

MAKING THE Connection TO Career Technical Education

Next weeks CTE page will feature MCTEAA

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STEM by Design in Chippewa Valley Schools

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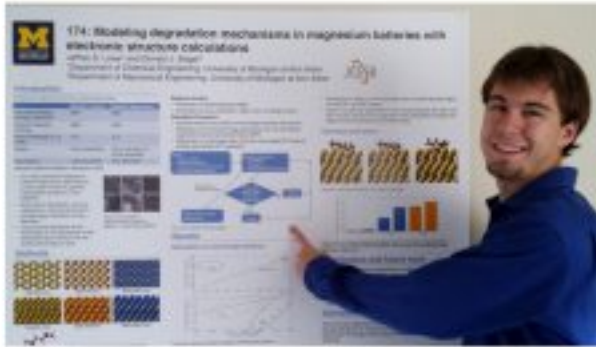
The greatest gift a student can give to an educator is the knowledge that they have made a positive difference in their life. As validating as this is, such feedback is a rarity for teachers, especially arriving unsolicited, several years after graduation. But such is the email that Design Technology instructor, Scott Mitchell, received in 2014 from Dakota High School alumnus Jeff Lowe (class of 2007). Jeff shares insights into the tremendous contribution that his teacher and career technical education (CTE) made in his life.

Before we tell the story, let me explain a few things: Design Technology—called “drafting” in the old days—is the program of study in Chippewa Valley Schools that provides students with an in depth, sequenced, educational experience in mechanical design. We offer students the possibility of four full years of study in this area; also a rarity. These days a computer and computer aided design (CAD) software are the primary tools used...unless, of course, you are a student in Chippewa Valley Schools. It has long been our belief that learning the design process is incomplete unless it is accompanied by rich, hands-on experiences and exposure to advanced technologies that support the Design-Build-Test philosophy of our teachers. Therefore, fabrication has been a part of what we offer for many years.

The most advanced students in our 4th year course called Research and Development (R&D) at Dakota High School, have access to a new and improved fabrication lab that is bigger and better equipped than anything we had to offer when Jeff was a student. In addition to basic hand tools and fabrication tooling, today's students are exposed to computer programmed and controlled equipment such as a state-of-the-art Haas CNC mill and CNC lathe, plasma cutter, laser cutter, welding, and soon to be upgraded 3-D printer. Yes, I did say “upgraded 3-D printer” because our design students have had access to 3-D printing for over 16 years!

What follows is from Jeff Lowe's email to his teacher, June 2014 (7 years after graduation): “I'm now a graduate student at the University of Michigan, working on my PhD in chemical engineering. I'm working on developing computational models for nanoparticle formation and I'm hoping to become a professor after graduation. I want to tell you what a continuous inspiration it's been to have you as a teacher in high school. I certainly had a leg up on other students during my undergrad at Michigan Tech. More importantly, though, what I learned in your classes still benefits me today. I think back to all of the projects: tennis ball launcher, trebuchet, pneumatic vehicles, boat regatta, and so many others. Each project helped me to go outside of my comfort zone (not being as good with my hands as I was with my mind), and they all helped me to learn what engineering is about. You were a great teacher, especially with your encouragement when my project ideas were much different from my classmates.”

“As an undergraduate college student, I finally had the



Dakota HS alumnus Jeff Lowe (class of 2007) is now a PhD candidate at U of M researching new battery technologies. About his high school Design Technology experience he says, “What I learned in your classes still benefits me today.”

opportunity to work in industry and see what it was like to interact with others in the workplace (just as you described so often in class). It was a great experience and it showed me the importance of education. Before this starts to sound like a scholarship essay, I want to let you know one more time that you have had a great impact on my life.”

