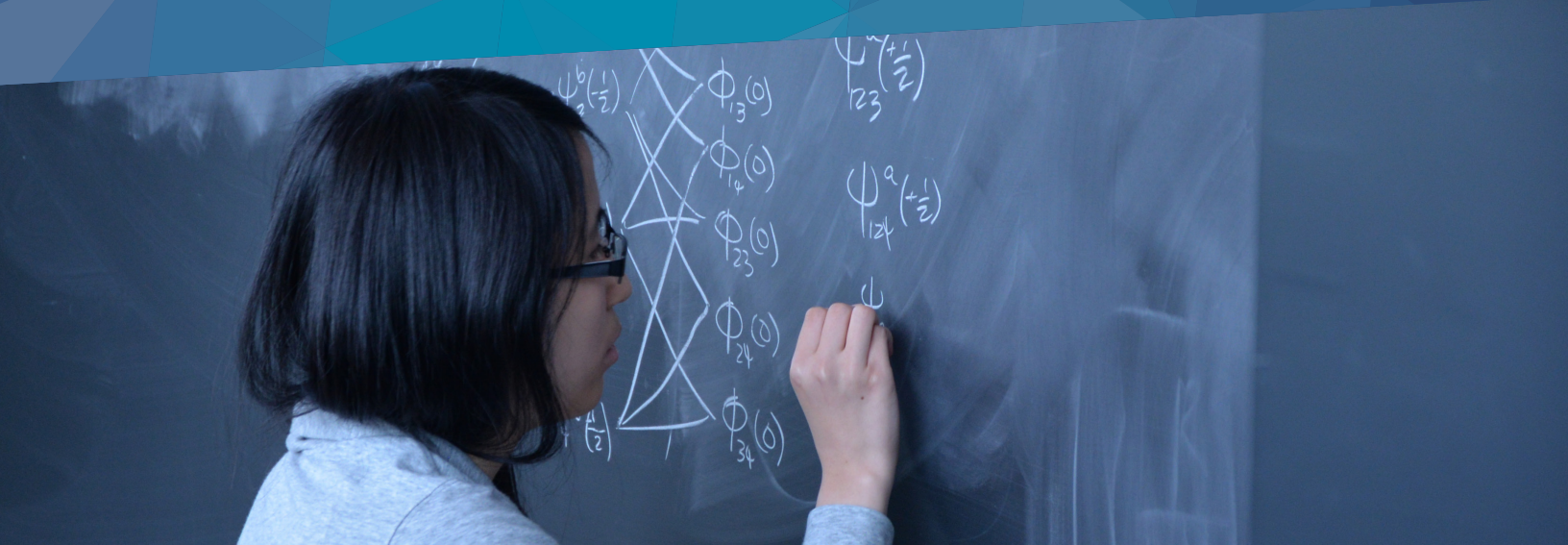


Perimeter Institute Uses **Möbius** in Physics Camp for High Achieving Students



Perimeter Institute is a leading center for theoretical physics and facilitating research, training, and educational outreach. Located in Waterloo, Ontario, this institution hosts an annual program called the International Summer School for Young Physicists (ISSYP). The purpose of the ISSYP is to inspire and strengthen interest in modern physics amongst some of the top high school students from around the world. This year, with help from Möbius, the ISSYP program introduced a new system for preparing young students for their two intensive weeks at Perimeter Institute. Möbius is Maplesoft's comprehensive online courseware environment focusing on science, technology, engineering, and mathematics (STEM) programs. The use of this new and unique platform provided students of the ISSYP program a more productive and enhanced summer school experience.

