Issue 2 March 2004

Interactions

The Newsletter of the

SHODOR EDUCATION FOUNDATION, INC.

1994– Celebrating 10 years of Service in Education Reform– 2004

STUDENT ENRICHMENT

CURRICULUM MATERIALS

FACULTY DEVELOPMENT

Look Inside:

Project SUCCEED– More Than Just a Summer Camp

By Matt Lathrop
Project SUCCEED & Mentor Center Director

Each summer students across the nation are flooded with information on the abundant summer opportunities available to them. Camp fairs, websites, and more bombard them with ideas for how to spend their summer. From sports camps to band camps, the possibilities seem limitless. Students are then forced to choose, "What excites me the most?" Last summer, more than seventy students from the Triangle Region of North Carolina decided they were excited by the opportunity to work alongside scientists and interns at Shodor to explore more about math and science! These students attended one or more workshops in which they were introduced to computational science, using computer models to study math and science.

Each year Project SUCCEED (http://www.shodor.org/succeed) offers workshops year-round for middle school and high school students. These workshops give students the chance to learn from practicing computational scientists. Computational science is the newest method of doing scientific research. Sometimes referred to as "modeling and simulation," computational science involves the combination of science, mathematics, and computing. It is used to study scientific events that are difficult to study using "traditional" research methods because the problems are too big or too small, too fast or too slow, too far away, too dangerous, or too expensive. Staff scientists at Shodor developed the SUCCEED workshops as a way to incorporate their research, or the materials they have developed into an educational setting for students. Support for the program has come from the Burroughs Wellcome Fund, Verizon, and modest program fees. We take great pride in continuing the tradition that no otherwise qualified student has ever been discouraged from participating in Shodor workshops due to an inability to pay.

The culmination of these workshops is the Shodor Scholars Program, a three-

I have learned about what Project SUCCEED means and how it's a serious camp with fun activities. I am LEARNING fast because the work is easy to understand.
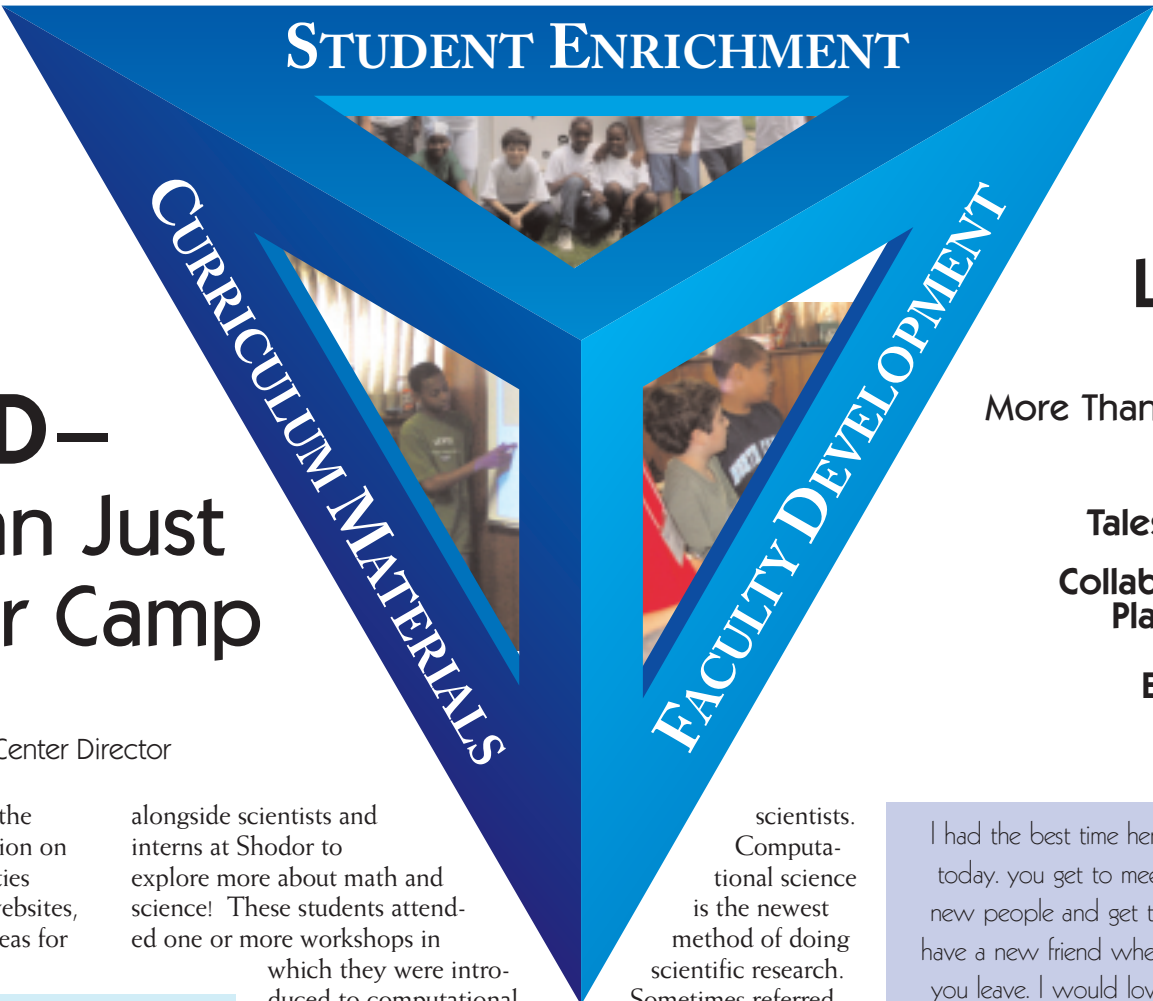
-Caleb,
SUCCEED Participant

