Welcome to the Full Option Science System (FOSS)!

As an administrator, you play a critical role in the implementation of a high-quality science program at your school. The purpose of this administrators’ toolbox is to orient you to the important pieces of the curriculum and to highlight those areas where your support will make a difference in setting teachers up for success. Each of these areas of responsibility is explained in the sections that follow for you to use as a guiding tool. These include:

1. Managing Materials
2. Using FOSS Technology
3. Creating a Culture for Science
4. Supporting Teachers with Time
5. Supporting Teachers with Professional Learning
6. Supporting Teachers with Access and Equity
7. Using the FOSS Assessment System
8. Observing Classroom Practice
9. Making Community Connections
10. Getting More Information

There are a lot of important pieces to a successful FOSS implementation. They will not all be accomplished at once. We recommend looking ahead and forging a long-term plan for your science program together with all your stake-holders, e.g., teachers, administrators, families, board members, community partners, etc. Start with a vision for what science teaching and learning looks like in your system, then use these tools to set goals and yearly action plans for moving forward and monitoring successes and challenges. The key is to know the reality of your system, meet everyone where they are, and to keep a mindset of continuous improvement.

To orient yourself to the FOSS program we recommend reviewing some of the resources found in the ThinkLink Knowledge Base. You can visit as a guest to access these resources.

1. About FOSS. Read the What Is FOSS? article in the ThinkLink Knowledge Base. You can view the short video and then read the FOSS Program Goals from the link at the bottom of the page. Here you will find a description of how the FOSS program addresses scientific literacy, instructional efficiency, and systemic reform.

2. A FOSS Module Overview from any FOSS Investigations Guide. You can review a printed copy or The Overview chapter in the Investigations Guide describes in detail the components of the program, the instructional design, and other important features that provide opportunities for all students to engage fully in making sense of the natural world.
MANAGING MATERIALS
FOSS NEXT GENERATION IMPLEMENTATION

Having a well-thought out materials management plan is crucial to success in implementing FOSS. This plan should address the logistics for on-going materials needs with modifications for site-based or centralized refurbishment models: a location for receiving and inventoring module kits, distributing materials to and from classrooms, arrangement for procurement and distribution of live organisms, provision of “teacher-supplied” materials, teachers’ role in inventoring kits before and after classroom use, mechanism for refurbishing the modules/courses, and establishing an annual budget for yearly expenses for consumables, “teacher-supplied materials,” and other materials support.

Read through the section on the FOSSweb on ThinkLink Knowledge Base as you design and implement your plan. Review the Considerations as your plan takes shape. FOSS is available for advisement as schools/districts set up systems (select “Pedagogical or How to Teach Question” from the Reason for Contact pull-down on the Contact Us form.).

Once you have decided on a management model (site-based vs. centralized), a thoughtful, gradual implementation is advised. See the FOSS Administrative Matrix for a quick look at a possible 3-year rollout of your materials system.

The teaching staff will benefit from a well-established materials management plan that works well with resources in your school or district. It is important to keep in mind that for a sustainable system, you will need to budget annually for the following needs:

- **Science notebooks for students:** A science notebook is the tool that each student will use to record their observations, data, thinking, explanations, and questions. Each student should be provided with one notebook per year (middle school students may need 2-3 notebooks per year.) We recommend using bound composition books.

- **Permanent and consumable materials:** Permanent materials will need occasional replacement due to age, loss, or breakage. Consumable materials need to be replenished more regularly. You can find Replacement Lists on the Delta Education website.

- **Live organisms:** Each life science module brings organisms to the classroom for students to observe and maintain in habitats. Plants seeds and brine shrimp eggs are provided in the kits. The Knowledge Base has an Organism Source page for suggestionson where/how to obtain other organisms. The Live Organism Schedule page details when to order if obtaining them through Delta Education or a biological supply house. Plant and Animal Care page has details on each organism and how to care for them.

- **Teacher-supplied materials:** Most “teacher-supplied” items are common classroom supplies such as writing utensils, access to computers, scissors, and water. For a complete list, see the Teacher-Supplied Materials article on the ThinkLink Knowledge Base. Develop a plan to provide necessary materials to ensure all investigations are taught seamlessly.
Digital technology is an integral part of the teaching and learning experience with FOSS Next Generation.

