Chapter 14
Using STEAM in Marine Science:
Incorporating Graphic Design Into an Existing STEM Lesson

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EXECUTIVE SUMMARY

This case summarizes two perspectives on inclusion of Arts in STEM/STEAM education and how they influence the modification of an existing STEM lesson. Teachers are encouraged to use many instruction models throughout their careers, and inclusion of new methods can seem daunting. This case hopes to illustrate how STEAM education can be included in a classroom through intentional use of graphic design in an everyday lesson or a longer unit. Students in the case are asked to design and build a robotic arm that is capable of accomplishing a task such as move or grasp an object. The specific context is Marine Science in nature but can be adapted to many other content areas.

LITERATURE REVIEW

PBL, PLTW, DBQ, Inquiry, 5E, Backward by Design, STEM, STEAM. Educators are exposed to so many methods, models, and (hopefully) best practices throughout their careers that it is no wonder they sometimes question why and how they will incorporate them all. One challenge that faces teachers today is covering the breadth of district and state-tested content each year while incorporating methods that seem "bigger" than the time allotted in the course. Specifically, in terms of Science, Technology, Engineering, Art, and Mathematics (STEAM) education, teachers are faced with the thought that in order to incorporate content and lessons from each of the five included disciplines, we must create an elaborate project-based lesson that might require weeks of instruction.

For example, the Dream Factory at Elizabeth Forward Middle School integrates all of these disciplines by having students set up their very own chocolate business. Students work with a local candy factory, print 3D molds for the chocolate, create artistic labels, analyze cost and sales, and look at the chemistry of the chocolate itself (Keruskin, 2015). Projects like this are inspirational. They are experiential in nature, provide links between disciplines, allow for connections to be made outside the classroom, and promote rigor in education in an engaging and fun way for students. However, some educators may find challenges such as time, technology, and support to recreate something similar in their own school.

STEAM education is interdisciplinary by nature, but it does not have to be an elaborate project like the Dream Factory. Some teachers are finding ways to inspire the creativity, collaboration, problem solving, and reflective learning that STEAM proponents encourage by simple tweaks to their everyday lessons. Take, for example, Henriksen's (2014) description of a teacher who integrates art into science lessons by having "students create visual advertisements to describe a science idea, or a concept, organism, and soon." The classroom described features daily use of STEAM-inspired lesson content, rather than a project or problem-based approach, and is still successful in developing the skills sought in quality STEAM education programs. Students are afforded opportunities to use creativity, visual communication, critical thinking (through comparison, explanation, and modeling), and collaboration,-just as in the project-based approach of the Dream Factory.

Why STEAM? (STEM + A)

My experience in the academic field as an educator indicates that it is possible to incorporate quality STEAM learning as the in-depth, time consuming project and as the everyday lesson that allows for coverage of the many standards. According to Beers (2011), quality Science, Technology, Engineering, and Math (STEM) education "exemplifies the cross-curricular learning that is the foundation of a twenty-first century curriculum." Beers (2011) writes that STEM education also promotes the four C's: Critical thinking and problem solving, Communication, Collaboration, and Creativity (p. 5). STEAM Education, then, should promote these skills while additionally providing greater opportunity for students to discover new ways of seeing, thinking about, and learning each discipline through the additions of arts education.

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