Meeting the Danielson Framework

Connecting STEM Redefined values and resources to professional development

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THE DANIELSON FRAMEWORK

Charlotte Danielson's "The Framework for Teaching Evaluation Instrument'' uses empirical studies and theoretical research to identify teachers' responsibilities that improve student learning. Informed by the Bill and Melinda Gates Foundation's research project "Measures of Effective Teaching," the 2011 edition of the framework sets detailed expectations for a teacher's knowledge and skill set.

Oftentimes, the values of diversity, equity, and inclusion (DEI) seem to introduce separate, additional goals that a teacher must meet. The Danielson Framework opens opportunities to justify and promote DEI in the classroom. As such, DEI practices are not a burden to teachers, but tools to help them achieve their greatest potential as a professional.

Throughout its standards and rubrics, the Danielson framework offers ways in which teachers can foster a greater sense of belonging for all students in their classroom:

- ➔ Ex: To achieve a distinguished ranking for component 1b. Demonstrating Knowledge of Students, teachers must "actively [seek] knowledge of students' levels of development and their backgrounds, cultures, skills, language proficiency, interests, and special needs from a variety of sources."
- ➔ Ex: To achieve a distinguished ranking for component 2a. Creating an Environment of Respect and Rapport, teachers must maintain teacher-student interactions that "are highly respectful, reflecting genuine warmth and caring and sensitivity to students as individuals."
- ➔ Ex: To achieve a distinguished ranking for component 4f. Showing Professionalism, teachers must make "a concerted effort to challenge negative attitudes or practices to ensure that all students, particularly those traditionally underserved, are honored in the school."

Teachers who achieve outstanding performances within the domain of Professional Responsibilities are those who respect their colleagues, as well as the students and families they serve. They adapt and grow, routinely evolving to remain effective and engaging. To maintain their professionalism, teachers must thus strive to the meet the following objectives:

(1) Affirm the identity of each student in their classroom.
(2) Equip all students, regardless of background, with the skills to be well-informed, empathetic citizens.
(3) Acknowledge educational barriers for students of various backgrounds, and take action to mitigate these challenges.

These goals are not new, as demonstrated by the references to these values in the now decade-old Danielson Framework. Now, all that is needed are the right tools to help these goals come to fruition.

OUR CONTRIBUTION

STEM Redefined seeks to provide teachers with the necessary materials and inspiration to improve their classroom management skills. If applied, the curated collection of resources can further a teacher's performance within the Danielson rubrics. This document demonstrates connections between components of the framework and STEM Redefined's work, offering specific examples of using resources to enhance lessons and professional development.

This document directly quotes "The Framework for Teaching Evaluation Instrument":
Danielson, Charlotte. (2011). "The Framework for Teaching Evaluation Instrument." The Danielson Group. Retrieved from www.danielsongroup.org.

1a: Knowledge of Content and Pedagogy

In order to guide student learning, accomplished teachers have command of the subjects they teach. They must know which concepts and skills are central to a discipline, and which are peripheral; they must know how the discipline has evolved into the 21st century, incorporating such issues as global awareness and cultural diversity, as appropriate. Accomplished teachers understand the internal relationships within the disciplines they teach, knowing which concepts and skills are prerequisite to the understanding of others. They are also aware of typical student misconceptions in the discipline and work to dispel them. But knowledge of the content is not sufficient; in advancing student understanding, teachers are familiar with the particularly pedagogical approaches best suited to each discipline.

The incorporation of global and cultural awareness into STEM education is a central component of STEM Redefined. Resources, if not presented in class, may still inform the teacher of unforeseen connections to various social movements and recent discoveries within the fields they teach. Teachers may also subscribe to newsletters from STEM Redefined to be regularly updated with information as the discipline continues to evolve.

- ➔ Ex: There is an ongoing movement against the construction of a 30-meter telescope on sacred land in Hawaii. While many believe that indigenous Hawaiians are "against science," an NBC News video demonstrates the importance of practicing astronomy research in an ethical manner.
- ➔ Ex: In the 21st century, child-bearing is recognized as an act that is not limited to heterosexual, cis-gendered women. A "The Lily" article can inform teachers on the matter, telling the story of a queer-specific doula collective in Washington, D.C.

1b: Demonstrating Knowledge of Students

Teachers don't teach content in the abstract; they teach it to students. In order to ensure student learning, therefore, teachers must know not only their subject content and its related pedagogy but the students to whom they wish to teach that content. In ensuring student learning, teachers must appreciate what recent research in cognitive psychology has confirmed: namely, that students learn through active intellectual engagement with content. While there are patterns in cognitive, social, and emotional developmental stages typical of different age groups, students learn in their individual ways and may come with gaps or misconceptions that the teacher needs to uncover in order to plan appropriate learning activities. In addition, students have lives beyond school, lives that include athletic and musical pursuits, activities in their neighborhoods, and family and cultural traditions. Students whose first language is not English, as well as students with other special needs, must be considered when planning lessons and identifying resources that will ensure their understanding.