FOSSweb on ThinkLink is the Internet access to FOSS digital resources. The platform provides teachers and administrators with pedagogical support, and both teachers and students access to resources that were specifically designed or chosen to complement the FOSS active investigations.

As a district administrator, decide how best to implement FOSSweb on ThinkLink in your district. Work with our Educator Success team at educatorsuccess@schoolspecialty.com to understand the options. Please refer to our ThinkLink Technical Requirements page on the ThinkLink Knowledge Base and work with your IT department to be sure that your system meets the minimum technical requirements.

FOSSweb on ThinkLink provides easy rostering solutions. We currently offer single sign-on with Clever, Google, SAML, and ClassLink. We also offer other rostering solutions. District rostering gives administrators access to reports for FOSSmap, year-over-year reporting, easier platform access, and many other benefits. Please contact our educator success team to begin the rostering process, either via email or our Contact Us form (choose Rostering or Implementation Question in the Reason for Contact drop-down). Please note, the only users who should be registered as individuals in the ThinkLink platform are true individual users who are not affiliated with a school or district.

LMS Integration is also available on the ThinkLink platform with LTI 1.3 compliance coming in Fall 2021. Districts can also share content to Google Classroom.

Assessment via FOSSmap (See Tool #7 for more on FOSS Assessment)

FOSSmap is FOSS’ online assessment system and is accessed through FOSSweb for both students and teachers. For details on how to assign an assessment, student access to FOSSmap, and how to make the best use of the reports generated by FOSSmap, navigate to the FOSSmap section in the Knowledge Base.

The FOSS support team is here to help you have a successful science teaching experience including the use of FOSSweb on ThinkLink, your portal for FOSS program digital resources. Contact Us using the form on the Knowledge Base.
CREATING A CULTURE FOR SCIENCE
FOSS NEXT GENERATION IMPLEMENTATION

Ensuring that each school maintains a high-quality science program requires stepping back a bit to assess the bigger picture. Where does science fit in the landscape of each school, your district, your community? Is science teaching and learning a priority? Do you have adequate resources to sustain a robust science program?

**Vision:** Start by working with your staff and community to craft a vision for what you want your science program to achieve. The vision should be both aspirational and realistic. What would it look like to achieve the goals you have for science? If your system has a vision for science, consider reviewing and updating it. Areas to focus on might include leadership, communication, professional learning, priorities, access and equity, instructional improvements, challenges, and of course, successes. Identify priorities that will help you move towards building capacity in each of the focus areas for the upcoming year and beyond. Finally, create a concrete action plan that addresses each science priority. Identify accompanying details, including who is responsible, persons involved, timeline, and resources.

Many of the other tools in the Administrators’ Toolbox will help you shape the vision, such as Supporting Teachers with Time (#4) and Supporting Teachers with Access and Equity (#6), as well as others.

**Communication:** Once you have a clear vision for what you want your science program to be, the next step is to be sure to communicate that vision to all stakeholders. Thinking about stakeholders can help to anticipate barriers and empower them to contribute or participate in the process. Change can be difficult, but transparency builds trust.

**Teachers need to establish a productive classroom culture** that fosters a growth mindset. Class norms, discussion starters, and word walls should be present in each class. (Processes and structures for supporting collaboration and facilitating productive discussions are described in the *Investigations Guide.*) Encourage students and teachers to show the fruits of their scientific endeavors on bulletin boards, class newsletters, school websites, etc. See the Making Community Connections (Tool #9) for additional ideas.

**Support:** Consider how parents can support your science program. Do you have local businesses that can support your science program and provide resources? Are there any local museums with whom to partner? Are there any grants you can apply for? What other resources can you tap into, especially when integrating English Language Arts, English language development, and environmental literacy?
SUPPORTING TEACHERS WITH TIME
FOSS NEXT GENERATION IMPLEMENTATION

After technology and materials management have been planned, the focus can shift to preparing and supporting teachers to implement FOSS. There are a lot of demands on the elementary teacher. Often science is not seen as a priority and most of the classroom time is spent teaching English Language Arts (ELA) and mathematics. Teachers need to know that their administrators not only believe in the power of science education but will support teacher efforts to find effective ways to use science as the context to practice skills developed in other areas of the curriculum.

