



Breaking Stereotypes and Increasing Representation in Marine Biology by Diversifying Children's Literature

ACTIVITIES AND
PROGRAM MODEL

MARIA MADRIGAL

DIEUWERTJE KAST

*Author affiliations can be found in the back matter of this article

ubiquity press

ABSTRACT

Marian Wright Edelman, Founder and President of the Children's Defense Fund is credited for saying "You can't be what you can't see." Unfortunately, in both the field of marine biology and in children's literature, scientists and main characters tend to be predominantly White. In an effort to increase representation and break stereotypes when it comes to people of color, the University of Southern California's Joint Educational Project (JEP) partnered with a non-profit publisher called Room to Read to create a Science, Technology, Engineering, Arts, and Mathematics (STEAM) Powered Career series. This children's book series is targeted for ages 6–8 and features three animated characters of color and profiles a gamut of diverse scientists and experts in their fields. Furthermore, to meet the needs of Los Angeles' large Hispanic communities, the books were translated into Spanish. One of the ten STEAM fields included in the series is Marine Biology which is written by Maria Madrigal and features Dr. Charnelle Wickliff, who are both underrepresented minorities. The book covers marine topics relevant to the local California region such as, kelp forests, tidepools, and even grunion! Room to Read printed over 90,000 free copies that were distributed to low-income families in Los Angeles to address book desert issues.

CORRESPONDING AUTHOR:

Maria Madrigal

University of Southern California (USC), US; USC Sea Grant, US; USC Joint Educational Project, US
mdmadrig@usc.edu

KEYWORDS:

URM; STEM; DEI; Children's Literature

TO CITE THIS ARTICLE:

Madrigal, M., & Kast, D. (2024). Breaking Stereotypes and Increasing Representation in Marine Biology by Diversifying Children's Literature. *Current: The Journal of Marine Education*, 39(1), pp. 1–11. DOI: <https://doi.org/10.5334/cjme.97>

University of Southern California's Joint Educational Project (JEP) serves a student population that is predominately Hispanic/Latinx and Black/African and also consists of 40% English Language Learners (ELL), of which 98% of the ELL students are Spanish Speakers (California Department of Education, n.d.). When JEP searched for books to accompany Science, Technology, Engineering, Arts, and Mathematics (STEAM) lessons, there was a notable void in niche science children's books that featured characters of color and were also available in Spanish. Dieuwertje Kast, JEP's Director of STEM Education Programs, was inspired to explore solutions to this problem through further study. JEP's challenge of finding children's science books with characters that reflect their student population was confirmed by data provided by the University of Wisconsin-Madison-School of Education Cooperative Children's Book Center that provides annual summary of books about and by Black, Indigenous, and People of Color (BIPOC) since 1985. The center's study, published in 2020, found that 41% of all children's books reviewed featured White main characters, and that there were more non-human characters (29%) than there were for all minorities combined (27%). In their study, 12% of the children's books featured an African American/ Black main character, and 6% featured a Latinx one (CCBC, n.d.). How are students from BIPOC communities supposed to envision themselves as scientists when the kids' books they are provided do not include them?

[I]f children do not perceive themselves as represented by the media or the literature they consume, they may also begin to feel invisible, unimportant (Levinson, 2020) or less important than others. The risks related to this aspect play along with the reaffirmation of a single narrative which is based on stereotypes, and which hinder the possibility for individuals to achieve their goals and dreams on the basis of their personal capacities and aspirations. And if children do not perceive themselves as architects, teachers or engineers they may not perceive these careers in the future (Braga, 2022).