I had the best time here today. you get to meet new people and get to have a new friend when you leave. I would love for new people to come and see how it is.

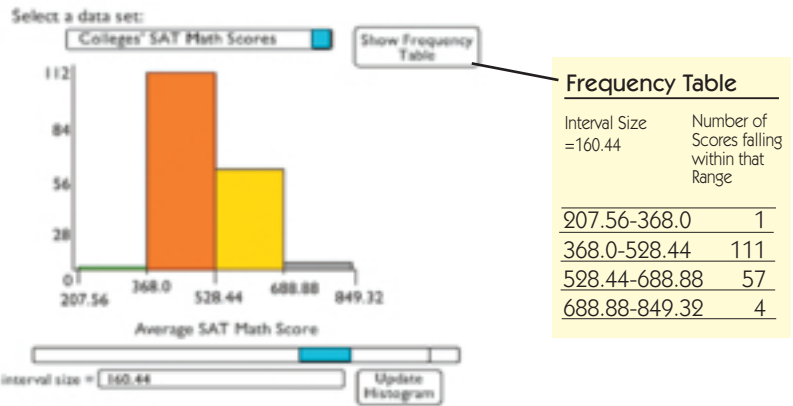Jasmine,
—SUCCEED Participant

Exploring Mathematics with Project Interactivate

By Bethany Hudnutt
Project Interactivate Manager

Functions. Probability. Histograms. Tessellations. Fractals. What do these words mean? Of course they all relate to mathematics but when you read these words do images and thoughts pop into your head identifying their meaning? Do they tickle your memory from a long ago math class or even a recent one? In any case the Shodor Education Foundation's mathematics courseware, Project Interactivate, provides you with ample opportunity for further exploration on any of these topics for both novice and expert. Freely available on Shodor's website, Interactivate gives mathematics students an exciting interactive environment for learning and exploring.

Many of the 104 activities try to render pictures of mathematical concepts and subsequently allow you to physically manipulate and interact with those mathematical ideas. These activities help turn these abstract ideas into concrete yet dynamic images. We call this "visualization."

As an example, screen shots of the Histogram activity are shown above right and below. These two screen shots show the exact same data set, SAT math test scores from 171 students, yet the graphs appear different. They appear different because the "interval size" has been changed using the slider bar beneath the graph (note how the slider is in a different position in the top graph vs. the bottom).

