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Integration and Metacognition: Engaging Metacognitive Capacity Building Strategies to Enhance Interdisciplinary Student Learning

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Abstract: One of the great challenges interdisciplinary programs face is figuring out how to get students to engage subject matter in a truly integrative way. To accomplish integration, students do not need to become experts in multiple fields, but they do need to understand how multiple modes of thinking, theoretical lenses, and content knowledge can be integrated so as to be applicable to real world issues. To complicate matters further, to become truly critical, analytical thinkers, students also need to integrate interrogation of their own processing strategies, attitudes, and biases into the interdisciplinary process. This combination of theoretical knowledge, content knowledge, and critical self-reflection is difficult for interdisciplinary

students to do and equally difficult for instructors to teach them to do. One invaluable tool to aid in this challenge is a curriculum based on a critical pedagogical approach that explicitly focuses on metacognitive development. The objective of this article is to aid interdisciplinary educators in developing the integrative thinking and reasoning processes of their interdisciplinary students by reviewing the metacognition literature and by demonstrating the value of specific pedagogical practices that explicitly and critically engage students in metacognitive capacity building.

Keywords: case study, digital storytelling, implicit bias, integration, interdisciplinary, metacognition, student learning

One of the great challenges interdisciplinary programs face is figuring out how to get students to engage subject matter in a truly integrative way. Integration, for interdisciplinarians, is the synthesis of critically examined insights from multiple perspectives to create a more holistic understanding of a subject (Repko & Szostak, 2017). To accomplish integration, students do not need to become experts in multiple fields, but they do need to understand how multiple modes of thinking, theoretical lenses, and content knowledge can be integrated so as to be applicable to real world issues. To complicate matters further, to become truly critical, analytical thinkers, students also need to integrate interrogation of their own processing strategies, attitudes, and biases into the interdisciplinary process. This combination of theoretical knowledge, content knowledge, and critical self-reflection is difficult for interdisciplinary students to do and equally difficult for instructors to teach them to do.

In this article, we explore one invaluable tool to aid in this challenge: metacognitive capacity building. Metacognition is "one's knowledge concerning one's own cognitive processes or anything related to them, e.g., the learning-relevant properties of information or data" (Flavell, 1976, p. 232). Put more simply, metacognition is thinking and learning about how one thinks and learns. Research on metacognition shows that engaging students in metacognitive learning experiences produces better learning strategies and knowledge construction (Spellman, Deutsch, Mulder, & Carsten-Conner, 2016; for examples, see Hewson & Thorley, 1989; Flavell, 2004; Chick, Karis, & Kernahan, 2009; Chua, Morris, & Mor, 2012; and Spellman, et al., 2016). Indeed, Schraw, Crippen, and Hartley (2006) contend that teaching for metacognitive development improves learning more than focusing on content knowledge only. And to thus improve learning, metacognitive capacity building should be an explicit component of instruction (Pintrich, 2002). When teachers use explicit metacognitive capacity building pedagogies they force students to examine the ways in which they learn and the biases they bring to their learning context. A focus on metacognition will help

students unpack their current strategies for knowledge building and aid them in determining new approaches to examining the content in front of them, both processes particularly helpful to those new to interdisciplinary study. Additionally, these processes are helpful in Interdisciplinary Studies programs that ask students to create their own courses of study. The more students are taught to think about their own learning, the more able they are likely to be to craft a personally meaningful degree and emerge from the degree process as capable in all the ways interdisciplinarians must be.

The objective of this article is to aid interdisciplinary educators in developing the integrative thinking and reasoning processes of their interdisciplinary students by developing the metacognitive capacities that will enable better practice of those processes. To that end, we offer a review of the metacognition literature and a demonstration of some specific pedagogical practices that explicitly and critically engage students in metacognitive capacity building.

Challenges Facing the Interdisciplinary Learner

Interdisciplinary educators strive to work in collaboration with disciplinary-based colleagues to prepare students for an ever-changing and complex global world. Calls for interdisciplinary approaches to academic research and real world problem solving come from various arenas. For example, major grant-funding organizations in the U.S. such as the National Science Foundation (NSF, n.d.) and National Institutes of Health (NIH, 2017) increasingly reward integrative approaches to research and knowledge production. Stakeholders from legislators and corporate executives to community organizers and skilled tradespeople use research based in interdisciplinary process to make informed decisions about multifaceted real world problems. Recognizing the need for interdisciplinary thinkers and actors, employers report valuing many of the skills common to interdisciplinarity, including creative-problem solving, strategic-thinking, communication skills, and leadership skills, which they also consider "hard to find" (Levy & Cannon, 2016). The call for interdisciplinary capacities is widespread.

While the need for capacities that enable interdisciplinary investigation is clear, interdisciplinary students (and their teachers) face a number of specific and unique challenges. To begin with, ID students must familiarize themselves with ways of speaking and ways of knowing (e.g. interdisciplinary, integrative) different from those typically encountered in K-12 education. As knowing becomes doing, students must also become

familiar with multiple disciplines' "defining elements," or their phenomena, epistemology, assumptions, concepts, theories, and methods (Repko, Szostak, & Buchberger, 2017, p. 133). Recognizing and understanding the defining elements of even one new or unfamiliar discipline, much less more than one, may prove daunting for senior scholars let alone undergraduate students (and those teaching them).