There are many reasons for science to be a core part of elementary school learning. Science supports students with “21st century skills,” and there are significant opportunities for cross-subject integration with Next Generation Science Standards and Common Core State Standards (CCSS) in ELA and Math. Science experiences facilitate: (a) critical thinking, problem solving, and collaboration skills, (b) relevant learning of language and mathematics, (c) cultivation of wonder about the natural world, and (d) exposure to careers in STEM. Science experiences are motivating for students and get them excited about learning and school.

Teachers need time to plan for integrating their science instruction. At the middle school level, giving teachers focused planning time as a science department supports successful classroom implementation.

In elementary grades, integrating ELA and science is a powerful way to educate children and make the most of the brief school day. Provide teachers with time and encouragement to strategically plan this integration. Typical literacy strategies (paraphrasing, read-alouds, summarizing, interactive reading, vocabulary etc.) can all be done within science instruction. FOSS has several resources to support teachers during their planning time. Look to these chapters in K–2; 3–5 and 6–8 grade bands: Science Notebooks and Science-Centered Language Development.

Consider the idea that non-fiction reading, such as the articles in FOSS Science Resources books, and writing aligned with ELA/ELD standards can be authentically taught and practiced using FOSS investigations as the context. Science writing includes recording observations and data, writing steps to a procedure/experiment, claims supported by evidence, writing summaries, and reflecting on new learning and further questions. Listening and speaking standards are very easily met during science discussions with partners and small groups, whole-class sense-making, and formal presentations.

Students deepen their content understanding and develop critical reading comprehension strategies using the FOSS Science Resources book. To support the convergence of science and literacy, plan together with librarians to include trade books that correspond to the FOSS modules to engage students in further science learning and literacy development. For grades K–5, these books are collected in a document that lists the book by module in the Science-Centered Language article in the Knowledge Base.
Typically, before teachers begin their first module, they receive preparation from a FOSS consultant. During this orientation, teachers experience FOSS lessons as learners to better understand the content themselves, as well as to be introduced to the components of the program and how to use them. We recommend that this be a six-hour session so teachers can feel comfortable and confident about using FOSS. If teachers receive a shorter exposure, recognize they will likely need support as they get started.

One of the major goals of the initial introduction is for teachers to become comfortable with the four elements of the active investigation—context setting, firsthand experience, data acquisition and management, and analysis and explanation (as described in the Overview chapter of each module). The active investigation is the general learning cycle FOSS uses. Note that it might take teachers a few weeks to fully internalize the four elements. But if teachers trust the curriculum and follow the Investigations Guide, and complete all the steps in a part of an investigation, they will have fully implemented an active investigation. Encourage teachers to complete all the steps in one part before continuing to the next (teachers should not skip around with the Investigations Guide). Sometimes beginning implementers try to get through as many steps as they can in one day, and then move on to the next part the following day. In so doing, they miss the crucial analysis and sense-making steps in the first part. To support teachers, remind them to view the Teacher Preparation videos on FOSSweb on ThinkLink.

Encourage grade-level planning specifically for science implementation. When beginning to use a new curriculum, many teachers focus on what they are doing during instruction. Discussions around classroom materials management, collaborative groups, and use of science notebooks will help support teachers during this initial stage.

Use the planning guide to determine which aspects of the instructional design you want to focus on in a teacher’s first year and then in the next few subsequent years, e.g., using the assessment system, incorporating science-centered language development, and facilitation of sense-making discussions.

