

RIFFLE	CoRe: Content Representation Tool (Loughran, Mulhall, & Berry, 2004)	RIFFLE
<b>Big Ideas/Concept:</b>	The development of science through history is embedded in the social, cultural, and political issues of the day.	
1. What you intend students to learn about this idea	Through the history of scientific discovery and advancement, much of the direction of research has been influenced by social, cultural, political, economic, ethical, and environmental issues and desires of the time (MO Science GLE 8.2.B). Furthermore, the background of the individual scientist is highly influential on what they chose to study (AAAS, 1990 & MO Science GLE 8.2.A). Also, often the established body of knowledge is highly influential on how new scientific discovery is interpreted, accepted, or rejected (AAAS, 2008 & MO Science GLE 8.2.B).	
2. Why is it important for students to know this	<p>Incorporating how social, cultural, and political issues have affected the development of science through the history of science into curriculum is something that will benefit students when it comes to understanding the motives that guide science. It will help them to see science more as a social need than an institution forced upon them. Furthermore, according to Solomon et al. (1992), using the history of science within the curriculum provides students a view of the interactive nature of experimentation; the human aspects.</p> <p>Driver et al. (1996) outlines economic, utilitarian, democratic, cultural, and moral rationales for why students should know about the nature of science. As far as learning about the cultural embeddedness of science, Driver’s democratic and cultural rationales are probably the most useful. Many of today’s policy issues have scientific dimensions. It is important—If students are ever going to have a role in political decision making—that they have an understanding of what roles science has in society currently and how it has played a role in the past. Moreover, Driver argues that scientific knowledge is possibly <i>the</i> major achievement of our culture, and if students are going to appreciate it they will need an understanding of framework and process of science and how it fits into society.</p>	
3. What else you know about this idea (that you do not intend students to know yet).	I can foresee nothing that I wouldn’t be OK with my students knowing about this idea. Students should be aware of all aspects of society and culture that influence scientific endeavors, even if they are unsavory. According to Sadler and Zeidler (2003), “discussions of scientific blunders and abuses can add another important dimension to science classrooms. These cases force students to critically evaluate the role of science within a society and the ethical ramifications of scientific work” (p. 40). Students should be aware that science is not perfect; mistakes are made, ultimately incorrect lines of thought are followed, and at times science is used in ways that can be detrimental to society. However ugly it may be at times, students should be aware of all the dimensions of science.	
4. Difficulties/limitations connected with teaching this idea	<p>I have very little background in the history of science and specifically what social, cultural, or political issues have influenced many of the topics I will be covering in my physics class. Furthermore, time constraints might weigh on the depth with which the topics are covered when other objectives must be met.</p> <p>Currently, I am having discussions with one of my old professors (Dr. Volkmann) about what might be done to incorporate a history of science course into the required coursework for undergraduate science education majors at our university. I think it is a travesty that I was required to take so many advanced content courses that I will likely never use in my physics classroom, but had no history of science requirement whatsoever. Hopefully, we will be able</p>	

