
How McMinnville School District Provides Science-Focused, Field- and Industry-Based Teaching and Learning for All Elementary Students

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*“The science experiences are an amazing opportunity for students to apply the knowledge and information they are receiving in the classroom to the real world,”
Third-Grade Teacher*

Like many districts across the country, the McMinnville School District, located in the northwest corner of Oregon, is busy teaching FOSS science regularly. In an era of testing, testing, testing, and reading, reading, reading, this alone is something to be proud of. In addition to great science teaching, classroom teachers are supplementing the program by providing students with field- and industry-based teaching and learning that connects to and extends the science content learned in the classroom. This district-wide initiative began in 2008 when Stephanie Legard, a fifth-grade teacher and teacher on special assignment (TOSA), worked to develop a science activity at Miller Woods that would extend the learning in second-grade classrooms. Stephanie consulted with a small group of second-grade teachers and with Jared Larson, a science department chair, to make the field trip activity as strong as possible.



A STUDENT EXAMINES HER FIELD TRIP DISCOVERY.

Miller Woods is located a few miles west of McMinnville in the coastal foothills. It is a beautiful 130-acre nature preserve with grass and pasture land, varying ages of diverse forested land, old growth trees, ponds and streams, hiking trails, and native plants. Miller Woods becomes a big, outdoor classroom where students from the six local elementary schools learn about insects, soils, water, wildlife, climate, and forestry. Miller Woods is a perfect destination for field-based teaching and learning. In the school district's "backyard," it provides a place to study and explore nature and to create a new generation of caring stewards for our natural resources. Every second grader in the district now gets to go to this incredible natural resource to conduct observations and hunt insects in three habitats: ponds, grasslands, and woodlands. The science experience lasts about three hours from the time students leave school until the time they return, but the lessons are called upon again and again throughout the year.

The district is supported by the McMinnville Education Foundation (MEF), a volunteer-driven, nonprofit organization that raises funds from parents, businesses, and other interested citizens to support education endeavors and programs. One of the goals of the foundation is to provide equity throughout the district by funding field- and industry-based teaching and learning in science and STEM for all grades, thereby making sure all students have access to these wonderful opportunities to enhance what they learn in the classroom. The program is titled the Elementary Science Experience. The McMinnville Education Foundation, along with district industry partners, Evergreen Aviation and Space Museum, McMinnville Water and Light, and the Yamhill County Soil and Water Conservation District, are instrumental in supporting the Elementary Science Experience and providing hands-on learning activities and transportation for students.

McMinnville School District has about three thousand elementary students attending the six elementary schools. Two thirds of students receive free and reduced lunch. Despite being a high-poverty school district, three



A STUDENT REVIEWS HIS FIELD NOTES.

of the district's elementary schools have been designated model schools: among the most exemplary schools in the state, as designated by the Oregon Department of Education. At the elementary level, Oregon Department of Education rankings of every school in the state focus on four areas: 1) academic achievement, 2) academic growth, 3) subgroup achievement, and 4) subgroup growth (individual student gains over two–four years for historically underserved subgroups).¹ Dr. Maryalice Russell, McMinnville School District's superintendent since 2002, and recently named 2013 Superintendent of the Year by the Oregon Association of School Executives, is the visionary behind the schools' achievements and the opportunities the district provides for students in math and science.

Taking students on field trips is not unique. Many teachers across the country provide these opportunities for students, despite the increased workload needed to organize an off-site learning experience. What is unique in McMinnville School District is the intentional connection between field- and industry-based teaching and learning and the indoor science program experienced by all students across the district and at all grade levels. Connecting authentic applications of learning in science to students' interests, such as

that which occurs in the Elementary Science Experience program, is also an effective teaching strategy for solidifying student learning. Texas A&M University, in conjunction with the Texas Education Agency, conducted a meta-analysis of research about the most effective teaching strategies to define how to best improve student learning, and researchers ranked strategies in order of effectiveness. The number one ranked strategy was called Enhanced Context Strategies, which is as follows: "Relating learning to students' previous experiences, knowledge or interests, e.g. using problem based learning, taking field trips, using the schoolyard for lessons, encouraging reflection."²

