



# Unlimited POTENTIAL

The Three Lakes Fab Lab is empowering students, developing critical thinkers and has the potential to boost the local economy

*Shelby Anderson*

**S**teve Yahr, director of the Three Lakes Fab Lab, remembers his first job in high school working at a television repair shop.

He spent his time fixing the big, heavy television sets that would sometimes burn out and need to be fixed. Yahr shakes his head when he thinks about how times have changed. He takes his cell phone out of his pocket and says, “Now we can’t live without these.”

Technology has progressed tremendously since Yahr’s first job and it will continue to evolve. Yahr and the rest of the school leaders at the Three Lakes School District know they have to prepare students for careers that don’t even exist yet.

In September 2014, the school district opened a Fab Lab, which the district hopes will help prepare students for the future while also giving them a glimpse of it.

It’s the second Fab Lab to open in a Wisconsin K-12 school. In 2013, Stoughton High School opened a Fab Lab with help from community and business partners.

A Fab Lab is a place where users are welcome to develop and build whatever they want. The sky is the limit. The Three Lakes lab, like most other Fab Labs, has tools such as 3D printers, a mini-mill, router, plasma cutter, and a laser engraver. With these tools, you can make any number of items. In fact, one of the classes offered by most Fab Labs is called

“How to Make (Almost) Anything.”

The machines in a Fab Lab are operated via computer numerical commands (CNC). You design your product on a computer using a computer-aided design program. Then you take that design and send the data to one of the tools, like a 3D printer, and it begins making the product according to the exact specifications directed by the computer software.

However, a Fab Lab is more than a collection of machines. It’s a global network of more than 500 labs. One of the major tenets of a Fab Lab is the sharing of ideas and knowledge. Every lab is outfitted with a web camera that allows people in different labs around



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the world to connect with each other and share their work or ask for help. A large monitor in the Three Lakes Fab Lab shows simultaneous live feeds from labs in places like Rotterdam, Chicago, Taiwan, and others.

“Here we are in northern Wisconsin and we can connect with anywhere in the world,” said Three Lakes school board member Terry McCloskey. “Our students have access to some of the same opportunities that students have anywhere else.”

### ■ A K-12 Fab Lab

The Three Lakes Fab Lab is located in the district’s K-12 school building housing an elementary, middle and

high school. It’s an appropriate location given that all grades in the district and a wide assortment of classes use the lab.

Since most of the students are in one building, it makes it easier to get students from kindergarten to grade 12 in the lab. The district also has a small elementary/middle school in a nearby town. Those students are occasionally bused in to experience the Fab Lab.

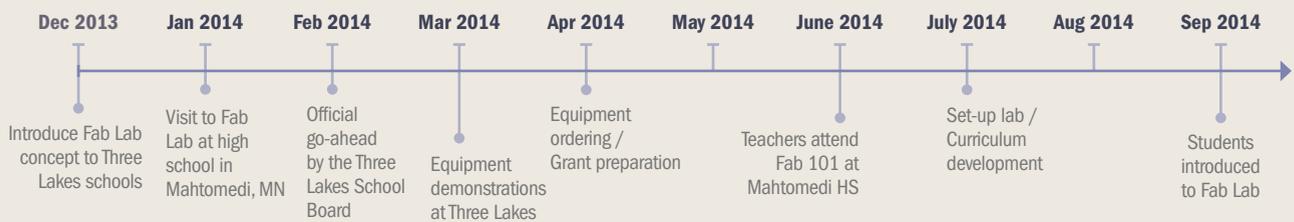
Yahr said it’s important to get students acquainted with the technology in the Fab Lab early so they become comfortable with it.

One recent project paired third graders with high school students. The teams of students were challenged to see who could build the

strongest bridge. A civil engineer visited the classroom and discussed engineering concepts and then the students began designing and building. The bridge models, which were constructed with cardboard, were produced using the Fab Lab’s laser cutter. One cardboard bridge held 45 pounds before it failed.

The project is also a good example of how the Fab Lab encourages cross-curricular collaboration. The bridge project began as an idea by a third-grade teacher who was teaching a unit on geometric shapes. The teacher approached Yahr about the idea of building bridges using the Fab Lab and the idea took off. Other classes, such as art, regularly use the lab as well.

## THREE LAKES FAB LAB TIMELINE



“The teaching staff here has really bought into it,” McCloskey said. “Steve and our administration have done a great job interacting with teachers.”

Teacher training also plays an important role in the Fab Lab. Yahr and two other teachers attended a two-week training camp at Mahtomedi High School in Mahtomedi, Minnesota. In January, Yahr and another teacher will be participating in Fab Academy, a 19-week program where participants plan and execute a new project each week.

### ■ Empowered Learning

The Fab Lab concept is built upon five key principles: empowerment, education, problem solving, job creation, and one that is harder to put into words. Yahr describes it as helping students realize that they have the opportunity and the power to imagine what might be and make it a reality.