Perhaps you're thinking what I was thinking when I read that, “Wow!” No matter what tool we use to measure effective teaching, it can't get much better than that. To be sure, Jeff was (and is) a gifted student. He describes a contribution that career technical education makes that is seldom acknowledged, but often the cornerstone of great CTE programs: the tremendous benefit of involving the academically gifted in relevant projects and project-based learning (PBL). The stereotype sometimes associated with CTE is one in which students are hands-on learners, but perhaps less academically talented. What

Jeff helps to demonstrate is that all students benefit from CTE. Sometimes the less academically motivated student finds relevance in CTE that answers the age-old questions, “Why do I have to learn this?” or “How will I ever use this?” Other times the outcome is, as Jeff describes: “I always excelled, but I was not as good with my hands as I was with my mind. The program enabled me to become more comfortable being uncomfortable, going outside of my comfort zone, and learning new skills

involved in creating with my hands.”

As a follow-up to the original email sent to his teacher 7 years after graduating from Dakota High School, I asked Jeff Lowe (now a 4th year PhD candidate researching new battery technologies) some additional questions:

Q: Did the Design Technology program help you to decide what you wanted to focus on for your career?

A: “Most definitely! That was my first exposure to what engineers actually do. Many students don't even get this kind of exposure in college, let alone high school. I was able to learn collaborative engineering skills as I worked in teams to build and test engineering devices such as a trebuchet and a pneumatic-powered vehicle.”

Q: Did the experience help you make better sense of how knowledge learned in core academic classes (math, science, English, social studies) applies in the real world?

A: “Yes. I remember one instance very well. While testing the pneumatic tennis ball launchers we had built, Mr. Mitchell asked each of us to calculate how far the ball would travel based on the amount of air pressure we put in the launchers. It seemed like a simple physics problem; air pressure relates to the force delivered to the ball, and force relates to the distance it will travel as the ball is being pulled back to the ground by gravity. But my calculations weren't even close! With the help of both my design and physics teachers, I learned that there may be other factors at play such as air resistance and the amount of



Budding engineers, Rachel Zaprawa and Kristina Stojanoski use the laser cutter to create a wood gear prototype that will later be fabricated out of metal on the CNC mill. Both girls plan to study mechanical engineering after graduation at Kettering University and Lawrence Technological University respectively.



The fabrication lab at Dakota High School offers advanced Design Technology students Haas CNC lathe, CNC mill, plasma cutter, welding, laser cutter, 3-D printing, and more. Lab technician Pat Dinunzio looks on as student Mike Serra fabricates a part on the CNC mill.



“I want Research and Development students to think differently; to use their own resourcefulness. This is the most important part; the intersection where design meets collaborative, creative innovation to solve challenges,” says Scott Mitchell, Design Technology instructor at Dakota HS, shown here with current student Mike Serra. Mike adds, “Each course in the 4-year program, has taught me more about the design and manufacturing process.”

time the force was actually applied. This was one of the first moments that I realized just how complex real-world calculations could be, but how interesting they could be at the same time. This drove me to gain a deeper understanding of physics and mathematics.”

Q: How important was the emphasis on projects?

A: “Projects are what allowed me to develop my communication skills through teamwork, my persistence through failure, and my understanding of real-world problems by seeing a project to completion.”

Q: What do you like best/least about your work &/or studies in which you are currently involved?

A: “I most enjoy interpreting my data. I became a chemical engineer because I like trying to apply math to real-world scenarios, and that's exactly what I do. Attempting to decipher a trend that governs how physical systems interact is very interesting. I also get to draw pictures of molecules, which allows me to be more creative and less technical. However, being a PhD student puts a unique stress on your life; hours can be erratic and an important part of your job is to convince others in your field that the research you've been completing for years is important, which can be daunting.”

Q: What is a typical day like?

A: “There is always something to learn. Typically, I read a paper in my field and try to apply it to an aspect of my research, or use it to help me better understand my research. I am in a computational lab, so I run simulations to model the interactions between molecules. If I have data to analyze, I am thinking about different trends that I see.”

Q: What advice do you have for a middle or high school student?

A: “The most important thing you can do for yourself is to try as many different things as possible and not allow your-

self to be manipulated by what other people think of you. The latter is difficult because in middle school and high school there is pressure to fit in. But in college and beyond, you're rewarded for being different. I studied Spanish in Costa Rica one summer and I worked at Oak Ridge National Laboratory in Tennessee on an artificial retina project. That is how I decided that I wanted to do research as a graduate student. Above all else, having great parents, mentors, and role models has allowed me to become the person that I am today.”

