VRC Robotics Career Readiness Online Challenge - Ceramic Engineering

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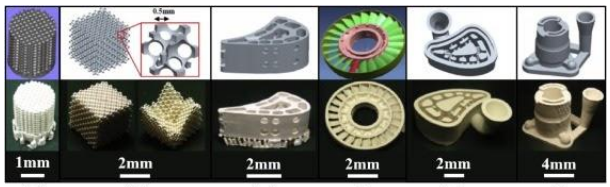
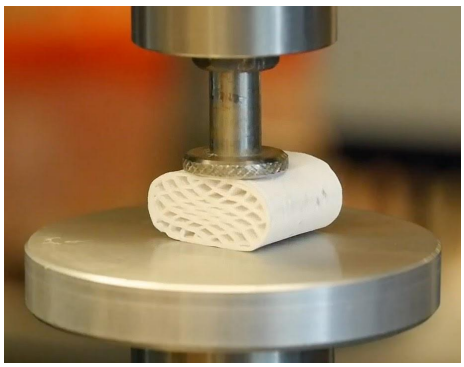
As of 2017, there are approximately 8.6 million STEM jobs, which make up 6.2% of employment in the U.S., according to the U.S. Bureau of Statistics. This growing percentage of jobs all incorporate the engineering design process in some shape or form. Among these careers that utilities this process would be ceramics engineering, which can be compared to our team's progressive process in robotics and is where we all have taken away something to learn from.

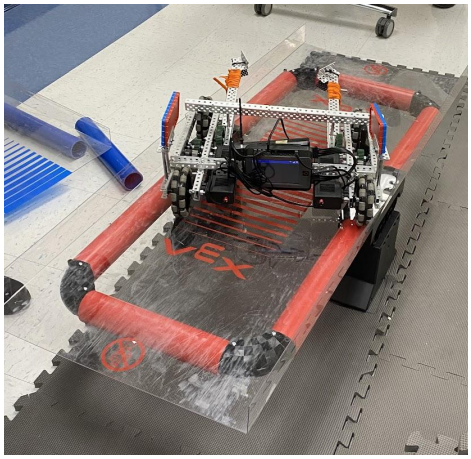
One doesn't hear about ceramics engineering often; however, you see the results of them everywhere, whether it be for glass, cement, electronic components, or nuclear reactors, which is why our team chose this STEM career. Our team, the Cosmics, didn't want to choose an engineering job that was popular to hear about, like biomedical, chemical, or civil engineering, but rather one that we didn't know much about ourselves. With online research regarding ceramic engineering, we learned that the U.S. has simplified the programs into materials science and engineering departments, making it multidisciplinary. A unique aspect of this career being under materials science is that it only deals with nonmetallic and inorganic materials made under high temperatures. Lastly, they can work in research, production, or sales while developing new materials, exploring new uses, designing, and helping customers out. Without a doubt, working with materials that are used for other areas of engineering and having many uses require meticulous effort through following the engineering design process.

Requiring a reliable material crafted from a ceramic engineer forces them to effectively use the engineering design process. According to the New World Encyclopedia, this career has gone from making dinnerware and decorative items to aerospace, automotive, and medical technologies, etc.  This exhibits how the engineering design process is responsible for the advancements within this STEM career because of growing questions and the increasing amount of varying tests for brainstormed prototypes. Like our team, ceramic engineers have an objective they base the rest of the process on to have a functioning material,

equipment, or prototype, which theirs would be how could they “develop new ceramic products as well as methods and equipment for processing ceramic materials.” We both dive into research for the best type of materials to utilize and methods that would be beneficial, as well as efficient; however, unlike our robot having the same challenge throughout the year, ceramic engineering has a variety of different applications it needs research for. While our team mainly brainstorms and designs prototypes through sketching, ceramic engineers engage in rapid prototyping with a CAD model and 3D printing because it shortens the time between designing and testing and is cost-efficient. 

Additionally, we both build a prototype based on our research, while keeping the objective in mind. After our robot is built and the materials for ceramic engineering are constructed through milling, batching, mixing, forming, drying, firing, and assembly, they are ready to be tested. Our robot prototype is tested by seeing if its autonomous mode works and if it’s able to lift mobile goals and move around efficiently, while the ceramic materials have specialized tests depending on their applications. For instance, biotechnology has its ceramic material tested through a series of tests involving pressure and compatibility with the body. 
Another example would be the protective, heat-resistant tiles on space shuttles going through simulation tests for weight, insulation, and debris protection. 
To finalize the engineering design process, both make improvements when needed. For example, our robot's programming

needed improvements and its arms needed increased functionality so it could be successful.



Clearly, both large and small scales of STEM applications involve the engineering design process to ensure successful designs.

On a different note, VEX Robotics has allowed us to grow within our interests and abilities in various ways. Besides Oceanna, all three of us have 2 years of experience competing in VEX Robotics. Sophomore year was our first time competing and we encountered a lot of struggles. We didn't necessarily have a high school robotics teacher when we started, which led to a lot of self-learning. From failed designs to working ones during practices that had inefficient functionality during competitions had taught us to adapt to many trials and errors and embrace asking for help from individuals more knowledgeable than us, even if we did not know them that well. Our biggest challenge this year has been limited resources and time constraints due to various senior year commitments. Despite these challenges, our team has been able to build a fully working design because of effective collaboration, increased communication, and balanced time management, all of which are soft skills that are preparing us for our future careers. With the accomplishments we have achieved, no matter the size, and our perseverance to overcome obstacles we have ensured our preparation for becoming a future biomedical engineer, astrophysicist, dentist, and therapist and any other future endeavors we choose to pursue.

To put it simply, just like any other STEM career, ceramic engineering follows the engineering design process resulting in the field's modern-day technologies. With robotics being under the STEM umbrella, this career does share similarities and differences in how we approach the design process. Moreover, our experience with problem-solving design challenges and approaching teamwork during our time with VEX Robotics has taught us many valuable lessons in preparation for real-world applications in our careers. A type of preparation that will further us in our careers and show to others the impact and importance of a robotics education.

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