MAKING THE Connection TO Career Technical Education

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MACOMB COUNTY

The Power of Projects in Chippewa Valley Schools CTE

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Career and Technical Education (CTE) programs have always been a place where students could expect a more "hands-on" learning experience. Career-focused, relevant and experiential learning is a hallmark of CTE. In thinking back to my own high school days in the mid-1970s, I realize that even though I was a strong academic student, the most memorable learning I had was associated with hands-on experiences.

At that time, in the "college prep" high school that I attended, CTE as we know it today did not exist. Like many young women, I availed myself of "Home Economics," one of the closest, comparable options to a CTE-like course. It immersed me in a hands-on, iterative process of trial and error, practice, and problem-solving. It was so unlike the rest of my day that I did not even think of it as "school," but clearly the practical lessons I learned remained.

Me and machine: I eventually mastered sewing skills so well that I made every homecoming and prom dress that I wore thereafter; preferring the final product that was uniquely mine. I spent countless hours outside of school honing my newly acquired skills. It was gratifying to challenge myself further and unleash my creativity. And when I got stuck—as I inevitably did—I sought out collaborators who could help brainstorm past the roadblock.

That is not unlike what I heard described by CTE students that I interviewed. In fact, my personal experience pales by comparison to theirs. Recently I was asked to showcase our Mechatronics & Robotics program to a visiting superintendent. We were both impressed by the projects we saw in process, and my guest indicated that he liked what he saw: "problem-solving projects of students' own design."

The "Electric Go Kart" is but one example. Sarah Byarski, Alex Hakim, and Jon Paul are three advanced Mechatronics students who are collaborating on this project that is truly of their own design, start to finish. They described the process that included initial concept, design, research, creating a parts list, investigating prices and brands for components that needed to be purchased; creating a test bench for electrical components (motor + battery + speed controller); designing (using CAD) and fabricating custom parts (using the 3-D printer, CNC, and other advanced manufacturing tools), programming, and much more.

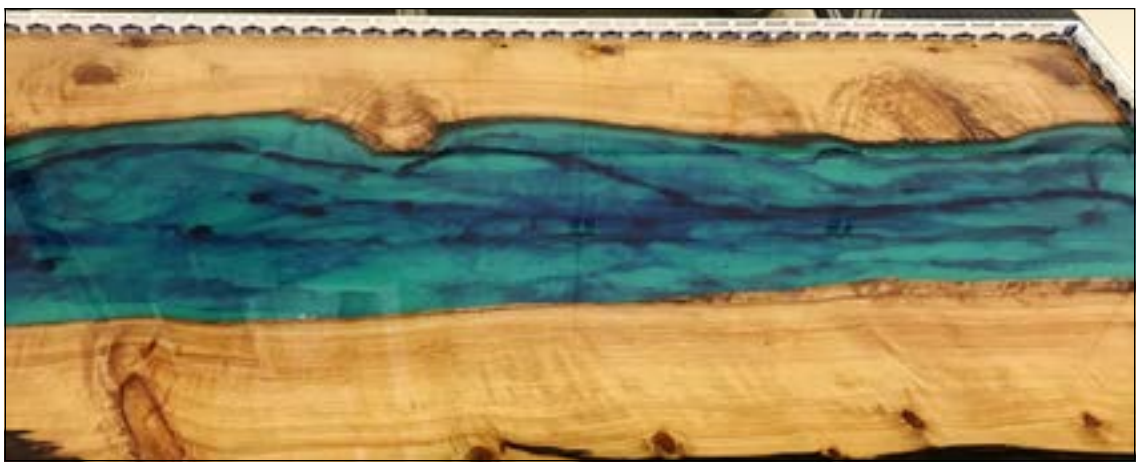
Was the first design the perfect design? No. And that is perhaps the point from which the greatest learning occurs. As Jon said, "We redesigned the back plate about 15 different times to be able to successfully hold more weight. The battery and the motor combined weigh about 30 lbs. and weight affects performance and battery life. We also needed to extend the frame at an angle which required applying math and physics calculations." Alex added, "We are constantly encountering new challenges that we find both frustrating and extremely gratifying once we resolve them. We are more involved and excited because we have complete ownership of this project."