Fortunately, interdisciplinarians, especially at the undergraduate level, need only develop adequacy, rather than mastery, in relevant disciplines (Repko & Szostak, 2017). As students gain adequacy in relevant disciplines, they will begin to see the strengths and limitations of disciplinary perspectives in relation to any specified problem. Identifying useful insights drawn from different perspectives sets students up for the process of integration, defined as "the cognitive process of critically evaluating disciplinary insights and creating common ground among them to construct a more comprehensive understanding" (Repko & Szostak, 2017, p. 21), and "one that would not have been possible using a single discipline" (Boix Mansilla, 2005, p. 20). Of course, this process is challenging. In order to integrate disciplinary insights, students must learn techniques for integration, or creating common ground, which vary depending upon the nature and extent of the conflict among the disciplinary insights in question (Repko & Szostak, 2017). Menken and Keestra (2016) propose three techniques that can assist those attempting integration: adding, adjusting, and connecting. Adding allows for the extension of a theory, for instance, into another discipline; disciplinary theories can also be adjusted by taking into account insights from other disciplines; and connection across disciplines can be achieved by finding common ground through a shared idea. These techniques exist on a continuum and may be used in combination. Naturally, learning the language and techniques for the whole of this process of integrative research takes time, practice, communication, and extensive faculty guidance to help students understand and implement all of the steps involved. Yet, with early and consistent training, undergraduate students can learn to engage in interdisciplinary integration (Newell, 2006), especially if that training includes metacognitive capacity building.

If we home in on the interdisciplinary or integrative classroom, we can understand why the dynamics and focus of this space can feel novel and disorienting for students. Encountering the academically diverse group of peers that inhabit such a classroom and navigating their varying backgrounds, interests, and ways of communicating can prove difficult. Because students typically arrive in such an undergraduate classroom with different disciplinary training than that of many of their peers (and even

their instructor), they may not share common perspectives, theories, or methods that often unite learners in a disciplinary-based classroom in which all operate under a shared umbrella of language, knowledge, and experience. Similarly, prioritizing learning grounded in issues and problem solving, as those in interdisciplinary classrooms typically do, in contrast to subject matter, as in disciplinary classrooms (Menken & Keestra, 2016), can leave students searching for their bearings. While these differences from what most students are used to can prove challenging, they also open up possibilities for communication across difference, a skill that Buis, Post, and Visser (2016) identify as a hallmark of interdisciplinary research and learning. For that communication to become possible, however, students must develop the ability to better understand their own thoughts, assumptions, and beliefs as well as those of others. It is in this process that metacognitive capacity building can play a crucial role in the development of the interdisciplinary learner.

Metacognition and Metacognitive Capacity Building

Metacognition is (again) broadly defined as "one's knowledge concerning one's own cognitive processes or anything related to them, e.g., the learning-relevant properties of information or data" (Flavell, 1976, p. 232) or is (again) thinking and learning about how one thinks and learns. Metacognitive capacity, that refers to the extent to which we are able to examine our own cognitive processes to impact our thinking and learning, can be expanded through intentional and explicit cognitive efforts (Pintrich, 2002).

Flavell's (1979) pioneering work on metacognition breaks metacognitive knowledge into three categories: strategy, task, and person. *Strategy,* or, strategic knowledge, is knowledge of strategies for learning, thinking, and problem solving that are applicable across all or most domains (Pintrich, 2002). *Task*, or knowledge about cognitive tasks, concerns developing an understanding that tasks may be different under different conditions and thus may require different strategies for their completion (Pintrich, 2002). Paris, Lipson and Wixson (1983) further describe cognitive task knowledge as involving learners needing to develop knowledge about the "when" and "why" of using certain cognitive strategies. Finally, *person*, or self-knowledge, encompasses, as Flavell (1979) puts it, "everything that you could come to believe about the nature of yourself and other people as cognitive processors. It can be further subcategorized into beliefs about intraindividual differences, interindividual differences, and universals of cognition" (p. 907).

In addition to these three categories of metacognitive knowledge, there are three metacognitive processes we engage in to retrieve stored, or possibly stored, information and/or build new knowledge: monitoring, controlling, and gathering knowledge about metacognitive processes (Miller, 2017). *Monitoring* refers to how we actively monitor our memory to determine whether we know something or not and if we do know it, if we can retrieve it or not. The "tip of the tongue" state, for example, is an instance when we perform metacognitive monitoring, determining that we know something, but that we ultimately cannot retrieve it (Miller, 2017). *Controlling* refers to the process when we intentionally direct our thinking. This could involve anything from the best way to learn a new skill to the best way to complete some task. Finally, there is *gathering knowledge about metacognition*, which refers to "a person's beliefs about cognitive processes" (Miller, 2017, p. 2). An example would be a person's beliefs about the roles of the conscious and unconscious minds in decision-making. These three metacognitive processes are quite important in metacognitive capacity building because, as Miller (2017) states, "[they] operate in concert at each phase of learning (i.e., encoding, storage, and retrieval)" (p. 2).

Individuals can and do develop metacognitive knowledge outside of academic environs and without outside facilitation (Flavell, 2004), but there is great value in incorporating metacognitive capacity building into the instructional process in any learning environment. Spellman, Deutsch, Mulder, and Carsten-Conner (2016) detail some of the major findings of research in this area:

> [B]enefits include longer-term retention and deeper understanding of science concepts (Blank 2000, Georghiades 2000, 2004), greater flexibility and innovation in how knowledge is learned and applied (Rickey and Stacy 2000, Rosencwajg 2003), improvement in reading comprehension (Loper and Murphy 1985, Brown and Palincsar 1989, Gourgey 2001) including reading on science topics (Yore et al. 1998, Koch 2001), improvement in academic achievement (Loper and Murphy 1985, Brown and Palincsar 1989), and increase in problem-solving ability (Carr and Jessup 1996, Stillman and Galbraith 1998, Zan 2000, Pugalee 2001, Schurter 2002, Kauffman et al. 2008). (p. 7)

Additionally, and as noted in our introduction, when being explicitly taught for metacognitive development, students develop more advanced learning strategies, are better equipped to construct knowledge, and learn content knowledge better than they do with instruction that focuses solely on content.