Another advocate for the program is Tony Vicknair, District Director of Secondary Programs. Tony develops programs that activate excitement in students about learning and about the future. He believes that the Elementary Science Experience program engages elementary and middle school students who then look forward to learning science in high school. The Science Experiences act as a "feeder to career pathways at the high school level." For example, a student may become inspired by the **FOSS Insects, Structures of Life, or Environments Modules** in elementary school, and when they reach McMinnville High School, they may choose Natural Resources for their career pathway. If so, they would then have the opportunity to mentor students on the Elementary Science Experience to Miller Woods. Another elementary student may be more engaged with the **Models and Designs, Magnetism and Electricity, or Levers and Pulleys Modules**. This student would more likely feed directly into middle school STEM programs, eventually matriculating on to the Engineering & Aerospace Science Academy (EASA), a grade 9–12 McMinnville High School Career Pathway program located at Evergreen Space Museum. These students would then volunteer with fifth graders during their industry-based STEM experience at Evergreen. FOSS plays a big hand in getting students excited about science and engineering. Students are introduced to FOSS kits beginning in kindergarten, and science remains a

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core component of their schooling until graduation and beyond. Thus, it is the district's goal to develop two field- and industry-based science experiences per year for each elementary grade level.

Creating great science experiences for K–12 students in the district is a joint undertaking. Tony works with Jared Larson, the Science Chair and Instructional Coach, throughout the year to ensure that field-based teaching and learning is aligned with grade-level standards and to make the experiences manageable. Classroom teachers help build and design the stations for the experiences. Principals then map out schedules, which also includes working with the schedules of high school student mentors who are in career pathways. Jared points out that, “We are unique because all six elementary schools in our district are getting the same field-based science experiences. It doesn't matter if one school is more affluent than another, has a stronger PTA than another, and is bigger or smaller. The experiences are equal.”

The investigations students do on their science experience vary. Fifth graders will extend the **Lever and Pulleys**



A STUDENT EXPLORES MOTION AT THE EVERGREEN AVIATION AND SPACE MUSEUM.

“My favorite part [of the industry-based learning at the water filtration plant] was building the pipes (plumbing) that makes water come to my house. Sometimes I think about how the water gets to my house and I wonder what the tubes (plumbing/pipes) look like that come to the sink. I wonder what the tubes (plumbing) look like when you flush the toilet.”

Riley, third grade, age 9

“When I mixed the water and dirt together and then poured it through the rocks and sand, I was surprised it came out clean. I learned that the higher water is poured from (gravity station) the faster it ran.”

Marley, third grade, age 8

Module by using spring scales, weights, and ramps for several experiments involving skateboards. For example, one experiment done with skateboards is to test the direction of motion and the force of friction. This is done by using a spring scale to measure the amount of friction force acting on a skateboard with wheels and a skateboard without wheels. Weight is added to the deck of the skateboards and students then write down their observations. Another experiment done with skateboards is to investigate how the different types of footwear impact the amount of friction between the foot and the floor. Students measure how far they can go with one push while wearing their shoes and then they measure how far they can go wearing just a sock on their pushing feet. These first-hand experiences highlighting the importance of friction are unforgettable.

Fourth graders conduct a soil study at Miller Woods in which they apply learning from the **Earth Materials Module**. They get an opportunity to study macro invertebrates and then work on a service-learning project to build birdhouses for the songbirds that live in the fields surrounded by the woods. All of this provides a new context under which to consider their studies on food chains and food webs.

Third graders study the **Water Module** and then go to the Norman Haskins Water Treatment Facility. They hike through the forest to one of the local reservoirs to see where their drinking



PLUMBING REQUIRES THE THOUGHTFUL APPLICATION OF SCIENTIFIC KNOWLEDGE AND A LITTLE TEAMWORK.

water comes from, and they build a plumbing system that models sending water from a treatment plant to their home. Lessons also include building water filters to filter muddy water and experiments that show how gravity effects water flow.

Second graders travel about ten minutes to Miller Woods after studying the **Insects Module** in the spring. Students learn what it means to be an entomologist. They study insects at the pond, in the fields, and in a wooded area. Second graders write their observations and insect

identifications in their “Insecta Inspecta” journals. Some students are so enthusiastic, they have to be reminded that they cannot pick up every insect they see.

First graders enjoy an engineering science experience at Evergreen Museum during the month of May. This is a fairly

new science experience for the district and it is continuing to develop and be fine-tuned so that it matches the science standards. Last year, students studied how an airplane wing has “lift.”

