Creating Success for Students with Learning Disabilities in Science

Leigh Ann Kurz Peggy King-Sears Sheri Berkeley

The Council for Learning Disabilities; 37th International Conference on Learning Disabilities; Las Vegas, NV; October 2015

ABSTRACT

An overview of research that supports instructional practices for students with learning disabilities will be presented along with a demonstration of instructional materials developed as part of an NSF funded project to improve science learning of middle school students with learning disabilities (LD). Implications for inclusive science classrooms will be discussed.

CONTEXT OF THE STUDY

Participants

- Small groups of 3-4 students with LD in grades 6, 7, and 8

Phase I

Each group received explicit instruction in science content that included:

- Investigating the basic sources of energy
- Describing the advantages and disadvantages of renewable energy
- Identifying key concepts of solar and wind energy and related terms
- Comparing solar and wind power

Phase II

Students applied their knowledge of solar and wind energy in the planning process of creating their Serious Educational Game (SEG) to teach others about renewable energy sources using goal setting and storyboarding

Phase III

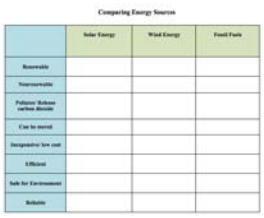
Students individually built their SEG on a computer using a specially developed software platform and focused on goal setting of tasks to be completed each session

Acknowledgement: This material is based upon work supported by the National Science Foundation under Grant Number: DRL-1420448. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

MATERIALS FOR INSTRUCTIONAL PRACTICES

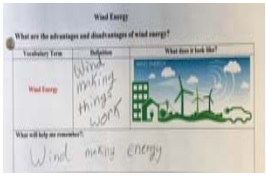
Science Notebooks

- Notebooks can be used in middle school content areas as a tool to build background knowledge (Rheingold, LeClair, & Seaman, 2013).
- Students with LD often have difficulty with organizational skills (Deshler, Ellis, & Lenz, 1996; Kim, Vaughn, Wanzek, & Wei, 2004).
- Notebooks were designed in binder form to provide organization and scaffolds that support student learning and serve as a "warehouse" of learning materials and resources.



Semantic Feature Analysis

- Use of graphic organizers (i.e., Semantic Feature Analysis) improve vocabulary and comprehension for students with LD in content areas (Anders & Bos, 1986; 1992; Bos & Vaughn, 2002; Dexter & Hughes, 2011).
- The use of graphic organizers helps students with LD build background knowledge that promotes learning of higher-level concepts in areas such as science (Dexter & Hughes, 2011).
- Semantic Feature Analysis was used as an interactive tool before, during, and after instruction to activate background knowledge, review content vocabulary, and compare and contrast energy sources.



Strategic Notetaking

- Strategic notetaking is effective for secondary students with LD to improve listening and notetaking skills (Boyle & Weishaar, 2001; Boyle, 2010).
- Students with LD benefit from explicit instruction to support comprehension of science text (Therrien, Taylor, Hosp, Kaldenberg, & Gorsh, 2011).
- Each notetaking sheet featured new vocabulary terms with corresponding picture cues. The teacher defined and discussed each term. Then the students wrote definitions on the notetaking sheet and described what would help remember each term.

Hands-on Learning

- Structured, hands-on experiential activities in science helps students with LD learn concepts more effectively (Scruggs, Brigham, & Mastropieri, 2013; Scruggs & Mastropieri, 2007).
- A solar oven made from a pizza box was used to demonstrate solar energy uses for cooking.

Multimedia

- Multimedia provides a means of creating instructional materials to convey content material, support student motivation, and meet student needs (Kennedy & Deshler, 2010; Mayer, 2011).
- A brief "breaking news" clip featuring the principal and assistant principal tasting delicious s'mores baked in the solar pizza box oven was created to support instruction and gain student interest during the first science lesson.

IMPLICATIONS FOR INCLUSIVE SCIENCE CLASSROOMS

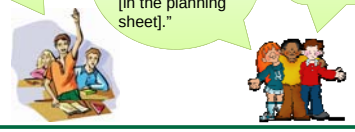
- Providing access to multiple supports and resources empowered students to choose materials that would support their individual learning needs.
- Using notebooks with separate sections for each unit and the accompanying resources provided organization and structure, as well as a "warehouse" of materials that students used as a reference.
- Presenting science content in multiple ways can support learning for individual students.

STUDENT QUOTES

"I learned a lot about wind energy that I didn't know before… from our articles … and our definitions and examples."

"It was easy to go look at my questions and answers I made [in the planning sheet]."

"The next time if I get stuck I should look back [in the notebook] quicker to look it up and help me make questions."



REFERENCES

- Anders, P. L., & Bos, C. S. (1986). Semantic feature analysis: An interactive strategy for vocabulary development and text comprehension. *Journal of Reading*, *29*, 610-616.
- Bos, C. S., & Anders, P. L. (1992). Using interactive teaching and learning strategies to promote text comprehension and content learning for students with learning disabilities. *International Journal of Disability*, *39*, 225–238.
- Bos, C. S., & Vaughn, S. (2002). *Strategies for teaching students with learning and behavior problems* (5th ed.). Boston, MA: Allyn & Bacon .
- Boyle, J. R. (2010). Strategic note-taking for middle school students with learning disabilities in science classes. *Learning Disability Quarterly, 33*, 93-109.
- Boyle, J. R., & Weishaar, M. (2001). The effects of a strategic note-taking technique on the comprehension and long term recall of lecture information for high school students with LD. *LD Research and Practice*, 16, 125-133.
- Deshler, D. D., Ellis, E., Lenz, B. K. (1996). *Teaching adolescents with learning disabilities: Strategies and methods.* Denver, CO: Love.
- Dexter, D. D., & Hughes, C. A. (2011). Graphic organizers and students with learning disabilities: A meta-analysis. *Learning Disability Quarterly*, *34*, 51-72.
- Kennedy, M. J., & Deshler, D. D. (2010). Literacy instruction, technology, and students with learning disabilities: Research we have, research we need. *Learning Disability Quarterly*, *33*, 289–298.
- Kim, A. H., Vaughn, S., Wanzek, J., & Wei, S. (2004). Graphic organizers and their effects on the reading comprehension of students with LD: A synthesis of research. *Journal of Learning Disabilities*, *37*, 105-118.
- Mayer, R. E. (2011). *Applying the science of learning*. New York, NY: Pearson.
- Rheingold, A., LeClair, C., & Seaman, J. (2013). Using academic notebooks to support achievement and promote positive classroom environments. *Middle School Journal 45,* 24-32.
- Scruggs, T. E., Brigham, F. J., & Mastropieri, M. A. (2013). Common core science standards: Implications for students with learning disabilities. *Learning Disabilities Research & Practice*, *28*, 49-57.
- Scruggs, T. E., & Mastropieri, M. A. (2007). Science learning in special education: The case for constructed versus instructed learning. *Exceptionality, 15*, 57-74.
- Therrien, W. J., Taylor, J. C., Hosp, J. L., Kaldenberg, E. R., & Gorsh, J. (2011). Science instruction for students with learning disabilities: A meta-analysis. *Learning Disabilities Research &Practice, 26*, 188-203.