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Inspired to Grow through Cross-Disciplinary Teaching and Learning

Audrey A. Fisch and Susan Chenelle

The four ninth graders at the table closest to the door hadn't exactly chosen to work together. Each had selected the same topic related to gentrification: the chromium contamination in the lot being redeveloped down the block from their school. Among the five groups working on their service learning projects, this group probably spoke to each other the least.

However, they were hunched over their iPads looking for articles relevant to the subtopics they had identified: the chemical properties of chromium and its uses, its positive and negative effects on human health and the environment, and the history of chromium at the nearby site and its clean-up. They copied and pasted the URLs from the sources into a shared GoogleSheet, where they also summarized the articles' key points and evaluated their credibility.

In completing this last step, the students discovered how important it was to read and think about their sources carefully. Through our discussions on gentrification in general, the students had come to recognize the variety of stakeholders with different agendas and concerns, including politicians, developers, and passionately engaged community residents.

The student who was looking into the remediation efforts at the contaminated site nearby found what he initially thought was a blog created by a concerned individual. The simply designed site thoroughly detailed the effects of chromium, the history of how it had ended up in the area, and the efforts to remediate the land. It seemed objective in tone, citing government studies as sources in answers to key questions about chromium. He was initially pleased to find a [website](#) that seemed to have everything he needed for the project, but then he scrolled down to the bottom of the page.

"Hold up," he said. Susan walked over to see what he had found. He scrolled back up to show her the name of the website and the information it featured, and then back to the bottom, where it said, "Copyright © 2005-2016 Honeywell International Inc." The site had been created by the company responsible for both the contamination and its clean-up. The straightforward-seeming information on the site no longer appeared so objective.

He showed what he had found to the other members of his group.

"So, what does this mean?" Susan asked.

"We need to compare what all of our sources say," one of the students responded.

It was the moment when they realized the importance of their own critical thinking in relation to their research on the topic. They were no longer simply seeking out the quick and easy source that would allow them to expeditiously finish the assignment. They were engaged and reflective learners, attempting to determine the truth about a complex topic relevant to their own lives, so that they could in turn inform others. They went on to create and deliver a presentation of their findings about the chromium contamination next door to a chemistry class consisting of juniors and seniors.

Shared responsibility for learning and action

The Common Core makes clear, in a way that wasn't entirely explicit before, that literacy is an important, shared responsibility: "Instruction in reading, writing, speaking, listening, and language are

to be a shared responsibility within the school” (CCSS). All teachers, regardless of discipline, have literacy expertise; we all read and write in our fields and are familiar with the genres and formats of our disciplines. The Common Core demands that we all participate in the project of growing our students’ literacy competence.

Though many states, including New Jersey, are modifying the Common Core, the recognition of the importance of disciplinary literacy and of student experience with what the Common Core calls informational text will surely persist. New Jersey, for instance, in the proposed New Jersey Learning Standards, eschews the language of informational text and returns to nonfiction, but the revised standards retain the Common Core’s focus on the wide-ranging, cross-disciplinary literacy that is vital to empowering our students to be informed, engaged 21st-century citizens: “Part of the motivation behind the interdisciplinary approach to literacy promulgated by the Standards is extensive research establishing the need for college and career ready students to be proficient in reading complex informational text independently in a variety of content areas” (CCSS).

Susan, as then-English department lead for her school, and Audrey, as a literacy consultant from New Jersey City University (NJCU), have been working to foster collaboration around literacy at University Academy Charter High School (UACHS) in Jersey City, NJ, by offering professional development workshops and initiating time and structural supports for teachers to undertake cross-disciplinary collaboration. In particular, we were, like Kathy Thayer, trying to share the “instructional lift” around informational text through collaborative teaching.

Our focus in promoting disciplinary literacy has been two-fold: 1) supporting teachers in using relevant, engaging informational texts in their own classes and 2) encouraging collaboration across disciplines. Content-area teachers often shy away from bringing in supplementary complex texts because their students already struggle with reading the textbook. However, we know students need to be reading a wide range of texts in all classes (NCTE; IRA). We also know that students will surpass our expectations when we create meaningful education experiences that allow them to connect what they are learning in school to their lives in the outside world (Lent). Building on that critical recognition of relevance, we can use careful scaffolding to help our students succeed in reading challenging texts.

This recognition of the importance of connection between school and students’ communities is a fundamental part of the service-learning focus embedded in UACHS. The arrival of gentrification and the remediation of chromium in the Jersey City neighborhood where UACHS and NJCU are located presented students with immediate concerns that mandated both study and action during the 2015-2016 school year.

New building projects driven by gentrification have displaced students from their homes and unearthed some of the history of the impoverished area, including the chromium contamination left to languish for decades after the closure of factories from Jersey City’s past.

When many UACHS freshmen chose to focus on the chromium remediation for their self-designed service-learning projects, we were excited that they would have an opportunity to connect their projects to their lives, but we also knew that to be successful in these ambitious projects, the students would have to grapple with science-rich, complex texts that would be generally challenging.