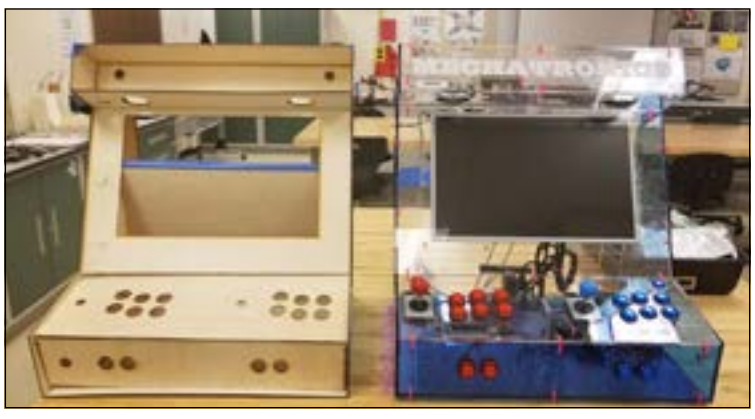
What are the most important ingredients to a successful, group project? What are the biggest lessons learned? "Collaboration is key," said Alex. Sarah added, "We're all of value to each other; no one person knows everything. Patience, teamwork, and communication are extremely important." "We've learned how to ask better questions, proactively think about what could go wrong, and reach out to other classmates to help brainstorm solutions to problems that our team alone cannot resolve," said Jon.

"Wow!" is what I thought to myself. This sounds like a list of highly desirable 21st Century learning outcomes and these intrinsically motivated students have clearly taken responsibility and initiative for their own learning. I'm proud to share this small sampling of theirs and other amazing student projects that I encountered in a day of discovery within just a couple of our CTE classrooms in Chippewa Valley Schools.

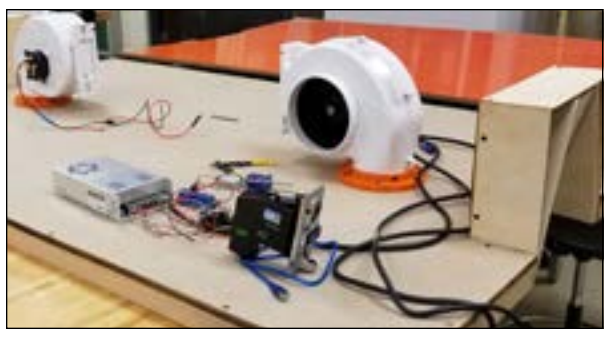
Seniors Sarah Byarski and Alex Hakim, aspiring engineers, collaborating on their capstone project.

Cameron Rowe is applying the second of many layers of a two-part, dyed, epoxy that is applied between two long "live edge" cuts of wood to create the effect of a flowing river. Followed by more layers of clear epoxy and lots of sanding with very fine grit paper, this table top will be combined with a contemporary, black metal base to create a truly unique dining table. With the epoxy alone costing several hundred dollars, Chippewa Valley Schools would like to thank J.B. Cutting for sponsoring Cameron's project!





Alex Paich applied his skills by making a game cabinet. After research, Alex designed it using AutoCAD, made a 1/16" scale model from mat board; tweaked it; then made a full scale model using thin wood cut on a laser cutter (shown left) tweaked it some more; and ultimately the finished product (shown right) made from clear Plexiglas. A salvaged TV screen serves as the monitor; a Raspberry Pi (microcomputer) serves as the brain. Complete with LED lights, 3-D printed buttons, and USB ports, the cabinet offers the option to plug in controllers for up to 4 players. Alex said, "I like the freedom to pursue learning through a project of my own design, and this project gets me excited to come to school each day." Since this is an individual project, what does Alex do if he can't resolve a problem by himself? "You never get it right the first time, and each iteration helps me resolve challenges. But when I'm really stuck? Peer learning is what we're all about in this class; we're like a small, close family who support each other.



Luke Tokarz, MeKaila Carter, and Katie Courneya teamed up to take on a very ambitious, custom-designed, air hockey table. This project is presenting them with a multitude of questions and challenges: How many holes are needed on the top of the air chamber to create a surface upon which a hockey puck will float? How much air pressure and power? How do we incorporate a 25 cent coin slot and make it turn on and off? Luke said, "It's a work in progress, but we've used everything from Inventor to design it, and 3-D printing for custom components like blower parts and the hockey puck." They've needed lots of different tools too like a circular saw, jig saw, laser cutter, CNC (to cut the holes); they even had to learn how to apply Formica. "The coding alone took over a month," said MeKaila who added that "This experience has been very powerful." They all agree that this is, by far, their favorite class, but they don't really think of it as "school" even though they have found the project to be much more complex and time-consuming than they ever imagined. Katie is already accepted to Lawrence Technological University to study mechanical engineering next fall and she said, "This experience has been the most awesome part of my preparation for college." Luke Tokarz and MeKaila Carter shown working on the electrical and mechanical components that will allow their air hockey table to function.