Select a data set: Colleges' SAT Math Scores Show Frequency Table

Frequency Table

Interval Size =68.76	Number of Scores falling within that Range
299.24-368.0	1
368.0-436.76	82
436.76-505.52	56
574.28-643.04	14
643.04-711.8	6
711.8-780.56	3

Average SAT Math Score

interval size = 68.76   Update Histogram

The power behind using computers lies in their ability to compute. You can quickly create many different histograms out of the same data set simply by dragging the slider bar, as shown above. Most statistics curriculums require students to analyze data and graphs in order to understand how graphs can be misleading. Utilizing the power of the computer, this activity allows students to quickly change the interval size on a histogram without bogging themselves down in the tedious computation necessary in order to do so by hand. They then can quickly visualize how simply changing the interval size changes the appearance of the graph and consequently the interpretation of that data even though all the graphs show the *exact same* data. If you would like to try this activity yourself, go to http://www. shodor.org/interactivate/activities/histogram.

Interactivate contains many such "visualizations" across the mathematics curriculum in which you can see how the overall system changes by making a simple change in the beginning conditions. Other visualizations in Interactivate include activities on equivalent fractions, graphs of functions, surface area and volume, tessellations, elapsed time, fractals, and other statistical graphs to name a few.

For teachers, Interactivate offers free, easy to use, meaningful technology to integrate into their mathematics curriculum. Besides the activities, Interactivate offers numerous supporting materials such as lesson plans based on the activities, worksheets, discussions on concepts presented in the activities, alignments to standards, a dictionary and a section specifically for elementary teachers.

All of Interactivate is accessible through Shodor's website: http://www. shodor.org/interactivate. Please feel free to contact Project Interactivate's manager, Bethany Hudnutt with questions or comments at moreinfo@shodor.org.

Select a data set: Colleges' SAT Math Scores Show Frequency Table

Frequency Table

Interval Size =160.44	Number of Scores falling within that Range
207.56-368.0	1
368.0-528.44	111
528.44-688.88	57
688.88-849.32	4

Average SAT Math Score

interval size = 160.44   Update Histogram

Each bar in the top histogram represents an interval (or range) of 68.76 points whereas each bar on the bottom histogram represents a range of 160.44 points. The height of the bar is determined by the number of data points, in this case SAT scores, that fall within that range.

Over 6 Million Served (Each Month!)

By David Joiner, Ph.D.
Staff Scientist

The last few weeks have been filled with milestones for the Shodor website. In early 2004, a significant redesign of the website –a project started in June of 2003– was unveiled, showcasing the three central strengths of Shodor: Curriculum Materials, Faculty Development, and Student Enrichment. Then our new higher bandwidth connection to the Internet, made possible by a partnership with the UNC Office of the President and MCNC, became fully operational. In the following weeks, several new educational organizations in the US, Canada, and the United Kingdom selected Shodor for inclusion in their respective "Best of the Web" lists.
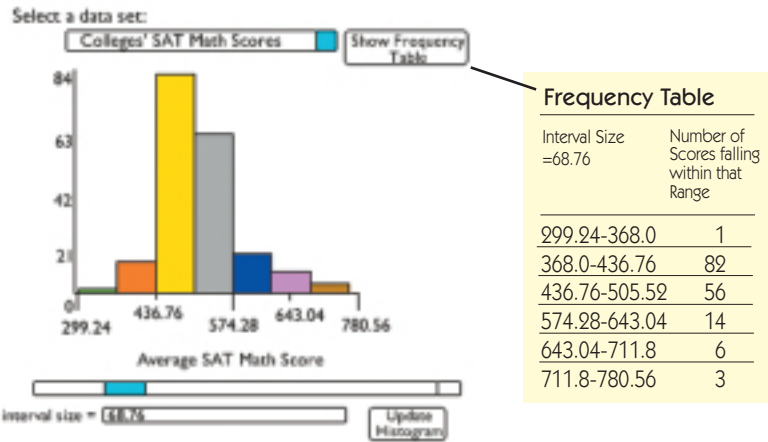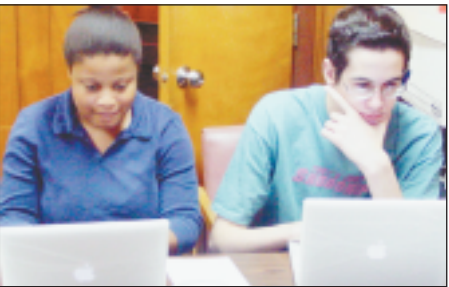
The result? As of the printing of this newsletter, we have achieved a major milestone for non-commercial educational websites: more than 6 million 'hits' per month! These 6 million hits every month come from more than 350,000 users requesting more than 1,300,000 web pages per month. Website usage has grown over 2500% in the last 6 years, 75% in the last year, and 25% in the last month alone.