An opportunity to offer guided reading practice presented itself in connection with the development of the aforementioned lot that students walk past every day. The previous site of an industrial chemical processing facility, this land was contaminated with chromium (VI), exposure to which can cause cancer, skin lesions, and other detrimental effects. This contaminated land was donated to NJCU for remediation and development. In 2015, the university began work on the first building at

the site: a dormitory.

The freshmen, most of whom shared the same physical science teacher, had studied the periodic table and the properties of chemical compounds. Mr. Dorman, their shared teacher, was amenable to our proposed collaboration in which the students would have the opportunity to apply their pre-existing content-area knowledge in science to two challenging, science-rich texts in order to reflect on the development of the contaminated site at NJCU.

Preparing the text

In addition to physical science, most of the freshmen were enrolled in a study skills class, designed to foster academic success and acclimate them to high school, which was taught by Susan, two other English teachers, and a math teacher, all of whom were amenable to the project. As our goals were skill-oriented and cross-disciplinary in nature, we thought this class would be an ideal additional site for this collaboration.

Susan identified two informational texts: an excerpt from an article on the different types of chromium published by the U.S. Department of Health and Human Services' Agency for Toxic Substances and Disease Registry and a local news report about a lawsuit attempting to stop NJCU from building on the remediated land.

Susan prepared the government piece according to the approach she and Audrey have developed for supporting students' success with informational text (see *Connecting Across Disciplines*). To keep the students focused on the information relevant to our instructional goals and the text pedagogically wieldy, we cut out any sections from the chromium article that were unnecessary in helping students achieve our purposes. The result was a manageable 780-word excerpt that students could successfully grapple with in their physical science class before reading the short news article in their study skills class.

We drafted discussion questions in a sidebar alongside the text of the chromium article to assist us and our teaching collaborators in directing students' attention to key ideas and details in the text (see Fisch and Chenelle). (Our template for preparing informational texts for classroom use is available here: <http://bit.ly/2fzFi6y>. Password: collab2016.)

We shared the draft of the excerpted government article on chromium, along with the discussion questions, so that Mr. Dorman could make sure our edited version and questions fully reinforced and addressed the content-area concepts relevant to his science class. His additions foregrounded the students' scientific knowledge in ways that Susan could not have anticipated: questions about what the Roman numeral indicated about the type of chromium under consideration, the relative properties of different kinds of chromium, the number of oxygens in chromium trioxide, and the kind of compound -- ionic, covalent, or metallically bonded.

The collaboration over the preparation of the text and questions for the article allowed Mr. Dorman to emphasize discipline-specific and complex scientific issues so that the use of the chromium text would be useful both as practice in scientific literacy and as reinforcement of science content.

Collaborative teaching

Collaboration isn't just about sharing materials; we also wanted to think about collaborative teaching and to work together with the science teacher to model different approaches to literacy instruction. We were fortunate that Audrey was able to come and join in the instruction of the government article on chromium with Mr. Dorman in three science classes. They read through the text together with the students, modeling and scaffolding close reading. Progressing through the article, Audrey and Mr. Dorman used the sidebar questions to draw students' attention to key ideas in the article and

issues about its credibility. The physical science teacher jumped in to reinforce a scientific concept or help draw out students' content-area knowledge to help them make meaningful connections between the reading and what they had already learned.

After the first-period class, Audrey and the physical science teacher agreed that students needed an engaging visual to activate their existing knowledge and hook their interest in chromium (Daniels and Zemelman). Quickly, they found images of common objects covered in chrome, like motorcycles. They also showed images of people working with chromium in protective gear along with images of warning labels about chromium, all of which primed students to read the dense and dry informational text with a greater sense of purpose and urgency. Students readily responded to the images and the next two team-taught periods progressed even more smoothly, with the students more successfully primed for the reading.

Mr. Dorman led the final two classes, closely following Audrey's model. At the end of the day, the science teacher reflected on the collaboration, remarking on not only how the lesson involved a lot more reading and student-centered discussion than he usually incorporated into his instruction but also how the lesson produced a lot more student engagement. At the same time, Audrey was impressed with how much scientific knowledge the students were able to bring to reading and thinking about the article.

Cross-disciplinary extension

After reading the chromium article in their physical science class, most students moved into their study skills class (or did so at some point over the next few days) where they independently read a news article discussing the efforts of two community groups to have a judge halt NJCU's construction on the contaminated site. This reading, in contrast to the chromium article, was less scientifically dense. Primed by the slow, scaffolded reading experience with the chromium article, students were able to read the local news article independently. Their final task, completed in their study skills class, was to explore in writing the issue of chromium contamination and NJCU's West Campus, using evidence from both readings.

Challenges to collaboration

Not all students had both the science and the study skills class, so a handful didn't have the benefit of both pieces of the cross-disciplinary lesson. Given the vast difference in students' high school schedules, this challenge is the norm, but it shouldn't prohibit the endeavor. Teachers were easily able to accommodate and assist those students who didn't benefit from the dual lesson, and the vast majority of students was able to benefit from the collaboration.

