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Just Add Water™ for fun, learning

We told you they were coming, and now they're available — Hach's new Just Add Water™ kits.

Now you and your students can conduct water testing at an affordable price. Choose from three kits and two teaching levels.

With Just Add Water kits, your students will learn how different parameters affect their drinking water, ponds and streams, and even wastewater. Each kit comes with everything you need to run 50 tests of each parameter.

All of our Just Add Water kits use test-strip technology, which allows your students to run tests without using dangerous chemicals. There's no fuss, no mess and no worries. It's so easy you'll be amazed with the simplicity of our Just Add Water kits.

Included in each kit is a teacher-tested "Curriculum on Diskette" which can be viewed on any web browser or it can be printed out in handout form. (Diskettes can be used on either PC or Mac systems.) And each kit can be ordered to teach third through sixth grades (Level 1), or seventh through ninth grades (Level 2).

• **Drinking Water**
Hach's Just Add Water Drinking Water Classroom kit gives students a great overview of the world of drinking water. Students will learn where their water comes from and how it gets to their homes, as well as why their bodies need water. Water quality test parameters include pH, hardness, copper and chlorine.
Catalog Numbers: Level 1—27880-00
Level 2—27643-00

• **Ponds & Streams**
The Ponds & Streams Classroom kit helps students understand and appreciate their lakes, ponds, rivers and streams. With

this kit, students will learn about the water cycle, identify watersheds, study the effects of acid rain and causes of nonpoint source pollution.

Water quality test parameters include alkalinity, phosphates, pH and nitrates.

Catalog Numbers: Level 1—27876-00
Level 2—27877-00

• **Wastewater**

This Wastewater Just Add Water curriculum is the perfect complement to Hach's Drinking Water kit. Students will learn about where our wastewater goes and the importance of the water treatment process.

Water quality test parameters include chlorine, phosphates and nitrates.
Catalog Numbers: Level 1—27878-00
Level 2—27879-00

The kits are available through Hach or through selected science education suppliers.



We want to hear from you

Here at Teaching Water Science, we are always interested in stories from your classrooms. So, if you have a story with pictures that would be of interest to other teachers, let us know.

Let TWS and all the other teachers know what you're doing. How did you go about starting your water science curriculum? What Hach tests are you having your students perform? Are your students testing a river, a lake, or just a brook near the school? Or are you testing your town's or city's water supply? And what kind of results are you getting? Help TWS get your story out so other teachers can learn how to begin, or even expand, their own program.

And here's the neat part. If TWS uses your story, we'll send you a FREE Just Add Water test kit to use in your class. Help TWS become a useful resource for your classroom, and send us your ideas, whether it's for a story (with pictures), or an idea to make TWS better. We'd love to hear from you.

To send us your story and pictures, your suggestion on how to improve TWS, or if you have question for Hawkeye the Hach Guy, write to:

Teaching Water Science
Hach Company
P.O. Box 389
Loveland, Colo., 80539

Or send e-mail to: h2ou@hach.com

Or call: 1-800-227-HACH (1-800-227-4224) in the USA, or 1-970-669-3050 outside the USA.



Hawkeye the Hach Guy!

He's keeping a keen eye on water quality!

Q Can you tell me what pH is, and what's the difference between acid and base?

A Water (H₂O) contains both hydrogen (H⁺) ions and hydroxyl ions (OH⁻). The term pH is used to describe the measurement of the H⁺ ion

concentration of liquids and substances. Simply put, pH relates to the relative acidity of an aqueous solution. Each measurement is given a pH value on a scale of 0 to 14, with 7 being considered "neutral."

If a sample has more H⁺ ions than OH⁻ ions, it is considered acidic, or having a pH of less than 7. Examples of acidic liquids around the house are vinegar, lemon juice and soft drinks such as cola. If a sample has more OH⁻ ions than H⁺ ions it is considered basic or alkaline, and has a pH greater than 7. Liquids and substances that are basic (alkaline) are baking soda, antacids and drain cleaners.

