

water science

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biology,” says Mr. Brogie. “You’ll be able to go much farther with photosynthesis and respiration, for example.”

Getting started with field trips – one step at a time.

If you haven’t taken your students out into the field before, it may seem a little daunting. But the rewards are well worth the effort, says Mr. Brogie.

“Take it one step at a time,” he says. “Start in the classroom with tests like pH and hardness that allow your students to develop scientific techniques using a simple test kit and tap water. Start with the question, ‘What am I drinking?’ Science doesn’t get much more personal than that!”

“Don’t try to do too much at first. Save the field work until they’re ready—meanwhile they will only get more excited anticipating the trip.”

Tests like DO (dissolved oxygen) and five-day BOD (Biochemical Oxygen Demand) require field work, so they are a natural next step. But as the tests you are planning become more numerous, you have to take a close look at costs.

Choosing the right equipment for your program and budget.

“I’ve been lucky,” says Mr. Brogie. “I’ve always worked in schools that were solidly behind our program, and we could afford the equipment we thought would give us the best value.” Brogie prefers to work with multi-parameter kits – kits capable of testing for a variety of chemical characteristics. “They’re a little more expensive than single-parameter kits, but they’re far more flexible.

“With a multi-parameter kit, students can work in small groups, each testing a unique parameter, and eventually



Hach’s venerable DR2000 spectrophotometer has been a favorite of teachers and scientists around the world for years. The new DR2010 datalogging spectrophotometer offers even more power and flexibility in kits like Hach’s DR2010 Aquaculture Laboratory.

combine their results to assemble a comprehensive profile of a local stream or river. Or they can each perform a battery of several tests.”

For teachers who expect resistance to the cost of multi-parameter kits, Brogie offers this advice: stress the cross-curricular value of teaching water science. “And emphasize the economy and long-term value of buying a more advanced kit. A kit capable of five tests is much less costly than five single-parameter kits.”

Other sources for the kits and the support you need.

During the summer months, Mr. Brogie teaches workshops for other teachers, through grants awarded from USA organizations such as the Woodrow Wilson Foundation and the Howard Hughes Foundation. These are wonderful opportunities for any teacher to participate in an intensive series of hands-on classes, taught by a team of master teachers. Their goal is to send all of their “students” back to their home schools armed with ready-to-use lessons and the basis of a solid water science program. Funding varies, but in many cases the foundation provides room and board as well as a stipend to cover travel costs.

“Many workshops like these are also great opportunities to acquire equipment,” says Mr. Brogie. “Often the teachers are invited to take home the equipment used in class. It can at least provide a starting point to get a small program going.

“While you’re building the program and your inventory of equipment, you should also contact your local colleges. Build a relationship with them, and you just might find (as I have) that they have water testing equipment they are willing to loan you! In our region, Northeast Community College and Wayne State College continue to provide resources for local science teachers.”

Make your kids true stewards of the land – as community volunteers!

“Here in Nebraska, we have a persistent problem with nitrates in our ground water – mainly the result of run-off and fertilizers used in farming. So, in our field work we focus particularly on monitoring and interpreting nitrate levels. It’s an important local issue, so it’s easy to spark their interest.

“Then we go one step further. Our kids go into the community and test local wells for nitrate levels. It’s a free service, but it’s enormously valuable to anyone who relies on well water at home.”

First, the class advertises locally to offer free nitrate testing. When community members respond, the team goes to work. “The kids collect samples, run the tests and discuss the results with homeowners.”

The success of this community program is measured in the smiles on the faces of Mr. Brogie’s student volunteers. “They feel great. They’ve applied all of their skills—and have seen firsthand how they can contribute to the well-being of their neighbors. It’s a lesson they will never forget!”

Water Science Clinic

Use a sample map to get your kids into the water – and into water science!

In warm weather, kids love to get into the water to collect samples – rather than scooping samples from a dock or lake shore. It really adds another dimension to the fun of studying water science!

Once you have found a local stream, prepare a sample map like the one shown here. (You may remember seeing this map in Hach’s *Water, Water Everywhere* curriculum. You’re free to use photocopies of this map to teach the concept before giving them the actual map for their next trip.)

