Standard V  
Learning Environment

Accomplished science teachers create and maintain a safe and engaging learning environment to promote and support science learning for all students.

Introduction

Accomplished science teachers believe that a positive and productive environment supports high levels of science learning for all students. Therefore, accomplished teachers create an environment where students feel engaged in science and connected in productive ways to their teacher and peers. Students of accomplished teachers know what is expected of them and are confident and willing to participate because they perceive that their explorations in science are valuable.

Accomplished science teachers take responsibility for the physical, emotional, sociocultural, and intellectual aspects of the learning environment. They also consider learning environments beyond the classroom. These teachers recognize that the hallmarks of a positive and productive learning environment include safety, student engagement, fair and equitable opportunities, and deeply embedded science values. Accomplished teachers create an environment that helps students gain the sense that they belong to a science learning community and that nurtures in students the inherent curiosity about natural phenomena that is integral to the culture of science.

Safety

Although student safety is a priority in every science classroom, accomplished teachers are exemplary in their efforts to ensure safety for all students before, during, and after investigative activities. Accomplished teachers continuously teach and model proper laboratory procedures, including the appropriate use of materials and equipment. They scrupulously maintain safety equipment and teach their students how to use it. Teachers ensure that their students know emergency procedures, and teachers continually monitor their students’ compliance with safety practices. Teachers ensure that all students and their guardians have signed safety contracts, and teachers use the contracts as an instructional and motivational tool in order to maintain a safe learning environment.

Accomplished science teachers realize that careful planning is crucial to safety and that safety considerations must be key when they are planning instruction. These teachers determine what laboratory activities are feasible based on students’
abilities and access to safety equipment. They ensure that the acquisition, storage, and disposal of chemicals and other materials meet all state and federal guidelines. They ensure that students dress and move appropriately in laboratory environments because they are intensely aware of the safety issues raised by the active nature and frequent transitions typical of a science classroom.

Accomplished science teachers realize that fostering a safe and inviting emotional climate is as important as ensuring students’ physical safety. Teachers understand that establishing a safe emotional climate encourages students to take intellectual risks and allows them to become part of the culture of science. Accomplished teachers create and maintain a sense of community by encouraging students to show concern for others, demonstrating high expectations for all, involving all students in the practice of science, and dealing swiftly and constructively with inappropriate behavior, such as bullying. The resultant sense of community encourages students to more actively collaborate in the processes of science and to respect all ideas, familiar or not.

Accomplished science teachers lay the groundwork for emotional safety by involving students in setting behavioral expectations and boundaries. As a result, students are invested in the norms of the classroom. Problems are less likely to arise, and when they do occur, students are more likely to be a part of the solution. Teachers handle behavioral issues fairly and respectfully, de-escalating confrontations and minimizing disruptions to the learning process.

Accomplished science teachers realize that promoting respect and emotional safety is especially important when dealing with potentially sensitive topics in science. Teachers are aware of topics that may be distressing to individual students. For example, lessons on genetics need to take into account students with limited family information or a background of genetic disorders. Accomplished teachers model respectful and sensitive discussion questions and responses with students, ensuring the emotional safety of all students. For example, if an accomplished science teacher were to present a lesson on genetics, the teacher would model how to conduct the discussion in a respectful way. Creating a family tree can provide interesting links between the science of genetics and real life but may also raise unforeseen personal issues. Therefore, an accomplished teacher might provide a fictional case history from which students could design a family tree.

Accomplished science teachers understand that myriad opportunities for science learning exist outside the science laboratory. They encourage students to take advantage of varied learning experiences, but they are careful to research safety guidelines and prepare students before utilizing outside venues. Accomplished teachers model respect for nature, and they ensure that students venturing beyond the classroom are aware of possible dangers. Accomplished teachers realize that the need for safety in science extends to all outside learning activities, including outdoor lessons, field trips, or independent home projects; when it is appropriate to do so, teachers educate parents and other chaperones and advisors in safety concerns related to field trips or home learning. In addition, accomplished teachers verify that
adult chaperones assisting with field trips have appropriate backgrounds and are present in sufficient number to ensure the security of the students. Accomplished science teachers also teach students skills to ensure their safety while researching or discussing science in digital or virtual spaces.

Engagement

Accomplished science teachers structure the physical environment of the classroom in such a way as to establish an engaging atmosphere. They provide exciting materials that students will be motivated to explore, and authentic materials that will help students experience the culture of science. Materials may include displays, technological devices, print materials, models, laboratory equipment, and other elements that will appeal to students. (See Standard I—Understanding Students.)

In order to maximize student learning and engagement, accomplished science teachers modify various aspects of the physical environment, including lighting, seating arrangements, traffic patterns, and the location of materials. Teachers pay special attention to how modifications in the physical environment can promote flexible student grouping. For example, on one day an accomplished teacher might arrange the desks in a circle for Socratic discourse and then the next day might arrange the desks in small groups for collaborative work. Accomplished science teachers involve students in organizing the classroom in order to create a student-centered space. If there are significant obstacles to teachers’ ability to control the physical environment, accomplished teachers are persistent in finding creative solutions to overcoming these barriers.

Accomplished science teachers utilize time effectively in order to maximize student learning. Teachers convey the importance of time management to their students. They establish patterns and routines that are orderly and effective to maximize student time on task. They teach students to apply efficiency to such classroom routines as procuring materials for lab experiments, managing laboratory notebooks, and submitting assignments.

Accomplished science teachers establish a productive social and emotional environment by demonstrating that they are committed to the belief that all students can learn and enjoy science. Accomplished teachers use techniques and methods that facilitate the academic performance of students from diverse racial, ethnic, and socioeconomic groups. Teachers are able to uncover the potential disconnects between school and home culture, and they make corresponding adjustments to the learning environment. Accomplished teachers recognize that there is a need to support all student groups, especially the underserved. An accomplished teacher would consider same-gender groupings for a lab activity that in past years had been dominated by one gender or another. For example, same-gender grouping might better allow for equitable participation from males and females in a lab activity using toy cars.