah: Context was also an integral part of this study and how the teacher and students learned about the topic of reproduction in an all girls Catholic school setting. Context for so many researchers is often assumed, yet in this study, context was relevant in a myriad of ways. For example, I find it interesting that in an all girls Catholic school, the issue that was discussed most often in the oral presentations and on the questionnaire responses was abortion, and that gender issues did not seem to have as strong a focus during classroom oral presentations and questioning. Vaille stressed that the teacher highlighted the Catholic church's viewpoint; yet, I was curious to know more about how the specific context of an all girls Catholic school setting influenced conversations about reproduction and abortion and values, beliefs and context. Lillian is a female, and I wondered why conversations about reproduction and gender issues were not addressed more explicitly. Therefore, as I consider context and the specifics of this study, I began to wonder about the role of our own values and beliefs as teachers (and researchers) and if/how/why we neglect to include values in classroom discussions, particularly in our

discussions of SSI? And what do we neglect in the development of lessons and curriculum, whether SSI or not, that closes avenues for students and teachers to engage in pedagogical practices that allow for deeper conversations of the content and contexts that we are teaching and learning?

Decision-Making

Brotman: This chapter also prompted me to think about what we want students to understand about decision-making processes. In the chapter, decision-making is largely described as a process of using facts and information, including the multiple perspectives of others, to weigh the advantages and disadvantages regarding particular SSI in order to come to a decision. Students come to recognize the "importance of using knowledge in decision-making" (p. 339) and their questionnaire responses related to this topic highlight the significance of "know[ing] the facts" and having all the "information" about the issue. Their responses to "how to resolve ethical issues" also call attention to "getting all the information possible" and "look[ing] at the advantages and disadvantages" (p. 340).

Certainly, gathering information and multiple perspectives in order to weigh different sides of an issue are critical aspects of decision-making, and ones that we want to relay to students. But are there other, perhaps messier, aspects of decision-making processes, or alternative models of thinking about decision-making that we might want students to also understand? For instance, people in the fields of cognitive psychology and health behavior have questioned whether individuals making choices do in fact weigh pros and cons in a rational way in order to make decisions in real-life situations (Reyna & Farley, 2006). My own research has attempted to complicate how we think about decision-making by illustrating how sexual health decision-making is tied to issues of identity for high school students (Brotman, Mensah, & Lesko, 2010). I think Sadler and Zeidler's (2005) study illustrating "rationalistic, emotive, and intuitive forms of informal reasoning" (p. 112) and how these forms interact in nuanced ways in relation to socioscientific decision-making provides further support for this perspective.

Vaille's recommendations for teachers include teaching students about "decision-making processes" and that "to resolve issues, they need to seek information" (p. 344). In addition to this important point, what else, if anything, do we want students to understand about decision-making processes?

Dawson: I would like to emphasize that this case study was a naturalistic study where the teacher set the agenda and my role was as an observer and supportive critical friend. Thus I was not imposing an external intervention on Lillian and her students. This teacher and others I have worked with do prioritize the importance of having information and knowing the facts before a decision can be made. There are other factors related to decision-making which in professional development with teachers I would now emphasize. These factors include listening to and

tolerating, if not respecting, the views of others (peers, teacher, and community); being aware of multiple perspectives; suspending judgment; being prepared to change one's mind if presented with evidence; questioning the veracity of evidence; distinguishing evidence from opinion; realizing that making a personal decision may be difficult and time consuming; and being prepared to defend a decision with evidence.

Mensah: Vaille, these are very important factors in promoting decision-making and I would add also in promoting more inclusive learning environments. One major area that researchers and teachers fail to connect SSI with is multiculturalism, and I offer this connection to multiculturalism broadly to include culturally relevant teaching (Ladson-Billings, 1995). Though culturally relevant teaching is emphasized as a method of educating all students, I find similarities between decision-making and culturally relevant teaching. Ladson-Billings presents three criteria for culturally relevant pedagogy: (a) Students must experience academic success; (b) Students must develop and/or maintain cultural competence; and (c) Students must develop a critical consciousness through which they challenge the status quo of the current social order. Vaille, I see a direct connection between issues you have raised in your chapter and the third criterion for culturally relevant teaching. I believe the idea of critical consciousness was evolving from Lillian and her students' understanding of reproductive issues.

