

A newsletter for students, parents, educators, and friends



Summer 2002

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Collaborations help Project Interactivate to achieve goals

by Shilpa Khatri, Shodor RA, UNC-Chapel Hill and Megan Chaney, Shodor RA, Duke University

Dr. Bob Panoff, co-founder and director of Shodor, likes to reference two quotes from his elementary school report card, "[He] works and plays well with others," but "runs with scissors." Here at Shodor, we may not literally run with scissors, but we are known to take risks and we definitely do use our creativity to collaborate with others.

One of our main collaborative projects is Project Interactivate (www.shodor.org/interactivate/). The goal of the project is to create, collect, evaluate, and disseminate java-based courseware for middle school mathematics explorations. Originally funded by the Department of Defense in a subcontract with George Mason University, Project Interactivate now also involves Addison-Wesley, the National Council of Teachers of Mathematics (NCTM), the Public Broadcasting Service (PBS), the EdGrid consortium, and

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Shodor Scholars Program teaches advanced computational science

by Michael Reckhow, Shodor RA, Harvard University

This summer, dedicated students from around the Research Triangle area participated in the Shodor Scholars Program in Computational Science (SSP). This three-week workshop introduced rising ninth and tenth grade students to a modern scientist's method of viewing the world, which includes a cycle of careful observation, thoughtful conjecture, and computational prediction and verification.

Students who participated in the program were nominated by their schools and filled out applications. A total of 32 students were selected for this year's two sessions, with daily classes and explorations from 9-4.

This class is an extension of SUCCEED program (Stimulating Understanding of Computational science through Collaboration, Exploration, Experiment, and Discovery). The idea for SSP grew out of the workshops that Shodor conducted for the Duke Talent Identification Program (TIP) for several years. Most summer workshops at Shodor have been only one-week long, Shodor

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the National Computational Science Institute (NCSI). Such collaborations allow Shodor to integrate technology into education on a much greater scale than would be achieved by working on our own. By sharing resources with organizations who have the same goals, we are more equipped to conquer the challenges we face. Much of Project Interactivate's success is due to the relationships Shodor has with other organizations.

Interactivate was initially developed when the Department of Defense schools asked Shodor to assist them in integrating technology into education. Today they have adopted Interactivate for use in their schools worldwide. Collaborations between Shodor and Addison-Wesley, PBS and NCTM have since helped to expand the number

of Interactivate applets and to develop extensive courseware for elementary and middle school teachers, specifically designed to supplement textbooks for teacher education, complement educational programming and promote national mathematics standards.

Project Interactivate has also benefited from Shodor's participation in the EdGrid consortium, which includes the Biology Student Workbench, Lesley University, the Maryland Virtual High School, SRI International, the University of Alabama and the University of Illinois at Urbana-Champaign. The consortium strives to integrate computer modeling into the education of pre-service teachers and has been an important force in developing and promoting the Interactivate materials.

Foundation Information

The Shodor Education Foundation, Inc., is a non-profit 501(c)(3) education and research corporation dedicated to the reform and improvement of mathematics and science education by the incorporation of appropriate computational and communication technologies.

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Interactions is a regularly published newsletter of the Shodor Education Foundation, Inc. To unsubscribe from this publication, contact 286 - 1911 or email newsletter@shodor.org

Exciting Developments!

New Staff Members join Shodor team:

Shodor is proud to welcome two new members to the foundation staff!

Kent Robertson is a High School math and science teacher who taught in private and public schools in Charlottesville, Virginia for ten years before moving to North Carolina. For five years he has been the High School science teacher at the Eastern North Carolina School for the Deaf. In 2000 he joined the SUCCEED-HI team and fell in love with computational science. He is assuming the responsibility for coordinating the curriculum development for SUCCEED-HI. After hours Kent can be found outside playing in the garden; hiking in the woods, mountains or our beautiful Carolina swamps; and spending time in the kitchen creating nameless dishes.