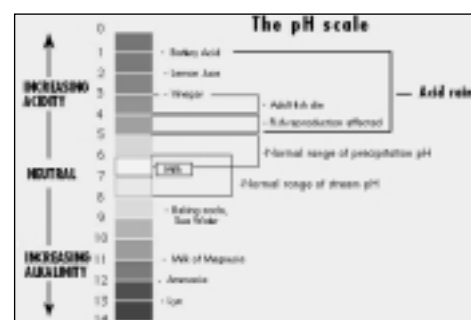
For every one unit of change on the pH scale—4 to 3, 7 to 8—there is a tenfold change in how acidic or basic the sample is. For example, the average pH of rain fall over much of the northeastern United States is 4.3, or roughly 10 times more acidic than rainfall elsewhere in the United States, which is 5.0-5.6. Lakes with a pH of 4 (acidic) are roughly 100 times more acidic than lakes with a pH of 6.

Measuring the pH of water is routine when assessing the "health" of a body of water. The pH of water is usually always changing, and a change in the chemical nature of the system will often reflect a change in the pH. The pH value of water is important to most organisms, and a change in the pH can result in the water becoming unsuitable. Most organisms are used to a specific pH range, and can die from the effects of a change in the pH. At pH values as low as 4.5 and as high as 9.6 the water becomes harmful to organisms.

One last thing, when measuring samples for pH, and when testing for other parameters in water, be sure to wear protective gloves and goggles. Samples with a very high pH (greater than 9) or a very low pH (less than 5) are potentially harmful and require special handling.

See you in the next issue of Teaching Water Science.

Do you have a question for Hawkeye the Hach Guy? If so, just e-mail your question about water science to h2ou@hach.com



TEACHING WATER SCIENCE



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Spring 2000

Visit us at H2OU at www.hach.com/h2ou/ or call us at 1-800-227-HACH. Outside USA, call 970-669-3050.

Check out Hach's NEW Environmental Education Products Catalog!

Looking for water test kits that are easy to use, inexpensive and guarantee a fun learning experience? Well, look no further because we have the catalog for you that's full of water test kits designed for the classroom—Hach's new Environmental Education Catalog.

In this new 24-page full color Environmental Education Catalog, you'll find kits for just about every test and every budget. And Hach kits are designed with accuracy and simplicity in mind. Every kit comes with everything you need to start testing right away—from drinking water to river water to soil testing.



And to help make your job easier, our Environmental Education Catalog includes teaching tips to make your job even easier. Plus, each kit comes with a helpful manual to take you step by step through the procedure.

Not sure what to test for? We can help you with that as well. Our Environmental Education Catalog offers suggestions on field testing, testing tap water, and even conducting tests on parameters that may be of local interest. And in conjunction with Teaching Water Science, Hach can help you develop a curriculum that fits your needs.

If you don't have an Environmental Education Catalog, don't wait any longer. Call us today at 800-227-4224 or 1-970-669-3050, or e-mail us at marcomlit@hach.com to request literature number 1980, and we'll send you your FREE catalog.

Water mystery at the Smithsonian

If you're wondering about water, then wonder no more. The Hands On Science Center at the National Museum of American History has Water Wonderworks in store.

The Hands On Science Center (HOSC) has put together, with the help of Hach Company, a fun and fascinating mystery for you and your students to solve at the Museum.

In the Water Wonderworks school program, aimed at fifth- through eighth-grade students, the mission of teachers and their students is to determine what kind of waterworks Washington, D.C., needs for the 21st century. With code names and case files in hand, the students (Hydro-Investigators) begin to solve science mysteries with the help of Special Agent H₂O and the HOSC staff. The Hydro-Investigators explore one of three topics: Types of Pipes (water pipes), Clean it Up (drinking water treatment), or Pollution Solutions (water and wastewater pollution).

To solve their mysteries at the HOSC, students must figure out such puzzling problems as, "What is the best way to clean water so that it is safe to drink?" and, "What are the best types of pipes to use in a waterworks?" But to do that, they must do their undercover research at headquarters (the classroom) using the Hydro-Investigator Casebook.

The Casebook activities are designed to help students become familiar with the science concepts and the historical perspectives in the program. Once that part of the mission is



Malcom Boey of Singapore, left, Margaret Veroneau, center and her brother, Joe, try their hand using Hach's digital titrator during a hands-on experiment at the Hands-On-Science Center in Washington, D.C.

complete, the students move on to the HOSC at the National Museum of American History to conduct their investigations.