The FOSS instructional design components are elaborated in professional learning chapters in the ThinkLink Knowledge Base—Science Notebooks, Taking FOSS Outdoors, Access and Equity, and Science-Centered Language Development. Schools have used these chapters for PLCs. If improving three-dimensional learning is a goal, there are grade-level specific chapters with strategies for supporting student engagement in science and engineering practices, deepening understanding of the crosscutting concepts, and supporting sense-making discussions. Focusing on one or two chapters at a time helps teachers hone in on developing a few instructional strategies. Several small and deliberate changes over time can be very powerful for increasing instructional effectiveness.
SUPPORTING TEACHERS WITH ACCESS AND EQUITY

FOSS NEXT GENERATION IMPLEMENTATION

FOSS incorporates Universal Design for Learning (UDL) research-based approaches and strategies in the instructional design to ensure each and every student has access to science and engineering learning experiences. It's important to review and support these guiding principles:

- All students come to school with language and a wealth of knowledge and experiences that can be tapped into to enrich the learning experience for everyone.
- All students benefit from actively investigating scientific phenomena and engaging in the engineering design process.
- All students are capable of constructing meaning through collaborative social interactions.

Refer to the Implementation Progression table in the Grade-Level Planning Guide about actions to take to meet the needs of all students. The chapter also identifies specific strategies for supporting vulnerable student populations who may be struggling in science. Districts have also found that engaging teachers and staff in professional learning around culturally relevant pedagogy supports a positive learning environment for everyone.

Use the planning guide about meeting the needs of all students is essential. Use the Access and Equity Chapter as a starting point for teachers to plan for differentiation. The Science-Centered Language Development Chapter also provides approaches and strategies for specifically addressing the needs of English Language Development learners. Many schools are now using FOSS as the core of their English Language development program. Language development happens most effectively when students are engaged and motivated to learn. The science and engineering practices are language intensive and provide both challenges and opportunities for language development. ELD standards provide ways for teachers to accelerate student learning in science, literacy, and language acquisition. For ways to support teachers in crafting science language objectives and science lessons that address your state’s ELD standards, refer to the Planning Guide and Other State Resources article in the Knowledge Base.

As an administrator, it’s important to listen to the concerns of teachers, families, and students and to work towards providing holistic solutions that take into account and validate the culture and language of every student, and the belief that all students can learn and engage in meaningful science investigations and engineering design challenges.
Assessment: Making sense of sense-making. Scientists make sense of how the natural world works. They develop, test and revise evidence-based explanations. Engineers apply that understanding to develop and improve solutions to real-world human problems. Our goal is to help every student become an effective sense maker and problem solver by doing what scientists and engineers do—at an age appropriate level—with guidance from their teachers.

The goal of assessment in the FOSS program is to provide students with information they can use to improve their sense making, and teachers with evidence of students’ learning that they can use to adjust their instruction to meet the needs of every child.

Assessment happens every day. Before instruction on a FOSS module begins, students take the Survey (pretest) to reveal prior knowledge. During each lesson teachers look at work products or observe students in active investigation to ensure that they develop the intended practices, core ideas, and crosscutting concepts (embedded assessments). Teachers review samples of student work to determine what the students are thinking and what their general understanding is at that time. Based on student formative assessment data, teachers use a next-step strategy to address students’ needs to move learning forward. After each investigation, students take an I-Check. This provides an intermediate check on progress. At the end of a module, students take a Posttest, which can be used to look at growth by comparing it to the Survey. When grades are necessary, there are suggestions provided in the Assessment Chapter (on FOSSweb on ThinkLink) to turn FOSS assessment information into grades.

Help teachers shift to formative assessment. FOSS provides many tools throughout instruction to support teachers making formative assessment an integral part of learning. Assessment will only advance learning when students receive feedback they can act on to improve understanding (rather than receiving a percentage or grade). There are many teacher-led FOSS next-step activities to help students reflect on their thinking to improve.

Research supports the power of formative assessment. Black and William (1998) reviewed a large number of research papers dealing with many aspects of teaching that were believed to influence student learning. They concluded that the learning gains triggered by formative assessment were among the largest ever reported for educational interventions with the largest gains being realized by low achievers. The FOSS project took these findings to heart, and conducted two projects (funded by NSF 2002–2009) to develop an assessment system that would build on these findings.

In 2010, Margaret Heritage published an important paper for the Council of Chief State School Officers that described what formative assessment should and should not be. Her message: Assessment is only formative—moves learning forward—when it surfaces evidence of student learning and is accompanied by useful feedback. We were very gratified to see that everything Heritage described as best practice was part of the FOSS Assessment system.
developed through NSF funding and now part of the Next Generation edition. We know we can improve student achievement. The challenge is to help teachers and students understand and implement the system.