	<p>to rectify this issue for future students. As for my limited knowledge of all the cultural issues that have had an affect on science through history, I plan to do some research on my own time and may eventually try to enroll in a history of science class through another university.</p> <p>With regards to the time issue, ultimately, it is important for students to know about the social and cultural aspects of science. Thus, it will be necessary to make efforts to embed these topics into my regular content instruction. Ideally, I will be able to cover content and culture at the same time.</p>
<p>5. Knowledge about students' thinking which influences your teaching of this idea</p>	<p>According to the studies of Driver et al. (1996), it seems somewhat clear that students have little awareness of the specific role that societal, cultural and political factors play in the production of our body of scientific knowledge. That being said, they do seem to have a decent understanding of the nature of human interactions; of the issues that influence arguments in their day to day lives. However, it seems that often their ideas are somewhat naïve.</p> <p>It will be necessary for me, in my instruction, to make clear connections between my students' ideas about human social interactions and how society has played a role in the advancement of science. Since they already have some ideas about this, it shouldn't be horribly difficult to mold their thoughts in the right direction. I will have to make efforts to plan my curriculum in a way that allows students to truly see and evaluate the social, cultural, and political influences that affect the development of scientific knowledge.</p>
<p>6. Other factors that influence your teaching of this idea</p>	<p>It's always seemed clear to me that students will place more value on their education when they can see how it relates to their lives outside of school. M.W. Caprio suggests that "only if we can integrate their science experience with the mainstream of our students' lives and give it meaning and purpose for them will there be any possibility that they will retain and enlarge the lessons they recite so well on our exams" (1999, p. 135). As such, the benefits of teaching the social, cultural, and political aspects of the science seem rather clear. These are all factors that make science real to students. No longer is the subject something that is disconnected requirement of the state, but rather their science class can become something of avenue to explore the world around them on a personally meaningful level.</p>
<p>7. Teaching procedures (and particular reasons for using these to engage with this idea)</p>	<p>McComas (2004) suggests that "Science is a large and powerful enterprise that lies within the greater human social system. What research is performed and what research is discouraged or even prohibited is best understood by considering human forces such as history, religion, culture, and social priorities" (p. 26). As this is the case, I feel as though one of the best methods that can be used to teach the social, cultural, and political roles of science is to teach the history of science. I currently am planning a unit in which I will be incorporating the story of how Newton came up with his Universal Law of Gravitation. He was highly influenced by a rivalry he had with Robert Hooke and this had a major role in him pouring his efforts into research on the particular matter. (A more in-depth description of this project can be found in my synthesis paper). In this lesson I will be making a point of making very explicit reference (as suggested by Abd-El-Khalik and Lederman, 2000) to the social factors that influenced Newton's work.</p> <p>Another method that I am currently using in my class to teach students about the social influence <i>of</i> science and the role society has <i>on</i> science is creatively referred to as "Semester One Physics Project for Mr. Riffle." My students</p>

	<p>have been given two options to do research on that will eventually end in a presentation that they will be giving to the class. Students are either to research a recent scientific advancement or an historical episode in science. They may choose anything at all that appeals to them, but every group is required to be able to articulate what exactly makes their topic scientific. Furthermore, to get specifically at the social nature of science, all students are required to include in their presentations an overview of the social context that influenced their topic. (The project overview can be seen in Appendix A).</p>
<p>8. Specific ways of ascertaining students' understanding or confusion around this idea (including likely range of responses).</p>	<p>It seems important that if I am going to assert the importance teaching the social, cultural, and political factors that influence science and that science has an influence on, that I make a point to assess whether or not my students actually learned anything about these things. The two teaching procedures that I mentioned above will certainly incorporate assessment strategies to check student understanding on those things in particular. The lesson I will be teaching using the story of Newton will be full of explicit questions about what influenced Newton's work as he formulated his Universal Law of Gravitation. The project my students are currently working on has a specific rubric component asking students to describe what makes their topic of choice scientific. Furthermore they are all asked to shed some light on what social factors influenced the work that led to their advancement or historical episode of choice. Ideally they will find that a variety of different factors have influenced the topic they are researching. Depending on what they decide to put their efforts into researching, they may find anything from governmental pushes for advancement, environmental factors, personal endeavors, and a range of other things. I suspect, if they search in the right places, they should have no trouble describing the social factors that have influenced their topic. Another method I might employ is the use of concept cartoons. (One that I created can be seen as Appendix B). Cartoons like the one I've created pose two opposing viewpoints of science to students in a medium that they are familiar with. They are then asked to discuss the viewpoints shown and come up with arguments for which one they agree with. The cartoon I've made introduces the possibility that culture has an effect on what scientists study. Hopefully this will get students to come up with examples of how culture has affected and influenced scientific advancements that they've seen in their own lifetimes.</p>

## References

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