To achieve a "distinguished" marking, the teacher should actively seek knowledge of students' levels of development and their backgrounds, cultures, skills, language proficiency, interests, and special needs from a variety of sources. Students' identities are likely to influence their experience of a STEM subject, as well as within their STEM pathway. Engaging students about the background that informs their collective knowledge is possible through the discussion of current events. Furthermore, teachers model inclusive language while addressing disparities may make themselves more available to students who are unsure if their teacher is welcoming of various backgrounds.

- ➔ Ex: An article on same-sex behavior in animals will aid teachers in affirming LGBTQ+ identities.
- ➔ Ex: A video on "The Physics of Jazz" may open discussion on connections students have seen while practicing or performing music to STEM concepts.

1d: Demonstrating Knowledge of Resources

Student learning is enhanced by a teacher's skillful use of resources; some of these are provided by the school as "official" materials; others are secured by teachers through their own initiative. Resources fall into several different categories: those used in the classroom by students, those available beyond the classroom walls to enhance student learning, those for teachers to further their own professional knowledge and skill, and those that can provide non-instructional assistance to students. Teachers recognize the importance of discretion in the selection of resources, choosing those that align directly with the learning outcomes and that will be of most use to the students. Accomplished teachers also ensure that the selection of materials and resources is appropriately challenging for every student; texts, for example, are available at various reading levels to guarantee all students access to the content and successfully demonstrate understanding of the learning outcomes. Furthermore, expert teachers look beyond the school for resources to bring their subjects to life and to assist students who need help in both their academic and nonacademic lives.

The STEM Redefined library may be used to supplement students' education outside of the classroom, especially if all students are not willing or ready to discuss heavy topics. Many of the articles discuss the applications of subjects such as computer science, ecology, cell biology, and others, allowing students to learn about potential STEM pathways. Student resources hosted on the website also provide non-instructional assistance, offering lists of role-model STEM professionals and potential scholarships. In the future, students may also access video series on "A Day in the Life" for various college-level STEM students.

- ➔ Ex: The TED Talk "The Toxic Baby" may be watched by a student interested in environmental and public health outside of the classroom. The video will demonstrate how the chemistry of certain pollutants promote cancer in certain populations, tying the biological concept of the development of cancer cells to a "real-world problem." This may inspire the student to study the subject further.
- ➔ Ex: An article on computer science student (and TikTok star) Alexis Williams may inspire a student to use their knowledge of code to further their involvement in ongoing social movements and politics.

2a: Creating an Environment of Respect and Rapport

An essential skill of teaching is that of managing relationships with students and ensuring that those among students are positive and supportive. Teachers create an environment of respect and rapport in their classrooms by the ways they interact with students and by the interaction they encourage and cultivate among students. An important aspect of respect and rapport relates to how the teacher responds to students and how students are permitted to treat one another. Patterns of interactions are critical to the overall tone of the class. In a respectful environment, all students feel valued and safe.

Teachers may foster respectful, warm classroom environments when they lead conversations with appropriate and accurate language. The STEM Redefined Glossary provides insight into labels such as "Latinx" and "Genderqueer" that students may identify with. Through the intentional facilitation of classroom conversations on subjects of race, gender, and sexual orientation, the teacher demonstrates that they are committed to equity and inclusion, opening the opportunity for positive relationships with students of any background.

- ➔ Ex: The National Geographic article "Dear Mangalyaan" allows the teacher to highlight an Indian effort in the field of astronomy, promoting the respect of STEM outside of the United States. The United States is not thought of as the only source of STEM research, and students grow to respect an international community of scientists
- ➔ Ex: The article "Is Artificial Intelligence Queerphobic?" allows the teacher to teach and normalize the terms they/them pronouns, gender fluidity, and queerness. The teacher routinely ensures that students do not dismiss such identifiers and/or put down students of various sexual orientations and genders.

2b: Establishing a Culture of Learning

A "culture for learning" refers to the atmosphere in the classroom that reflects the educational importance of the work undertaken by both students and teachers. It describes the norms that govern the interactions among individuals about the activities and assignments, the value of hard work and perseverance, and the general tone of the class. The classroom is characterized by high cognitive energy and by a sense that what is happening there is important and that it is essential to get it right. There are high expectations for all students. The classroom is a place where the teacher and students value learning and hard work.

STEM Redefined resources highlight the necessity to use science as a public good. Teachers are encouraged to use resources to present real-world applications that may inspire students to study further within the field and help mitigate social inequities. Students are able to use STEM Redefined resources to understand their role as learners and find new connections between classroom material and non-classroom life.

- ➔ Ex: A homework activity to create a public health infographic, paired with the MIT Press article "Visualizing Data to Save Lives" allows students to understand the importance of statistics in relaying information for the benefit of society as a whole.
- ➔ Ex: After learning about photovoltaic cells, students are given the opportunity to read about racial disparities in solar deployment. The culture of learning promotes conversations on the importance of solar panel usage in a variety of communities.