Intentionality is crucial for this enterprise to be successful, which is why

there is value in developing an interdisciplinary curriculum that incorporates metacognitive capacity building by following an educational philosophy that engages the self in relation to the world in which the self resides. Critical pedagogy is just such a philosophy as this approach embraces a constructivist view of the world that is predicated on interrogating and perhaps upending societal inequities through deconstructing and reconstructing the narratives being examined (Kincheloe, 2008). Deconstruction is the procedure of surfacing false binaries that are pervasive and sustained by cultural systems of belief and ideology (Derrida, 1977). Or as Dugan (2017) describes it, deconstruction involves "the process of deeply examining taken-for-granted assumptions related to stocks of knowledge, ideology/hegemony, and social location" (p. 43). And, of course, *that* involves deep examination of the self. Reconstruction follows deconstruction as a tool that "draws on personal power, knowledge, and identity to alter, adjust, adapt, or otherwise rebuild theory in ways that contribute to a more just world" (Dugan, 2017, p. 46). Use of both deconstruction and reconstruction helps students just starting interdisciplinary study construct a new understanding of real world problems and their roles in confronting those problems, with the metacognition involved enabling the integrative practices at the heart of the interdisciplinary process.

To reiterate, both metacognition and the interdisciplinary process (with its integrative practices) draw upon the personal to inform the academic. Both value weaving together educational and life experiences in order to create more complex and holistic insights (Tanner, 2016). And the same metacognitive thinking that supports the development of self-analysis and the application of resultant insights also supports the development of empathy or insights into others and attendant skills in written and oral communication, abilities also crucial to interdisciplinary investigation. Thus, metacognition can be particularly useful in an introductory-level interdisciplinary classroom where students' abilities are "emerging" but not yet as developed as they will need to be (Carmichael & LaPierre, 2014, p. 63). Of course, we might finally note that pedagogy promoting metacognition aligns especially well with an interdisciplinary studies classroom in which students are learning to do integrative work because metacognitive theory is itself integrative. Early research on metacognition synthesized insights from education and psychology (Chick, n.d.) setting up continued productive conversations across these and other disciplinary knowledge bases.

The next section of this article will detail lessons that explicitly engage metacognitive capacity building activities to improve interdisciplinary students' abilities to work on real world issues. These lessons we have

chosen to highlight do not represent a comprehensive curricular plan for an interdisciplinary course or program, but rather show the range of contexts and approaches where metacognitive capacity building techniques can be applied to the learning experience to improve the practices of integration that interdisciplinary work requires. The first lesson, on implicit bias, can be completed in two to three class meetings and would be appropriate for brand new interdisciplinary students. The second lesson, on the production and transmission of tar sands oil, can be completed in two to three weeks and would be appropriate for an introductory or intermediate Interdisciplinary Studies course. The final lesson, on leadership identity development, takes a semester to complete and would be appropriate for an advanced Leadership Studies student.

Lesson One: Implicit Bias

Introduction

We all have implicit biases (sometimes referred to as implicit attitudes). Coming face-to-face with those biases in supportive classroom environments and confronting what they really mean, where they come from, how they affect behaviors/actions, and the roles they play in how a person understands, experiences, and engages with new questions, ideas, and people are paramount to building metacognitive capacity and becoming a skilled interdisciplinarian. Greenwald and Banaji (1995) define implicit bias as "introspectively unidentified (or inaccurately identified) traces of past experience that mediate favorable or unfavorable feeling, thought, or action toward social objects" (p. 8). Additionally, Greenwald and Banaji point out that these implicit biases "of which the actor is *not* conscious at the moment of action…are …strongly predictive of behavior" (p. 7).

This may sound innocuous enough, but when these implicit biases or attitudes have the potential to impact our behaviors related to social identities and social categorizations, including, but not limited to, race, gender, sexual orientation, religion, and privilege, they become extremely pertinent to the interdisciplinary student's study of real world issues (see Banaji & Greenwald, 2013, for a thorough overview of research in this area). Students, though, are often resistant to the idea of implicit bias because it suggests that they are not in control of their beliefs and actions. The best opportunities, then, for engaging implicit bias arise in activities that not only bring the bias to students' conscious attention, but that also make explicit the metacognitive process for examining that bias and include tools for

deconstruction and reconstruction that create a supportive space to explore context-specific ways to mitigate the potential negative effects of implicit bias. The following lesson that can help to introduce students to this process can be used in the early stages of their interdisciplinary study so that this critical reflective action becomes an ever-present component whenever they engage in integrative practice.

Application

There are numerous measurement tools used to examine implicit biases and attitudes, but the most commonly used, and the one that is recommended for this lesson, is the Implicit Association Test (IAT) (Greenwald, McGhee, & Schwartz, 1998; Greenwald, Poehlman, Uhlmann, & Banaji, 2005). The various versions of the IAT measure the strength of associations between concepts by asking participants to respond as quickly as possible when categorical terms (for example, "white" and "black") are combined with evaluatory terms (for example, "good" and "bad"). Implicit associations are demonstrated based on the speed differentiation between associating certain categories and evaluations (for example, "white" with "good" vs. "black" with "good"; for a full description of the methodology, see Greenwald, McGhee, & Schwartz, 1998). IATs have been demonstrated to be highly reliable and valid measures for determining implicit associations (Greenwald, Poehlman, Uhlmann, & Banaji, 2005; Nosek, Greenwald, & Banaji, 2007; Brunel, Tietje, & Greenwald, 2004).

There are free versions of these tests available online (implicit.harvard.edu), and each test takes no more than 10 minutes to complete. At the time of this writing, there are 14 available tests, any of which could have value to an interdisciplinary course of study. It is important to note, though, that these tests may make students uncomfortable because they may not be happy with the results they receive. It is common for students to believe that the results are telling them that they are racist, discriminatory toward women, or equivalently negative toward other groups of people. In fact, as students can be brought to see, the tests do not say anything of the sort, but because of the potential for discomfort, conditions need to be created that support students in examining what their results mean for them.

To this end, there are numerous activities you might undertake before a class discusses the results of the IATs. First, the students should be primed to be open to the power unconscious processes have in relation to our actions. This can be accomplished in a harmless manner by having them experience a *cognitive trap*. To cope with the complexity inherent in most decisions we

use unconscious routines or heuristics to help us make choices (Hammond, Keeney, & Raiffa, 1998). This unconscious shortcut helps us make good choices much of the time, but when a faulty assumption is involved, we will fall into a cognitive trap. A classic example that is very easy to demonstrate and will take no more than 10 minutes at the end of the class period before your implicit bias discussion is called the *anchoring trap.* Hammond, Keeney, and Raiffa (1998) describe anchoring like so: "[W]hen considering a decision, the mind gives disproportionate weight to the first information it receives. Initial impressions, estimates, or data anchor subsequent thoughts and judgments" (p. 48). The trap comes in when we think two pieces of information are related, but in reality the first piece of information is unrelated, unhelpful, or misleading about the second piece of information.

