

# Algebra 1—An Open Course: Pilot Profile and Case Study

## New Resources for New Approaches

*Algebra 1 – An Open Course* is a flexible, comprehensive, learner-centered program that integrates a broad range of pedagogical approaches. It is designed to open the door to mathematical concepts for all students, and to give teachers new tools to address the challenges of math instruction. It is part of the National Repository of Online Courses (NROC), a collection of media-rich, adaptable, and affordable curricular content resources. This case study is one in a series that highlight a number of the new approaches to mathematics education made possible with these resources.

## Open High School of Utah

### BACKGROUND

Open High School of Utah (OHSU) is an online charter high school that is serving students in grades 9-12 across Utah. It is moving toward exclusive use of open educational resources (OER) to create its curriculum; currently OHSU uses about 90% OER content. In return it makes its courses available to educators around the world to use freely.

OHSU opened in fall 2009 for full-time online students. New legislation allowed it to accept students attending brick-and-mortar schools and taking supplemental online courses beginning in fall 2011. OHSU teachers receive training and support to develop and modify their own curriculum before they begin teaching online.

Open High School piloted *Algebra 1 – An Open Course* in fall 2011 and spring 2012. OHSU will continue using its own customized version of NROC's *Algebra 1* course in 2012-13 and beyond.

### WHY NROC?

Open High School chooses its open educational resources carefully. Although OHSU students were performing slightly above state math test averages with their original online algebra course,<sup>1</sup> the administrative team of Director DeLaina Tonks and Curriculum Director Sarah Weston participated in the NROC pilot<sup>2</sup> of *Algebra 1 – An Open Course* because they wanted a more robust, assessment-driven course.



### PROGRAM STATISTICS

- **School Enrollment:** 350 full-time students, 50 supplemental course enrollments
- **LMS and LOR:** MoodleRooms
- <http://www.openhighschool.org/>
- **Contact:** DeLaina Tonks, Director

### PILOT DETAILS

- **Number of Students:** 68
- **Teacher Experience:** Nine years in a traditional classroom; one year teaching online
- **Course Type:** Fully online; full-time and supplemental students
- **Terms in Use:** *Algebra 1* piloted over two semesters in 2011-12 school year; customized for the 2012-13 school year

### INSTRUCTIONAL APPLICATIONS

**Course Customization**  
**Asynchronous Content Delivery**  
**Individualization**  
**Online Teacher-Led**  
**Credit Recovery**

<sup>1</sup> OHSU students test more than 10% above state averages in science and English, and several points higher in mathematics.

They chose NROC because of the well-researched content, and the presentation of that content. Ms. Tonks noted that "[NROC] put so much effort into putting the course together; they conducted screen tests of possible presenters to see which ones resonated most with the students. The research with teachers and administrators took two years, and that level of guidance has made a huge difference in the way the course is perceived by the students." Open High School serves students statewide, but is still a relatively new school, and benefits from the resources that NROC has put into the research and development of its courses.

OHSU wanted a course that was robust and flexible. Piloting *Algebra* allowed them to start with a full course that included assessments, presentations, and an online textbook, and still make it their own. "We were able to move all of the course SCORM files [learning objects at the Topic level<sup>3</sup>] directly into MoodleRooms where we tweak, we modify, and we see what the students are interacting with," said Ms. Tonks.

The course rigor, according to Ms. Weston, is "just right." She and Ms. Tonks like the level and frequency of the assessments, and the variety of tools available for students to use to learn and review content.

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- DeLaina Tonks,  
Curriculum Director

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### THE PILOT PROJECT

The Open High School of Utah pilot for *Algebra 1 – An Open Course* was offered to students in grades 9-12, some of whom were taking algebra for the first time and others who were taking the course for credit recovery. Sixty-four of the students were full-time online students, and four students were taking the course as a supplement to their brick-and-mortar classes; these were first-time online students. Many were from a homeschool background and wanted the advantages of a course that meets state or Common Core State Standards while retaining the flexibility they had as homeschool students. A few students were pregnant or teen moms, and they appreciated the flexibility of the online environment.

OHSU used the data collected through MoodleRooms, particularly the assessments in the courseware, to track student progress and intervene when necessary. Pilot teacher Annie Swinton was able to see which tools students accessed and how much time they spent in each pedagogical feature of *Algebra 1*. If students struggled with a concept, she could guide them toward the resources they had not yet utilized. Ms. Swinton also found this information helpful to share with parents who were concerned about their students' progress.

