

Learning by Asking 'Why': How Research at Marquette Teaches the Value of Questions and Puts Meaning to 'Critical Thinking'

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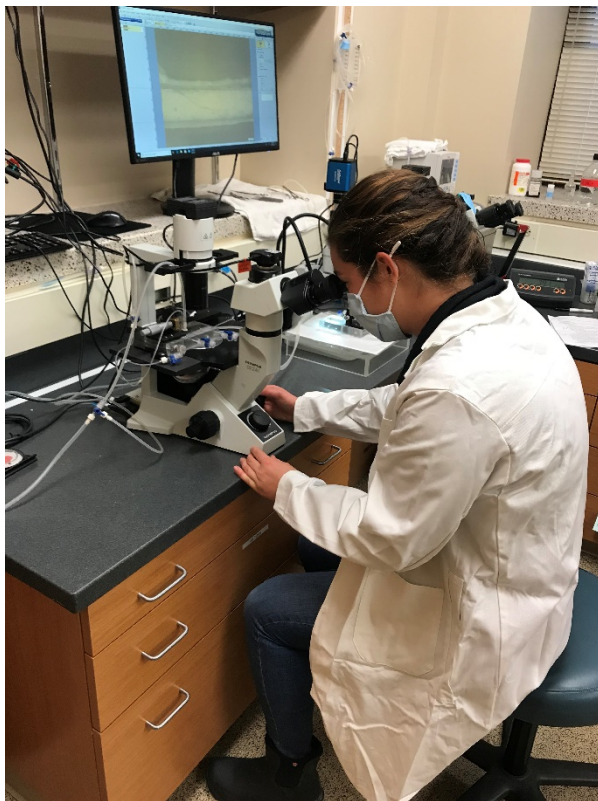
One of the main ways we as humans learn is through questioning what we see, hear, and experience in the world around us. Over the past few weeks working as a student intern in Dr. Sundberg's Integrative Muscle Physiology and Energetics Lab at Marquette, one of the most important lessons I have learned is the value in asking 'why' and thinking critically. This exceptional educational opportunity has excited me and shifted my perspective in the way I think about things encountered in daily life.

There is almost always a 'why' behind everything we are taught in the traditional classroom setting but understanding the 'why' is what makes these claims valuable and distinguishes active learning from passive. Research is an inherently active learning process as it provides the opportunity to not only ask the 'why', but then develop a systematic approach to hopefully answering it. Applying what I have learned thus far from my research experience has caused me to ask more 'why' questions in my classes and actually think about the material being presented. Why is the information being taught valuable? Why is this information what we accept as true? Why does this apply to my future and how can I use this in practice? Asking the 'why' has enriched my learning experience by helping me interact with information from classes in a more personal and active way.



Beyond asking why, we are routinely reminded in the classroom about the importance of developing our critical thinking skills and their integral role in the learning process. For me as a student, critical thinking had remained an abstract concept until recently. Through my involvement with research, I have been able to apply these skills to real life problems whose answers matter and can have quantifiable outcomes. The addition of hands-on research experience to traditional classroom learning makes the elusive term 'critical thinking' a tangible process with a distinct purpose. The skills I have developed and the information I have come to understand through application in research is more meaningful and longer lasting than simply memorizing a list of terms. My research opportunity at Marquette has provided the space for me to put critical thinking to practice and experience how the concepts we learn in the classroom matter in a larger context.

In my research internship, we are trying to answer 'why' our muscles get weaker and fatigue more rapidly as we age. This question matters because although muscle weakness and fatigue for a younger healthy adult may be an inconvenience, for an older adult it can become debilitating. Put into the context of everyday life, for healthy younger adults, muscle weakness and fatigue might mean not being able to lift as heavy of a weight in the gym or slowing down when finishing a hard run. For an 80-year-old, muscle weakness and fatigue can mean an inability to stand up out of a chair or needing to rest several times to be able to make it up a flight of stairs. In the studies I am involved with, we are collecting data such as whole muscle force and power production of the quadriceps before compared to after a dynamic fatiguing task and single muscle fiber force and power generated under conditions mimicking various levels of fatigue. As we collect the data, I have the opportunity to gain experience with techniques used not only in research but also in clinical settings, such as electrical muscle stimulation, Doppler ultrasound, MRI, and muscle biopsies to name a few. These experiences give me the chance to apply fundamental concepts that I have learned in my exercise physiology courses, such as the force-velocity and the length-tension relationship of muscle, to solve real world problems. This hands-on experience learning the research process, laboratory techniques, and applying concepts from my classes demonstrates how critical thinking is employed to understand the data and methodology to answer the 'why'.



Overall, involvement with research has given me the opportunity to develop skills and grasp concepts that are transferable to both the classroom and career setting in a meaningful and enduring way. It has ignited an excitement in me for education and knowledge as I am supported, challenged intellectually, and strongly encouraged to find answers to the 'why' in what I see, hear, and experience in the world.