

### **Teaching measurement techniques in biomechanics through inquiry-based labs**

Inquiry-based labs seek to engage students in an authentic process of scientific *inquiry*, where students pose and invest scientific questions. The effect of inquiry-based labs has consistently been found to be positive [1]. In addition, the results of Furtak and her colleagues underline the importance of the teacher's role in actively guiding student activities [2]. Inquiry-based teaching was found to have a higher impact when activities are well structured, with scaffolding to assist learners, and when students engage in evidence-based explanation.

Offered as an optional course in the bachelor mechanical engineering curriculum at EPFL, "Experimental methods in biomechanics" teaches measurement techniques used in biomechanics. The course employs an inquiry-based teaching approach with three hours of lab per week in the spring semester. Labs begin with an open question that students research in pairs. For each open question, the students spend two lab sessions, so in total 6 hours. "As a biomechanical engineer who works with an orthopedic surgeon, what biomechanical tests would you suggest to your surgeon colleague for a tendon made from engineered tissue?" is an example of such a question. After a brief introduction of the clinical and the biomechanical aspects of a specific tissue, students are guided through the steps of the scientific inquiry approach by teaching assistants. Student pairs design their own experimental protocol and draw conclusions based on the evidence collected, which they are specifically encouraged to discuss between groups. An important aspect of this course is also to teach the students how to keep a lab book in which they report their experiments. This communication will report on the design of the course, highlighting the structure put in place to provide students with appropriate guidance. Students' satisfaction as well as students' self-evaluation of learning from the course evaluation will be presented.

[1] Alfieri L., Brooks P. J., Aldrich N. J., Tenenbaum H. R. (2011). "Does discovery-based instruction enhance learning?", *J. Educ. Psychol.* vol. 103, no. 1: 1–18,.

[2] Furtak E. M., Seidel T., Iverson H., Briggs D. C. (2012). "Experimental and Quasi-Experimental Studies of Inquiry-Based Science Teaching: A Meta-Analysis", *Rev. Educ. Res.*, vol. 82 (Sept. 2012) no. 3: 300–329.