Dustin Mengelkoch is a North Carolina native who graduated from the University of Texas-Austin with a degree in Greek and Latin and did some postgraduate work in the Classics at USC. He and his wife decided it was time to move back to NC after some time in California and that is when Dustin discovered Shodor. He is excited about working on the National Computational Science Institute (NCSI) and learning more about computational science here at Shodor.

Interactivate Featured at Wisconsin Museum: The Neville Public Museum of Brown County, Wisconsin will be featuring Interactivate's Tessellate! activity at a kiosk as part of a new exhibit, "Culture Counts: People, Patterns and Pi". By highlighting a wide range of artifacts and cultures, the exhibit will emphasize the centrality of mathematics to most human endeavors. John Jacobs, the museum's curator of science, came upon Tessellate after searching the web and emailed Shodor asking if the museum could showcase it at a kiosk for this exhibit. Shodor is proud to partner with the Neville Public Museum in order to educate people about the broad applications of mathematics. The museum expects over 100,000 visitors during the eighteen month duration of the exhibit.

Shodor Web again "Best of the Web" Several organizations who judge web content have again selected the Shodor website to be among the "Best of the Web" in science and math. Forbes.com again included Shodor along with NASA and the Smithsonian. Shodor was also nominated for a Technology Innovation Award, and will be included in the NSF-funded National Science Digital Library.

Congratulations to the whole team!

Shodor collaborations promote educational programs

by Shilpa Khatri, Shodor RA, UNC-Chapel Hill and Megan Chaney, Shodor RA, DukeUniversity

Along with Interactivate, Shodor has many other programs that collaborate with various organizations in the name of computational science.

NCSI

The National Computational Science Institute, a project spearheaded by Shodor, collaborates with many other organizations and groups to offer a national set of in-person, video-conferenced, and web-accessible workshops, seminars, and support activities. These workshops are targeted towards faculty of predominately undergraduate institutions, minority serving institutions, community col-

leges, and education colleges training the next generation of K-12 teachers. Through NCSI, Shodor is able to inform professors how Interactivate applets and other technology can be used in the classroom. This work is done as a joint effort with the Education, Outreach and Training Partnership for Advanced Computational Infrastructure (EOT-PACI), The National Center for Supercomputing Applications, the University of Illinois at Urbana-Champaign, Clemson University, regional workshops around the country. Appalachian State University, the

National Computational Science Education Consortium (NCSEC), the Burroughs Wellcome Fund, Sigma Xi, the North Carolina Supercomputing Center, and more than two dozen academic institutions, high performance computing centers and vendors. Most of the financial support for NCSI comes from a three year \$2.75M grant from the National Science Foundation. The focus of the workshops is computational science and the information presented is organized and disseminated using Shodor's award-winning Computational Science Education Reference Desk (CSERD).

MSI-HPC

Shodor, through NCSI and CSERD, works with the Minority Serving Institution - High Performance Computing (MSI-HPC) group to provide content on parallel programming to instructors from MSI locations around the country. Shodor intern James Uhing is currently developing parallel programming examples in JavaSpaces for this purpose.

Sigma Xi

Through NCSI, Shodor is working closely with Sigma Xi, the national research society. This summer Shodor interns provided content for Sigma Xi and their American Scientist magazine. Jabeen Ahmad designed a mentor database for Sigma Xi, Carla Clark and Sophie Sullivan designed an audio-video viewer for a series of Sigma Xi lectures, Ebonee Farrow and Jason Jones developed a geo-referenced index of Sigma Xi chapters, and Conrad Kirby has developed a series of models of epicyclic motion for an American Scientist article. NCSI will also offer workshops for Sigma Xi chapters.



