

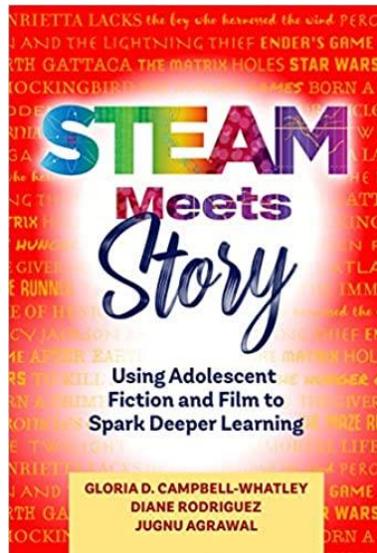
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Review of STEAM Meets Story: Using Adolescent Fiction and Film to Spark Deeper Learning

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STEAM Meets Story: Using Adolescent Fiction and Film to Spark Deeper Learning, by Gloria D. Campbell-Whatley, Diane Rodriguez, and Jugnu Agrawal, is a practical book that presents interdisciplinary STEM lessons for grades 6-12, with a focus on applications for disabled, culturally and linguistically diverse (CLD), and urban students. This book encourages educators to present engaging and relevant activities to students who might otherwise struggle with challenging STEM curricula. The acronym, STEAM, stands for Science, Technology, Engineering, Art, and Mathematics. The authors added “A” to their title, highlighting the acronym STEAM because of the importance of literature and the arts to culturally relevant STEM curriculum. In the book, they use STEM and STEAM interchangeably.

To address the perception that difficult STEM classes are not accessible to CLD or disabled students, Campbell-Whatley et al. created a series of lessons that are adaptable and malleable for students of differing abilities. They also point out the importance of literature and the arts to the STEM curriculum, emphasizing repeatedly that students do better in classes where they relate to the material and can imagine themselves in similar roles. In an increasingly diverse nation with numbers of English learners in the classroom on the rise, a culturally and linguistically sensitive curriculum for STEM is particularly important for fostering the development of linguistic skills surrounding challenging STEM topics. The lessons presented in *STEAM Meets Story* bridge the gap between abstract scientific language and literary or cinematic examples of scientific language in action.

Organized into two sections, *STEAM Meets Story* starts with three chapters about the benefits of connecting literature and the arts to STEM subjects. The second section presents lesson plans based on popular adolescent fiction and films with related resource materials and suggested differentiation or extension options for students with differing skills

or interest levels. My review will discuss both of these sections, first with an examination of the research and practical applications of using literature to enrich STEM curriculum. Then, I will explore the specific thematic lessons that the authors created. In this second part of *STEAM Meets Story*, the chapters offer lessons by subjects and their connections to literature: presenting science first, then math, followed by engineering, and then, finally, technology. Subtitles in this review reflect common themes that I observed in the text.

Section I: Practical Applications of STEAM Meets Story

Cross-disciplinary approaches between literacy, language, and STEM gives opportunities for teachers in different subjects to present lesson plan materials in discussions that reinforce multiple concepts in the readings or movie viewings. *STEAM Meets Story* provides teachers with detailed, step-by-step lessons so teachers can easily deliver standards-based curricula to students with little preparation or alteration to the suggested activities. However, at the same time, teachers need to recognize that the lessons are aligned to Common Core State Standards (CCSS) rather than the Next Generation Science Standards (NGSS), a choice that might impact an administration’s acceptance of the lesson for a STEM or science-focused classroom, but the standards listed on the related website for the book (Campbell-Whatley et al., 2021, p.27-28), can help guide science or STEM teachers towards lessons with standards that are also closely aligned with the NGSS platform.

Connecting Literature to STEM

The big question addressed in the first section of *STEAM Meets Story* is why connect literature to STEM? Campbell-Whatley et al. repeatedly address the purpose of linking literature to STEM, offering

some valuable advice on how cross-disciplinary instruction encourages interests and strengthens engagement with STEM subjects. For disabled and EL students, the challenges of STEM can seem insurmountable, but linking STEM to everyday experiences or enjoyable reading passages can be particularly valuable for improving performance and confidence in the STEM subjects. The authors point out that non-fiction STEM texts often include technical terms and challenging vocabulary. For CLD students, ELs, and those with disabilities, proficiency in STEM-related subjects is difficult to achieve. The authors explain that using literature in STEM content classes can help improve students' proficiency and motivation. "Integrating the literature into core content areas enables urban CLD adolescents with disabilities to explore a single concept from different vantage points, and it also utilizes all the different modalities of learning, and both lead to the formation of more neural pathways" (p. 6). For CLD and disabled students, linking literature to STEM through explicit, inquiry-based, and problem-based instruction—as provided by the lessons in *STEAM Meets Story*—can improve understanding and build connections to personal experiences.

In addition to improving performance and encouraging interest in students, there are other reasons for integrating the arts into STEM curriculum. One oft-cited reason in *STEAM Meets Story* is the underrepresentation of culturally and linguistically diverse groups, people with disabilities, and women in STEM academic and career positions. Some engineering and technology fields have very few women in them, but when girls see videos of female engineers or computer scientists, they feel much more encouraged to apply themselves to the subject. Literature also provides a link for female students, as well as for CLD or disabled students, because they can more easily envision themselves in STEM fields after reading about others engaged in

scientific inquiry, engineering, designing, or technology fields. In Chapter two, Rodriguez, Agrawal, Coles, and Hoag explain, "skills and confidence gained acquiring STEM content may pivot students toward a career in STEM... Literacy skills connected to science are valuable for enhancing young adults' understanding of scientific inquiry" (p. 25). For CLD, disabled, and EL students, the study of literature can provide useful language skills necessary for inquiry-based research and experimentation, and can encourage curiosity in scientific topics.