Ladson-Billings (1995) contends that culturally relevant teachers "engage in the world and others critically," and in order to do this, "students must develop a broader sociopolitical consciousness that allows them to critique the cultural norms, values, mores, and institutions that produce and maintain social inequities" (p. 162). Here I see a strong and useful framework to assist teachers in becoming "good teachers" of students and helping students in the process of decision-making. If students come to understand that the process of schooling is not simply learning facts, but learning allows them to take facts and other information and situate it all within a larger sociopolitical framework, this will equip them to make adult decisions—decisions that are value-laden, emotional, political, and debatable.

Brotman: Decision-making often involves a strong emotional component, one that cannot always be supported with evidence. I would also argue that decision-making can be tied to how people see themselves, and how they want others to see them. I have been trying to understand the ways in which our relationships and interactions with others and the world around us, including societal discourses around SSI, factor into our decision-making processes. These aspects of decision-making seem to me to be important for teachers to understand, as they highlight the potential complexity of decision-making as it may happen in the real-life scenarios we are aiming to prepare our students for.

Mensah: And the real-life scenarios for which we prepare our students to make decisions definitely require critical consciousness. What may be even more challenging is that teachers will have to be selective of topics and take a certain level of risk in their topic selection.

SSI Topics

Dawson: There are many different SSI that may be selected by a teacher. Choosing a particular SSI topic will depend on many factors including the mandated curriculum, interest and expertise of the teacher, students' interests and age. In the case study described in this chapter, the teacher chose the topic of reproductive technology, an area that is controversial in the context of a Catholic girls' school where students must be made aware of the Catholic perspective. The content area of reproduction is of interest to 16-year-old girls. Also the teacher had a biology background and expert knowledge in the area. Reproductive technology is available in Australia but is expensive and is the subject of debate in the media. Issues around reproductive technology raise strong emotional responses from those affected by infertility. However, in some contexts, for example conservative Christian schools, boys' schools or schools located in countries with less health care, the topic may not be considered appropriate. Thus, what criteria should be used when deciding on a topic? Are there some SSIs (perhaps climate change) that are universal?

Mensah: Teachers will select and teach topics that they have confidence in teaching. Their decision-making regarding topic selection is very much related to self-efficacy, content knowledge, and pedagogical content knowledge. However, should we treat all topics equally? How do we decide which topics to teach? Do we pay particular attention to those topics that have local interest yet global relevance? Because our world is increasingly becoming more accessible to issues of local, state, national, and global significance, how does a teacher, or a community, truly decide which SSI to teach in schools? For example, there are some issues that are under-addressed in the school curriculum, such as clean water or organic food production. I recognize that the school curriculum is stressed—teachers are held accountable for teaching the "mandated" curriculum, yet how many learning opportunities are lost when topics that potentially have more far-reaching consequences on our understanding (i.e., local and global stability) are not considered to be part of the mandated curriculum?

Brotman: Vaille and Felicia highlight many of the criteria that I see as being critical for selecting appropriate SSI: alignment with the curriculum, teachers' interests and comfort level, students' interests, school and societal context, and prevalence of ongoing debate in the current media. In a related vein, some SSI might be particularly relevant locally, and may provide opportunities to reach out to local informal institutions and resources with the potential to enrich SSI curriculum through real-world connections. While certain issues might often fit these criteria and thus be frequently addressed in classrooms, like climate change, the above factors will always need to be considered in deciding on a topic. In particular, I think students' interests and perceptions of the relevance of the issue to their lives are critical (as we saw in this chapter), and those interests will vary depending on the context. I would also argue that providing teachers with strategies for choosing SSI based on students' interests would be a useful approach to explore.

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