In reviewing research on the influences on early childhood career aspirations, Almarode found that "the common element in what children want to be when they grow up and role playing is that they have to have 'seen' the career or role in order to name it or act it out. That is, they must have had direct experience with such a career or occupation" (Almarode, 2012). Children learn from their experiences and interactions with the world that surrounds them. It is not surprising that children give job titles that they are familiar with like that of a teacher or a doctor. The factors that influence children's career choices are varied with multiple hypotheses based on various learning theories but with a resounding consensus that it is a continuous life-long process from early childhood through adolescence (Hansen, 1976). Some seminal studies have suggested that children in lower socioeconomic households have more limited career aspirations simply due to the lack of exposure (Bobo, Hildreth, & Durodoye, 1998). Lack of knowledge is a major cultural restriction, and if the child is not exposed early and consistently to accurate occupational information, [they are] no more likely to make up the deficit in later life than [they] would be to make up such a deficit in reading or arithmetic" (Bugg, 1969). If children have limited exposure to careers because of where they live or who they encounter, it is crucial other avenues are utilized to increase their awareness. A study by Lucrezi, Milanese, Danovar, and Cerrano found that children learned about marine biology largely outside the classroom with 82% citing documentaries as the top influencer followed by books at 45% (Lucrezi et al. 2017) (Figure 1).

There are numerous books focused on the ocean but very few featuring characters of diverse communities as part of the storylines and even less written by authors of color. This problem is not unique to marine biology or other STEAM fields. These deficits have been highlighted many times from Nancy Larrick's 1965 study on race in children's books with slow progress throughout the years leading to 2014's "We Need Diverse Books" movement that gained strength through social media (Dahlen, S.P. 2020; Godfrey, M. 2021; Koss, M. D. 2015; Larrick, N. 1965). In pop culture, positive responses from children (and adults) have been observed when seeing big industry leaders like Disney feature characters that look like them as lead characters as depicted in *Encanto* and the live-action release of *The Little Mermaid*. These diverse characters make people feel seen and acknowledged. Consequently, it makes sense to have children's books that reflect their diverse communities.



Figure 1 Table covered with open books as students read the spread dedicated to remote operated vehicles, photo taken by Dieuwertje Kast, permission to be reproduced.

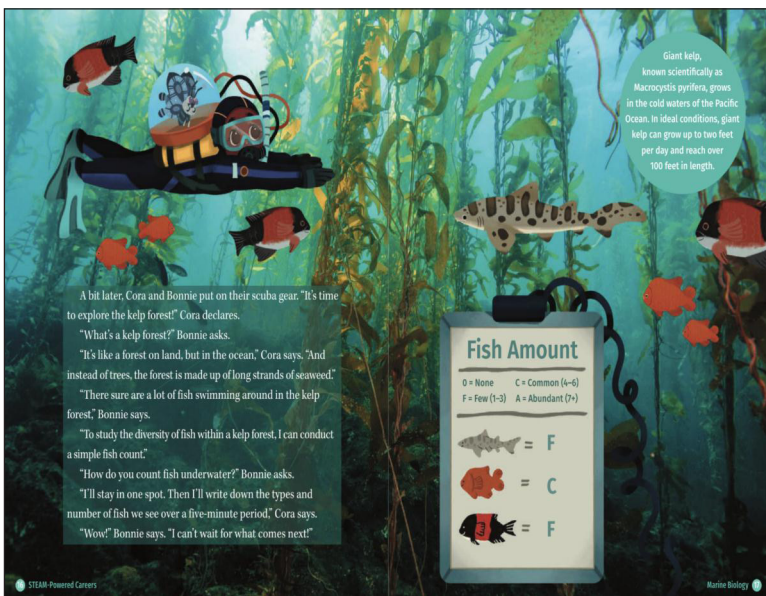


Figure 2 Pages 16–17 from the Marine Biology Book in the STEAM Powered Careers Book Series written by Maria Madrigal and published by Room to Read. There is permission to be reproduced.

Representation must go beyond changing the color of the characters' skin. Authors must be vigilant in not feeding into cultural stereotypes. These were important factors considered when creating the STEAM book series with the non-profit publisher Room to Read (Room to Read, n.d.). Kast made a concerted effort to recruit diverse colleagues as authors and featured scientists in the STEAM book series. The series is centered on three main characters of color including Cora (Black female), Jae (Asian male) and Mia (Latina female) along with their sidekicks Bonnie the butterfly, Felicia the fox, and Sunny the snail (see Figure 2).

The marine biology book aims to demonstrate how scientists study the ocean and the diverse life in it and features Cora and Bonnie. Cora is a smart and adventurous Black girl shown in and out of the water teaching her butterfly friend all the ways that one can study the ocean. The characters take us on a journey learning about plankton, kelp, and grunion. There may be an assumption that marine biologists must be able to swim but Cora and Bonnie show us that is not the case especially with the use of technology (see Figure 3).