Section II: Literature, the Arts, and STEM-Focused Lesson Plans

The second section of *STEAM Meets Story* is laid out in chapters that examine the intersection of literature or movies and each of the STEM disciplines. Chapter four, the first chapter in the section, highlights ten literary or cinematic works and provides language and science-based lessons related to these artistic selections. Ranging from a study of the properties of water in a non-fiction retelling of an African boy's creation of a town-saving windmill to the analysis of scientific terms in a biology classroom scene in the movie *Twilight*, the chapter on science and literature attempts to teach scientific concepts while connecting the material to the students' real-life experiences. Chapter five provides lessons around the topics of mathematics and literature. The authors of this chapter point out that "performance on math assessments improves with performance in reading" (p. 63). For disabled or EL students, reading and language barriers can interfere with math success, so fictional stories that introduce or enhance important mathematic concepts can help students achieve higher levels of math success. As such, the chapter provides seven lessons around films and books that can lead to interesting activities and conversations about math.

In Chapter six, the authors provide ten more lessons, this time on the topics of engineering and literature. As a hands-on, collaborative, and problem-based subject, engineering offers opportunities for educators to engage students with multiple modalities in their lessons. The lesson plans in this chapter include some opportunities for students to build drones, robots, and models, and conduct experiments, which all relate to elements in popular books, movies, or television series. In the lesson about *Harry Potter*, the students create a model of a Quidditch pitch and compare it to sports fields many students know from their lives outside school. The authors describe how the interactive lessons in engineering and literature provide an alternative approach to identifying strong STEM students with formal written assessments: performance-based assessments. Project-based learning and problem-based learning appear in multiple STEM lessons in *STEAM Meets Story* because open-ended assignments and collaborative projects encourage higher-order thinking and problem-solving skills (p. 85).

For Chapter seven, the last chapter of *STEAM Meets Story*, all ten of the lessons use the book and movie, *Hidden Figures*, to guide activities and discussions about technology and STEM. Much of the chapter recommends lessons that could also closely align with library or media sciences classes, exploring digital citizenship, digital footprints, plagiarism, and citing sources. While extremely important topics for students to study, the study of citations, plagiarism, and using technology to update writing products neglects the wide range of possibilities in coding, programming, and computational thinking for CLD and disabled students, many of whom could enjoy such lessons with little worry about previous linguistic skills. At the same time, it is important for students to recognize the challenges that come with modern technology and the internet, and they

should be familiar with ways to stay safe and respectful online.

Conclusion

Although *STEAM Meets Story* is a great introduction to cross-disciplinary studies of literature, cinema, and STEM topics, some elements of STEM are weaker than others in the book. The lessons tend to focus more on language arts activities, such as defining vocabulary, character analysis, or story mapping, but only a few of the lessons in the science, math, and technology chapters encourage hands-on interaction, student-led inquiry, experimentation, or design. As the weakest chapter in the book, the section on technology has only one creatively technological lesson; print a three-dimensional object, while the rest of the chapter focuses on plagiarism, digital citizenship, and other research-based activities. As a result, the lessons that encourage project-based learning stick out as more interesting and exciting for students, while the lessons that ask students to research vocabulary or STEM topics online seem like throwaways for teachers who want to engage their students.

One of the strengths of *STEAM Meets Story* is its use of literature to provide thematic questions about culturally and historically relevant scientific themes. For instance, in multiple lesson plans, the authors recommend asking students to present on issues of race, caste systems, alternative fuel sources, or future uses of technology. Timely discussions of the Black Lives Matter movement, virtual learning platforms, and COVID-19 can help educators provide lessons that are relevant to important social issues that students have faced in the past few years. For culturally diverse students, the inclusion of discussions about racial discrimination in the lessons provide relatability and meaning to their everyday experiences.

Another strength of the book is its rich resources, provided in both the book and on the publisher's website. The authors explain many methods of scaffolding and supporting CLD and disabled students with mnemonics, vocabulary cards, story maps, and other helpful handouts. They also list questions for students, websites to visit to support learning, vocabulary lists to research, and grading rubrics for both educators and their students. These resource materials are extremely helpful for special education and general studies teachers who want to explore STEM through literature. Further, many of the lessons are language-rich and give students from CLD backgrounds a chance to explore scientific language in a relatable and less intimidating method than they would have done in a standard non-fiction science or math textbook.

Overall, *STEAM Meets Story* is a useful teaching manual for educators with culturally, linguistically diverse, and disabled students. The book makes use of explicit instruction, inquiry-based learning, problem-based learning, and culturally relevant topics to analyze links between STEM and literature or cinema. Students will enjoy exploring science, technology, engineering, and mathematics in an accessible, fun, and innovative way that is different from the language-dense textbooks of the typical science classroom. Educators will appreciate having engaged students who are developing the critical-thinking skills to analyze and discuss challenging concepts in STEM lessons.

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