RESEARCH BRIEF

# Open Educational Resources & Students' Independent Knowledge Creation:

## The Maine Student OER Innovations Project

*Photo courtesy of Thomas W Woodward*


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**The Center for Education Policy, Applied Research, and Evaluation**

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**In collaboration with the**

**Maine International Center for Digital Learning**

UNIVERSITY OF
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The Center for Education Policy, Applied Research, and Evaluation (CEPARE), in the College of Education and Human Development of the University of Southern Maine, provides assistance to school districts, agencies, organizations, and university faculty by conducting research, evaluation, and policy studies.

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# Research Brief

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### The Maine Student OER Innovations Project

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## Introduction

Beginning in the fall of 2003, Maine undertook a cutting edge project—all 7th and 8th grade students were given laptop computers to use in their classrooms. The Maine Learning Technology Initiative (MLTI) was created by former governor Angus King as a way to enhance teaching and learning across the state, but more specifically to help level the playing field for Maine's students in a rapidly changing, globally-competitive world marketplace. The initiative was designed "to prepare students for a future economy that will rely heavily on technology and innovation" (Task Force on the Maine Learning Technology Endowment, 2001, p.vi). The report further rationalizes the need for the MLTI program in the following excerpt:

> *"Our schools are challenged to prepare young people to navigate and prosper in this world, with technology as an ally rather than an obstacle. The challenge is familiar, but the imperative is new: we must prepare young people to thrive in a world that doesn't exist yet, to grapple with problems and construct new knowledge which is barely visible to us today. It is no longer adequate to prepare some of our young people to high levels of learning and technological literacy; we must prepare* all *for the demands of a world in which workers and citizens will be required to use and create knowledge, and use technology as a powerful tool to do so"* (Task force on the Maine Learning Technology Endowment, 2001, p.6)

The technology available first in middle schools and most recently in high schools in the state has set Maine apart from other states in terms of the experience that it is able to offer students.

Despite the technology resources available to Maine students, many classrooms have yet to be transformed in a way that might have been anticipated. In all too many cases, teachers are still the gatekeepers to knowledge, and students gain permission and access to knowledge through their teachers. After years of observations and data collection about the MLTI program, researchers began to wonder what would happen if students were asked to use a laptop to teach *themselves* some of the content that is taught in schools traditionally by teachers. And what if the students only used open educational resources (OER)?

## Background

During the 2008-09 school year, the William and Flora Hewlett Foundation funded a small pilot study in Maine to determine the impact professional development focused on the use

of OER in mathematics may have on teaching and learning. Two cohorts of teachers, both in traditionally under-served areas of the state, participated in the pilot. Several important findings from this pilot study were:

1) Many teachers seek out instructional materials using the Internet and change those materials to suit their needs. However, the vast majority never repost and/or share those materials with other teachers using the Internet.
2) Many teachers in K-12 schools do not use OER materials simply because they are unaware of their existence.
3) Although teachers have been using the laptops for many years, the majority of them have yet to focus their energy at the highest level – impacting their students. Instead teachers continue to be concerned with their own learning with regard to technology.
4) And finally, simply introducing teachers to OER materials does not ensure their use of those materials in the classroom nor does it suggest that they will consider changing their practices.

The findings associated with the pilot study described above were very valuable in beginning to understand how OER may be used at the K-12 level. However, as indicated by the findings, there are many complicating factors that make widespread adoption a somewhat distant reality. (Copies of the entire pilot study report, entitled **Examining the Use and Support of Open Educational Resources (OER) in the K-12 Setting: An Exploratory Investigation of Algebra I Teachers Engaged in Professional Development With OER,** are available at www.usm.maine.edu/cepare/publications.htm)

As a result of the findings above, researchers began to consider what may happen if students were used as an entry point for OER materials in schools instead of teachers. Students are often far less fearful of technology than are the adults who teach them and because of their constant exposure to technology, they may often learn to use technology much more quickly. With that in mind, and very little by way of hypothesis, the Maine Student OER Innovations Project was created.