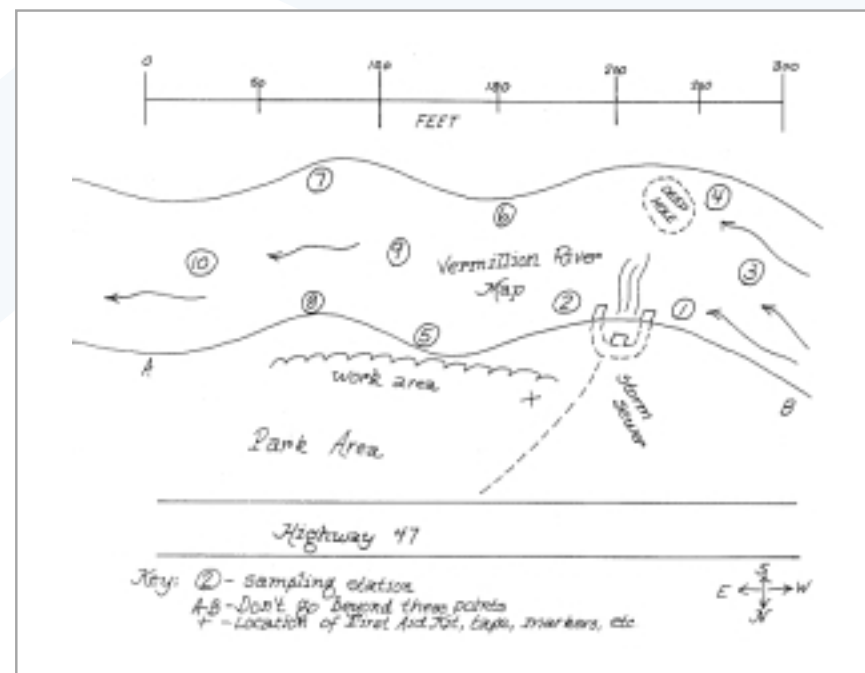
Assign many sampling stations – even more than a single student can possibly reach in a single session. A full line-up of sampling tasks keeps them focused on their work! To make on-site navigation easy, relate each sample site in the stream to an obvious feature ashore – a bend in the stream, a storm sewer pipe, or a dock, for example.

Divide your class into groups of three to four students. Before you leave for your field trip, give each student a sample map. (Keep a few spares to replace the maps that inevitably wind up in the water!) In each group, two to three kids will operate the test equipment and record results, while the fourth student collects samples.

Ideally, you should provide equipment for each group to perform a battery of three to four tests at each station. Afterward, the groups will all present their results and consolidate them to make a complete stream profile for class interpretation. You can easily add equipment as your water science program grows.

Need more information? Check out pages 14-19 in the *Teacher’s Guide to the Water, Water Everywhere* curriculum. Or send us an e-mail with your question: h2ou@hach.com.

Sample Map



Get Wet!

Project WET (Water Education for Teachers) is a terrific resource for educators of students in grades K-12 across the USA, Canada and Mexico. If you haven’t attended a Project WET workshop or checked out the program on line, you should take a look right away and get involved!

Project WET is dedicated to facilitating and promoting awareness, appreciation, knowledge, and stewardship of our water resources, largely by providing classroom-ready teaching aids and building a network of state and international Project WET programs managed by coordinators who provide training workshops for teachers. The program is based on the belief that an early awareness of and respect for water resources can encourage a personal lifelong commitment of responsibility and civic participation. Project WET is also grounded in the belief that “water is important for all users.” Connect with Project WET, and you’ll have access to workshops, materials and the support of many others who are also educating young people about water.

Today the Project WET network reaches teachers, students and dedicated volunteers in 47 states, one U.S. Island, Canada and Mexico.

To learn more about Project WET, click on these great connections:

- **The Project WET home page** where you can learn all about the program and find the Project WET coordinator in your state. www.montana.edu/wwwwet/
- **The Project WET Curriculum and Activity Guide** along with other great Watercourse publications. www.montana.edu/wwwwater/publications/wet_pub.html
- **Or contact the home office the old fashioned way!** Call or write to: Dennis Nelson, Executive Director, Project WET, 201 Culbertson Hall, Montana State University, Bozeman, MT 59717. Tel: 406-994-5392.



Making water science fun and affordable

Each morning when the school bell rings, teachers from coast to coast take on the same challenge – making kids interested in science. Whether you’re teaching third graders or high school seniors, it’s a big job. But for a teacher whose budget for classroom equipment is tight, it’s even harder.

One master teacher, Terry Lewis of Pierre, SD, has been tackling this challenge for more than 30 years. He knows all about motivating students, and he’s learned to handle tight budgets, too.

Mr. Lewis first integrated water science into his curriculum as a classroom teacher in the 1970s. Through the years, he has used Hach test kits with students from the primary grades through high school, but he has especially enjoyed introducing younger kids to water science (grades K-6). For kids this young, he has found that test kits based on Hach’s simple “visual” methods are excellent teaching aids.