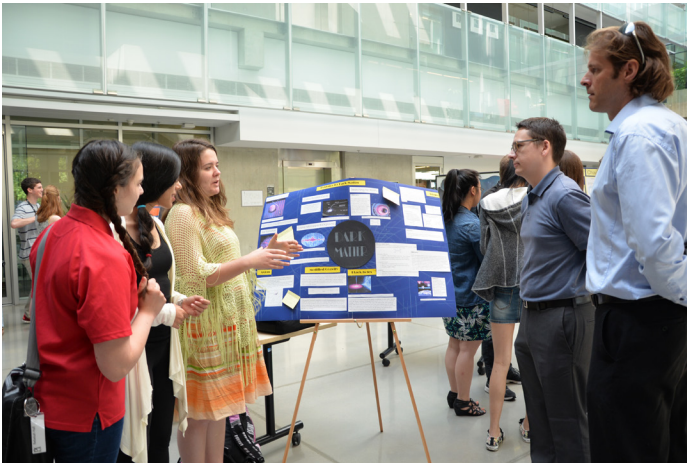
During the ISSYP program, students attend several keynote lectures from researchers at Perimeter Institute; they visit SNOLAB, an underground physics laboratory; and are partnered with a mentor for one week concluding with a presentation on a physics related research topic of their choice. The program covers many different topics in physics such as quantum mechanics, special relativity, general relativity, and cosmology.

The program receives an average of three-hundred applications from students in grades eleven and twelve from around the world. Competition is intense, and

students who are chosen for the program are extremely bright and advanced for their age; however there is some variation in their level of math and physics knowledge. For this reason, the Institute prepares a review session for the students before the start of the program. Students are asked to review a "math primer" document to prepare them with the background needed for the program. This year, Perimeter Institute chose Möbius to deliver a dynamic and interactive math primer document online, replacing the traditional static pdf handout.

Dr. Kelly Foyle, Outreach Scientist at Perimeter Institute and her team prepared the review material within Möbius and deployed it to the students two months before the start of the program. "Our original math primer document was nothing fancy, just a static document for students' review," said Dr. Foyle. "But, using Möbius, we were able to make the document much more interesting, and interactive. I found that more students had used it and prepared themselves before coming to the course."

Because it is designed especially for math based courses, Möbius is the perfect platform for the ISSYP review program. The natural math notation that is built into the Möbius platform is equivalent to the notation a teacher would use on a chalkboard. The questions that students can complete are those that would appear in assignments or paper tests.



Sending a printed handout document had also presented other challenges previously. If a student had a question or needed feedback on their work, they didn't have a teacher to guide them. Now, with the use of the online Möbius platform, students get instant feedback on their work. Students immediately see where they have gone wrong or if they got the answer correct. It also offers students the option to keep practising by giving them algorithmic variations of the same question until they master the concept. Dr. Foyle notes that this was one of the features that she found to be the most helpful. It allowed students to complete the review before the start of the summer camp and keep practicing in their free time during the camp. "It is certainly an enhancement to what we had before."

Möbius offers several question types including graph sketching, free body diagrams, numeric responses, multiple choice, fill in the blanks, and many others. "Unlike other online education tools, Möbius supports math content very strongly," said Dr. Foyle. "It allows me to expand on the math topics we cover, and deliver them in a wider variety of question types. This provided the students with a much more interactive and dynamic experience, making it easier and fun for them to learn new concepts."

This is not the first time Maplesoft technology is being used at Perimeter Institute. In the past, Maple licenses were given away to students upon completion of the ISSYP. In the summer of 2014, Maple was introduced to the program curriculum. Maple problems were provided to help students enrich their skills, and optional Maple assignments were given to those that were looking to excel. After a successful introduction of Maple into the ISSYP program, moving to Möbius was an easy transition.

With the introduction of Möbius, the number of students that completed the review material was much higher compared to previous years. "Bringing the review content online seemed to resonate better with the students, which, in turn, allowed for a more level playing field among the young campers," said Dr. Foyle. For future ISSYP programs, Dr. Foyle plans to make Möbius material available even earlier so that students can get a good head start on the necessary concepts for the camp. She also plans to create more customized questions, leveraging the flexibility available in Möbius. Dr. Foyle and her team look forward to effectively cutting down the review time in the classroom and preparing students for a more in-depth and meaningful camp experience.