"It (the Casebook) prepares them for their investigations at the Museum," Theresa Esterlund, Director of the Hands On Science Center, says. "The Casebook complements the program in the HOSC by providing pre-visit preparation

Continued on next page



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Problem solvers see the big picture

Taking lots of pictures, and teaching chemistry.

The two seem to have little in common, but Pam Carter, who teaches Chemistry II at Madill High School in Madill, Okla., hopes taking pictures of her chemistry students in action will generate interest from other students and lead them to her classroom. Carter then hopes to maintain their interest with hands-on experience using Hach water-testing equipment.

Carter first learned about Hach test kits while attending a National Science Teachers' Workshop several years ago. She attended one of the sessions and was surprised at how easy it was to use Hach equipment. She went about learning more about water testing and Hach test kits, and it wasn't too long afterwards that she made it a part of her curriculum.

"I was looking for something that students could do, that was repeatable, and that concerned the environment," Carter says. "It was something they could do that was tangible, and they find it interesting. For the first few years of the project, the students came up with a problem they could solve."



Students in Pam Carter's chemistry class in Madill, Okla., run tests on a local water source using Hach test kits.

Wonderworks

From previous page

activities, post-visit applications and supplementary exercises."

The trip to the HOSC gives the Hydro-Investigators 90 minutes worth of hands-on experiments that are designed to help the students find solutions to the water quality questions posed in the Casebook. To enable students to use real scientific equipment and chemicals, Hach test equipment is on hand in the lab, including digital titrators and color-wheel test kits for testing pH. From there, they take their findings back to headquarters and share the information with the other groups of Hydro-Investigators, documenting their investigations in their Casebooks.

"The activities in the HOSC help students understand science in their everyday lives as they uncover the science and history of specific drinking water issues," Esterlund says of the experiments done at the Museum. While at the Museum, Hydro-Investigators learn more about drinking water and water treatment plants, as well as testing for safe and clean water.

The HOSC program helps students understand historical

Hach's Water Ecology and Limnology Test Kit

Model AL-36B Hach cat. no. 1802-33

This popular kit is designed to meet the needs of fish and wildlife conservation personnel. The pH is determined colorimetrically using a color comparator with color discs. Acidity, alkalinity, carbon dioxide, dissolved oxygen and hardness tests are done using drop-count titrations.

Among the problems the students took on was to determine the water quality of two ponds, one of which was near an oil well. Another problem was to learn why cattle drank out of one pond, even though there were two other ponds nearby. The students have even tested one of the city's water supplies.

"Sometimes the results were detectable, sometimes they weren't," Carter says. Fortunately, she says, they've never found anything of consequence.

Now Carter's class tests an evolving water source near the high school. The school has dug an outdoor laboratory pond, and the students are testing for changes in the water as the pond forms. Carter says the data has been difficult to analyze since all they have is first-year baseline data. After one year of testing, however, Carter says there has been an increase in dissolved oxygen and a decrease in carbon dioxide. The other parameters have remained about the same, which she says is "comforting" to know.

The students' work testing the pond goes beyond the classroom as they present their findings to the local Rotary and Lions clubs.

"We use this as a way to make our impact on our environment real," Carter says of the classroom presentations.

Developing the curriculum using Hach products wasn't very difficult, Carter says. In her Chemistry II class, she teaches a section on water pollution and how it occurs, and that's where the Hach test kits come into play. Every month, her students test their selected water source and record the data. Each student gets to perform each test at least once. At the end of

perspectives, as well. For example, Hydro-Investigators test water using different methods used in the past. And they use old water pipes and "clue cards" to determine different pipe characteristics. The historical approach, according to Esterlund, enables students to investigate environmental issues, technological advances and interactions between science and American society.

In its short run, the program has become very successful, Esterlund says.

"Teachers who have brought groups have returned with different classes," she says. "The program fits in well with most middle school curricula, and it incorporates national science and U.S. history standards."

For more information about Water Wonderworks, contact Theresa Esterlund, Director, Hands On Science Center, 1-202-786-2307 or esterlundt@mah.si.edu, or visit the Museum's web site at <http://americanhistory.si.edu/hosc/index.htm>.

To schedule your class for the Hands On Science Center, contact Andrea Lowther, Tour Coordinator, 1-202-357-1481.

the school year, the students use the data to learn how to make scientific graphs on the computer.