**Implementation.** After twenty years of researching and promoting formative assessment, Dylan Wiliam prescribed a productive implementation framework that we have adopted and adapted to meet the needs of FOSS teachers.

1) **Choice:** Allow teachers to choose where they start. For most teachers this is the embedded assessment available for each lesson (one part). FOSS has developed a process, called the Reflective Assessment Practice that takes only 10 minutes of a teacher's time after class, and has proven time and again to provide big advantages in terms of student achievement. You can find more about this practice on FOSSweb by downloading the Assessment Chapter for any module. Another choice might be giving students the Survey before instruction and the Posttest at the end. Or in the first year (when things move more slowly because teachers are just learning the curriculum themselves), they use the I-Checks to provide evidence of progress. These benchmark assessments can be given using paper and pencil, or online (using FOSSmap). The online tests also provide practice for state tests.

2) **Flexibility:** FOSS provides a place to start, but teachers need to make these processes their own. So, for example, you will want to encourage teachers to stay firm on reviewing a sample of student work after class for ten minutes only (to ensure that teachers do it after every session), but how they sort the student work, or how they record the data to look at learning trends will change over time as teachers find systems that work well for them.

3) **Small Steps:** This may be the most important factor. We want these practices to become permanent. That means making small changes, and practicing those until a habit forms. Then teachers can add another aspect of the system they choose to include.

4) **Accountability:** Have teachers set small attainable goals and be accountable to you or to a teaching partner. Or find time for teachers to meet in grade level groups to study student work and to share and refine their practices over time.

5) **Support:** As a responsible administrator you will need to support teachers to make the mind shift from traditional assessment and grades to formative assessment, and provide time to meet in groups to discuss the implications. Because these formative classroom practices might be new to teachers, they need permission to find what works best for their students.

**Developing a Growth Mindset.** During the development of the FOSS Assessment System, we saw a profound shift in the culture of classrooms that fully implemented formative assessment as a teaching/learning practice. Teachers reported students asking when they would get to take the next test so they could see their progress and know what they needed to work on! Students were not afraid of making mistakes, and perseverance became a predictor of success. We didn’t have a name for this shift at the time, but given Carol Dweck’s work, we can now say that it was a shift to a growth mindset for both teachers and students.
OBSERVING CLASSROOM PRACTICE
FOSS NEXT GENERATION IMPLEMENTATION

In science, students collect data and analyze those data to make sense of the experience. In a similar manner, FOSS recommends that schools collect data about science instruction on a regular basis and analyze them to determine next steps to further professional learning. Many schools have protocols for making classroom observations, but those are likely not specific to science. FOSS has developed a classroom observation tool that can be adapted to fit each school’s need.

1. Form-fillable PDF or
2. Word document (modifiable)

The tool has several sections and it is recommended that administrators only use those relevant to the goals or expectations agreed upon as areas of focus. When getting started, we recommend working with just the first two pages as they address critical components of the program—classroom culture and active investigation. A school might focus their entire first year on those sections to ensure a solid foundation.

The remaining sections of the observation tool are meant for evaluating more advanced elements of instructional practice. It is important to note, depending on the lesson and when the class is observed, that you might see only a portion of the practice elements listed in the observation tool. Additionally, the “code” is not specifically defined so you will need to determine what you will use as criteria for measuring levels of progress. Finally, we recommend that teachers use the observation tool as a self-assessment tool for reflecting on their own practice and promoting a culture of continuous improvement. Teachers could collaborate to write specific descriptors for each observation category. This supports a growth mindset for teachers and makes the observation tool more relevant for each school.

As you observe science in the classroom, it is typical to see a range of comfort and expertise—some teachers will be successful with their first module while others might need more support. The observation tool can serve as a way to measure this and identify areas of future emphasis towards your school goals. We also recommend making observations during science time to identify areas of success and areas in need of support.
MAKING COMMUNITY CONNECTIONS
FOSS NEXT GENERATION IMPLEMENTATION

Engaging parents and the community can strengthen a school’s ability to educate the whole child beyond the power designed into a FOSS module or course.

