This What Works Clearinghouse (WWC) report, part of the WWC’s Primary Science topic area, examines research on the effects of Full Option Science System™ (FOSS) on science achievement for students in kindergarten through grade 8. No studies of FOSS that fall within the scope of the Primary Science review protocol meet WWC standards. Because no studies meet WWC standards, the WWC is unable to draw any conclusions at this time about the effectiveness of FOSS on science achievement.

**Intervention Description**

Large numbers of U.S. students lack proficiency in science, and students from different ethnic and socioeconomic groups show disparities in science achievement. Science knowledge and skills are important for both academic and workplace success, and a variety of interventions have been developed to improve student achievement in science.

FOSS is a science curriculum for students in kindergarten to grade 8 with content in physical science, earth science, and life science. The curriculum consists of a series of 8- to 9-week modules in kindergarten to grade 5, and 9- or 18-week courses in grades 6 to 8. Students conduct a series of investigations during each module or course in which they:

- Examine a focus question that guides instruction and learning.
- Work in small groups on hands-on activities to explore phenomena in the natural or designed world (for example, measuring the mass of materials before and after mixing them; observing what happens after mixing baking soda and vinegar; going outdoors to see which naturally occurring materials form a solution in water).
- Document observations, organize data, and generate explanations using words and drawings in science notebooks.
- Read informational science text in a FOSS Science Resources book.
- Discuss relevant science and engineering concepts and practices.
- In grades 6 through 8, students also complete required online activities.

The FOSS assessment system includes both formative assessments embedded throughout instruction and summative assessments administered at the beginning and end of the course or module and after completing each investigation. FOSS provides teachers written and online instructor toolkits, course preparation videos, guides to implementing each investigation, teaching slides, course teaching notes, assessments, and assessment coding guides.

**Research Summary**

The WWC identified nine studies that investigated the effectiveness of FOSS:

- One study does not meet WWC standards.
- Eight studies are ineligible for review.

Because no studies of FOSS meet WWC standards, the WWC is unable to draw any conclusions about the effectiveness or ineffectiveness of FOSS on science achievement.

The nine studies reviewed for this report are listed in the References section.

**References**

**Study that does not meet WWC group design standards**


**Studies that are ineligible for review using the Primary Science review protocol**


The study is ineligible for review because it does not use a study design eligible for review under the WWC’s group design standards, regression discontinuity design standards, or pilot single-case design standards, as described in the WWC Standards Handbook (Version 4.0).

Frederick, L. R., & Shaw Jr., E. L. (1999, November). Effects of science manipulatives on achievement, attitudes, and journal writing of elementary students revisited. Annual Meeting of the Mid-South Educational Research Association, Point Clear, AL. Retrieved from https://eric.ed.gov/?id=ED436410. The study is ineligible for review because it does not use a study design eligible for review under the WWC’s group design standards, regression discontinuity design standards, or pilot single-case design standards, as described in the WWC Standards Handbook (Version 4.0).

Giglio, K. R. F. (2014). How elementary teachers’ beliefs about the nature of science mediate implementing prescribed science curricula in their classrooms (Doctoral dissertation). ProQuest Dissertations and Theses. (UMI No. 3648962). The study is ineligible for review because it does not use a study design eligible for review under the WWC’s group design standards, regression discontinuity design standards, or pilot single-case design standards, as described in the WWC Standards Handbook (Version 4.0).

Plevyak, L. H., & Mayfield, A. (2006). Water within their world. Taproot Journal, 16(1), 4–8. The study is ineligible for review because it does not use a study design eligible for review under the WWC’s group design standards, regression discontinuity design standards, or pilot single-case design standards, as described in the WWC Standards Handbook (Version 4.0).


Valadez, J., & Freve, Y. (2001). The effect of inquiry-based science teaching on standardized reading scores. Fresno, CA: Fresno Unified School District-Urban Systemic Program. The study is ineligible for review because it does not use a study design eligible for review under the WWC’s group design standards, regression discontinuity design standards, or pilot single-case design standards, as described in the WWC Standards Handbook (Version 4.0).

Zimmerman, R., Maker, C., Gomez-Arizaga, M., & Pease, R. (2011). The use of concept maps in facilitating problem solving in earth science. Gifted Education International, 27(3), 274–287. The study is ineligible for review because it does not use a study design eligible for review under the WWC’s group design standards, regression discontinuity design standards, or pilot single-case design standards, as described in the WWC Standards Handbook (Version 4.0).

Endnotes

*In April 2021, the WWC revised the list of ineligible studies on the reference list and updated the number of studies included in this review on page 1 of this intervention report. The WWC did not modify any other information originally included in the March 2020 release of this report.

"The descriptive information for this intervention comes from the program’s website (https://www.fossweb.com/). The What Works Clearinghouse (WWC) requests developers review the intervention description sections for accuracy from their perspective. The WWC provided the developer with the intervention description in August 2019; however, the WWC did not receive a response. Further verification of the accuracy of the descriptive information for this intervention is beyond the scope of this review.


The literature search reflects documents publicly available by April 2019. Reviews of the studies in this report used the standards from the WWC Procedures and Standards Handbooks (version 4.0) and the Primary Science review protocol (version 4.0). The evidence presented in this report is based on available research. Findings and conclusions could change as new research becomes available.

Recommended Citation