Each night we take a look back at the previous 30 days of web use. While part of Shodor's privacy policy is that we do not collect any personal information on our web users, we do want to know what pages are looked at, when users look at them, and what operating systems (e.g., Windows, Mac OSX, Linux) and browsers people are using. This helps us ensure that our site works for all of our users, regardless of the hardware or software choices they make.

We have developed a database to help users find their way through our collection of educational materials, lessons, and student opportunities. Items from every Shodor project are stored in the database along with subject specifications and grade level specifications so that users can browse for materials by subject, grade, or both. In addition, we have introduced a keyword search feature that can be used to search the site.

The new website design was led by Michael Reck-how, a Harvard undergraduate and veteran Shodor intern. Working closely with Executive Director Bob Panoff with input from Shodor's Board of Directors, the team started by creating a design document detailing what materials were on the site, how users navigate the site, how "look and feel" would be automated, and how to incorporate current best practices. Michael led the effort in creation of PHP scripts and worked on the database design and site catalog, assisted by staff member Kim McDonald. Chris Johnson, an undergraduate intern from UNC, was the lead graphic artist. Also assisting were Mentor Center interns Alexandra Evans, Monte Evans, Ebonee Farrow, Kevin Kelley, and Leigh Phillips.

You can watch our continued growth yourself by looking at http://www.shodor.org/aw.

In Memoriam

We would like to extend our warmest sympathies to the family and friends of David Dandro, a retired technology executive who recently "adopted" Shodor as one of several education projects. Dave died unexpectedly February 3, 2004. For several months, Dave was helping us by lending his significant business experience to develop a long-range plan for financial and scientific support for the Mentor Center @ Shodor. He spent many hours meeting with the staff and interns, and then with members of the RTP community on our behalf. Just as we were getting started, it seemed, he was taken from us. In gratitude for the help he provided us in so short a time, the Shodor Board of Directors has approved a memorial scholarship program to enable two students from Faith Lutheran School in Raleigh — another of Dave's adopted causes — to attend SUCCEED workshops.

Shodor Staff

President & Director
Robert M. Panoff, PhD

Staff Scientist
Dave Joiner, PhD

Bioscience Educator
Cornelia Seiffert, MA

Mathematics Educator
Bethany Snyder Hudnutt

Engineering Educator
Garrett Love, PhD

Administration
Joyce South

Computational Science Educator
Kent Robertson

Computational Scientist
Matt DesVoigne

Mathematics Educator
Matt Lathrop

NCSI Staff Associate
Kim McDonald

NCSI Staff Associate
Diana Tanase, MA

System Administrator
Michael Stabosz

Visiting Scientist
Valerie DeBellis, PhD

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week workshop for rising 10th and 11th graders that also serves as the primary proving ground for future interns for the Mentor Center @ Shodor. The Scholars Program is a more intensive workshop, which not only teaches students about computational science, but also teaches them how to build their own models. The first two weeks of the program serve as building blocks for the final week when students are asked to break into collaborative teams, choose a topic of interest to them, research it, and build a model to help visualize and explain it. At the end of the third week the students present their models to Shodor staff and interns as well as other members of the academic community. To learn more about the Scholar's Program, as well as how it can lead to a future internship at Shodor, take a look at Shodor intern Connie Chu's article in this newsletter.

We are now accepting applications for our summer workshops. You can apply online at http://www.shodor.org/succeed/ or email moreinfo@shodor.org to find out more. Hope to see you this summer!