**Design of the Study**

The Maine Student OER Innovations Project was designed to help researchers better understand what happens when students are given responsibility for their own learning. As part of this project, two teams of three middle school students from three different schools (n=18) were offered a basic orientation to various OER materials and their functionality. During their first meeting(s), students were asked to choose a topic in one of the major content areas (science,

social studies, math, or language arts) that had been identified by a teacher as an area that often causes confusion for students. Participating students worked together in their teams over the course of two months in the fall and winter of 2009 to create materials to assist teachers in their instruction of the chosen topic.

A teacher mentor worked with the two teams of students at each school as a resource for technology-related issues, as a content coach (as needed), and more importantly as a contact and data collection resource for the researchers. Students were given complete decision-making authority in terms of what type of product they would create to present the topic they chose. Upon completion of their projects, all participating students and their teacher mentors were brought together to present their materials to each other and provide final feedback to the project team about their work.

In keeping with the original plan for the Maine Student OER Innovations Project, 18 students were chosen from each of the three different schools. Figure 1 describes the participating students' grade level and gender. School-level administrators and the

**Figures 1, 2, & 3: Participating Student Gender and Grade Level**

| School #1 | |
|---|---|
| **Gender** | **Grade** |
| M | 8 |
| M | 8 |
| M | 8 |
| F | 8 |
| F | 7 |
| F | 7 |

| School #2 | |
|---|---|
| **Gender** | **Grade** |
| M | 8 |
| M | 8 |
| M | 8 |
| M | 8 |
| F | 8 |
| F | 8 |

| School #3 | |
|---|---|
| **Gender** | **Grade** |
| M | 8 |
| M | 8 |
| M | 8 |
| M | 8 |
| F | 8 |
| F | 8 |

teacher mentors who would work with the teams throughout the project chose students prior to the orientation. Researchers communicated to administrators and teacher mentors that they should choose students who were neither at the top nor who were at the bottom of their class but rather average students who were independent workers, curious about the world around them, adventurous but without being distracted, collaborative (especially with students who are not like them), and those who have the ability to look for more than one answer to a question. At each of the three schools sites, the six participating students were divided into two groups of three, based on judgments made by the research team after each school team completed their orientation to OER.

A variety of techniques were used to identify the schools that were ultimately chosen to participate. As a starting point, researchers reviewed data collected in three separate surveys conducted with principals, technology coordinators, and teacher leaders in Maine's middle schools. Researchers looked for responses that indicated a high-level of technology use by the survey participant. Researchers then tried to identify where *all* of the three surveys for a single school revealed a high level of technology use. It was reasoned that a school with high levels of technology use by administrators, teachers, and technology coordinators would be more likely to be excited to participate in a project such as this one and become engaged in a more meaningful way than perhaps a school with low levels of technology use. The three schools that were chosen to participate ended up being perfect matches for the Maine Student OER Innovations Project. Each of the schools turned out to be particularly progressive in their attitude towards technology and in their willingness to participate in a project like this one.

*School #1*

School #1 serves students in grades 6-8 in Portland, Maine's largest city. The school serves a unique cross-section of kids: some students come from some of city's most advantaged families while others come from some of the city's most disadvantaged. The school is situated geographically between a neighborhood that has traditionally been home to the city's low-income families, a college campus, and some of the city's most historic homes. In addition, a significant number of individuals and families from many countries around the world immigrated to the city approximately 10 years ago and have made the school one of the most diverse schools in Maine. According to their website, "more than 120 of the school's approximately 500 students speak 28 languages and come from 17 countries"

*School #2*

The students at School #2 are in a decidedly different environment than that which exists at School #1. School #2 is in a town that is home to one of Maine's most notorious retailers and is one of Maine's more wealthy communities. In addition to the retail giant, the town is home to dozens of other retail stores that attract hundreds of thousands of visitors throughout the year, particularly in the summer. The town, which is a little more than 15 miles from the Maine's largest city, also boasts many miles of coastal properties that allow for the collection of significant tax dollars to support local schools. The school itself could be described as a place where 'everybody knows your name' as many of the students have been together, either in the classroom or as a result of local sports or activities, since very early childhood.

*School #3*

The town wherein School #3 lies is home to one of the original college campuses in Maine. The small town is about 10 miles from Maine's largest city and according to the school's website, it is home to about 16,000 people. Because of the influence of the University, the students at the school are in a similar situation to that of the students at School #2 in that they are relatively advantaged in comparison to students in other areas of the state. The school serves approximately 650 students and boasts little by way of ethnic diversity. Students at the school, like those at School #2, have likely known each other since early childhood because of the close-knit nature of this small community.