“You don’t have to buy the most expensive instrument available to have a successful water science program,” he says. “In fact, for young kids color cubes and color discs are perfect.”



Young students learn fast with hands-on equipment that makes them feel like real scientists – like the color disc shown here. It’s fun!

“A test using a color disc, for instance, takes only ten minutes. That’s short enough to hold a fifth-grader’s interest, and it’s easy enough for him or her to succeed. But the test procedure is also full of skills that all students need to develop. So, they’re learning the skills and processes they need to meet national standards—and they’re having a lot of fun doing it.

While learning basic skills, kids also start to learn about bigger issues—the variables affecting the quality of the water they depend on for life. “By studying water quality, students learn about watersheds, water treatment, their community, and corporate responsibilities to protect water from pollution. When students compare water test results with what is living in a body of water, they learn about the importance of water quality first hand.”

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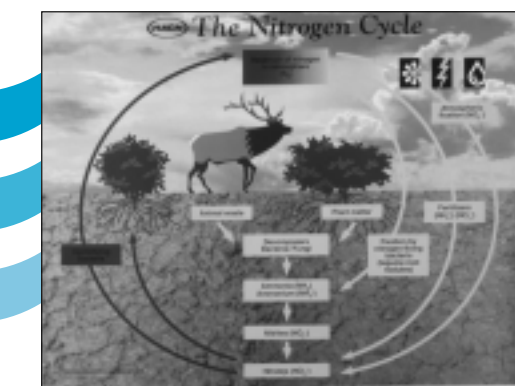
Teaching Critical Skills

Mr. Lewis started using Hach test kits in the 1970s, but he is still amazed at the skills and vocabulary that even students in primary grades develop when using the kits. They expand their scientific skills by learning to observe, measure, infer, research, experiment and analyze. They read thermometers, organize data and develop interpersonal skills by working in teams. They even improve their math and writing skills!

The Vocabulary of Water Science

Using test kits helps to teach kids the key concepts of water science:

acid rain	acid / base
algae	plankton
aquifer	zooplankton
eutrophication	phytoplankton
erosion	food chain
ground water	food web
water cycle	producer
water table	consumer
transpiration	decomposer
turbidity	toxic
nitrates	thermal
phosphates	organic
dissolved oxygen	wetlands
pH	Celsius / Fahrenheit



Send for FREE stuff

These booklets and posters are great for reinforcing key principles in water science. And they’re free! So, check the boxes alongside the ones you’d like, and clearly print your name and address on the other side of this page. Then fold, tape and mail this card today. Or you can send your order via e-mail: h2ou@hach.com. Or fax: 970-669-2932.

- Environmental Educational Products Catalog* – coming soon! Lit. #1980 If you’re teaching water science, you’ve got to check out Hach’s new catalog of test kits, accessories and teaching aids for classes from kindergarten through college.

It’s more than just another catalog! It includes the portable test kits that have made Hach the world leader in water science – and a favorite among teachers at all grade levels. You can always count on Hach kits to deliver superior accuracy. They’re easy to use, and they’re tough enough to stand up to hard use in the hands of any student!

There are kits for every grade level, and for virtually anything you might want to test for. From simple, single-parameter kits based on a color cube or color disc to advanced multi-parameter kits capable of a complete battery of tests, Hach has it all!

- Nitrogen Cycle Poster* This colorful 23” x 18” poster explains one of the most important cycles of environmental science. Lit. #9299
- Granting Your Wish List: How to write winning proposals for science education projects.* This new booklet shows you how to turn bright ideas into effective grant proposals. If you have ever felt discouraged by the thought of struggling with a grant proposal, this is for you! It’s full of step-by-step instruction and great advice—on topics such as defining your project, finding potential donors, and building your budget. Lit. #6132
- Test Strip Flyer*, including two FREE Test Strip samples. Hach’s new Water Quality Test Strips are the most convenient way to test water. You just dip the strip in water... and compare the results with a chart! This new flyer includes two sample Hardness Test Strips and a list of additional Hach Water Quality Test Strips available. Lit. #2022
- Water, Water Everywhere Portable Laboratory* This comprehensive brochure describes Hach’s unique water testing lab custom-designed for education. Built around Hach’s powerful new DR/820 colorimeter, this portable lab is ideal for river watch and ecology programs. The DR/820 offers simple, push-button operation and step-by-step prompts. The kit comes with everything you need to test eight different parameters. It also includes Hach’s popular three-volume *Water, Water Everywhere* curriculum. Lit. #1905
- Periodic Table Poster* The ultimate reference table for any classroom! Lit. #9356

