
REPRESENTATION OF GENDER AND RACE OF SCIENTISTS IN CHILDREN'S EARTH SCIENCE TRADE BOOKS

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ABSTRACT

Data from children's Earth science trade books quantify that males and Caucasian scientists are portrayed significantly more frequently than females and minority scientists.

Numerous reports cite underrepresentation of women and minorities in science and project a critical shortage of scientists in the future (Clark, 1999; COSEPUP, 2005; Malcolm, 2006; NSF, 2004). Although many factors are cited for this pattern, few contribute to the development of young students' perceptions of science and their ability to become scientists. However, students' perceptions of scientists clearly develop at an early age. For example, several studies have demonstrated that students in elementary classrooms commonly perceive scientists as Caucasian males in white lab coats (Barman, 1997). Since reading is a fundamental skill developed in elementary school, we suggest that all teachers be aware of any bias in their teaching materials.

We are interested in the possible influence of children's science trade books on students' perceptions of scientists. Trade books are a ubiquitous feature in classrooms and students are encouraged to visit the library and select books of interest. The goals of this study are to reveal the disparity in how Earth scientists are portrayed in children's trade books, describe the disparity, and inform preservice and inservice teachers that Caucasian males disproportionately dominate the examples of scientists presented in these books.

SOURCES OF DATA

We constructed a database of books that included pictures and illustrations of Earth scientists. The books were selected in several ways. We began by compiling recent "best" lists from diverse sources: NSTA Recommends (<http://www.nsta.org/recommends/>), *The Horn Book*, *The New York Times Parent's Guide to the Best Book for Children* (Lipson, 2000), and Science Books and Film's Annual Best Children's Science Book List (<http://www.sbsonline.com/pages/BestBooksHome.aspx>). We also added appropriate books from books in a series

("Let's-Read-And-Find-Out-About-Science, etc.") and published books on fusing science and literature (King and Sudol, 1998). We visited publishers at NSTA meetings and we searched Amazon.com using specific keywords (e.g., mineral, volcano, etc.). Lastly, we bought books off the shelf at independent and large, chain booksellers across the U.S.A.

Each book was reviewed to determine if photographs or drawings of scientists (geologists, meteorologists, astronomers, astronauts) were included. If the book

portrayed scientists, the number of males and females were counted. We also noted if the scientist was African-American, Caucasian, or other (Latino, Asian). Data was recorded in a spreadsheet (see <http://www.gvsu.edu/geology/> then Research Projects then Databases for books for K-12 students/teachers). In some cases, it was not possible to determine the gender or race of a scientist. These scientists were recorded as unknown.

HOW TRADE BOOKS SHOW SCIENTISTS

Figure 1 shows the results of our study. This data only includes scientists that had a determinable gender and race. Only 311 of the 692 books we studied showed Earth scientists. The number of photos in each book that showed scientists ranged from 1 to 55 with an average of about 5. Some figures include more than one geologist. Of the 1,572 scientists shown in the figures, 1,207

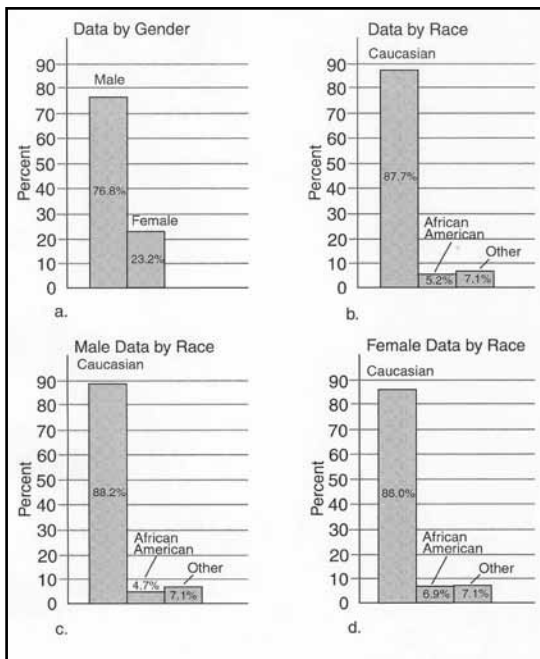
are male and 365 are female. Out of the 1,207 males, 1,065 are Caucasian, 56 are African-American, and 86 are other minorities (Asian, Latino, American Indian, other). Out of the 365 females, 314 are Caucasian, 25 are African-American, and 26 are other minorities.