**Project Implementation**

The Maine Student OER Innovations Project began in August 2009 with an orientation for students from one of the three schools. The project design originally called for a summer orientation involving six students from each of three schools (18 total students), but due to difficulties with communication during the summer, only one of the school teams was able to participate. At the time, this seemed to be an unfortunate occurrence; however, as the students began to work on their projects in fall 2009, the research team realized that there was much to be learned from the first group that could be used to enhance the project for the other two groups.

At the beginning of the 2009-10 school year, coordinated trainings for the remaining students took place. In late October 2009, two separate trainings were held for groups of six students each and their teacher mentors at their individual school sites. So while the first group of trained students was nearing the completion of their projects, the other two groups were just beginning their projects. In order to gather topics for student teams to choose from for their projects, teacher mentors were asked to speak to their colleagues in person and try their best to gather a basic understanding of the concept/lesson so that they could then explain it to participating students. In addition, students were asked to talk to their teachers about concepts/lessons that were particularly challenging to teach. Asking both teacher mentors and participating students to seek out possible 'problems' to consider made identification of possible projects a team effort. However, identifying 'problems' in this way also left significant room for misunderstanding exactly what the teacher was trying to communicate. In at least two cases, the teacher mentor and/or the students had to ask the teacher for more details in order to fully understand what the concept/lesson was.

Once the students had chosen their topics, they were given complete freedom to work on their own. A cornerstone of the project was that students would not be given any 'help' by the adult mentors or other project staff, especially if it were with an issue that the adult felt the students could resolve on their own. The goal was for students to direct their own learning, and not to be unduly influenced by what teachers might think was the best way to learn the concept/lesson. If asked, the teacher mentor would support the students but only with issues that were simply too complicated for the students to resolve on their own.

Students at each school site were given approximately eight weeks to work on their projects. Per the research proposal, students were asked to work approximately four hours each week for a total of 32 hours over the course of the project. Because of the varying schedules at each school, students did not always work for two-hour stretches at a time, which had been the original intention of the researchers. Instead, the teacher mentor at each school, worked with the students to determine a schedule that would allow all students to attend every meeting. In some cases, the students would meet for an hour and a half one day and two and a half hours another day (each week). It was recommended that the teams work for no less than one and a half hours at a time to ensure student focus. The project team and teacher mentors expressed the significant importance of attendance at every meeting, making exceptions only for illness or important appointments.

**Student Products**

The materials created by student teams at the three different schools varied widely. In some cases, students made smaller products and put them together to create one large product. For example, a group at one school made an iMovie of themselves as the actors, added an open source video, and put them all together in a wiki. Another group at a different school made a Keynote presentation, recorded audio of each other talking about the topic, took photos, and then housed the whole product in a wiki.

In other cases, especially where the groups engaged in higher levels of collaboration, the students made one large project while working together. At one school, one of the student teams made a 'quiz' in Google forms. By taking the quiz, the participant could determine what political party they were part of based on their answers to each of the questions. Another group at a different school made a stop motion animation film using iMovie. Though the variation in

student products may have been anticipated, it was not clear at the beginning of the project just *how* widely the products would vary.

Closer observation of the products by the research team revealed how significantly the products expressed the interests of the students' who had created them. In a group where there was an admittedly artistic student, there was an artistic element, and sometimes that artistic element was very prominent. And in some cases, the products were less reflective of the students' interests, but this was due more to the lack of technology needed to create what they wanted to create. At one school, the students who ultimately made the quiz had wanted to make a video game but the Flash technology was not available to make this a reality nor did they have time to learn how to use Flash appropriately. The following is a brief description of the products submitted by each of the groups:

- Students constructed a multi-part project that included an iMovie they produced, a movie clip found on the Internet, and information and pictures posted on a blog. Their topic dealt with the effects of bacteria on the body.
- Students in this group created a short movie using the stop motion animation technique of filming. They took photos, recorded their voices, and put those pieces together to make the movie. Their topic dealt with the different ways to represent the concept of slope in mathematics.
- Students used the Google forms tool to create a quiz. Within their quiz they included photos and questions they generated. The way a person answered the quiz questions would reveal which political party they were part of. Their topic was to explain what it meant to be part of one political party or another.
- These students used Keynote, a wiki, photos they took, and a podcast as the different pieces of their project. Their topic was based on explaining the different parts of the 1st Amendment and what they mean.
- The students created an iMovie that included music clips and topical explanations they made by shooting footage of each other. They were asked to explain how cells are building blocks that form much larger structures.
- Students used iMovie, sound clips, and their own footage to explain what symbolism is and how it may be recognized.