3a: Communicating with Students

Teachers communicate with students for several independent, but related, purposes. First, they convey that teaching and learning are purposeful activities; they make that purpose clear to students. They also provide clear directions for classroom activities, so that students know what it is that they are to do. When teachers present concepts and information, those presentations are made with accuracy, clarity, and imagination; when expanding upon the topic is appropriate to the lesson, skilled teachers embellish their explanations with analogies or metaphors, linking them to students' interests and prior knowledge. Teachers occasionally withhold information from students (for example in an inquiry-based science lesson) to encourage them to think on their own, but what information they do convey is accurate and reflects deep understanding. And the teacher's use of language is vivid, rich, and error free, affording the opportunity for students to hear language well used and to extend their own vocabularies. Teachers present complex concepts in ways that provide scaffolding and access to students.

Resources from STEM Redefined can introduce new concepts such as pollution, environmental factors on DNA, and the medical research methods. These scaffolding activities introduce key vocabulary in a pop-science context. Students learn complex concepts, as well as the way in which they may be communicated accessibly.

- ➔ Ex: The *Guardian* article "US people of color still more likely to be exposed to pollution than white people" describes nitrogen oxide, referring to the compound as NO2. The short article introduces the chemical compound in the context of society, allowing teachers to build scaffolding before a chemistry lesson on naming compounds.
- ➔ Ex: An article on an Afrofuturist Museum links to students' interest in future technologies and art, building vocabulary for "design future thinking."

3b: Questioning and Discussion Techniques

Questioning and discussion are the only instructional strategies specifically referred to in the framework for teaching; this fact reflects their central importance to teachers' practice. But in the framework it is important that questioning and discussion are used as techniques to deepen student understanding rather than serving as recitation or a verbal quiz. Good teachers use divergent as well as convergent questions, framed in such a way that they invite students to formulate hypotheses, make connections, or challenge previously held views. Students' responses to questions are valued; effective teachers are especially adept at responding to and building upon student responses and making use of their ideas. High-quality questions encourage students to make connections among concepts or events previously believed to be unrelated, and arrive at new understandings of complex material. Effective teachers also pose questions for which they do not know the answers. Even when a question has a limited number of correct responses, the question, being nonformulaic, is likely to promote thinking by students. Class discussions are animated, engaging all students in important issues and in using their own language to deepen and extend their understanding. These discussions may be based on questions formulated by the students themselves.

Students are encouraged to use resources to debate pertinent issues in STEM and society, so long as people's livelihoods and rights, as well as scientific "facts," are not up to discussion.

- ➔ Ex: After a lesson on electricity or renewable energy, students engage in a debate about electric car policy. Students discuss the total environmental and social effects of electric vehicles. Various forms of electricity generation are discussed, as well as the broader context of sustainable transportation services.
- ➔ Ex: A discussion on bioethics is held after learning about Henrietta Lacks, and students are encouraged to challenge previously held views on medical research.

3c: Engaging Students in Learning

Student engagement in learning is the centerpiece of the framework for teaching; all other components contribute to it. When students are engaged in learning, they are not merely "busy," nor are they only "on task." Rather, they are intellectually active in learning important and challenging content. The critical distinction between a classroom in which students are compliant and busy and one in which they are engaged is that in the latter students are developing their understanding through what they do. That is, they are engaged in discussing, debating, answering "what if?" questions, discovering patterns, and the like. They may be selecting their work from a range of (teacher-arranged) choices and making important contributions to the intellectual life of the class. Such activities don't typically consume an entire lesson, but they are essential components of engagement.

Students are encouraged to imagine solutions for social inequities using the information learned in class. They are encouraged to seek additional information to solve real-world problems described in a STEM Redefined Resource. Students understand that their work may one day have an impact on others and are engaged in the entire lesson because of their intellectual contributions.

- ➔ Ex: Following the viewing of the TED Talk "Gender Inequality in Health," students describe a medical research sampling method that ensures that the effects of drugs on women are studied.
- ➔ Ex: During "busywork" time during a lesson on gene editing, students discuss controversies regarding human gene editing and the implications of GMO plants on global food supplies.

4e: Growing and Developing Professionally

As in other professions, the complexity of teaching requires continued growth and development in order to remain current. Conscientiousness about continuing to stay informed and increasing their skills allows teachers to become ever more effective and to exercise leadership among their colleagues. The academic disciplines themselves evolve, and educators constantly refine their understanding of how to engage students in learning; thus growth in content, pedagogy, and information technology are essential to good teaching. Networking with colleagues through such activities as joint planning, study groups, and lesson study provides opportunities for teachers to learn from one another. These activities allow for job-embedded professional development. In addition, professional educators increase their effectiveness in the classroom by belonging to professional organizations, reading professional journals, attending educational conferences, and taking university classes. As they gain experience and expertise, educators find ways to contribute to their colleagues and to the profession.

STEM as a discipline has evolved to exist beyond academia, and educators must refine their understanding of the subject to demonstrate its impact on various social identifiers in society. Along with a STEM Redefined representative, educators will be able to anonymously share issues with resource implementation, as well as form solutions for these challenges. Educators within an implementation program will be encouraged to plan lessons and study groups together, as well as to set up mentorship programs between 12th and 9th grade students in STEM classes.