It was important for the book to show that not all marine biologists are required to be expert swimmers while also being mindful of not feeding into the stereotype that Black people can't swim. A 2010 study funded by USA Swimming Foundation found that 69% of Black/African-American children, 58% of Hispanic/Latinx children and 42% of White children had little to no swimming ability (Irwin et al. 2010). A follow up study revisited the identified barriers to address the factors that contributed to the lack of swimming skills. In identifying these barriers, the study assessed the various assumptions to debunk any myths and address any real obstacles to swimming abilities.

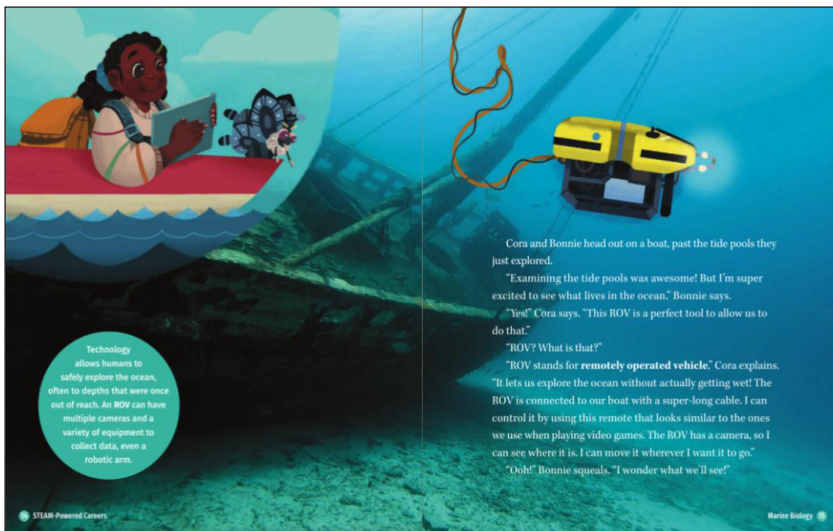


Figure 3 Pages 14–15 from the Marine Biology Book in the STEAM Powered Careers Book Series written by Maria Madrigal and published by Room to Read. There is permission to be reproduced.

The barriers are complex but were narrowed down to economic status, access, and family history (Layne et al. 2020). While these are intricate issues to consider, they were outside the realm of what this book could tackle. However, they were influential in creating a series that ensures that children see themselves in these characters. While the books do not address these barriers directly, it is crucial to show young readers that they are just as capable as the characters and that they belong in all places whether it is at a beach or a laboratory (see Figures 4 and 5).



Figure 4 Justin Gaffney, a PhD student in marine environmental biology, showcases grunion to local elementary students during a book reading, photo taken by Dieuwertje Kast, permission to be reproduced.



Figure 5 A young student examines the kelp forest page of the marine biology book. Kelp forests are a native habitat to California, photo taken by Dieuwertje Kast, permission to be reproduced.

In addition to having characters with agency, a deliberate effort was made to highlight real-life examples of professionals that reflect the diversity within our communities. The marine biology book features Charnelle Wickcliff who shares her use of drones to study a special marine habitat formed by rhodoliths, hard calcareous red algae. Readers learn that Charnelle grew up visiting a local aquarium that operates on a suggested donation rate but is otherwise free to visit. Sharing this childhood experience is valuable to demonstrate the importance of accessible community resources that can serve as entry points along a life-long journey into career exploration. They also discover that when her family moved far away from the coast and lived in the desert, Charnelle continued to build her scientific skills. While she missed being near the ocean, she took advantage of the engineering courses available at the local community college that included robotics. Her career path provides various examples of resilience for young readers interested in being a marine biologist whether you are near the ocean or land-locked (see [Figures 6 and 7](#)).



Figure 6 Charnelle Wickcliff getting ready to fly her drone above Catalina Island. Photo provided by Charnelle Wickcliff. Permission to be reproduced.



Figure 7 Charnelle Wickcliff sorting through a rhodolith sample in the laboratory. Photo provided by Charnelle Wickcliff. Permission to be reproduced.