**Overall Findings**

One of the difficulties encountered with this particular research project is the wide variety of findings collected from work done with student teams at each of the schools. In some cases, the findings were duplicated from site to site, but in other cases there were findings that were site specific. For the purposes of reporting, researchers have identified those findings which are most relevant to all of the three sites and that are most important for consideration should a project like this one be replicated. Generally speaking, findings for the project have been divided into three major categories: 1) Students and Learning; 2) Students and their Peers; and 3) Students and Technology.

*Students and Learning*

Several findings related to students and their learning were detected during the research for this project. To say that participation in this project *changed* the way students learn would be to overstate the reality. Instead, it is more accurate that participation in the project changed student awareness of their preferences for learning and their awareness of how they are taught, both very important elements of learning.

The majority of the students who participated in this project had a difficult time understanding that they were, in fact, in complete control of their learning. It was reported in pre- and post-interviews by several of the students that some teachers use laptop technology for instruction but that instruction is still being driven by more traditional techniques including lectures, notes, movies, and group work. As reported by students, these activities often involve use of the laptops, but that laptops are not being used in ways that move instruction to a higher level. As a result, students still seem to be very limited by what they think is 'learning'. Many students believe that if it's not notes or a lecture or group work, then it's not learning. This type of ingrained thinking made it very difficult for students to 'think outside the box' about the different ways they could choose to learn about their topic.. Even in the end, many students suggested that they wanted guidelines for what they were supposed to learn and suggestions for possible products that they could create.

The students who had the most trouble considering alternate strategies for learning, as detailed above, were those students who may be considered 'high achievers' by their teachers and their peers. In a typical classroom, these students are given a detailed assignment and they know exactly what is expected of them in order to get an 'A'. In the case of this project, there were no guidelines and these students were lost in terms of how to do the project 'right'. One of

the students even admitted at the opening orientation that his favorite way to learn was via worksheets—he was good at them and they were easy. When asked at the end of the project if he still liked worksheets, he admitted that they were boring but that completing them worked well for him.

Though many of the students felt as though this project was challenging, some of them also felt as though that was precisely what made it enjoyable. Oftentimes students disengage from learning because it is too easy and thus becomes boring for them. The idea that a task that is hard may be fun was identified by Seymour Papert, a noted mathematician who was part of The Future of Learning Group, a group organized by individuals from MIT. Papert found that people learn best when they are given the opportunity to actively construct new knowledge, rather than having knowledge presented to them. One day, while working with first-grade students as they learned how to program computers using the computer language called Logo, a young boy described the work as both "hard" and "fun". In a 2002 article, Papert wrote,

> *"Once I was alerted to the concept of "hard fun" I began listening for it and heard it over and over. It is expressed in many different ways, all of which all boil down to the conclusion that everyone likes hard challenging things to do. But they have to be the right things matched to the individual and to the culture of the times."*

At least one student who participated in the project expressed the idea of 'hard fun' explicitly while others merely implied it. When asked if he felt this experience was easier or harder than his typical learning experiences at school, one student replied, "I think it was probably harder because you really didn't have any concise goal. But it was a lot more enjoyable because of that." This particular student enjoyed the challenge of the project and thus remained engaged throughout. Creating opportunities for students to learn in this way is necessary in order to maintain student engagement and ensure learning at the highest level.

One very significant observation made at each of the three schools (though not with all students) was that some of the students felt like they were much better at finding information on their own as a result of participating in this project. In many classrooms where the laptops are used, the teacher will give students an assignment along with a list of websites to use for sources. This is an effective strategy in part because the volume of information available on the Internet is so vast that students have a hard time weeding through it on their own. However, when students are asked only to use sources that are hand-picked for them, they never develop the web search and evaluation skills that are necessary for them to become good consumers of information.