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<sup>2</sup> About 35 programs around the country piloted NROC's *Algebra 1 – An Open Course* between 2010-2012. As part of their pilot participation, programs agreed to share student enrollment and results data, and agreed to allow their administrators and teachers to be interviewed before, during, and after the course. This information helps to inform the ways in which NROC can continue to support educators and students.

<sup>3</sup> Each Topic focuses on a single concept and is supported by a Warm-Up assessment, conceptual Presentations, several animated Worked Examples, Practice problems, a Review assessment, and Topic Text (an integrated online textbook).

## FLEXIBLE COURSE DESIGN

When Open High School decided to use *Algebra 1 – An Open Course*, Ms. Weston downloaded it into the OHSU MoodleRooms implementation and organized it into quarters to match the school’s academic calendar. Ms. Swinton organized the course into one-week modules, with two Topics per week.<sup>4</sup> Although the course allowed students to progress through Topics at their own pace, she added deadlines to set a minimum pace. She found the content easy to move around and reorder to meet the school’s content progression and pacing needs. Ms. Swinton designed the first assignment to help students get comfortable with the various tools and resources in the online course.

Ms. Swinton used the assessments built into *Algebra 1 – An Open Course* in each Topic: a pre-assessment or Warm-up, Practice problems, and a topic Review. The assessment scores and records of student time working in the courseware helped her to understand how well students understood the material. In addition, students took the Unit Quizzes, an end-of-semester Exam, and an end-of-year Exam, also provided as part of the courseware. "The level of data we get from the frequent assessments is extremely important, but the assessments are not overwhelming for the students," said Ms. Tonks. "They are really well balanced."

*"The course structure is more intuitive than a textbook."*

- Annie Swinton,  
Teacher

OHSU used the Topic Text<sup>5</sup> integrated in the courseware and did not need a print textbook. Ms. Swinton reported that one student printed out all of the Topic Text for *Algebra 1*, referred to it when he had questions, and rarely needed to contact her for additional help. The only tool that was required for all students to use in each Topic was the Review assessment; the teacher found the feedback particularly helpful for students. Students liked the Worked Examples; one student said, "I like these a lot – I learn better this way. I like to see the way things are done, how to work [the problem] out." Overall, Ms. Swinton liked that "the course structure is more intuitive than a textbook."<sup>6</sup>

In order to meet the needs of her fully online students, Ms. Swinton added more tools for students to use to learn, review, and reinforce content covered in the Topics. She added screencasts (brief video commentary created by the teacher) to introduce the week’s material, along with some additional screencasts in areas where she found that students consistently struggle, such as linear equations. She also added some of the interactives she learned about through her participation in the NROC Network,<sup>7</sup> and a review assignment that students could take as many times as they wanted prior to taking a Unit Quiz.

Ms. Tonks noted, "We need content that is modifiable, allowing us to remix, modify, and add to it to meet our needs. Our goal is to keep things in-house, keeping students within our MoodleRooms environment so as to not give them opportunities to get distracted if they link out to outside resources."

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<sup>4</sup> *Algebra 1- An Open Course* covers two semesters of content and contains 12 units, 25 lessons, and 68 modular Topics which are individual learning objects.

<sup>5</sup> The Topic Text feature is an integrated textbook that provides comprehensive coverage of topics with additional explanations, manipulatives, and examples written specifically to coordinate to the courseware. The Topic Text pages may be printed per topic, or as a complete textbook for off-line studying and note-taking.

<sup>6</sup> To view samples of the Worked Examples, Practice Problems, Presentations, and other pedagogical features of *Algebra 1: An Open Course*, please visit <http://www.NROCmath.org>.

<sup>7</sup> The NROC Network, <http://www.NROCnetwork.org/>, is an online community of teachers, technologists, and curriculum designers dedicated to creating and supporting quality online content. The Network provides additional resources and training, often developed by teachers who are using NROC content.

## INDIVIDUALIZATION

Very few of the pedagogical features in *Algebra 1 – An Open Course* were required for all OHSU algebra students, but there were many different ways for students to learn and review material in each Topic. Students worked through the conceptual presentations, problems, and other pedagogical elements that fit their own learning styles. If students struggled with a particular Topic, the teacher guided them to additional Khan Academy videos. “I love being an online teacher. That may sound silly, but when you teach a class of 40 you spend half your time managing. In the online class I get to work with students one-on-one or in small groups,” said Ms. Swinton.