JEP recruited many first-time authors and scientists of color from a gamut of disciplines and/or departments including Maria Madrigal from the USC Sea Grant Department (see [Figures 8 and 9](#)). Maria never imagined a career in the marine sciences; she did not know it was an option for her



Figure 8 Authors and Scientists of the STEAM Powered Career Series with Room to Read, photo by: Dieuwertje Kast, permission to be reproduced.



Figure 9 Maria Madrigal with marine biology book and Dr. Dieuwertje Kast with oncology book, photo by: Maria Madrigal, permission to be reproduced.

until an AmeriCorps position based at an aquarium managed by the Los Angeles Conservation Corps named the SEA Lab crossed her path. The SEA Lab was founded to diversify the field by providing paid entry-level employment to underrepresented young adults. It embodied the idea that representation matters. It was through her tenure at the SEA Lab that she understood the value of her presence as a Latina from Compton raised by two Mexican immigrants. This intersectionality mattered and made an impression on the thousands of students that visited the aquarium. There was an unspoken acknowledgment, yet intentional, that all students felt welcomed because they saw themselves reflected in the staff leading their field trip experience.

Fortuitously, Maria joined USC Sea Grant shortly after the SEA Lab's closure just as Dr. Dieuwertje Kast was recruiting authors for the STEAM book series in 2020. There was an initial hesitancy to take on the writing task but the objective of the project was compelling and allowed her to continue the legacy of her work at the SEA Lab. Knowing the feeling of belonging when one sees another BIPOC member in the crowd of fellow marine biologists propelled the effort. Throughout her trajectory, Maria has witnessed a small increase in the diversity of faces in the field and is happy to continue to contribute to these efforts by creating books that help students envision themselves in these roles.

LESSON PLANS

The STEAM Powered career series includes an accompanying lesson plan (in English and Spanish) for each book that reinforces the subject matter. In the marine biology book, Cora and Bonnie visit the tidepools to complete a biological survey using a simple tool known as a quadrat. The quadrat sampling method is used to assess the diversity and population of the marine life found in an area. The lesson plan involves students making their own quadrat and

conducting a count to understand the process. It is a lesson plan that can easily be adapted for various grade levels with the ability to simplify or expand its complexity (see Figure 10). https://www.roomtoread.org/media/us0o2tvq/marine_biology_lesson_plan.pdf.



Figure 10 Grayson Fung places a pipe cleaner quadrat in a habitat filled with tiny eraser animals during an educational program. Photo by Dieuwertje Kast. Permission to be reproduced.

IMPACT

The book series is digitally available at no cost on Room to Read's literacy cloud to maximize its potential reach. However, knowing the importance of tangible books, 90,000 books were printed for distribution (9,000 sets consisting of all 10 books). Mindful of the value of representation, Dr. Kast organized book assemblies at seven schools where the authors and featured scientists were present to read and hand out the books (see Figures 11 and 12). The direct interaction facilitated the opportunity for students to relate to professionals with similar backgrounds as theirs. First-grade teacher at Mack Elementary, Ms. Leticia Duggan shared the students' excitement in receiving the books and seeing Maria in the book, "We need to see ourselves in stories. We looked together and saw her picture in the book. [And] that was great!"



Figure 11 Maria placing book into student's tote bag at a JEP book assembly, photo by: Dieuwertje Kast, permission to be reproduced.



Figure 12 Maria holding plankton tow net at book assembly, photo by: Patricia Valencia, permission to be reproduced.

In addition, books were also gifted to eight after school program sites that accompanied a mobile marine touch tank presentation where students had the opportunity to see and touch live animals (see Figure 13). The marine biology book serves as an introductory tool to spark interest and lead to further exploration of the material included in the book.



Figure 13 Student at mobile touch tank with sea stars, photo by: Maria Madrigal, permission to be reproduced.

The series was also printed in Spanish as it is the primary language for 91% of Los Angeles Unified School District English language learners (LAUSD) (see Figures 14 and 15). Thirty-five thousand Spanish versions of the books were afforded to the seven USC JEP school sites that participated in the assemblies during the month of October in 2022 in addition to the English copies. There has been a resounding appreciation for the Spanish books from educators allowing them to meet an evident need. Patricia Valencia, Instructional Coach for English Language Learners/Standard English Language Learners, expressed the value of these books.



