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What is FOSS?

The FOSS program is correlated to human cognitive development. The activities are matched to the way students think at different times in their lives. The research that guides the FOSS developers indicates that humans proceed systematically through predictable, describable years, and that students learn science best from direct experiences in which they describe, sort, and organize observations about objects and organisms. Upper elementary students construct more advanced concepts by classifying, testing, experimenting, and determining cause and effect relationships among objects, organisms, and systems.

FOSS investigations are carefully crafted to guarantee that the cognitive demands placed on students are appropriate for their cognitive abilities. Developmental appropriateness and in-depth exposure to the subject matter with multiple experiences give FOSS its "horizontal curriculum" character (numerous activities that provide a great variety of experiences at a cognitive level) as opposed to a "vertical curriculum" design (activities that attempt to take students to inappropriately complex and abstract levels of understanding). A horizontal curriculum provides challenges for all students and results in a much deeper understanding of the subject.

SCIENTIFIC THINKING PROCESSES

Although many programs use thinking processes, FOSS is the only one that has organized them into a developmental sequence specifically related to cognitive stages.

- OBSERVING
using the senses to get information
- COMMUNICATING
talking, drawing, acting
- COMPARING
pairing, one-to-one correspondence
- ORGANIZING
grouping, serializing, sequencing
- RELATING
cause and effect, classification
- INFERRING
superordinate/subordinate classification, if/then reasoning, developing scientific laws
- APPLYING
developing strategic plans, inventing

The scientific thinking processes guide the selection of content for FOSS. Although students possess the capacity to use all the scientific thinking processes to some degree throughout their lives, some processes are more powerful at certain ages.

LEARNING WITH UNDERSTANDING

FOSS derives information about learning from both academic sources and practical experience in classrooms.

The academic sources emphasize that:

- learning moves from experience to abstractions. FOSS modules begin with hands-on investigations, then move students toward abstract ideas related to those investigations using simulations, models and readings.

- a child's ability to reason changes over time. FOSS designs investigations to enhance their reasoning abilities.
- fewer topics experienced in depth enhance learning better than many topics briefly visited. FOSS provides long-term (8-10 weeks) topical modules for each grade level, and the modules build upon each other within and across each strand, progressively moving students toward the grand ideas of science. The grand ideas of science are never learned in one lesson or in one class year.

Practical experience in classrooms demonstrates that students learn best by doing. When involved in learning something of interest, students come to understand concepts more fully, remember them longer after the experience, and develop confidence in their ability to find things out and to understand science.

Practical experience has taught us that when language arts experiences are embedded within the context of learning science, students improve in their ability to use their language skills. Students are eager to read to find out information, and to share their experiences both verbally and in writing.

Practical experience shows that all children can learn science, that there is no differentiation between genders in interest or ability to understand science concepts, that students with learning difficulties often shine in solving science problems, that students learning English as a second language have success alongside their fellow students, that gifted students are often inspired to "run with the topic" beyond the interests of other students. FOSS is a great way for all students to learn science.

FOSS is the result of academic research on learning interwoven with practical experiences in classrooms. The thoughtful introduction of science concepts as well as the sequencing of ideas result in a curriculum that leads to learning of science with understanding by all students.

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