In addition, the science teacher was understandably anxious about undertaking a new lesson style. The co-teaching approach, however, easily put his mind at ease, and he quickly caught on and adapted to the new style, adding it to his personal pedagogical toolkit in a way that can only enhance his own future teaching.

Mr. Dorman was unequivocal about the pay-offs: "Tying prior scientific content knowledge to this active learning discussion strategy motivated students in a refreshing, invigorating way. Students were eager to participate; they appeared empowered now, drawing from experiences of more than one content area."

Teacher feedback

As reflected in the brief survey we conducted to assess our collaboration, all teachers involved in the linked lessons said that the collaboration enhanced their teaching. The study skills teachers liked that students came into their classes with some background knowledge about the topic of chromium contamination and development of the NJCU site. Two-thirds of these teachers reported higher

levels of student engagement and a higher quality in the student work. Many also indicated that the collaborative lesson provided background knowledge and confidence in the students that facilitated improved student discussion and participation.

Most teachers also felt that approaching the topic from two angles helped enrich students' understanding and that the quality of student work was somewhat higher, while all teachers observed that students connected the material to the real world.

One teacher noted: "collaboration aids in securing learning because [students] get further practice and it activated prior knowledge." Another said, "When done right, the interdisciplinary approach to teaching compels students to make connections."

Most importantly, all teachers said they would recommend more collaborative lessons.

Student outcomes

In their written responses, students articulated generally coherent arguments against building on the chromium-contaminated lot, though their attempts to use evidence from the readings was not always successful. Many students accurately listed the possible health effects of exposure to chromium, but overlooked the more nuanced point that only those working directly in contaminated areas are at significant risk, according to the readings. Students also struggled to use evidence from both articles, relying more heavily on the government article they had read together in their science class than on the news story about local contamination.

For example, one student was able to work successfully with the idea, from the government article, that "chromium in soil does not dissolve easily in water and can attach strongly." She was also able to describe accurately the health dangers chromium can pose, including lung cancer and skin ulcers, and its heightened risk for children.

However, when the student turned to the news article about the local remediation, her reasoning became more confused, and she reasoned, inaccurately, about the comparative danger of chromium contamination of soil versus water, and worried, without enough use of scientific evidence and reasoning, that "the chromium would spread. That would affect us who live around here in a big way."

This student's work and the teachers' general observations suggest a number of important conclusions. First, the careful scaffolding and teacher-led instruction of the science article seems to have improved students' comprehension and scientific literacy generally. However, the independent reading of the news article proved a more challenging task than we had anticipated, and students, like the one above, struggled to assimilate the more abstract scientific discussion to the specific conditions of the NJCU remediation effort. Clearly, more teacher-led instruction and more scaffolding was necessary for the complex task of applying general scientific knowledge about chromium to the specific situation of chromium remediation in Jersey City.

Student feedback

We also surveyed the students, and an impressive 74% indicated that the readings and discussion about chromium and the NJCU development of the contaminated site helped them connect the content from their science class to the real world.

One student observed that they had previously "learned about elements but never seen [them] in a real-world setting." Another said, "the lesson was interesting" and wanted "to know more about what is happening in my community."

In the end, this cross-disciplinary lesson demonstrated the potential, the challenges, and the need for

consistent practice in tasks that ask students to think and write across texts and disciplines and to apply their school-based learning to the world outside.

Conclusions

Creating meaningful cross-disciplinary literary experiences for students takes time and effort, and the rewards are not always immediate or unqualified success. Indeed, the most immediate outcomes for both students and teachers involved in our chromium collaboration were growing pains and a bit of struggle outside their respective comfort zones.

This relevant, authentic learning experience, however, allowed us to support our students' reading, writing, and thinking skills while also obtaining valuable information about areas in which the students needed further support. The project also enabled all the involved teachers to grow professionally, as we collaborated to make meaningful cross-disciplinary learning happen in our classrooms. And while we may have been moved to do this work by the demands of the CCSS, the project drew from our core passions: for teaching to move student learning into the realm of meaningful connections with their communities.

One student noted the value of the lesson in preparing them for his service-learning project on gentrification: "I believe that giving additional information on the issue [of chromium remediation] helped the students understand gentrification much better and helped them with their projects [and] gives us a chance to speak up about gentrification."

Because the project allowed both students and teachers the opportunity to reflect on this cross-disciplinary literacy collaboration, everyone also experienced a high level of ownership in the project and, particularly for the students, a level of metacognition about the cross-disciplinary literacy skills they were developing and how they could use them to speak to and shape their own community. This kind of ownership and engagement is, indeed, what's inspiring in education today.

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Together, they have collaborated on *Using Informational Text to Teach To Kill A Mockingbird* (2014), *Using Informational Text to Teach A Raisin in the Sun* (2016), and *Connecting Across Disciplines: Collaborating with Informational Text* (2016), all from Rowman and Littlefield. They have also published related work in *English Journal* and *English Leadership Quarterly*.