To show this phenomenon to students (don't tell them what you are doing ahead of time) give half of your class this two-question written quiz (adapted from Hammond, Keeney, & Raiffa, 1998):

How would you answer these two questions?

1. Is the population of Turkey greater than 35 million?
2. What's your best estimate of Turkey's population?

Give the other half of your class this two-question written quiz:

How would you answer these two questions?

1. Is the population of Turkey greater than 100 million?
2. What's your best estimate of Turkey's population?

Most students do not actually know the population of Turkey (at present, Turkey has approximately 80 million citizens), but their answers as to their "best estimate" of the population become *anchored* to the random number included in the first question. It does not matter whether the students answer "yes" or "no" to the first question; the students who received the second quiz will, on average, estimate the population to be much higher, statistically significantly higher, than the students who received the first quiz. (Anecdotally, this author has given these quizzes to well over a dozen classes and has gotten the expected result every time.) What makes this a representation of unconscious processes is that the students had no idea they were anchoring their second answer to the first question. Brought to see that they did so they are also brought to see how unrealized bias can affect behavior – and to see that in a way that does not make them uncomfortable. Additionally, they have just experienced an example of the insight metacognition can provide. As instructor, you can point out that through this knowledge they have gained about metacognition and active attention to metacognitive monitoring and controlling, they can mitigate the anchoring effect in the future, as, for example, in their interdisciplinary work.

The second way to help students navigate the discomfort of the IATs is to have them take the tests on their own outside of class, not with the whole class in a computer lab or equivalent setting. While the tests are relatively simple and quick to do, working on their own allows them to work at their own pace and in their own space, avoiding pressures and distractions that can hurt the validity of the test results ("Project Implicit FAQ," n.d.). Students should be advised to read all of the materials the Project Implicit website provides about the tests and the research behind them and take a few practice tests before starting on the assigned tests. Again, any of the tests on the website would be appropriate for students in an interdisciplinary course, but if the course and/or program is concerned with confronting social issues, we would recommend that you at least have students complete the Race IAT, the Gender IAT, and the Sexuality IAT.

The final activity you should have students do before coming to class to discuss any implicit biases the tests have revealed is prompted reflective journaling. Reflective journaling is a way for students to metacognitively engage with the experience they have just had by critically examining not just their results, but also their reactions to the results (Hennessey 1991, 1993). Such reflections help students engage in the deconstruction process. Some prompts to use include

- What were your initial feelings while taking the IATs?
- What was your reaction to your results?
- Were your results expected or surprising? Why?
- Whether you agree with your results or not, why might you have received those results?
- What are these tests actually assessing?

After such preliminaries, when students come to class to discuss implicit bias, put the students in small groups to discuss their answers to the prompts in their reflective journals and to additional questions like these (Chapman & Brooks, 2017):

- Can you think of examples of behaviors or decisions you have seen others make that may be a result of implicit bias?
- Can you think of examples of the role implicit bias has had in your personal or professional experiences?
- How might these tests be relevant to the study of interdisciplinarity and to your integrative knowledge development?
- Can you think of strategies to confront potential implicit biases in real world situations?

After 20 to 30 minutes in small groups, the students can be brought back together to share the results of their tests, their journaling, and their

discussions, if they want (students should not be forced to share if they are not ready), and explore the ramifications of implicit biases for their perceptions of themselves and of the interdisciplinary course of study they have chosen. Students should be encouraged to grapple with how the combination of conscious preference and potential implicit bias may have led them to choose to study what they study and how this might impact their approach to interdisciplinary work. You can then complete the implicit bias assignment by having students return to their reflective journals to explore any new insights they have gleaned.

Outcomes, Considerations, and Reflections

Implicit biases are formed through experiences, so taking these tests and exploring these questions offer students an opportunity to consider their own upbringings, their communities, and their consumption of the larger culture. This focus on personal experience is useful in the learning process because it makes the results more tangible and real. Students are forced into the metacognitive task of thinking about how they "learned" these implicit biases/attitudes (self-knowledge) and how they might "unlearn" or deconstruct what they have "known to be true." And they can be encouraged to consider what the potential implications will be as they engage in interdisciplinary inquiries. Indeed, the need to attend to bias can be applied to all manner of processes in the interdisciplinary classroom, as (for example) choosing which disciplines to engage when examining environmental policy or preferencing quantitative analysis over oral history when critiquing environmental policy or assigning tasks to their group members in a class project on environmental policy. Full reconstruction of students' views on bias will not happen through just one assignment, but building on these emergent understandings will allow for the further cultivation of metacognitive capacity in this and other areas and improved interdisciplinary thinking and doing.

The lesson described above will help to frame the course in which it is used (and any program the course is part of) as an environment that values critical reflection, encourages the exchange (and change) of knowledge and opinions, and aims to disrupt hegemony. If presented with this lesson early in the interdisciplinary experience, students may be primed to interrogate their own and others' implicit assumptions when real world situations or scenarios arise within their course of study (Junker & van Dick, 2014; Hoyt & Burnett, 2013). Being intentional about confronting implicit beliefs can lead to behavior that demonstrates more nuanced thinking about groups

and the issues that impact groups (Hoyt & Burnett, 2013), a real plus in interdisciplinary work and in life itself.

We all have implicit biases that may impact how we engage with the world. The exploration of implicit bias through the critical pedagogical approach of deconstructing and reconstructing knowledge described in this lesson is a means to start the process of metacognitive capacity building while also pushing interdisciplinary learning towards more democratic, equitable, and just goals.