NCSI participants were "pulled" to

WEAVE

Shodor also collaborates through the Web-based Educational framework for Analysis, Visualization and Experimentation (WEAVE) Project with professors Henri Gavin and John Dolbow at Duke University in the Civil and Environmental Engineering department. WEAVE is a series of web lessons on a variety of engineering topics, including a pilot project on the dynamics of buildings subject to earthquakes, and the modeling of such systems using a

laboratory shake table. Shodor interns Renee Gerber, Megan Chaney, and Albert Ren have provided assistance in the development of interactive web tutorials and Shodor will be active in helping to disseminate the WEAVE materials.

NCSLP

The National Computational Science Leadership Program recently concluded with the 2002 Summer Institute in Champaign, Illinois. Over the last two years, in conjunction with the Supercomputing series of conferences, Shodor board members, staff, and interns including Julie Beier and Debra Brewer trained more than 200 high school teachers from across the country in the use of computational science software. Other members of the consortium that presented the program include East Carolina University, the National Center for Supercomputing Applications, the Krell Institute, Stanford Linear Accelerator Center and the University of Alabama-Huntsville.

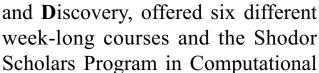


SUCCEED Summer Workshops

http://www.shodor.org/succeed/

For yet another summer, the Shodor offices were filled with middle

and high school students learning math and science as a part of the SUCCEED summer workshops. SUC-CEED, which stands for Stimulating Understanding of Computational Science Through Collaboration, Exploration, Experiment,



Science.

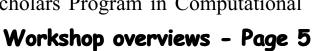
Students learned about a wide va-

riety of topics from astronomy to structural engineering to to computer science. These classes were taught by Shodor computational scientists and research apprentices.

The participants, some of whom attended free of charge or at reduced rates, were se-

lected from local schools. This program is supported in part by the Burroughs Wellcome Fund.





Visit completed SUCCEED classes online at: http://www.shodor.org/succeed/calendar/complete.html

Student Voices: Reflections taken from students' online journals...

"I enjoyed the hands on activities because they let us see what goes on in the real world without just listening to a teacher. With the combination of both being taught by a teacher and using the computer like we did today it made the perfect program for seeing and experimenting with the real world!"

"I am really sad this program is over. It was a lot of fun and I wish I could come here again. It was really educational for me and taught me a whole lot. I liked today because I am really proud of my group's project and I think we all worked hard to create it. This is truly a wonderful experience and will help me in the long run."

"We did a bunch of really cool stuff with fractals and musical notes. We explored Mandelbrot and Julia Sets, and found frequencies of the notes in 3 octaves. I wish this program could go on for another week!"

What went on at SUCCEED this Summer?

Modeling Your World

Modeling Your World introduced students to the role of computational and communications technology in modern science. Participants used several modeling tools to investigate real scientific problems. Students learned

how to create computational solutions to problems such as population dynamics, galaxy formation, insect behavior and aerodynamics. One student



wrote: "I had a great time today, because I learned a lot about air pressure...I learned about airspeed, altitude, and angle of attack. It was fun."

Physics Explorations

This new summer session introduced aspiring middleschool scientists to the study of a few classical physics systems including the motion and interaction of objects encountered in our daily lives. Students participated in several hands-on activities including launching rockets to demonstrate the effect of gravity, using laser beams to discover properties of light and reflection, and building electric motors to learn basic properties of electricity and magnetism. Computer models were used to help illustrate some of the physical details.

Math Connections

During the five full days of this workshop, the students explored mathematics as the foundation for understanding physical phenomena through pattern recognition. As part of the scientific process, students completed a project

that they presented to the class as well as a professional audience. The students learned how to use Unix and Perl, participated in interactive activities involving fractals and patterns, and solved numerous mathematical



"brain teasers", and discovered how Fibonacci relates to pine cones that Pythagoras was a musician as well as a mathematician.