Progression of implementation happens in three phases. In phase one (or year one) of implementation, it is important to communicate with the community about what is going on with science at your site. Elementary teachers should send home “Letter to Families” at the beginning of each module and may use the Home/School Connections for homework or differentiation, also found in the “Family Resources and Extensions” section of each module on FOSSweb on ThinkLink. Middle school teachers should look to the extensions at the end of each investigation for ways to make local connections. Once these relationships are established, consider additional ways of engaging the community.

During phase 2 and 3 of implementation, elementary teachers may be confident enough to welcome parents or community volunteers into their classroom to help with prepping or cleaning equipment for activities or helping to monitor small groups as students investigate. Some may want to share their time and expertise with a classroom to support a specific FOSS module, such as building bird feeders for the schoolyard to extend the kindergarten Animals Two by Two Module, or to assist with planning or implementation of a major school-wide project, such as developing a school garden or outdoor classroom. Consider gathering information about parents’ (and grandparents’) skills and expertise as they fill in their back-to-school paperwork.

To deepen your network consider nearby field trip venues that align well with a specific FOSS module. Consider making these annual field trips to extend the classroom learning to the real world, build anticipation as students move through the grade levels, to get the community more invested in the mission of the school, and to solidify student learning. Ideally have at least one trip per grade level. Having annual field trips, at each grade level (FOSSconnect article: How McMinnville School District Provides Science-Focused, Field- and Industry-Based Teaching and Learning for All Elementary Students) to specific community venues can extend the classroom learning to the real world.

Also consider building community by having students invite businesses, non-profits, community members, and parents/grandparents to whole school events—like celebrations of learning, science fairs, or science nights. Each of these is a way to showcase student learning. In a similar light, consider sharing achievements and success with the school board.

Homework as home/school connections
The goal of homework is to practice the application of concepts and extend learning to a new environment. In addition to using the Home/School Connections in FOSS K–5 modules and Interdisciplinary Extensions in FOSS K–5 modules and Middle School Courses, teachers can create opportunities to bridge the classroom with the home and

Continued on the next page
local community. Students can interview family and community members on a topic relevant to classwork. For example, students participating in the Waves Course, can interview older family members and neighbors to hear personal stories about the history of telecommunication. Students can also be tasked to explain or teach a concept or skill from the classroom investigations to an adult or sibling at home.

**Engaging Families**

Schools across the country have found great success having science nights where parents and community members are invited for an evening of science and engineering exploration. Active PTOs or PTAs may enthusiastically support organizing something like this. Parents love when students become the teacher and lead the parents, grandparents, and young siblings through a science exploration from a current FOSS module.

Finally, some parents and grandparents would like ideas of ways to extend science outside of the classroom. Teachers can share the resources on FOSSweb on ThinkLink, the Home School Connections for each investigation, or some of the extensions at the end of each investigation. Overall, encourage a schoolwide stance of asking for help and support instead of assuming that parents and community members will not be interested.

No matter what you’re doing, communication is essential. Make sure teachers know about the “Home/School Connection” tab under “Family Resources and Extensions” on FOSSweb on ThinkLink for more ways to support communication. Parents may have other questions, you can send them to the FAQs on FOSSweb. If they want a simple overview of what FOSS is, send them a link to “What is FOSS?”
GETTING MORE INFORMATION
FOSS NEXT GENERATION IMPLEMENTATION

If you have questions or need more information about the following items, read these chapters on FOSSweb (downloadable PDFs).

• Planning Guides for each grade level
  Grade-Level Instructional Segments
  Three year implementation progression

• Science-Centered Language Development (K–2, 3–5, and 6–8)

• Sense-Making Discussions for Three-Dimensional Learning (for each grade level)

• Science Notebooks (K–2, 3–5, and 6–8)

• Science and Engineering Practices (for each grade level)

• Crosscutting Concepts (for each grade level)

• Common Core ELA (for each grade level)

• Common Core Math (for each grade level)

• CA ELD and FOSS (English Language Development, CA state resource)

• Access and Equity

• Taking FOSS Outdoors (K–5, 6–8)

• CA Environmental Principles and Concepts (CA state resource)