

Gabriella Blazich

Literacy and Discourse in STEM

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Classroom Culture Analysis

Throughout the semester that I spent student teaching at an elite Long Island public school several years ago, I experienced a school culture that was different from any other school culture that I have experienced as a teacher to student. During this time, I was placed in an 11th grade Living Environment classroom. Students, their parents, and school administration place a very high level of importance on academics, but a very low level of importance on discipline and respect. Students were extremely academically competitive with each other and truly did seem to want to learn as much as possible. Small class sizes, high student-to-teacher ratios, and early implementation of educational technology supported the students in their learning. The head of the science department also constantly stressed the importance of integrating NGSS practices into everyday lessons. She made sure that all of the teachers in her department had a deep understanding of the guidelines that NGSS sets for high school students. She also frequently held meetings and PD sessions to present teachers with lesson ideas that were aligned with NGSS Science and Engineering Practices. This emphasis on NGSS helped students to understand what science truly is and to practice some of the skills that are crucial to actually doing science, such as making and justifying claims and analyzing evidence.

Students did not complete many hands-on labs. All labs were either virtual or just done on paper. At the start of each lab activity, students wrote a hypothesis or prediction for the lab. After each lab, students completed a CER. I feel that this both helped and hindered sensemaking for our students. Writing numerous CERs definitely helped students to understand how to write a

claim and justify that claim with evidence. Students seemed to appreciate the CER section of their labs because they were able to showcase their knowledge, include their own experiences, and expand upon a part of the lab that interested them. However, writing a CER did not seem applicable to every activity that was considered a lab. In many of these activities, students did not collect any data. This led to a lot of confusion amongst the students about what to include in their claim and how to actually use evidence from the activity to support their claim.

During my semester of student teaching at this school, my cooperating teacher always emphasized the importance of collaboration between students and student-centered learning. Students frequently worked together in groups of three or four to complete labs and projects. The groups were intentionally designed to include students at different academic levels. I feel that these collaborative assignments were very conducive to sensemaking because students seemed to truly learn from each other and enhance their knowledge by explaining concepts to their peers. Argumentation skills were also emphasized and practiced.

One example of this was during our unit on genetic engineering and biotechnology. Students had often asked me about the non-GMO label that they sometimes saw on their snacks. Some had heard their parents talk about buying non-GMO foods or had seen stories about this topic on TV. To address their interest and misconceptions, we had students participate in short debates on the consumption of GMOs with a partner. Each student was assigned a viewpoint and was paired up with a student with an opposing viewpoint. Students had to find evidence to support their viewpoint and write a paragraph using their evidence to justify their position. This activity was similar to writing a CER. Students then met with their partners, presented their positions, and wrote a consensus statement addressing the scientific and social issues involved in the consumption of GMOs. During their debates, students got to talk about their own knowledge

and experiences with GMO foods. In this activity, students were given the opportunity to find their own evidence from a credible source, evaluate evidence, justify a claim, engage in argumentation, and communicate their thinking to a partner. All of these skills are essential to sensemaking and science in general.

Although academic success was highly valued at this school, discipline was not. This was especially true under the previous principal, who retired the year before I student taught there. The students were aware of the fact that they could get away with almost anything without getting in trouble. On the rare occasion that students were disciplined for some sort of infraction, their parents would usually call the school and talk administrators out of actually disciplining the student. Most teachers at this school felt that parents do not typically show respect for teachers and parents will call the department heads and administration for almost anything. For these reasons, most teachers will not even report students for being late or disrespectful. This created a school atmosphere that often felt like it is “teachers vs. students,” and that these two groups work against each other instead of working together. There was a lack of trust between the teachers and the students. One student openly mocked my cooperating teacher and I numerous times and once called us “dumb and dumber” in front of the entire class. My cooperating teacher refused to discipline him or send him to administration. I felt that the school culture created by this lack of respect and discipline was not conducive to sensemaking. Because of this dynamic, teachers often did not seem to want to do anything extra to help the students. For example, my cooperating teacher never held extra help sessions. I would often stay after school to work with students who had questions or wanted to review for assessments.

Overall, I felt that I learned a lot during my semester of student teaching at this school. I feel that one of the most valuable things that I learned during this time was the importance of

incorporating the NGSS Science and Engineering practices into lessons whenever possible. Before this, I did not have a strong understanding of NGSS or what these standards require of students. I also learned the benefits of having students complete CERs after laboratory activities. I sometimes have my current 9th grade Living Environment students complete CERs after lab activities, but I have not implemented this activity to the extent that my cooperating teacher did. We have mostly done this activity with labs that required students to collect their own data. This seems to be more beneficial to sensemaking than just having students complete a CER after every activity.

I have tried to follow my cooperating teacher's example of designing lessons that involve collaborative groupwork. Because of pandemic restrictions, this has been quite a challenge this year. Students are often hesitant to work with partners in breakout rooms. I am hopeful that implementing collaborative groups will become easier in the future when students can work together in person. I also really like the argumentation activities that my cooperating teacher planned. I felt that students learned a lot about both scientific and social issues when participating in the GMO debate and also got to practice their argumentation and justification skills. I have tried to implement activities like this one in my current classroom, to varying levels of success. Some students have struggled to make their thinking known to their partners and critique their partners in constructive and respectful ways. My current students are two years younger than the students I had while student teaching, so I think this has contributed to some of the issues that I have encountered with my students while doing these activities.

Throughout my time student teaching at this school, I also learned about what I do not want in my own classroom. For example, I very quickly realized that students should not be asked to write a CER for every activity. Teachers should make instructionally appropriate

choices and work to incorporate NGSS Science and Engineering practices into lessons in ways that make sense to students. I also learned how important respect and trust between students and teachers is. When teachers do not respect or trust their students, a toxic classroom culture can form. This is also true when students do not trust or respect their teachers. This can lead to a cold and unwelcoming classroom environment that is not conducive to learning. My experiences here have greatly influenced the way that I interact with my students. I hope that I have created an environment where students feel comfortable and able to learn. I have worked hard to get to know my students on a personal level and gain their trust and respect. Students generally follow classroom rules and are respectful of their classmates and me. Additionally, I hope that I have formed collaborative relationships with my students' parents and guardians. Teachers and family members should work together to support students, not work against each other.

Going forward, I want to continue to provide my students for opportunities for collaboration with their peers and implement NGSS aligned activities and lessons. I hope to continue to have my students compete CERs when instructionally appropriate. Since my current students are younger and less experienced with writing in science than the students I had while student teaching, I have had to modify our CER and discussion worksheets. I usually provide students with sentence starters for each section. I also hope to implement more modeling activities into my lessons. Three of my four classes are inclusion classes, and I have been very lucky to have a co-teacher who is willing to experiment with activities and modify all materials as needed.

I also want to provide students with more opportunities to share their own background knowledge and interests. Students learn best when they can relate to the content that they are learning. This has been a struggle for me this year because of pandemic restrictions and

adjustments to online learning. My school shortened each period from 41 to 30 minutes, which has made it very difficult to cover all of the material that students need to know for the Regents. This has limited the amount of choice and creativity I have in delivering the content. I am hopeful that I will be able to work more with my students on practicing skills such as argumentation, analysis of evidence, and justification of a claim with evidence in the coming years.