Carter's first kit was Hach's Water Ecology and Limnology kit that has six different test parameters, including dissolved oxygen, alkalinity, pH and hardness. Through the years, she's been adding to her original kit to include tests for nitrates and phosphates, as well as parameters for swimming pools. Her most recent additions have been Hach's LeadTrak® kit and Pocket Colorimeter™.

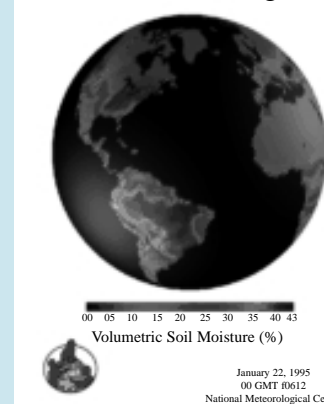
Students help GLOBE watch the world

Not all classroom exercises turn into in real-world results. With the GLOBE® Program, and the Internet, that's all changing.

The GLOBE (Global Learning and Observations to Benefit the Environment) Program, with the help of students and teachers from around the world, is providing scientists with much needed information in order to develop a detailed picture of the Earth's environment. The program's goal is to increase environmental awareness, contribute to the scientific understanding of our planet and help students become better in science and math.

Students and teachers from more than 8,000 schools in 85 countries are working together to supply data to GLOBE scientists. So far, the network of students and teachers has

The GLOBE Program



provided more than four million environmental measurements. From Argentina to Uruguay, from Australia to the United States, GLOBE has become a worldwide network of data gatherers and data analyzers.

The work of data gatherers is made easier with the help of Hach test equipment. Hach has more than 30 products that meet GLOBE requirements and are available to get you and your students involved with

the program. Included in Hach's list of products is the NI-14 Nitrate Kit, which is one of the few nitrate kits on the market that meet GLOBE requirements.

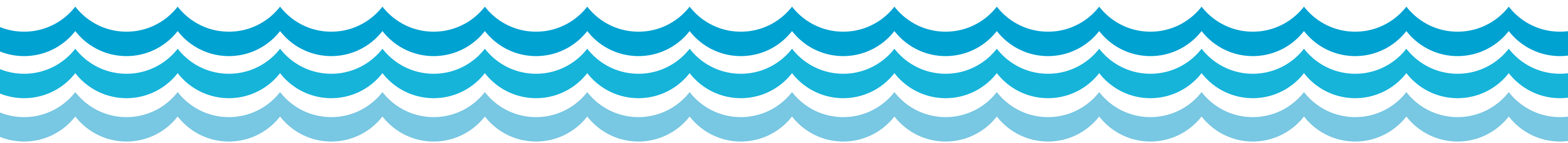
Through the GLOBE program (www.globe.gov), students make a regular set of environmental observations that have significance in the scientific world. Following scientific protocols, students observe and gather their data — atmospheric temperature, cloud cover and precipitation — and then enter it on to the GLOBE web site. As students progress through school, and the program, they conduct more sophisticated experiments such as water chemistry, soil characterization and land-cover studies.

"The students can make a real contribution," says Ann Hardison, director of communications for GLOBE. "They're not just replicating an experiment that hundreds of others have done before, they're collecting usable data."

And it's the usable data that makes learning more fun, Hardison adds.

"First of all, we've seen that students learn better by doing than by just reading what others are doing, particularly in the sciences," Hardison says. "It gives them a sense of ownership."

Teachers play a role by helping students learn how to take measurements, as well as understand the significance and impact



of the observations. To make teachers comfortable in their role, GLOBE offers regional workshops to help them understand the test procedures. The training seminars are required, and for a very important reason.

"It's very important that the scientist using the data have confidence in the data," Hardison says. "And we take steps to assure data quality. The critical part is the hands-on training for the teachers. They must go through a workshop that lasts three to five days. They practice all the tests, and they discuss the ways they'll use those protocols to teach their students."

Roger Bales, GLOBE scientist at the University of Arizona, says scientists are eager to use data collected by students involved in the GLOBE program.

"When GLOBE students can provide scientists with consistent, carefully collected data, we are better able to determine whether, and how, changes in water and air temperatures affect water transparency and dissolved oxygen concentration and other important water quality characteristics," Bales says. "We have now reached the point where GLOBE constitutes one of the largest water-quality networks in the United States and is certainly the one with the most readily available data."

