

Through Different Eyes:
Viewing a Recommended Curriculum in Two
Distinct Classroom Cultures

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Although all physics teachers at the Pittsburgh Public School District receive the same curricular materials – including a list of standards, a syllabus, a list of benchmarks (specific student ability expectations), a textbook, access to a test bank and various external assessment agencies, and online links to suggestions – the culture that the teacher has created in her classroom will ultimately affect the use of those materials. Some of the suggested materials will (or will not) specifically appeal to the teacher depending on that culture, and the teacher will subsequently choose materials that reinforce the culture when possible. In cases of obligation, the teacher will present similar materials in different ways depending on the classroom culture. The total effect of the teacher's choices will cause very different environments, and the result will be sharply differing learned curricula.

In Cultures of Curriculum, Pamela Joseph et al. describe six distinctive classroom cultures that carry with them unique hopes, visions, challenges, and faults. Two of those cultures, *Connecting to the Canon* and *Confronting the Dominant Order*, are alternatives to the didactic “lecture and learn” culture that seems to prevail in the American education system. Each of these cultures promises success, though their terms for that success vary significantly.

The first seeks to reinforce essential ageless truths, largely within the framework of the traditionally prevailing Euro-American male-dominated history and culture. The vision of this culture is that by forging and strengthening links between the students and those truths, the students will become interested in classical accomplishments and actively pursue forming a relationship with them, learning about them and claiming ownership of their core values. By working hard, any student can acquire the “cultural capital” necessary for a successful life. The teacher acts as a

guide on this arduous struggle, questioning the students and encouraging them. However, this questioning is not designed to leave the students without a feeling of resolution – it is only meant to temporarily unsettle them enough to investigate and resolve the conflict. Hence, through methods such as discussion and confronting preconceptions, the advocates of *Connecting to the Canon* would help provide the students with access to the valuable “cultural capital” that is an understanding of math, science, and technology.

The other culture seeks to challenge the accepted roles of societal groups and provide as level a playing field as possible for gaining that “cultural capital” beyond the limited range and voice of the dominant culture. Advocates of *Confronting the Dominant Order* hope to rouse the students from their complacency by illustrating a social or cultural problem in vivid, personal, meaningful terms. Then, in the context of this problem, the students and teachers engage in genuine dialogue, sometimes conflating their supposed roles, in a cycle of confrontation, transformation, and reflection. This cycle often ends before the students acquire resolution. This is expected, as the goal of the unit was not to resolve the problem but to expose it and address it in a way that would allow students to learn content and procedure. Hence, a science teacher in this culture might present a plausible looming crisis such as the prospect of global warming, with the intention of weeding out political and socio-economic biases, teaching students to seek out data, challenge its sources, and draw their own conclusions. The student would therefore gain not only knowledge about how science works, but also an understanding about the culture’s views and how those influence their perceptions of citizens and scientists.

Imagine two different introductory physics classrooms in a Pittsburgh Public High School. In each classroom we find roughly 20 students with the same ethnic and gender breakdown: approximately half of the students belong to a minority race, and about half of the students are female. The students are juniors and seniors, and, as this is not an honors course, “average” academic students by whatever standards the school deems appropriate (it is worth noting that these standards are unlikely to be directly identified with either of the two cultures listed above). One of these classrooms resembles a *Connecting to the Canon* environment, while the other is most closely aligned with *Confronting the Dominant Order*.

In the former classroom, Mr. Regent (the teacher) has set up his large room so that the desks along two sides face in towards a throw rug. On the rug is an old-style leather chair. During class time, he sits in the chair and discusses physics concepts with his students, citing examples of their encounters with these concepts in everyday life and questioning the students as to why things work the way they do. In the rear of the room are a collection of simple lab tables, covered with blocks, cardboard, wires, and other sundry items. The seven class meetings a week alternate between investigations, discussions, problem sets, and reviews. Achieving the standards given to him are his primary concern; he wants students to connect with physics in a meaningful and practical way so they can understand more about the world in which they live (and thus they will have obtained “cultural capital”). He follows the recommended schedule but occasionally trumps a section that he feels is too abstract.