Math Explorations

Students in the program learned about complicated problem solving through discussions, brainstorms, and independent and group investigations. A variety of the most intriguing and fun topics relating to mathematics were chosen to go over during this session. A student commented: "Today we worked with tessellations and block puzzles. The block puzzles were cool because they were challenging. We learned about tessellations and got to mess around with the tessellations on the computer."

Engineers in Training

This session introduced rising 6th through 9th graders to the basic elements of the computer-aided engineering design process through exploration and development

of small scale systems. Students developed techniques in the measurement and collection of experimental data, the use of computational models to process data and aid design, and the construction



of an engineered system. Students designed and constructed load-bearing beams made of candle wax, made buildings of pins and drinking straws, and designed a daredevil stunt for a matchbox car, then watched as their projects collapsed, cracked or catapulted according to their predictions.

Internet Science Explorations

This workshop explored the role of computers and communications technologies in modern science. The participants learned effective search techniques, the tools of online collaboration, the basics of computer modeling, how to evaluate the credibility of an information source, and how to retrieve and organize on-line information. In one activity, the students wrote out instructions on how to make a peanut butter and jelly sandwich and a Shodor staff member acted like a computer and tried to interpret the directions. After several messy tries, the sandwich was finally complete and the students learned that computers need very exact directions in order to perform even a simple task.

Lots of Collaboration, Exploration, Experiment and Discovery!

Information Compiled by Alexandria Evans, Shodor RA, Durham School of the Arts

Shodor interns show talent beyond their years by Jabeen Ahmad, Shodor RA, Greenhope High School

Every summer and throughout the school year, Shodor offers internships to high school and college students interested in math and science. These interns work on some of Shodor's most complex and important projects, doing work that is often reserved for college and graduate students.

This summer, about thirty interns were involved in

teaching, programming, web designing and documentation. Many students come to Shodor with little or no experience with computational science and learn from the scientists and older interns in a very open environment.

Ben Pahl, a senior at the North Carolina School of Science and Math who has interned at Shodor for several years, has learned new skills each year. When he first arrived at Shodor, he pictures and putting them the SUCCEED workshops. onto web pages. Later, he

learned to program in PERL and Java. Currently, Pahl works to debug Java applets on Interactivate and develop applets for the National Council of Teachers of Mathematics. He is also compiling lesson plans for a Portland State University course for transcribing Braille. "I have been able to use what I have learned at Shodor to help

other students at my school with their web pages," Pahl said.

Ebonee Farrow, a sophomore at Northern High School who has been with Shodor for over four years, also has had the opportunity to learn computing skills including HTML, Javascript, and several digital imaging programs. "Shodor provides me with a nice working en-

> vironment where I feel like the work that I am doing is important," she said. Currently, Ebonee is working to create a clickable map for Sigma Xi, which will help to improve the look of their website.

Carla Clark is a junior and hear lectures online and





a creating a survey web page for The Education Consulting Team. "The work that I am doing makes me feel important because we are doing projects that are often done by college graduates. It is a great opportunity for me," Clark said.

Shodor Scholars continued from page 1

staff realized from that there was aneed to bring older students to the SUCCEED workshops by offering a more comprehensive, extended course.

The course emphasized modeling as a part of the process of evidence based reasoning. During the first week, Staff Scientist Dave Joiner taught the students about modeling tools such as Stella, Starlogo, GalaxSee, and Interactivate and how they can be used to model problems in many areas of science. Software Engineer Alton Patrick used the second week to introduce the students to programming languages so that they could customize their models to address more complicated situations. Bob Gotwals, Bob Panoff, and Dan Warner also gave guest lectures during the first two weeks. Shodor interns helped tremendously.

The third week was devoted entirely to an in-depth project that included research, modeling and analysis, and a presentation at the end of the week. The projects were completed in groups to emphasize collaboration, a cornerstone of all SUCCEED programs. The final projects were presented to Shodor staff, parents, interns, and other guests.