Because little help was given to students who participated in this project, they were forced to navigate the deep waters of information on the Internet, and perhaps surprisingly they came out of the project with a newfound confidence in their abilities.

One interesting piece of information to note is that the students who felt the *most* confident in their ability to find information were students who may be considered by their teachers and peers to be in the middle or below in their class in terms of achievement. This is important because it is often the students in the middle or on the bottom of the achievement scale who never develop the confidence to move from the place they have been, in many cases, for the entirety of their school career. Helping students become more confident in their ability to learn is a very important impact of this project.

*Students and their Peers*

Working in groups was the cornerstone of this project. Participating students admitted that they did some of this in class, but that there were often complications involving other students not contributing an appropriate amount of effort, working with other students that they did not like, and not being in control of the activities at a level that is preferable to some. Going into this project, students knew that they would be working in small groups at their schools and that they would be potentially collaborating with students from other schools. All of the students were prepared for the experience of working in groups and as a result some interesting observations were made.

One aspect of collaboration and group dynamics that was entirely underestimated by the researchers was the developmental level of the participating students. Middle school students were identified as the participants in this project because they are the group that has been consistently exposed to the laptops for the greatest amount of time. However, researchers failed to recognize the incredible needs these students have for socialization with their peers, especially in contrast to high school students. In addition, researchers asked the students to work together after regular school hours, a time usually devoted to some sort of extra-curricular activity where general socialization is allowed or, for some students, a time when they are allowed to do something other than schoolwork. Often, students at each of the three sites spent a significant amount of time socializing with each other and not taking on the task at hand. Though difficult, researchers and teacher mentors did not interfere with student decisions to socialize instead of complete their work; part of asking students to learn on their own is that they need to *decide* to learn on their own.

At the end of the projects many students agreed that they had spent too much time socializing and not enough time working on their projects. In one case, one student felt as though their project was a "complete failure" because they spent too much time socializing and did not have enough time left to make a product that they were satisfied with. This lesson was an important one for the students because they became more aware of their learning. This is also an important lesson because it reinforces the limits placed on students learning as a result of the structure of traditional schooling. Students are forced to learn in classrooms every day, and sometimes in ways that they do not enjoy. Thus, when given an opportunity to learn in any way they choose, they have a hard time motivating themselves.

Another unanticipated finding associated with the project was the students' interest in participating in the project stemming from the potential it held for helping other students. Researchers were prepared to observe student interest in the project as a result of the opportunity to work on a 'special', somewhat selective project, which would incorporate technology. However, early on it was clear that students were very much interested in the value that their product may hold for students having a difficult time understanding certain concepts. Many students commented in their initial interview that their reason for participating was because they wanted to help other students.

Similarly, researchers did not anticipate participating students' interest in working with the students at the other schools. At the summer orientation, many of the students arrived wondering where the other students were and researchers had to report that last minute changes to the project prevented the participation of the other two schools at that point. In post interviews, students also commented that they were disappointed that they did not get to communicate with the students from the other schools. And finally, at the gathering to celebrate the conclusion of the project, the students were *very* excited to finally meet each other and see what other groups had chosen to do for their projects. As mentioned previously, were this project to be extended, a significant component would include opportunities for students to communicate with each other on a regular basis.

On a more general level, this project turned out to be an exceptional exercise for students in developing their abilities to work in groups and collaborate. In many instances, students developed an idea for a product, collected information, determined that their idea would not work, and had to begin the process anew. This process encompassed several important 21st Century skills, including: analysis, evaluation, synthesis, interpretation, and reflection.

Unfortunately, very few experiences that students have in classrooms today incorporate all of these skills, nor do they require students to be intrinsically motivated to gain new knowledge.

In the post interview, two of the students commented that the work they did as part of this project was much like they anticipate the 'real world' to be like when they have a real job. When asked what the most important thing he learned was, one student said, "I learned that this is what a real office is going to be like. You're gonna to have to work on your own a lot…and you're gonna have not much detail, but you're going to have teammates to work with you. You're going to have to rely on each other." Several other students made this comment though somewhat less explicitly. The reflective nature of this comment makes this an important learning experience for the students who were able to understand their work at this higher level.