Mr. Regent has accepted the textbook but avoids using it extensively (except for occasional problem assignments). In fact, the textbooks are usually at the students’

homes, their role is limited as a reference for his students. Instead, he scoured the links provided to him by Pittsburgh Public to find units that would help his students meet their objectives. For example, he came across a MagLev project through the links, and he decided that it would be effective if he implemented it during his magnet discussion in the following way: he presents a vivid background story that engages the students' imagination (perhaps by describing the proceedings that Pittsburgh was going through at one time to implement it), then he engages the students in an inquiry project where they experience levitation effects due to electromagnets. The students observe varying currents and compare the effects. Next, he brings the students together at the rug and asks them questions about what they observed and how that might affect transportation. He then turns the discussion to the relationship between electricity and magnetism and tries to instill a feeling of respect for its discovery. He will also devote a day to having the students individually solve simple (but useful) problems related to electromagnetism. There may also be a large, difficult problem that requires the cooperation of the entire class (this process the teacher especially likes, because as a collective group, the students can challenge a more truly 'real' physics problem). He will use plenty of similar units, such as having the students investigate the glowing pickle or light bulbs in a circuit, but it's always with the eye on fascinating the students by challenging some previous conception and providing them with correct, functional knowledge. Mr. Regent avoids lecturing on content material unless the students have found themselves at a conceptual roadblock; he knows that the students would perceive uninitiated subject matter as vague, abstract, and uninteresting, and they would choose not to pay attention.

Mr. Regent views himself as a master of both physics content and pedagogy, and he sees his role as one of showing the students that their lives are better off if they understand physics. He knows that students come from different cultures and that their minds are not empty, but he also believes that there is a certain neverending truth to be found in physics that is the same for, and accessible by, everyone. As such, he speaks vernacular in the classroom and communicates with the children, not to them. However, if the students are to achieve that “cultural capital,” they must decide to work for it. Mr. Regent prides himself on his reputation as “the hardest science teacher in the school,” because as he puts it, “once you get through me, you’ll be ready for whatever comes next.” The students need not work alone; he’ll help anyone who requests assistance, but the responsibility rests squarely on the students’ shoulders.

As is required by the curricular materials, his students keep a notebook. This notebook is typically filled with problems, notes from the investigations, conceptual quizzes, and physics definitions. Some students will choose to record notes from the discussions and some will not. He will not tell the students to “write this down.” However, in Mr. Regent’s class, these notebooks are permitted reference materials on periodic exams, which may come from the test bank (in the case of the semester exam) or be designed by the teacher. The “standard” physics problems are as practical as possible – asking questions about phenomena that the students have experienced when available. The remaining questions on the exams are more demanding but directly related to the investigation units, so as to reward students who worked hard and kept good notes. Additionally, he willingly takes advantage of the PASS exams to receive feedback on how well his students are achieving the standards.

In the room across the hall, Ms. Challis' class exhibits a very different culture. The room looks very transient – as if any given configuration of chairs and lab tables was apt to change if need be. The students mostly disregard them anyway, and they sit wherever they please. All indications are that Ms. Challis never sits down. She resents the limitations of her seven class meetings a week being short and choppy, since they occur in 41-minute chunks, with the exception of the 82-minute double period that meets twice a week. In those meetings, students discuss problems with the teacher, perform experiments, and meet with each other in small groups to hash out scientific explanations. This teacher shows that she holds the standards in high regard; she is deeply concerned with empowering the students to make strong and educated decisions in their lives as a result of the class, even if that means spending a significant portion of class time exposing social implications of scientific achievements.

Ms. Challis completely neglects the textbook, finding it to be unhelpful in achieving her goals. She explicitly challenges the students early in the school year that “physics as it is today is a white man’s game,” and continues to harp on that point, with the hopes of angering (and motivating) the three quarters of her class population that are not white males. She had also decided to use portions of the suggested MagLev unit in her class, but in a much different way than Mr. Regent. Her students would discover it while working within the context of a much larger unit on pollution. The MagLev system would be a proposed method of reducing pollution. As they discussed the feasibility of such a project, they would explore the properties of electromagnetism and superconductivity so that they would decide whether it was truly possible. However, MagLev would only be one of a number of proposed alternatives to reduce air pollution in mass transit; the students would also investigate hydrogen, hybrid, and

electric vehicles and present cases for them in a debate setting, with part of the class acting as a jury. The Pittsburgh Public curriculum materials did not recommend this month-long unit explicitly, but Ms. Challis assumed that it was implied due to the website links and since it addresses no fewer than eight of the nine standards set forth in the syllabus. In fact, the entire year was nothing but a series of a half dozen or so of these types of units: one or two per grading period. The only mathematical problems that the students would face are within the context of these extended investigation units. However, she concerns herself with providing ample mathematics and exposure to traditional physics concepts. Additionally, while she vaguely follows the curricular requested arrangement of topics, she sees them as flexible and pliant should either the students or the units call for it. She does not view the course intermediate objectives as chronologically significant; for example, she prefers to introduce the students to the concept of energy before force. She sees no reason to stick to an ancient sequence of topics just for the sake of tradition or even for the sake of an abstract logical structure that the majority of her students would likely fail to grasp.

