

An Encounter With Optics For Grade School Students

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The “Optics Suitcase,” a highly acclaimed potpourri of optics teaching tools, continues to spark interest in optical science among grade schoolers.

We presented the suitcase in 10 schools in the Rochester area in the spring of 2004. The program was a team effort that involved graduate students from the University of Rochester’s Institute of Optics and OSA’s undergraduate student chapter at the university.

The collaboration between graduate and undergraduate students brought different skills and talents to the table. The graduate students had had more experience giving presentations and had more knowledge of optics; the undergraduates were better able to communicate with small children.

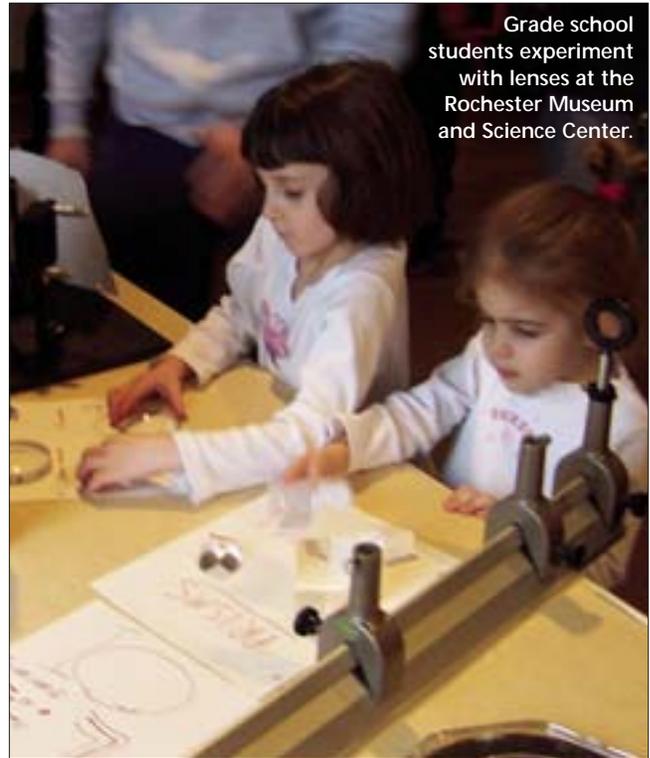
The “Optics Suitcase” is an educational outreach program created by Institute of Optics professor Stephen Jacobs, who developed the idea of assembling a series of reusable demonstrations to get children excited about science, especially optics. The suitcase contains a step-by-step guide to giving the presentation, along with supplemental

viewgraphs. A cornerstone of the program is that it offers young student participants the opportunity to demonstrate on their own to family members key concepts such as diffraction, polarization and selective reflection.

Making the connection

The first challenge we faced was identifying classrooms to visit. John Schoen, a member of a local school board who is also acting director of the University of Rochester’s Center for Optics Manufacturing, asked Rochester science educators to “advertise” the program in their schools. Immediately we received numerous requests for in-class presentations.

Over the course of one semester, we presented the program to children in



Grade school students experiment with lenses at the Rochester Museum and Science Center.

seven classrooms: six fourth-grade classes and an advanced placement physics class. We also participated in two on-campus demonstrations and spent a Saturday at the Rochester Museum and Science Center giving demonstrations and lessons to children of all ages who passed by our booth. The effort proved very successful in more than numerical terms.

Two heads are better than one

We found that having two presenters in each class worked best. A two-member team ensured there were more hands to make transitions smoother between the individual demonstrations. It was also a positive experience for students—sometimes a graduate and an undergraduate—to work side by side. Each presenter was able to bring something different to the table, so that ultimately the time spent together was a learning experience for everyone involved.

At the Institute of Optics, there is approximately a one-to-one ratio of graduate to undergraduate students. The outreach program has helped enhance the sense of community in the institute by introducing students whose paths would otherwise never have crossed. We hope that as this program continues to

Children’s responses to the question, “What is optics?”

(Spelling has not been corrected)

Before Presentation	After Presentation
“Some body part”	“Light and color”
“Living things”	“Color and light”
“I think it is magic”	“Optics is change of colors”
“Ecterisity”	“Mysterious”
“A coars taken in college”	“Colors”
“I think it means option’s because evryone need options”	“A study about light”
“Optics are under watter studing like studing sea creacors”	“Enjeriring and sience”
“A test”	“Light”
“It’s a deasese”	“It’s a type of science”
“I think it’s about rocks”	“It is about light and science”
“I think optics are what you want to do when you grow up”	“The study of lite”

Undergraduate Tom Kraus and graduate student Sharon Weiss present to a fourth-grade class.



Doctoral student Cedric Salisbury shows a fourth grader how rubber balls that look the same can bounce differently.

grow, so will the relationships between undergraduate and graduate students at the institute.

“Ask me to teach and I learn”

Teaching is the ultimate learning activity since it requires effective communication, as well as the use of high order learning skills, such as analysis and self-evaluation. For many student presenters, participation in the program was a challenge. Cedric Salisbury, a third year optics doctoral student, says he “was apprehensive about giving an outreach presentation [to fourth graders] ... I was afraid that the concepts would be lost. In order to deal with that issue I had to realize the other cause of my wariness ... *myself*. I was uncertain as to how well I could communicate to others.” Tom Kraus, a senior in optics, agrees: “[It] is quite challenging because we have to fully understand the basic optical principles that are occurring and then think outside the box for ways of explaining [them] to carry the message across, but yet make sure that we do not lose [the children].”

The program also offered an opportunity for graduate students to practice presenting their own research. Gregory Brady and Matt Bolcar, both doctoral students in optics, gave the presentation to an advanced placement physics class which included additional

demonstrations involving popping a balloon with a HeNe laser and showing computer-generated diffraction patterns. They also talked about the University of Rochester, the Laboratory for Laser Energetics and some real-world applications of optics.

The most rewarding aspect of the entire experience was to see how the

children benefited. “Although the students were only nine years old, they were very receptive to and excited about learning something new,” comments Holly Bender, a senior in optics. Fourth graders are knowledge-thirsty sponges who jump at any opportunity to answer or ask a perceptive question. Before and after each presentation, the children were asked “What is optics?” The table on the facing page shows their responses. Alexis Lanning, a third-year optics doctoral student, says, “There is nothing more significant than realizing you have taught a child something that clearly sparked their enthusiasm and interest.”

Acknowledgments

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Molly Park, a first year grad, helps students experiment with Magic Stripes, a polarization demo.

Rupal Varshneya is in her senior year at the Institute of Optics. She is the outgoing president of the undergraduate OSA student chapter and will be the educational outreach chair during the 2004-05 school year. Jessica DeGroote is starting her third year in the Institute of Optics doctoral program. She was the outreach chair for Institute of Optics graduate students for the 2003-04 school year.