“This process not only develops and reinforces critical-thinking skills, but also enables the students to have a hands-on experience while visualizing the process from imagination to product completion,” said superintendent George Karling.

The Three Lakes Fab Lab opened in September 2014 and already students and community members have utilized it to make unique and innovative products.

The Three Lakes Library challenged high school students in the Fab Lab to design a better magazine display. The library buys plastic magazine holders for \$40 each. Students are in the process of designing a version that is stronger and will cost less. The students have produced a couple of prototypes and are close to a finished product. The local library is interested in purchasing the magazine holders produced by the students and Yahr said other libraries have also expressed interest.

Another challenge came from a local dentist office that asked students to design a better bitewing for x-rays that would be more comfortable for patients. This project is still in the early stages.



## Florence High School Opens Fab Lab

**The Fab Lab seems to be catching on in northern Wisconsin.**

In addition to the lab in Three Lakes, the School District of Florence County opened a new Fab Lab at the start of this school year.

Superintendent Ben Niehaus said the district looks to the lab to help incorporate STEAM subjects into the district’s curriculum, prepare students for employment after graduation and motivate students to pursue post-secondary education options. Niehaus is optimistic that the lab will change students’ perception about technology.

“We hope it sparks an interest in those students who otherwise may still perceive technology education as dirty, difficult jobs predominately for males,” Niehaus said.

Although the Three Lakes School District helped Florence establish its new Fab Lab, getting it started was not easy. The district was able to get two grants to cover some of the cost of equipment. The district still had to make a significant investment in the lab. The lab has also been a challenge in regards to scheduling and teacher capacity.

Despite these challenges, Niehaus and leaders in the Three Lakes School District hope the two labs attract new industry to the area.

“If our regional schools are providing educational opportunities through the STEAM and Fab Lab movement, we’re optimistic that business and industry will value this knowing there are students being prepared in our local region with the technical, analytical and problem-solving skills desired and needed in so many fields today.” □



themselves back up and try again.”

### Community Sustainability

Looking ahead, Yahr said the next step is developing a curriculum for the Fab Lab for all grade levels that can be shared with other districts. The Three Lakes Fab Lab hopes to serve as a model lab that school districts from across northern Wisconsin and the rest of the state can visit to gain an understanding of the

Fab Lab concept.

In the meantime, the district is looking for funding to help support the lab. The start-up cost for a Fab Lab can be a challenge for some districts. Three Lakes secured a grant from the Department of Workforce Development for \$132,000. However, the initial cost of modifying a classroom, buying equipment, and covering training expenses and salaries cost about \$325,000. McCloskey said the district is busy grant writing and looking for additional business partnerships.

School and community leaders have high hopes for the Three Lakes Fab Lab. They believe it can help play a role in educating a highly skilled workforce that, in turn, can boost the local economy and build a strong, sustainable community.

As part of their work in the Fab Lab, Three Lakes students have been meeting with local business leaders and potential employers. Yahr said students are making connections and building relationships. Although no Three Lakes students have yet received job offers as a result of their work in the Fab Lab, Yahr said he can see that it is already making a difference in the students.

“Students are growing confidence in themselves as a result of their making experience.”

When planning for and developing the Fab Lab, the school district met

### The Engineering Design Process

The Three Lakes Fab Lab sharpens creativity and problem-solving skills through the engineering design process, which is on prominent display on a large sign posted on the wall of the lab. The process begins with identifying the problem, then researching and brainstorming, and ends with building and testing. If the product doesn't work as designed, you start the process over.

“Our take on it is that the Fab

Lab is as much a mindset as anything else,” Yahr said.

One of the most important lessons that students learn in the Fab Lab is that it's okay to fail.

“Along the way, they learn that it's okay to make mistakes,” said Yahr. “It's part of the learning process.”

“We're teaching our students how to think for themselves,” Karling said. “We're challenging them to be critical thinkers.

We want them to know it's okay to fail. We want to teach them to pick



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Fab Lab is a space where people of all ages and abilities can create things unique to them. Like a studio filled with instruments where musicians come to compose and play music together, a Fab Lab is filled with design software and machines for people to turn the designs into items. And like making music, making things in the Fab Lab is filled with starts, redesigns, exploring different avenues, theories, and U-turns on the way to making that perfect project.

with business leaders in the area. District leaders were surprised to hear many businesses say they could expand their operations if they had more skilled workers. The challenge is finding employees with the right skill set.

Businesses in the Three Lakes area said these skills or traits include: not intimidated by technology, able to identify a problem and build structure around it, work the problem to completion, and work in a collaborative team environment. Karling said these are the same skills that are emphasized and developed in the Fab Lab.

“We believe the Fab Lab concept is critical in the future in K-12 education,” Karling said. “It’s something that’s absolutely important in the economy and the sustainability of small communities.” ■

*Shelby Anderson is editor of Wisconsin School News.*



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