Figure 14 Maria with English and Spanish versions at a JEP book Assembly, photo by: Linda Chilton, permission to be reproduced.



Figure 15 Maria at LA Festival of Books with attendee, photo by: Dieuwertje Kast, permission to be reproduced.

The need for bilingual and language specific printed resources is critical for the success of our programs. LAUSD's Dual Language Programs are continuously growing and in demand. Just this year there are 211 identified Dual Language TK-12 programs alone in our district. The scarcity of these materials is appalling when considering the impact print resources have on student learning and engagement.

Books were also made available to students outside of LAUSD including Felton Elementary located in Lennox with 43% of students coming from Spanish speaking households. Maria led a bilingual presentation for students and their parents. Parents were thrilled to receive the books as they can be engaged in their child's education. The opportunity for bilingual authors to share their work in both languages reiterates the richness that diversity offers to all communities beyond the classroom. Sharing the books at the Los Angeles Festival of Books expanded the message and value of representation to the thousands of participants that attend the yearly event seeking both English and Spanish resources (see [Figure 15](#)). The meaningful distribution of books to Spanish speaking communities outside of the Los Angeles area was also accomplished with help from the MERITO Foundation. Through a community partner, they provided books to a children's hospital in the city of Oxnard whose Latinx community makes up 75% of its population.

CONCLUSION

Marian Wright Edelman stressed "You can't be what you can't see." This is the encompassing message that projected the STEAM Powered Career Book Series forward into fruition. With thoughtful selection of STEAM careers, authors, and scientists to feature in the books, Dr. Dieuwertje Kast met an identified need for their programming but also elevated diverse voices not often heard. Through three characters that reflect the children in the Los Angeles community, young readers receive a window into a wide variety of STEAM careers that they can aspire to pursue. Educational resources that provide diverse examples of professionals are important so that children may envision themselves in workplaces and in occupations along their life-long career exploration. We hope the marine biology book presents a realistic perspective that a career in the marine sciences involves more than being a dolphin trainer. The interest and growth in the blue economy will surely provide diverse opportunities in what has historically been a very limited and competitive job market. Though issues of representation or lack thereof are complex, through subtle crafting of stories, authors can address perceived barriers and stereotypes attributed to underrepresented groups. Children must know that they belong in all places and that their career options should not be limited by the color of their skin.

ETHICS AND CONSENT

Informed consent to participate with the book series was provided by parents, guardians, or family advocates. All of the students photographed in this article had media release forms signed by their parent or guardian and approved the use of the photos for publication.

REPRODUCIBILITY

- [English Series](#)
- [Spanish Series](#)
- [STEAM-Powered Series: Marine Biology in English](#)
- [Marine Biology Book in Spanish/Carreras Impulsadas por STEAM - Biología Marina](#)
- [Lesson plans & Multimedia Content](#)

ACKNOWLEDGEMENTS

We'd like to thank Room to Read for all of their support of the STEAM Powered Career Series from start to finish. In terms of the marine biology book and its distribution and usage, we'd also like to thank USC Sea Grant and Education Programs Manager Linda Chilton.

We'd also like to thank our partner elementary schools (Dr. Theodore T. Alexander Jr. Science Center School, Lencia B. Weemes Elementary, Norwood Street Elementary, Vermont Ave

Elementary, Foshay Learning Center, Thirty-Second Street USC Performing Arts Magnet School, and John Mack Elementary) for hosting our book assemblies and assisting with the distribution of 90,000 to low-income students of color.

FUNDING INFORMATION

Funding for the book series was provided by Room to Read in partnership with Tatcha.

Joint Educational Project's STEM Education Programs are funded by USC Good Neighbors Campaign Grant, private alumni funding, and corporate donors including Raytheon, Hyundai, and Union Bank.

The book's publication has been produced with support from the University of Southern California Sea Grant Program, the National Sea Grant College Program, the National Oceanic and Atmospheric Administration, and the U.S. Department of Commerce, under grant number NA18OAR4170075.