*Students and Technology*

Though it was a very prominent part of the project, the technology involved with the work done by students became less of a focus as the project progressed. Students were still continually reminded of OER and the need to use them and they used their laptops for all aspects of the work they did. However, there was much to be learned from this exercise about how students learn and how they learn when working together in small groups.

An interesting aspect of the participating students that was revealed early on in the pre-interview was that the male and female participants use the Internet for very different purposes. There is, of course, some crossover amongst the two groups but generally speaking, the identified groups of students use the Internet in the following ways:

> *Girls*: use the Internet and its resources primarily for social networking (e.g., Facebook) and communication with their peers (e.g., Skype, Gchat).
>
> *Boys*: use the Internet and its resources primarily for creating products (e.g., art) using free resources they find on the Internet and for playing video games (some web-based, some downloaded).

The boys as a group were also much more likely to 'play' on the Internet and try to figure out how to use something new, while the girls were more likely to simply use what is already there. Girls also seemed much less likely to explore on the Internet during their free time and instead they chose to communicate with their peers. This difference in how males and females used the Internet is important to note because of the way in which it may have influenced the choices made by student groups about the products they would create. There were far fewer girls

participating in the project overall which may have made their influence overall less than that of the boys.

One of the complications of the project was the varying nature of technology available from school to school. At one school, the students had access to a special camera for taking photos as part of the stop motion animation film, among other resources. They also had access to a great deal of software that students at the other schools did not. And though many of them did not access the teacher mentor as a resource during the project, some of the students had worked with him before in his media room and had a higher level of knowledge of the possibilities available with the technology than did students at the other schools. This is not to say that any of the projects of the students who did not have access to that technology suffered but merely to say that equalizing the experience of the students at different schools is a difficult task.

Perhaps because of the way in which students use technology and the Internet in such a ubiquitous way, they seemed almost unfazed by OER and the opportunities available as a result of using them. Students reported that they almost never purchased any materials from the Internet indicating that everything they use is free anyway, regardless of whether or not it was considered OER. Without a doubt, students expanded their understanding of OER as a result of participation in their project, but almost all of them reported that they would not seek out OER resources for projects (with the exception of Wikipedia where allowed), unless they had exhausted other searches. This highlights the idea that students will use what *works* and what is *easy to find*. Many had difficulty locating the information they wanted and the search engines were sometimes challenging to use. When OER become visible enough that students can search like they do in Google (despite the fact that there is creative commons search in Google) for those resources, students may take notice. Until then, students will continue to simply use what works.

**Lessons Learned**

The researchers learned many lessons during this project, and many of these were related to the logistics of conducting the study. But one of the most fundamental and overarching lessons was related to the impact of the dual philosophical concepts of negative and positive freedom on the students and processes. Negative freedom is freedom from constraints, while positive freedom is freedom to make enlightened choices. From the very beginning and

throughout the various stages of this project, the researchers attempted to ensure that the students and their learning were free from constraints. Several steps were taken to ensure that teachers were not directing the students to the 'right answer' using teacher designed and directed learning strategies—the students were not to be constrained by the way they normally learn in school.

But in so doing, promoting positive freedom became more difficult. The students became free to make enlightened choices, but needed guidance to accomplish this. They needed scaffolding to reach positive freedom. And knowing how much scaffolding and of what type was many times difficult to discern and anticipate.

Thus, more scaffolding may have been beneficial in this project. However, it may have been detrimental to the outcomes. More scaffolding may have provided too much guidance—guidance to what teachers saw as enlightened choices. It is difficult to know. Possibly students and teachers first need to know what they do not know, before they can learn anew. Maybe students and teachers first have to experience the tension between negative and positive freedom before students may become true independent learners in charge of their own learning. Clearly more work is needed in this area, and the researchers in this project would recommend additional research, where OER is used as a catalyst for open learning and teachers, students, and researchers work as collaborators in exploring the development of independent learners.

**Concluding Thoughts**

During the five-month duration of the project, much was learned from students about the way they learn, the way they interact with each other, and the way they use technology both for work and for play. In the end, it was clear to all involved that the research had only begun to skim the surface. The findings delivered in this report ultimately show the potential power of OER and students' independent knowledge creation but also that much more needs to be understood about the behaviors of students when they are asked to direct their own learning.

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