Lesson Two: STIRS Case Study on the Production and Transmission of Tar Sands Oil

Introduction

The Association of American Colleges & Universities (AAC&U) launched its Scientific Thinking and Integrative Reasoning Skills (STIRS) initiative in 2014. Designed to foster undergraduate students' "integrative, evidence-based inquiry into unstructured, real-world problems," the STIRS program yielded sixteen case studies developed by STIRS scholars ("Scientific Thinking," n.d.). The STIRS case studies focus on issues such as congressional apportionment, the relationship between MMR vaccines and autism, whether the U.S. should have an official language, and the transmission of tar sands oil via pipelines. The case studies, available for free download from the AAC&U website (https://www.aacu.org), provide students with a framework for engaging with the featured issue, including background information and readings, images, and figures produced by various stakeholders. Additionally, each case study features a number of questions and activities that ask students, individually and collectively, to engage with the data and participate in active learning.

The STIRS site also features a brief introductory message outlining the purpose of the case study method and how its use can enhance learning about processing messy real world problems. The introductory materials identify six attitudes and practices crucial for success: openness toward new experiences, interest and curiosity, preparation outside of class, metacognitive awareness, cooperative learning, and active learning and participation (Singh, n.d.). While there are certainly other ways to cultivate these attitudes and practices, case studies are one useful tool for doing so. The authors have used several STIRS case studies in interdisciplinary or integrative studies courses and can attest to their value. This discussion will focus on the use of Tami Carmichael's (n.d.) "People, Place, and Pipelines:

Debating Tar Sands Oil Transmission" case study in an Introduction to Integrative Studies course and consider how the metacognitive development involved contributes to the interdisciplinary integration undertaken in the course.

Application

Organized thematically, the tar sands case study features environmental, economic, and cultural debates regarding the production and transmission of tar sands oil via pipeline. By defining the problem, determining relevant disciplines, and presenting the problem through the insights of each relevant discipline (Newell, 2001), Carmichael lays the groundwork for students to engage with the interdisciplinary process. The three thematic areas featured in the tar sands case study align with the broad, organizing disciplinary categories of the sciences, social sciences, and humanities. The three-pronged approach allows students to recognize and work to identify conflicts reflective of disciplinary perspectives and work to synthesize views representing those perspectives in order to understand the issues involved more holistically, thus supporting the needs and goals of an introductory integrative studies classroom. Approaching one complex topic from multiple disciplinary perspectives reveals the diverse language, knowledge, and experience those with different disciplinary backgrounds bring to the topic. While these differences can prove frustrating as students talk across one another, they also provide an opportunity for students to talk *with* one another, using collective knowledge to establish connections among the thematic areas involved and supporting documents provided. Drawing upon metacognitive processes, students monitor the information each knows about the topic (Miller, 2017). Even when they have some familiarity with a topic such as tar sands oil, by monitoring and ultimately comparing their knowledge, students come to see their disciplinary-based knowledge as fragmentary. Thus, students learn to use both prior knowledge and metacognitive processes when approaching a complex topic and may modify how they think about and evaluate the topic given their discovery of the diversity of perspectives possible and alternative ways of thinking and evaluating (Welch, 2017).

Prior to reading the case study, students reflect in writing upon the weight or value they assign to economic, environmental, and cultural concerns where real-world issues are involved. Through this critical reflective exercise, they also consider why they assign higher or lower values to each of these three kinds of concerns. For instance, do personal interests,

familial values, or messaging from media or political sources influence how they view issues? This preliminary activity helps students think about the priorities and sympathies they will bring to their reading of the case study or, metacognitively speaking, how they will approach what they will be studying. Recognizing biases prior to reading gives individual students and the collective group insight into how preconceived notions can influence understanding of an issue. Specifically, through the written reflection and follow-up discussion, students become more mindful of biases they might have in favor of or opposed to aspects of an issue under study. In class, students typically acknowledge being more easily convinced by data and other evidence that align with what they value most. Conversely, they report greater resistance to data and other evidence that align with what they value less. While the preliminary reflection on and identification of personal biases do not necessarily transform how students proceed to handle the major threads of the debate on tar sands oil transmission, they do encourage awareness of individual and disciplinary blind-spots (Boix Mansilla, 2005).

Since STIRS identifies students' self-awareness as vital for success with the case study method, it is not surprising that all the case study authors, including Carmichael, provide prompts for students to address that promote their metacognition. Fundamental to developing metacognition is "recognizing the limit of one's knowledge or ability and then figuring out how to expand that knowledge or extend the ability" (Chick, n.d.). As a way of gauging preliminary knowledge (and its limits), the tar sands case study presents several statements for students to contemplate:

- The development of natural resources like oil will be economically beneficial.
- There are other considerations regarding oil development that are more important than financial/economic considerations.
- Pipelines will not have a long-term impact on environment and wildlife.
- Our environment and our communities are safer if we use pipelines to carry oil. (Carmichael, n.d., p. 4)

Through individual reflection and larger class discussion, students grappling with the implications of such statements gain a greater sense of what they know – and can support with evidence – and do not know about the topic. Because most students express an opinion about each of these statements without knowing much about tars sands oil or pipeline development, this part of the earlier activities in the class work with the case study allows for consideration of how personal biases or assumptions shape initial, and generally uninformed, "gut" responses. Considering the ways

they have reacted to this series of statements gives students an awareness of the limits of their knowledge and what they should therefore be open to learning as the class proceeds through the case study – reading, processing information, and asking questions, in class and out.

The final activity in this lesson allows students – whose earlier, uninformed thinking may have been deconstructed – to start to engage in the reconstructive process of critical pedagogy, while continuing the metacognitive development that will assist them in doing the interdisciplinary and integrative work of the course they are taking. Students are given an assignment to write "an editorial in which you take a stance for or against building a tar sands pipeline in your home state" (Carmichael, n.d. p. 18). This task is meant to result in a persuasive essay grounded in evidence and directed toward a public that may be ill-informed or misinformed. To successfully accomplish this assignment, students must examine what they have come to understand about this subject upon which they themselves were initially ill-informed or misinformed and how they arrived at their new understanding. In the process, they will have developed self-knowledge and heightened their ability to assess and address a complex problem, viewing it through an interdisciplinary lens and using the integrative strategies of the interdisciplinarian.