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS

MMO is the first author of this paper and of the marine biology book that is a part of the Room to Read STEAM-Powered Career Series. DJK was the Project Coordinator for the STEAM-Powered Career Series with Room to Read.

AUTHOR AFFILIATIONS

Maria Madrigal  orcid.org/0009-0008-5198-1394

University of Southern California (USC), US; USC Sea Grant, US; USC Joint Educational Project, US

Dieuwertje Kast  orcid.org/0000-0002-0857-6480

University of Southern California (USC), US; USC Sea Grant, US; USC Joint Educational Project, US

REFERENCES

- Almarode, J.** (2012, September). *Helping young children decide what to be when they grow up starts early*. <https://ttac.gmu.edu/archive/telegram/archives/sept-2012/article-1>
- Bobo, M., Hildreth, B. L., & Durodoye, B.** (1998). Changing patterns in career choices among African-American, Hispanic, and Anglo children. *Professional School Counseling*, 1(4), 37–42.
- Braga, A.** (2022, March 22). *The importance of children's representation in literature and media*. Humanium. <https://www.humanium.org/en/the-importance-of-childrens-representation-in-literature-and-media/>
- Bugg, C. A.** (1969). Implications of some major theories of career choice for Elementary School Guidance Programs. *Elementary School Guidance & Counseling*, 3(3), 164–173.
- California Department of Education** (n.d). *School Directory*. <https://www.cde.ca.gov/>
- CCBC Diversity Statistics.** (n.d.). Cooperative Children's Book Center. <https://ccbc.education.wisc.edu/literature-resources/ccbc-diversity-statistics/>
- Dahlen, S. P.** (2020). "We Need Diverse Books": Diversity, Activism, and Children's Literature. *Literary cultures and twenty-first-century childhoods*, 83–108. DOI: https://doi.org/10.1007/978-3-030-32146-8_5
- Godfrey, M.** (2021, August 27). *Diversity in children's books from 2012 to 2020*. Jambo Books Blog. <https://blog.jambobooks.com/diversity-in-childrens-books-from-2012-to-2020/>
- Hansen, L. S.** (1976). Career development education: Humanizing focus for educators. *Journal of career education*, 3(1), 42–48. DOI: <https://doi.org/10.1177/089484537600300107>
- Irwin, C., Irwin, R., Martin, N., & Ross, S.** (2010). Constraints Impacting Minority Swimming Participation Phase II Qualitative Report. *Qualitative report*.
- Koss, M. D.** (2015). Diversity in contemporary picturebooks: A content analysis. *Journal of Children's Literature*, 41(1), 32–42.
- Larrick, N.** (1965). The all-white world of children's books. *Saturday Review*, 48(11), 6–65.

- Layne, T. E., Irwin, C. C., Pharr, J. R., & Irwin, R. L.** (2020). Factors impacting swimming participation and competence: A qualitative report. *International Journal of Aquatic Research and Education*, 12(4), 10. DOI: <https://doi.org/10.25035/ijare.12.04.10>
- Levinson, J.** (2020). Why Diversity in Children's Media is So Important. *Psychology in Action*.
- Lucrezi, S., Milanese, M., Danovaro, R., & Cerrano, C.** (2017). 'Generation Nemo': motivations, satisfaction and career goals of marine biology students. *Journal of Biological education*, 52(4), 391–405. DOI: <https://doi.org/10.1080/00219266.2017.1385509>
- Room to Read.** (n.d). *STEAM Powered Careers Collection*. <https://www.roomtoread.org/steam/>

Madrigal and Dieuwertje Kast 11
Current: The Journal of Marine Education
DOI: 10.5334/cjme.97

TO CITE THIS ARTICLE:

Madrigal, M., & Kast, D. (2024). Breaking Stereotypes and Increasing Representation in Marine Biology by Diversifying Children's Literature. *Current: The Journal of Marine Education*, 39(1), pp. 1–11. DOI: <https://doi.org/10.5334/cjme.97>

Submitted: 03 June 2023

Accepted: 12 November 2023

Published: 24 January 2024

COPYRIGHT:

© 2024 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See <http://creativecommons.org/licenses/by/4.0/>.

Current: The Journal of Marine Education is a peer-reviewed open access journal published by Ubiquity Press.