Ongoing communication is critical, particularly in a fully online course. Students and parents received auto-emails if students hadn’t logged in for a particularly long time, or if an assignment was overdue. If a student didn’t respond, Ms. Swinton would reach out via phone, text message, or chat message. Because the OHSU team loaded the *Algebra 1* content into their own MoodleRooms application, students and teachers used the same communication tools as in the rest of their courses, without having to log into another application. If students were struggling, they could reach her during daily office hours. Ms. Swinton noted that, “I have a close personal connection with each student; I check in with them every week to make sure they’re doing well.”

Sarah Weston, the Curriculum Director, said “Importing the NROC SCORM learning objects [the Topics] into MoodleRooms allows us to grab data on student scores, track the activities the student has opened, and note how long a student has spent in the Topics in the course. It allows us to tailor teaching styles and instruction to fit the students’ needs and to identify what and how the resources are being used by the students.”

## EARLY RESULTS

Ms. Swinton found that teaching online took about the same total amount of teaching time as in the classroom, but she was able to spend more time working one-on-one with students and less time grading assignments. She liked that students received a lot of feedback in the Practice, Review, and Unit Quizzes. The system didn’t just tell students they were wrong; it guided them as to where to find additional help. “Students have the ability to go practice and practice until they get it right!”

*“I enjoy the course. It helps me understand math in a way I didn’t before.”*

- Student

Students were interviewed for the pilot research study, and they reported that the course increased how much they liked math, and that they were better at math after using *Algebra 1 – An Open Course*. They liked the organization of the course components and found it easy to access and navigate through the course. One student said, “I enjoy the course. It helps me understand math in a way I didn’t before.” They also liked the freedom of the online course format because it allowed them to work on the course at their own pace and according to their own schedule, reviewing material as needed. Another student reported, “I like the freedom it gave me; I can do stuff during the week and work on weekends if I need to.”

## ADDITIONAL RESOURCES

The school director, curriculum director, and teacher all take advantage of NROC support resources. Ms. Swinton noted that the “NROC professional development materials—videos, PDFs, etc.—were fantastic. They made it easier to start modifying the course.” All three school representatives attended the NROC Member Meeting in Monterey, California in spring 2012 and found it to be a valuable experience. Ms. Tonks noted the annual NROC member meeting is not just a conference: “The NROC members have a really strong voice in the direction of the courses. We are the drivers and have a say in the way things are headed.”

Ms. Tonks and Ms. Weston appreciated the immediate and helpful support they received when they contacted NROC staff. Ms. Swinton participates in the NROC Network, and uses worksheets created and shared by another NROC member in her own classes. She also monitors a LinkedIn group that lets teachers share resources and brainstorm with each other.

*“It is particularly helpful to have the consistency of pedagogy and structure across all of the modules in all three integrated math courses.”*

- Sarah Weston,  
Curriculum Director

## WHAT'S NEXT?

Annie Swinton piloted *Algebra 1 – An Open Course* in the 2011-12 school year. Open High School will continue with the course in 2012-13, but is customizing it as Utah has adopted the Common Core Integrated Pathway for Mathematics. Curriculum Director Sarah Weston and the three OHSU math teachers are mapping all of the content modules and math standards in algebra, pre-algebra, and geometry. Ms. Weston is redesigning the courses into Math 1, 2, and 3, so now all three courses will have components from *Algebra 1 – An Open Course*, as well as NROC’s *Arithmetic*, *Beginning Algebra*, and *Intermediate Algebra* courses, and the *Geometry* and *Statistics* topics. Ms. Weston noted, “It is particularly helpful to have the consistency of pedagogy and structure across all of the modules in all three integrated math courses.”

## ABOUT NROC AND THE MONTEREY INSTITUTE FOR TECHNOLOGY AND EDUCATION

NROC is a project of the Monterey Institute for Technology and Education (MITE), an educational non-profit organization committed to improving access to high-quality education for everyone. With funding from The William and Flora Hewlett Foundation and The Bill and Melinda Gates Foundation, the National Repository of Online Courses (NROC) project is designed to develop and distribute high-quality online content to a worldwide audience. Sustained by institutional members of the NROC Network, NROC is an Open Educational Resource (OER), part of a movement fueled by the belief that everyone is entitled to an education, regardless of their financial or social circumstances.

**For additional information on *Algebra 1 – An Open Course* please visit <http://www.NROCmath.org>, or email [membership@montereyinstitute.org](mailto:membership@montereyinstitute.org).**