Crosscutting Concepts: What Do They Look Like in a FOSS Elementary Classroom?

NSTA Atlanta 2018
Goals

• Explore ways FOSS utilizes crosscutting concepts to deepen student understanding of science content

• Engage with phenomena that expose CCs: cause and effect, patterns, and structure and function

• Examine ways CCs progress as organizing principles vertically K-5 and across a grade level
FOSS is a complete, modular, research-based curriculum developed at the Lawrence Hall of Science with support from the National Science Foundation.
FOSS Active Investigation

Includes
- Hands-on activities
- Formative assessment
- Science notebooks
- Science-centered language development
- Reading FOSS Science Resources
- Technology-based activities
- Outdoor activities
FOSS Next Generation Modules

**Complete Kits include**

- 1 Teacher Toolkit
- Equipment kit for 32 students
  - Consumables for 3 class uses
  - Measurement tools included
- 32 FOSS Science Resources books
- 1 FOSS Science Resources big book (K-2)
- Access code for FOSSweb content
Crosscutting Concepts

Cause and Effect

Patterns

Structure and Function

Systems

Scale

Change and Stability

Matter and Energy
Crosscutting Concepts

Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas.

(NRC Framework, 2012, p. 233)
Guiding Principles of Crosscutting Concepts

Crosscutting concepts:
- Help students better understand core ideas in science and engineering
- Help students better understand SEPs
- Build familiarity through in depth repetition
- Grow in complexity and sophistication across grades
- Provide common vocabulary for both science and engineering
- Should be assessed with practices and core ideas
- Are for all students

--Appendix G—Crosscutting Concepts
Cause and Effect: Three Stations

• **K: Materials and Motion: Inv. 1.3 Testing a Raft**
  FQ: How can you sink wood?

• **3rd: Motion and Matter: Inv. 2.3 Twirly Birds**
  FQ: What happens to the motion of a twirly bird when the design changes?

• **4: Energy: Forms of Waves**
  FQ: How are waves involved in energy transfer?
Bridge Crosscutting Concepts

• FOSS now uses this bridge icon to highlight locations where the teacher can make links to the same practice addressed in other modules at the same grade level.
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- The Crosscutting Concept chapter further supports the teacher in how to do this.
Bridge Crosscutting Concepts Third Grade
Let’s think back to the beginning of the year when we worked with twirly birds and we took them outside. What were some of the things that affected the motion of the twirly bird? What caused them to move the way they did?

When we____________ the twirly bird____________.
FQ: What happens to wet paper towels overnight?
Water and Climate

• Discuss what happened overnight.

• Draw a model in your notebook of what happened.
Culture of Productive Talk

• Bring notebook to the circle. Use your sentence starters to support your discussion

FQ: What happens to wet paper towels overnight?

• I observed/noticed…
• I think… because…
• I agree/disagree…
• I wonder…
Effect-and-cause poster for third grade

Effect

Cause

INTRODUCTION

Nurturing and empowering students to integrate evidence to support valid conclusions requires the development of students' critical thinking and problem-solving skills. Effective teaching practices help provide students with an organizational framework to assist in understanding the world from the macro to the micro level. Although crosscutting concepts are fundamental to understanding science and engineering, students also need support to build robust reasoning skills. Critical thinking and problem-solving skills can help students develop the ability to think logically, reason, and make informed decisions. (National Research Council, 2011, p. 89)
Appendix G—Crosscutting Concepts

- Skim through the select pages from NGSS Appendix G for Structure and Function, Patterns, and Cause and Effect

- Consider how these CCs progress through the grade level
Crosscutting concepts for all

- Crosscutting concepts provide a common framework on which to anchor new scientific understanding.

- Using overarching concepts is effective for English Language Learners and diverse learners.
Crosscutting Concepts

[Crosscutting] concepts help provide students with an organizational framework for connecting knowledge from the various disciplines into a coherent and scientifically based view of the world.

Although crosscutting concepts are fundamental to an understanding of science and engineering, students have often been expected to build such knowledge without any explicit instructional support… These concepts should become common and familiar touchstones across the disciplines and grade levels.

--A Framework for K-12 Science Education, Chapter 4: Crosscutting Concepts
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