Additionally, the district is working on a brand new field trip for kindergartners.

Last year they successfully piloted an outdoor pond study unit along with the **Animals Two by Two Module**. Many of the youngest students have never had a “nature” experience. They were so excited about being able to see live specimens such as snakes, beetles, salamanders, centipedes, and caterpillars. It was a great opportunity for them to be able to see which critters were the “same” and which were “different.” Jared has met with a few kindergarten teachers, and they are organizing the pilot program into a field-based experience for all kindergartens to enjoy in the spring of 2013.

Extending FOSS modules can still happen even if you do not have funding for field- and industry-based experiences. Are you studying the **Insects Module**? Conduct an insect search right in your schoolyard. Is your class investigating the **Levers and Pulleys Module**? Use some simple machines in the schoolyard. What about the **Landforms Module**? Search for examples of erosion and deposition after a rainstorm. Can't find any? Try to create some by pouring water on the earth. The Science in the Schoolyard Guides™ found on FOSSweb highlight places in the FOSS program where you and your students can go outside to apply the concepts studied in the classroom to the schoolyard. Certainly, if you would also like to engage students in field-based learning, consider starting the way McMinnville did—with one teacher, one group of students, and a great site. Invite administrators in your district to observe the impact on students and try to grow the program.

The FOSS team commends the McMinnville School District for this exciting work! 🌿

¹2011–12 Next Generation Accountability Policy and Technical Manual: System Used to Identify Priority, Focus, and Model Title I Schools; Office of Assessment and Information Services (Oregon Department of Education, August 31, 2012).

²Timothy Scott, et al, “Texas science initiative meta-analysis of National research regarding science teaching: Executive summary,” (Texas Education Agency, 2005).

Field Trips to Extend Learning from Classroom

Grade Level	Module	Site	How is the FOSS module being incorporated?	Financial and Other Support from Community and State
K	Animals Two by Two, Trees	Wetland Park—McMinnville Parks and Recreation	Animals Two by Two —worm movement relay game; water snail and tadpole observation Trees —woodland hike with identification; leaf rubbings	McMinnville Education Foundation provides buses and substitutes as needed.
1st Grade	Air and Weather	Evergreen Aviation and Space Museum	Students make paper airplanes at the museum after learning about the lift of an airplane's wing. They study clouds and air movement in the classroom.	McMinnville Kiwanis completely supports this first-grade field trip.
2nd Grade	Insects	Miller Woods	Insect hunt and observation in ponds, grasslands, and woodlands	McMinnville Education Foundation provides buses and substitutes as needed. Miller Woods provides the site for second-grade field trips. Career Pathway high school mentors are on hand for guiding stations; community volunteers also assist.
3rd Grade	Water	Norman Scott Water Treatment Plant	Discuss water cycle and look at examples while hiking to reservoir; engineer gravity fed plumbing system	McMinnville Water and Light completely supports this third-grade field trip.
4th Grade	Earth Materials, Food Chains and Webs (DSM)	Miller Woods	Earth Materials —At Miller Woods, complete journal soil pages based on Earth Materials Food Chains and Webs —observe macro invertebrates, plants, birds and their interactions with the environment; Service Project: building bird houses	McMinnville Education Foundation provides buses and substitutes as needed. Miller Woods provides the site for fourth-grade field trips.
5th Grade	Levers and Pulleys	Evergreen Aviation and Space Museum	Direction of motion and force of friction using skateboards and spring scales, manipulating surface contact, bearings, and ramps	McMinnville Education Foundation provides buses and substitutes as needed. EASA provides classrooms for Engineer Career Pathway students to host fifth-grade classes.
Middle School	Landforms	Metsker Park	After studying landforms & erosion on Mt. Shasta and Mt. Hood (local), go on a forest hike to document erosion; stream table investigation	Yamhill County Parks—McMinnville Education Foundation funds this field trip.

Note: Oregon Department of Education STEM Grant, along with the McMinnville Education Foundation, Miller Woods, Norman Scott Water Treatment Plant, McMinnville Kiwanis Club, Evergreen Aviation and Space Museum, and the Yamhill County Soil and Water Conservation District have all helped to support the creation of these field trips.