Ms. Challis sees herself as an agent for change. She wants to see the world become one full of actively aware, scientifically literate citizens. She wants physics to become more than just a “dead white man’s game” by actively involving her students in authentic challenges. She seeks to involve her students in difficult questions such as “why are there so few women studying physics?” and “what can we do to reduce air pollution?” which even she doesn’t know the full answers to – as opposed to Mr. Regent’s questions of the form “how does a capacitor work?” She expects to learn from her students as well as teach them, and she seeks to encourage each of the students individually. More than anything, she sees the hard questions – and their

answers – as firmly rooted in the classroom culture as a whole. The task before them – to try to address those problems – is one that involves the entire class as a whole. Each participating, be it a student or the teacher, contributes to a collectively constructed knowledge.

As in Mr. Regent's class, the students keep a notebook. Ms. Challis and her students call them "journals," and the students record their progress on their projects periodically. They also answer their math questions and keep project handouts from each other's groups within these journals. Their grades come primarily from their journals, progress, and presentations within each unit. Though she resents being forced to give a semester exam, she allows the students to use their journals and is confident in their abilities to solve the problems, even when taken outside of the big project contexts. She, like Mr. Regent, willingly employs the PASS diagnostic exams; she believes that they are a much better assessment tool than the semester exams: they actually address the changing, living standards rather than conform to a dead system. She also actively campaigns to gain more autonomy over her curriculum – including allowing her to assess her own students without the need for a semester exam, as that resource is not only worthless (which she also found the book to be), but actually counter to her course aims.

Both of the fictional teachers listed above proclaim that they are adhering to the standards and that they are using the recommended curriculum in some fashion – although they are also taking ownership of it and modifying it significantly, creating two distinct cultures. The question now is not whether a student learns more in one

than in the other, but rather, what are the differences between what a student is expected (and likely) to learn in one class as the other.

A student in Mr. Regent's class has been expected to learn how to solve numerical problems, explain everyday phenomena using concepts from physics, and address a new problem in terms of trusted scientific methodologies that were learned from the investigations. The student, while likely to gain those desired outcomes, is also likely to learn only fragmented bits of the enterprise that is Physics, what formula to use in given situations, how to "trick" Mr. Regent into giving out information. The student may also be left with little or no ability to transfer that knowledge from its familiar contexts.

Meanwhile, a student in Ms. Challis' class would be expected to face the world with motivated and scientifically literate attitude, with tools for acquiring scientific knowledge and questioning authority. The student would also be expected to have a working understanding of physics as it applies in certain situations (and, hopefully, in broader contexts). The student is also likely to have had exposure to the full spectrum of physics topics (and thus might be expected to suffer on written examinations) due to the much slower nature of Ms. Challis' class, become emotionally charged or depressed about a stagnant issue, and be faced with a difficult task in adapting to future, more traditional science courses.

In either case, students are likely to achieve many of the standards set out for them in the syllabus by the district. However, the students in Mr. Regent's class might perform better on the semester exams, and observers might reason that they have learned more physics than those in Ms. Challis' class. However, someone interviewing students from each class might be very impressed with the relevant knowledge of Ms.

Challis' student. The cultures and the results are different for each of the two teachers, even though they follow the same recommended curriculum and standards. Students would likely identify well with one of the two options, and in either case are likely to learn more than if the teacher were to adopt a "traditional" lecture and cookbook lab format. In many respects, it is a shame that there are not more classes like the two of these currently practicing in the Pittsburgh Public district.

Acknowledgements:

Please see the attached Pittsburgh Public Physics 1 syllabus and benchmarks, obtained from <http://www.pps.k12.pa.us/academicoffice/science/default.asp>.

The MagLev unit came from <http://webquest.org/> (as linked from the Pittsburgh Public website) and is only one example from many on that site – some, such as the study of cracks, seemed more well suited for Mr. Regent's class, while others, such as the Energy study, seemed to be better for Ms. Challis. The MagLev unit was a nice compromise because it fit into each classroom very nicely.

The two classroom cultures came from Joseph, Pamela et al. (2000). Cultures of Curriculum. New Jersey: Lawrence Erlbaum Associates, Publishers.

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