By now you can see that the Design Technology program in Chippewa Valley Schools does much more than just teach the fundamentals of computer aided drafting. Whether a student wants to be a CAD designer, any type of engineer, work in PhD level research

like Jeff Lowe, or branch off into CNC machining, robotics, programming, or something else entirely different, they benefit from this program. There is a good reason why Design Technology is officially recognized as a STEM program: it clearly integrates science, technology, engineering principles, and math. Both current students like Michael Serra and past students like Mitch Kelps, say they find the experience engaging, relevant, and one that delivers benefits for years to come!

We need innovative thinkers in all occupations — people who collaborate, ask good questions, and take calculated risks — to find new solutions to challenges. Research supports the notion that everyone needs to become skillful at “design thinking,” an essential quality of innovators. Just as learning to use the scientific method is important, the engineering design process is a beneficial addition to the tool belt for all students. To learn more about “design thinking” you may want to read Tony Wagner's book, *Creating Innovators*.

To learn more about the “engineering design process” check out: sciencebuddies.org/engineering-design-process/engineering-design-process-steps.shtml.

Combined, Chippewa Valley and Dakota High Schools have four, full-time teachers in the Design Technology program: Scott Mitchell, Allan Kobler, Jason Youngblood, and Jomo Walker.

To learn more about this program (or any of the 14 different CTE programs we offer) go to: chippewavalley.schools.org/academics/cte

Chippewa Valley Schools Career Technical Education

Chippewa Valley Schools offers Career Technical Education (CTE) programs at Chippewa Valley High School and Dakota High School. These programs are designed to prepare students for a broad range of employment opportunities and continuing education. Follow-up studies continue to find that the most successful high school graduates were those who took a college-prep program and a Career Technical Education program of study. CTE programs are staffed by teachers with related business and industry experience that enhances the learning process with real-world relevance. CTE programs are offered in these areas:

| CTE PROGRAMS | PREREQUISITES |
|--|---|
| Automotive Technology Business (3 pathways) <ul style="list-style-type: none"> • Business Management • Accounting & Finance • Information Technology Construction Trades Design Technology Family & Consumer Science Graphic Design Culinary Arts Marketing Mechanics & Robotics Medical Academy Teacher Cadet Woodworking/Cabinetmaking | Some CTE programs are taught at one high school only, but programs are available to students at both high schools. A complete program of study in a CTE area usually involves a sequence (or multiple) courses. Advanced courses often have the preceding course as a prerequisite. For these reasons, students should plan early to include CTE as part of their high school experience. |

All CTE programs adhere to the District's policies of nondiscrimination on the basis of race, color, religion, national origin or ancestry, gender, age, disability, height, weight or marital status in all programs, activities, and employment. In addition, arrangements can be made to ensure that the lack of English language skills is not a barrier to admission or participation. Support services are available through Carl D. Perkins Education Act for students with special needs; inquiries related to nondiscrimination policies should be directed to: Civil Rights Coordinator, Assistant Superintendent of Human Resources, Chippewa Valley Schools, 19120 Coles Avenue, Clifton Township, MI 48026. Phone: (588) 723-2090. Nondiscrimination inquiries related to disability should be directed to: Section 504 Coordinator, Director of Special Services (same address) Phone: (588) 723-2180.

Anchor Bay Schools
 Armada Area Schools
 Center Line Public Schools
 Chippewa Valley Schools
 Clintondale Community Schools
 East Detroit Public Schools
 Fitzgerald Public Schools
 Fraser Public Schools
 Lake Shore Public Schools
 Lakeview Public Schools
 L'Anse Creuse Public Schools

For more information about CTE, contact Scott Palmer at 586.228.3488 or spalmer@misd.net



Macomb Intermediate School District
 44001 Garfield Road
 Clinton Township, MI 48038
 586.228.3300

For more information about the MISD and the 21 school districts, go to www.misd.net

Mount Clemens Community Schools
 New Haven Community Schools
 Richmond Community Schools
 Romeo Community Schools
 Roseville Community Schools
 South Lake Schools
 Utica Community Schools
 Van Dyke Public Schools
 Warren Consolidated Schools
 Warren Woods Public Schools