Apply online: www.shodor.org/succeed

Shodor gave me the chance to explore my teaching style in a non-threatening environment. This has helped me out in methods classes and as I am starting student teaching.
-Susan Edwards, Mentor Center Intern

Working at Shodor enhances my overall education as I find myself learning something new everyday.
—Amanda Amoateng MentorCenter Intern

SUCCEED Summer 2004 Calendar

Event	Dates	Times	Grade Levels	Workshop Fee*
Modeling Your World, Session A	June 7-11	9am-Noon	Rising 6-8	$175
Engineers in Training	June 7-11	1pm-4pm	Rising 6-8	$175
Internet Science Explorations	June 14-18	9am-Noon	Rising 6-8	$175
Modeling Your World, Session B	June 14-18	1pm-4pm	Rising 6-8	$175
Math Explorations	June 21-25	9am-Noon	Rising 6-8	$175
Medicine and the Biomedical Sciences	June 21-25	1pm-4pm	Rising 8-9	$175
Environmental Science	June 28-7/2	9am-Noon	Rising 8-9	$175
Forensic Science	June 28-7/2	1pm-4pm	Rising 8-9	$175
Shodor Scholars program	July 19-8/6	9am-4pm	Rising 10-11	$150

* Full and partial financial assistance is available: no qualified student will be turned away for financial reasons

SUCCEED-HI – Celebrating Three Years of Progress

By Kent Robertson
Computational Science Educator

SUCCEED-HI makes the exciting new field of Computational Science accessible to deaf and hard of hearing middle and high school students and their teachers. Several years ago, Shodor staff working with deaf students during a SUCCEED workshop determined that two things were needed: first, technical signs for computational science vocabulary, and second, better lessons that allow deaf students to practice computational science. One of Shodor's scientists at the time, Bob Gotwals who is now the associate director of the Morehead Planetarium and Science Center, developed a plan to address these two needs, recruited collaborators all over the state and country, and secured funding from the National Science Foundation's Program for Persons with Disabilities.

TECHNICAL SIGNS

Computational Science –numerical models and simulations, data visualization, and informatics– will continue to play an increasing role in scientific discoveries. These discoveries will in turn affect our social discus-

Visit SUCCEED-HI online:
www.shodor.org/succeedhi

sions and policies. In order for our deaf citizens to be involved with these discoveries and discussions, their own language – American Sign Language (ASL) – needs to support them. The SUCCEED-HI team first compiled a list of the technical vocabulary used by computational scientists. A team of computational scientists, interpreters, and deaf students and professionals then developed ASL signs for this technical vocabulary.

Lymari Ramos, a deaf professional at Interpreters Inc. signs the technical vocabulary. These technical signs are available on the

SUCCEED-HI website at:
http://www.shodor.org/succeedhi/succeedhi/interpreters.html

COMPUTATIONAL SCIENCE LESSONS

The SUCCEED-HI website provides a growing body of exploration based lessons. The students use and or build computer models on a broad range of middle and high school math and science topics. By changing the parameters in the models, the students are able to discover the pertinent math and science concepts. By exploring the models in these lessons, the students learn science by doing science.

Cindy Decker-Pickell, a deaf instructor at the Eastern North Carolina School for the Deaf, signs all of the text throughout the lessons in ASL. These lessons are available on the SUCCEED-HI website at http://www.shodor.org/succeedhi/

The SUCCEED-HI staff is collecting feedback from science teachers in North Carolina and Deaf Schools across the country. This feedback is being used to develop new enhancements to the SUCCEED-HI website. Please send your comments and suggestions to: moreinfo@shodor.org.

Tales of a Shodor Scholar

By Connie Chu, Mentor Center Intern
Riverside High School

Computers, Ph.D.s, and a brick building on Broad Street—that's your basic description of Shodor. I first heard about the foundation from my geometry teacher, who recommended me for the Shodor Scholars Program (SSP). Attending this summer's workshop turned out to be a terrific opportunity to interact with North Carolina high school students that were interested in math and science, just like me. On the first day, we jumped into astronomy, modeling the solar system through a computer simulation program. We also worked together to untangle ourselves from ropes. Doing "just for fun" group activities made Shodor very welcoming, while using new programs, such as STELLA, AgentSheets, and NetLogo, allowed us to put new spins on projects through computer simulation.