Data provided by the students is immediately available to GLOBE scientists. Scientists then provide feedback to the students to help them understand the data, generate new questions and reach data-supported conclusions.

"Water is one of those things that people need to survive," Bales says. "Although water is plentiful on the Earth, only a small fraction is actually suitable for most of our purposes, like drinking or irrigating crops. The chemical aspects of the water are, therefore, very important to us."

And with everyone working together, it's a win-win situation for the students, teachers, scientists and Mother Earth.

For more information about how to join the GLOBE Program, call: The GLOBE help desk 1-800-858-9947 Or send e-mail to: info@globe.gov

For more information about Hach products that meet GLOBE specifications, call: 1-800-227-4224 and ask for literature No. 2025

Or visit our web site at: www.hach.com/h2ou/h2globe.htm

Numbers add up to test kits, learning

OK, so Peggy Hubble admits to copying some numbers. It's not like it was a test or anything. What's the big deal, right?

Well, for the 100 or so students who attend her science classes each school year at Edison Middle School in Sioux Falls, S.D., the big deal is that they now get to use Hach water-testing equipment. Those numbers Hubble copied were product numbers off Hach test kits. She caught sight of the numbers while attending River Quest, a seminar put on by the Illinois River Coalition.

"After the workshop, I wrote down the numbers of the kits and called for a catalog," Hubble recalls. "And I ordered the kits that we used at the workshop." (If you want a free Environmental Education Catalog, the only number you need is 1-800-227-4224.)

While the river coalition has since disbanded, her Hach products have withstood the test of time, and her students. Hubble has been using Hach products for about six years. She says she's pretty impressed with the ease of use, although she adds that it never hurts to get some training, as well as some practice.

"The first two years, there was a lot of practice," she says. "But they (the kits) have easy directions to follow."

The practice, she says, was to make sure she understood the test procedures and what kind of test results to expect. And even though she recommends training, she's quick to point out that the Hach test kits are a lot easier to learn and use than other water test kits.

"Hach kits are kid friendly," she says.

Hubble was able to get her first Hach kit with the help of grant money through the local school district. Her test kits include testing reagents for dissolved oxygen, nitrates, alkalinity and phosphates, as well as three pH Pocket Pals™, two TDS Pocket Pals and three nitrate Pocket Pals.

Hubble says her students have tested water sources such as ponds and tap water, but her classes mostly concentrate on testing the Big Sioux River, which runs through Sioux Falls. Students test the Big Sioux River twice a year—fall and spring—and then compare the numbers to see what kind of effect spring runoff has on the river. So far, what they've learned is the river is high Total Dissolved Solids. She said the results weren't unexpected, with South Dakota's history in farming and livestock. She says phosphates were also found in the water. After gathering the data, the information is put on a graph and is shared with parents during Open House at the school.



Student's in Peggy Hubble's eighth-grade science class check the results of their pH test on the Big Sioux River in Sioux Falls, S.D.

Hubble and her students have been able to include a wider spectrum of science using Hach products by studying how the wildlife needs and uses fresh water.

Hubble says she's willing to share what she's learned in developing a curriculum with Hach products with other teachers. She's pretty straightforward about what's easy and what's difficult in setting up a program.

"Kids are not the problems," she emphasizes. "it's usually the money."

Hach can help with that, too. Just call 1-800-227-4224, or e-mail us at h2ou@hach.com, and ask for literature number 6132 and we'll send you *Granting Your Wish List: How to Write Winning Proposals for Science Education Projects* for free.

Pocket Pals

Hach pH Pocket Pal—cat. no. 44350-01
Hach Temperature Pocket Pal—44450-01
Hach TDS Pocket Pal—44400-01

Hach's Pocket Pals are easy to use, economical and reliable (which is a good thing for classroom use). Don't worry about their durability because Pocket Pals are dust proof and waterproof. They come in a variety of test applications, including lakes and rivers, swimming pools and spas, and food processing. You can test for pH, temperature, TDS (total dissolved solids), conductivity and ORP (oxygen reduction potential) in most water samples.

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 Education Products Catalog – 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 any parameter. 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! Lit. #1980

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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

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