Outcomes, Considerations, and Reflections

The case study method promotes students' higher order thinking skills, including using evidence-based approaches to make informed decisions about the featured topic, all while building awareness of their own learning process. Supporting this objective, the pipeline case study features readings, graphs, figures, and tables from sources produced by both public and private entities. The various forms of data presentation allow students to determine their strengths and weaknesses in evaluating evidence presented in different formats. Some students struggle with quantitative data, such as a US State Department table on greenhouse gas emissions, while others welcome visual or rhetorical analysis to explain figures and tables, such as those dealing with the proposed pipeline route over the high plains aquifer and the potential effects of the pipeline on aquifers. Determining their strengths and weaknesses in encountering and analyzing evidence allows students to "actively monitor their learning strategies and resources and assess their readiness for particular tasks and performances" (Bransford, Brown, & Cocking, 2000, p. 67). A CRAAP test worksheet is included at the end of the case study document to guide the evaluation of sources on the basis of

currency, relevance, authority, accuracy, and purpose. Using the worksheet to evaluate various sources and types of data and other evidence gives students another means of assessing the academic strengths and weaknesses of the ways they themselves have used those sources.

The case study method encourages metacognitive and integrative thinking and learning. As students with different disciplinary backgrounds work collaboratively to understand the topic featured in the case study, they begin to compare and assess how they and their classmates encounter and make sense of the featured topic. Metacognitive thinking among an academically diverse group of students helps set the stage for the integrative thinking central to interdisciplinary work as students begin to add to, adjust, or connect disciplinary insights. By experiencing the process of integrative thinking and problem solving within a team, students gain a first hand understanding of how insights from different disciplinary perspectives can be pulled together to produce new knowledge and ways of knowing. This experience helps create the space for more individualized integrative thinking and problem solving, as students develop adequacy in more than one discipline. Further, they learn to identify, evaluate, and resolve disciplinary conflicts on a contemporary issue, thus preparing them to pursue the more complex processes the full-fledged study and application of the interdisciplinary endeavor will entail (Newell, 2001).

Lesson Three: Leadership Identity Development Through Digital Stories

Introduction

Leadership Studies is a relatively young interdisciplinary field that pulls heavily from a variety of disciplines including Philosophy, Political Science, History, Management, Education, Cultural Studies, and many others to present an integrative study of the phenomenon of leadership. Well before students realize that Leadership Studies is an academic discipline, though, they experience leadership. It is around us always, from our parents and teachers to our first experiences playing games with peers. Leadership is personal as well as academic. Leadership educators acknowledge this dualistic interplay in their curricular design. It is common in Leadership Studies programs, be they major or minor programs, to have an advanced leadership course for students nearing the completion of their requirements that focuses on their leadership identity development. This type of course aims to support students in the examination of their leadership identity

development, helping them to distinguish benchmarks for continued growth and to articulate their own personal philosophy of leadership to guide their transition from collegiate leadership environments to new contexts post-graduation. The lesson described in this portion of the article presents digital stories as a critical pedagogical tool that promotes the metacognitive capacity building and knowledge integration students in this version of an interdisciplinary course need to develop to successfully engage in this deeply personal, intellectual work.

Application

The educational benefits of digital storytelling as a pedagogical tool used within the context of post-secondary institutions have been well documented in literature that cuts across disciplines such as American Studies, History, Business, Education, and Leadership (Lambert 2007; McLellan, 2006; Ohler, 2008; Robin, 2008). According to McClellan (2006), digital stories' emergence in education can be attributed to the unique way in which they enhance students' acquisition of knowledge and facilitate higher levels of critical inquiry and meaning making through the use of visual and textual images. Digital stories help to create inclusive learning spaces that allow for honest and authentic dialogue about and across differences as well as perspective taking (Brookfield, 1993; Pendakur & Furr, 2016). In creating and sharing their stories, students learn to acknowledge peers as knowledge keepers and, in the process, adopt more complex, non-authority-bound approaches to leadership (Dugan, Kodama, Correia, & Associates, 2013, p. 9).

Digital stories as adapted for pedagogical purposes tend to involve relatively inexpensive personal forms of digital technology that use an assortment of media such as video clips, soundtracks, computer-generated graphics, and narration to construct a coherent three to five minute narrative (McShay, 2010; Ohler, 2008). Some digital stories also incorporate the use of web-based applications such as streaming media, podcasts, and blogs (McClellan, 2006). Regardless of the types of media that are deployed in digital stories, they all share an essential characteristic, which is that they rely on the use of the students' personal voices. Within the context of digital story development, personal voice becomes the central vehicle through which students are given agency to articulate, visually represent, and critique how their lived experience is shaped by their history, social beliefs, and institutional systems and practices. Through the use of this tool, students are able to convey both the authenticity and diversity of the human

experience, making it a powerful learning platform that supports critical inquiry around identity and difference. It allows for acquisition of academic knowledge via engagement in dialogue about issues of diversity, leadership, and social justice.

Digital stories can take the form of autobiographical narratives, historical documentaries, critical incident analyses, instructional presentations, and other such learning modalities. Their personal voice makes all modalities an effective means to evoke dialogue and perspective taking among those audience members who view the digital story, and it also makes them a powerful tool to promote critical reflection in the story developer. Ohler (2008) further explains the benefits of using digital stories to facilitate this form of learning among students:

> Students hear themselves via recorded media for the purpose of listening, self-assessment, and rewriting and/or speaking or recording the narration process. The power of hearing oneself for self-assessment purposes can't be underestimated. It's as though the process of getting words out of one's head and out in the open air exposes them to a quality of critique not available within the confines of one's internal landscape, even if the only people reviewing the narratives are the authors themselves. (p.58)

Digital stories allow students to situate their experience within the center of the story and use it as a point of critique and analysis, again, developing the students' capacity for critical reflection. According to King and Baxter Magolda (2005),

> Defining characteristics of critical self-reflection include how one understands their own beliefs, values, and sense of self, and uses these to guide their decision-making as they navigate the world around them. Furthermore, … another dimension of critical self-reflection is how one views oneself, in relationship to and with other people, and makes choices in social situations. (p. 574)

Digital stories can help students achieve insight in all these areas.