The students responded wonderfully to the information taught during each of the two sessions and Shodor hopes to see many of them back here in the coming years as interns. Learn more about SSP at the course webpage:

http://www.shodor.org/succeed/ssp/

Shodor Alumnus Makes Gift of Valuable Software

by Monte Evans, Shodor RA, UNC-Chapel Hill

Ben Davenport, one of Shodor's first interns and the original programmer for GalaxSee and Surface, has continued to stay in touch since he graduated from Princeton and moved west to work for Microsoft. On several occasions, when writing back to say hello, he offered to help by making a donation that his company would match. Little did we know how generous the matching program at Microsoft could be.

After a careful survey of software needs, staff scientists Dave Joiner and high school intern Ronnie Johnson put together a "wishlist" of Microsoft products that would help Shodor in our education programs and training labs.

The list included copies of Microsoft Office suite for all the machines, both Mac and PC, and copies of the updated Windows operating system that we could use for testing our software on different platforms.



Ben then made a donation of several boxed copies of the software we requested which he could obtain at reduced employee prices. Then Microsoft matched his gift by giving an equivalent amount of licenses for the same software. Because the matching program uses internal pricing to determine the number of licenses, we were able to get 64 additional licenses. The "street value" of this donation, calculated at the price we would have to pay if Shodor had to buy 64 copies of Office or Windows at retail is over \$30,000!

"This donation really has made us more productive already," said Bob Panoff, executive director. "We have more machines for training, with up-to-date copies of Excel, for instance. We also can do more extensive testing for Interactivate applets by running on both Windows XP and Windows 2000."

INTERN OPPORTUNITIES

Want to get on the job training and increase your skills in a variety of technical and educational areas? The following volunteer and paid opportunities are available to qualified high school and college students:

Teaching Apprentice - Assist computational science educators and teach modeling to SUCCEED students

Newsletter Apprentice - help write, edit and layout stories for this newsletter

HTML, Java & Perl Programmers - make interactive web-based science and math activities

MacOs/Linux/Windows - assist with regular system maintenance and backup procedures

Graphic Designers - Design dynamic graphics for the Web

For more information: contact Bob Panoff at 286 - 1911 or rpanoff@shodor.org

Fall Saturday Workshops Schedule

Saturday Explorations in Science and Mathematics for middle school students is a series of computer-enhanced science and mathematics workshops. The information covered is a sampling of the course material for the SUCCEED summer workshops.

For more information, see:

http://www.shodor.org/succeed/programs/sef2002/

Workshops will be held at our training facilities from 9:00 am to 12:00 noon on: October 5, October 12, October 19, October 26, November 2 and November 9.

To sign up online, visit:

http://www.shodor.org/succeed/application/sesF02.html



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If you want up-to-date information, visit our WEB site at www.shodor.org or e-mail: info@shodor.org

Looking for an Internship?

Take a look inside this issue for some of the projects we are currently working on! Shodor staff are always willing to work with individuals interested in science, math and computing. Contact us for more details: info@shodor.org

Activities for Kids Science & Math Explorations for Students

Monty Hall: Probability in action

Games stayed: 10 Games stayed and won: 4 Experimental probability to win: 0.4 Games switched: 11

Games switched and won: 11 Experimental probability to win: 1.0







This activity allows the you to experiment with a game of probability where the outcome stumped mathematicians for many years. The activity is modeled after an old TV game show, "Let's Make a Deal" with the game show host Monty Hall. The game consists of three doors; one winning door and two losing doors. The contestant is to choose one of the three doors. Once chosen, Monty reveals one of the losing doors that is not the one the contestant has chosen. At that point, the contestant decides whether to stay with the door originally chosen or switch to the other unopened door. The activity keeps track of how many times you win when you stay vs. how many times you win when you lose. Does it make a difference whether you stay or switch? Play the Monty Hall game for yourself and decide!

Play Monty Hall at:

http://www.shodor.org/interactivate/activities/monty3/index.html