Our study demonstrates gender and racial bias in children's Earth science trade books. Males are presented three times more frequently than females. Caucasians are shown seven times more frequently than racially diverse scientists. In the books, white males are shown more than forty times more frequently compared to African-American females or females of other races.

THE REAL EARTH SCIENCE WORKFORCE

With respect to gender, the children's trade books portray males as more than three times more likely to be Earth scientists com-

FIGURE 1. TRADE BOOK DATA FOR GENDER AND RACE.



pared to females (see Figure 1a). This ratio significantly exceeds the current proportion of men and women entering the workforce (59.1% male and 40.9% female for B.S. degrees in Earth science; NSF, 2004) or the near equal proportions in the general U.S. population (48.9% males, 51.1% females). A similar pattern was reported for college geology textbooks (Mattox and others, 2008).

The misrepresentation of Earth scientists in trade books does not improve when race is considered. The trade books imply that Caucasian Earth scientists are almost nine times more abundant in the work force compared to their non-Caucasian peers (see Figure 1b). The percentage of minority graduates with a B.S. degree in Earth science is comparable to the trade book data (12.3% vs. 8.9%, respectively). However, the Earth sciences are unfortunately noted for their poor representation of minorities (Huntoon, 2005). The ratio of Caucasian to non-Caucasian individuals is about 3:1 for the U.S. population. Using the U.S. data as an ideal target, the trade books are significantly lacking in minority representation (10.3% in the tradebooks vs. 24.8% in the U.S. population).

BEST BOOKS TO USE

No single book in our database included men and women of all three racial groups at proportions similar to or near the numbers of recent graduates with B.S. degrees in Earth science or the U.S. population. That said, we offer the following books, illustrated by drawings and photographs, as examples for consideration in your classroom. Linda DeWitt's *What Will the Weather Be?* (drawings by Carolyn Croll) shows near equity in gender and race (2 male Caucasians, 1 male African-American, 2 female Caucasians, and 1 female African-American). In Aliko's *Fossils Tell of Long Ago* (drawings by Aliko), the four scientists are all minorities and one is a woman. Minorities in science are well represented but gender is unequal. The children shown as scientists in this book are incredibly diverse. In Nic Bishop's

Digging for Bird-Dinosaurs scientists explore for fossils in Madagascar. The lead scientist, Cathy Forster, is Caucasian. Her field crew includes native geologists, including a woman. Photographs in John Paul Zronik's *Oil and Gas* show a female African-American geologist working with a minority male of a different race. Zronik's book uses pictures of three racial groups.

SUGGESTIONS TO AUTHORS

Authors and publishers should seek gender equity and a broader representation of race in their trade books. Illustrators might choose to draw scientists to represent the proportions in the U.S. population. Where appropriate, text and captions should add clarity by identifying scientists by name as well as by what they are doing. Some books, such as *I Want to be a Geologist* (or astronaut, etc.) could be re-illustrated with greater consideration made toward equity. A database full of diverse pictures could be beneficial and made available to all authors and publishers. Perhaps over-representation of women and minorities in Earth science trade books might encourage children to picture themselves as scientists. A new series of ten books by Scholastic, titled "Women's Adventures in Science," is for middle-school students; perhaps similar books for younger students are needed.

IN YOUR CLASSROOM

How can we encourage every student to consider science as a career? First, we teachers should be aware of the possible bias in the books we select and how it might impact our students. Second, survey your classroom books and those in the library and compare them to the diversity of your students. Then, if you need some books with diverse scientists, you can search our database (see <http://www.gvsu.edu/geology/> then Research Projects then Databases for books for K-12 students/teachers) to select books that match the diversity of your classroom. A simple place to start is with one book and one child. Find an appropriate book for the students of color or the

girls in your classroom and share it directly with them, highlighting that they are just like the successful scientists. Lastly, consider having your students visit and explore online resources that match their own background (see included websites).

WEBSITES FEATURING MINORITIES AND WOMEN IN EARTH SCIENCE

Contributions of 20th century women to physics—includes one on geophysics, and a few on astrophysics: <http://cwp.library.ucla.edu/>

A database of 12 female geologists in varying fields, including paleontology, seismology, and cartography (some are better than others): http://geology.about.com/od/biographies_women/Geologists_Biographies_Women.htm

National Association of Black Geologists and Geophysicists: <http://www.nabgg.com/>

Association for Women Geoscientists: <http://www.awg.org/>

African Association of Women in Geosciences: <http://www.aawg.org/>

The Geoscience Alliance, “committed to broadening the participation of Native Americans in the geosciences”:
<http://www.nced.umn.edu/content/geoscience-alliance-0>

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