Now, I'm an intern. I had been hoping to study epidemiology in the future, and, after completing the Shodor Scholars Program, I knew I wanted to pursue this interest by working with computers more. Therefore, I interviewed for a job and was set up with a mentor, Kim McDonald, a former intern and now a staff member herself. My current project involves adding terms to the online biomedical glossary. I have also created my own webpage. Working at Shodor is one of the best jobs a student could have. The office is open until six on weekdays and sometimes on Saturdays, providing plenty of flexibility for students with busy schedules. The work is fun and actually geared toward my interests. Plus, I experience or learn something new every day. Since I began my internship, I've extracted DNA from an onion, learned how to use HTML, and discovered that food left at the edge of "the fishbowl" (the nickname for one of the intern work areas) is for everyone. Staff and interns are always available to help, and I think that's the best part of Shodor; we work, we play, we laugh, and we grow together. If you would like more information on the Mentor Center or the Scholars Program, please contact Matt Lathrop by phone at (919) 286-1911 or by email at moreinfo@shodor.org.

Apply online for internship:
www.shodor.org/mentorcenter

Collaboration: Working and Playing Well with Others

By Robert M. Panoff, Ph.D.
President and Executive Director

For the last ten years, Shodor directors and staff have pursued the development of our programs and plans in partnership with many groups and individuals, without whom, well, Shodor just wouldn't be Shodor. I have often remarked that a look at the school-age report cards of the prototypical Shodorific person would likely have included two notations: "Works and plays well with others," but also "Runs with scissors!" Sure we take some risks in being an independent non-profit, but it's fun to be able to interact with so many partners. Fun, but not easy, because at the very heart of collaboration is labor, that is, hard work.

From the beginning, we have worked with both state and national supercomputing centers, helping define and implement computational science education programs reaching K-12, college, and graduate communities. For the last seven years the National Science Foundation (NSF) funded this work through the Education, Outreach, and Training Partnership for Advanced Computational Infrastructure (EOT-PACI) (see http://www.eot.org). We have been the central component of the instructional team for the National Computational Science Education Consortium (http://www.ncsec.org), and a key part of the workshop team for the Advanced Networking for Minority Serving Institutions.

In North Carolina, we are working with many of the local school systems and colleges in the area of faculty enhancement. Without intending this to be an exhaustive list, here are a few examples. Shodor staff have assisted Durham Public Schools in implementing their NSF-funded RAMP math education project, offering workshops and developing and hosting their website (http://www.shodor.org/ramp). In partnership with Meredith College, for example, Bethany Hudnutt and several interns are modifying existing Shodor materials and creating new interactive explorations for math and science at the undergraduate level (http://www.shodor.org/MeredithApps). Garrett Love and his interns have been working with Duke University professors creating materials for virtual laboratories in the WEAVE project (http://weave.duke.edu). Kent Robertson continues to extend the SUCCEED-HI project to help deaf students and their teachers explore computational science in ASL in partnership with educators across the state (http://www.shodor.org/succeed-hi). Dave Joiner and Intern Conrad Kirby and others have been working with Sigma Xi, The Scientific Research Society, headquartered in RTP, to create interactive explorations for their on-line publications (http://www.americanscientist.org/AssetDetail/assetid/17936). Cornelia Seiffert has been leading a team of interns helping the many programs funded by the Burroughs Wellcome Fund Student Science Enrichment Program build a web presence (http://ssep.bwfund.org).

Internationally, our collaborations are strong and growing. On military bases around the world, American school kids attending U.S. Department of Defense Dependent Schools use Project Interactivate (http://www.shodor.org/interactivate) as part of their regular instructional program, and numerous education groups around the world have us listed as a "highly recommended" resource. And our newest collaboration with Eduteka, a non-profit in Colombia, will result in a translation of all of Interactivate into Spanish.

Have an idea for a collaboration? Do you know someone who could benefit from working with us? Feel free to contact me directly, or get in touch with any of the staff at Shodor by email at moreinfo@shodor.org or phone at (919) 286-1911. As our bank likes to say, "Let's get started."