In the advanced leadership course we are discussing here, students complete a semester-long project that reflects a synthesis of what they have learned about leadership over time, an examination of their leadership identity development, and their philosophy of leadership, through digital storytelling. Embedded in this synthesis is an analysis of how different disciplinary sources of knowledge contributed to their understanding of leadership. While the central question of this assignment is "What is your personal philosophy of leadership?" students are prompted to use the digital story to describe their working definition of leadership and, more

importantly, demonstrate through the use of imagery and narration how they have come to this definition, making this project interdisciplinary in both content and form. Students are asked to use this medium to document how they have been socialized to understand, value, and enact leadership and to examine the personal assumptions about leadership with which they have begun the course. They are expected to affirm or critique (and deconstruct) the leadership concepts, theories, and models they have been taught through the lens of their lived experiences and acquired knowledge, and are also encouraged to use the assignment to reconstruct normative ideas around leadership, highlighting the unique perspective that is now their own.

As an assignment, digital storytelling serves as a beneficial metacognitive pedagogical tool for a leadership course because both the process of development and the deliverable itself require the students to critically investigate their own assumptions about leadership (Brookfield, 1993; Pendakur & Furr, 2016). Preskill and Brookfield (2009) wrote that critical reflection, a foundational component of metacognition, "grounds not only our actions but also our sense of who we are as leaders in an examined reality. We [come to] know why we believe what we believe" (p. 45). The digital story assignment allows students to explore their thoughts and emotions and compare subjective experiences to theory and/or facts through a unique collection of multimedia and digital artifacts (Joint Information Systems Committee, Leeds Metropolitan University & University of Leeds, 2012, p. 8). According to Sandars, Murray and Pello (2008),

> The choice of topic, writing the storyboard, collecting the media, selecting the media and creation of the story all require creative choices to be made by the learner. The learner has to constantly reflect on both what and why they are making particular choices…. Reflection on why a particular image was used will promote deeper learning and understanding of the self. (p. 775)

This intentional, persistent reflective process seems especially beneficial in an advanced or capstone course. Joint Information Systems Committee, et al. (2012) suggest that it informs the future professional practice of students while simultaneously shaping their growing personal identity:

> A grasp of the reflective process is essential to maintain ongoing personal and professional development even after leaving formal educational settings, such as universities. In order to become self-regulated learners, students face the task of continually evaluating and learning from experiences. (p. 6)

According to Sandars et al. (2008), "Each step of the production of the digital story provides an ideal opportunity to stimulate reflection and this is

in addition to reflection on the final overall product" (p.775). Throughout the semester-long project, students complete a series of assignments and other activities that facilitate reflective practice, including contemplative prompts sequenced to support them in advancing their digital story. For example, students are introduced to critical perspectives on leadership theories, models, and approaches early in the semester, starting with a simple evaluation of a book on leadership. Students select one popular press leadership book to review and write a brief summary on the text's central idea(s), especially the assumptions about leadership, and addressing if, from the student's perspective, the book does or does not reflect truth about leadership. This assignment serves as a gateway into a class lesson that highlights the similarities and distinctions among critical thinking, critical reflection, and critical theory. Intentionally integrating this theory and these processes into the discussion allows new themes to emerge through the analysis of the popular press books permitting students to interrogate (and, in the process, deconstruct and reconstruct) normative ways of understanding and enacting leadership. Thus, from the start of the course, students are encouraged to respond to concerns about ideology, the flow of power, the significance of relationships, and the role of context in the theory and practice of leadership and to pursue such concerns in the creation of their digital stories.

Throughout the duration of the course students use the same process of critique during class lessons on the historical evolution of leadership studies and on a variety of families of leadership theory. They are asked to describe the major components of these theories and their strengths and limitations. They must make application of the theories to their own life experiences and must also provide examples of "leadership in practice," reflected through an article, video clip, image, or description of a current or historical event. They thus are challenged to seek evidence in their own lives and in the world around them that might support or problematize dominant narratives around leadership, again deconstructing and reconstructing views (as the critical pedagogy in use here requires that they do) to develop new, enhanced, and complex ways of understanding and presenting the subject under study. And, of course, students are regularly reminded that this practice of critique should be applied in the development of the digital stories in which they will deconstruct and reconstruct leadership in ways that reflect their distinctive voices.

The activities described above prepare students to consider the following prompts in the development of their digital stories (Chapman & McShay, 2017, p. 141):

- What theories and concepts from this course or other courses help

to illustrate your understanding of leadership?
- Which leadership concepts resonate with you and why?
- How might you incorporate your own language for communicating these concepts?
- Alternatively, what critique of the literature has informed your understanding of leadership?
- What leadership experiences have you had that counter the literature or conventional notions of leadership?
- What is missing from the literature that you would like to communicate in your digital story?

Another activity introduces students to the Leadership Identity Development (LID) model, a model developed to promote understanding of the processes a person experiences in creating a leadership identity (Komives, Owen, Longerbeam, Mainella, & Osteen, 2005). This activity encourages students to recognize how significant experiences, relationships, and other developmental factors have contributed to their practice of leadership as well as their leadership identity. To supplement this activity, the class is introduced to identity mapping and the Cycle of Socialization that helps students understand the ways in which we are socialized to play certain roles, how we are affected by issues of oppression, and how we help maintain an oppressive system based upon power (Harro, 2000). Understanding of this sort can bring to the forefront the explicit and implicit codes of behavior that reinforce dominant prototypes of leader and leadership that may go unnoticed otherwise (Menken & Keestra, 2016). Students have an opportunity to investigate their socialization into certain views of leadership – what they were taught and the messages that they received through social institutions that situated them as powerful or powerless or superior or inferior (Harro, 2000). This reflective process makes visible the ways in which they have learned to understand, value, and enact leadership. To enhance that visibility, students are directed to the following prompts for consideration in the development of their digital stories (Chapman & McShay, 2017, pp. 144-145):

- What is your first recollection of leadership?
- Who helped to shape your self-concept and your understanding of others?
- How has your understanding of leadership changed over time?
- What significant experiences triggered these changes?
- In what ways do your social identities intersect with your leadership identity?

- What role do values, ethics, and justice play in your philosophy of leadership?
- How do relationships present themselves in your definition of leadership (between and among individuals, groups, organizations, and systems)?
- Do you believe that leadership is accessible to everyone?
- Is diversity, inclusivity, or pluralism a priority for you?

The final, formal component of this semester-long lesson is the sharing of the students' digital stories. As in other reflective approaches, the personal learning journey experienced through digital storytelling is greatly enhanced when the process and product are shared with others (Moon, 2004; Sandars, et al, 2008). Digital stories provide a means by which students can engage in the practice of self-reflexivity. And they also provide a means by which student peers can critique, discuss, and explore one another's understandings of leadership.

Sharing contributes so strongly to the reflective experience that attendance of all students during digital story presentations is emphasized. Unless the class is small, students are divided into smaller groups of four to five to allow for greater attention to each digital story and deep, meaningful dialogue about each. Initially, students might be uncomfortable pushing for dialogue that goes beyond giving affirmations and identifying commonalities in their digital stories, so teachers should encourage them to push for more. They should challenge students to be curious, seek clarity, and apply a critical lens so as to fully explore alternative ways of understanding leadership that have emerged in the course of the presentations and discussions. Thus participating in the final stage of the full digital storytelling experience engages students in developing competencies helpful in the study and practice of leadership because the process facilitates social learning, the giving and receiving of feedback, and emotional intelligence (Robin, 2008), competencies helpful in the pursuit of other sorts of interdisciplinary study and practice, as well. Rossiter and Garcia (2010) suggest that creating and sharing digital stories serves as an exciting means towards creating true community within adult learning settings, helping those in such settings to develop the metacognitive capacity for perspective taking that allows those with different perspectives (like different disciplinary perspectives) to bridge differences and integrate diverse views to achieve increased understanding of any complex subject.

After the sharing of their digital stories, final reflective prompts are given to the students intended to help them see that their views on leadership theory, their understanding of leadership identity, and the development of their personal philosophies on leadership are not fixed with the end of

this course and its lesson, but will continue to be challenged and change as they engage in new life experiences and reflect upon them. These prompts (Chapman & McShay, 2017, p. 148) include

- What stood out to you the most as you think about the process of developing your digital story?
- In what ways were your perspectives about leadership, identity, and difference informed by this process and how does that make you feel?
- What unanswered questions do you have?
- How do you feel about the themes you explored in the story now and how might that change over time?
- How does your philosophy of leadership relate to your hopes for the future?
- How does your philosophy of leadership empower you?
- How does this philosophy relate to your career and civic readiness?

Ultimately, the process of critical reflection that occurs while they are developing and sharing digital stories allows students to make meaning of their knowledge and experiences so that they leave the course (and, in our case, the program it concludes) having committed to and able to clearly communicate what they believe and value about leadership to this point. The hope is that students will have developed a rationale for their beliefs and actions, will be able to make informed leadership decisions whose assumptions have been critically examined so as to make visible the role of power, hegemony, and ideology, and, when faced with inevitable challenges, will have a sense of confidence that is rooted in their philosophy of leadership (Preskill & Brookfield, 2009).

Outcomes, Considerations, and Reflections

Digital stories can help students develop a critical self-reflective orientation in ways that have important implications for leadership development. King and Baxter Magolda (2005) assert that this type of orientation can best be described as a flexible belief system that increases students' ability to adapt and make decisions in diverse social and cultural situations. Furthermore, such an orientation helps them resist using an ethnocentric lens to interpret and make meaning of social realities and contexts with which they have limited familiarity. As students build metacognitive capacity from critically reflecting upon the creating and sharing process they are better positioned to identify and critique problems, issues, and themes and connect to the ways in which they have come to understand their own social location and

societal participation (McShay, 2010), skills that are paramount to successful interdisciplinary inquiry. The use of digital stories with Leadership Studies students also allows them to position their voices among others in the examination of constructs (in this case, constructs such as identity, power, oppression, and privilege as they relate to leadership theory and practice), another skill all would-be interdisciplinarians need to learn and apply. The resultant reflection expands well beyond the self for "when we reflect, we attempt to cast a critical eye over the events around us and analyze the part we play in those events. This allows us to learn from our experiences and adjust our future behavior accordingly" (Joint Information Systems Committee, et al., 2012, p. 6), which is, again, a capacity desirable in interdisciplinarians. As a pedagogical tool, digital stories prompt reflection that creates the perfect environment for explicit metacognitive capacity building and for the enhanced capacity for integrative thinking that is so central to interdisciplinary work of any kind.

Conclusion

Interdisciplinary programs come in many shapes and sizes. The lessons from our own programs described here do not create a blueprint for all programs to follow, but we hope they serve to demonstrate the value that lessons that incorporate metacognitive capacity building strategies and a critical pedagogical perspective can bring to improving students' ability to identify, interpret, and integrate disciplinary assumptions and knowledge into a new understanding of complex real world issues, skills that are at the heart of interdisciplinary study of all kinds (including our own characterization of Leadership Studies). Further, we hope readers will see the need to make metacognitive capacity building an intentional and explicit component of the integrative learning they teach in their interdisciplinary courses. We have made an effort to show how metacognitive capacity can aid in the integrative process necessary to interdisciplinary work since we see the skills involved as mutually beneficial. The better we understand how we think and learn, the better we will be at creatively confronting real world issues. Through knowledge of self and knowledge of disciplines, and the integration of these knowledge types that metacognitive capacity building enhances, interdisciplinary students will become interdisciplinary thinkers and doers who are ready and able to act to address and resolve the complex problems that plague us today.

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