

2023 Technology Fee Full Proposal

Title: Determining the self-efficacy of gross anatomy students with biophysical data

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Purpose and Specific Objectives:

Medical education research (to include dental, physician assistant, nursing, etc.) often explores latent constructs that are measurable with surveys. While these are meaningful, could these research questions be augmented with biophysical data? This project seeks to advance the study of self-efficacy in the health professions students with less bias and more objectivity. Self-efficacy is the belief that one can be successful at a particular task. This belief is a powerful motivator and has been shown to relate directly to *actual* success (Turan, et al, 2013).

The primary purpose of funding this equipment is to facilitate the study of instructional strategies in gross anatomy on students' self-efficacy with the goal of improving instruction and the learning environment. Secondly, these kits offer additional measurement parameters for use in the Anatomical Sciences Education research realm.

The first study will test three hypotheses. First, this equipment will be used to test the hypothesis that a student's increased response to sweating of the palms indicates a low self-efficacy. This study will utilize the "galvanic skin response" (GSR) tool and function. Sweating of the palms is a subconscious sympathetic "stress" response, and according to Bandura, one of the pillars that drives our sense of self-efficacy is whether our bodies "act stressed" (Bandura, 1977). Self-efficacy is a latent construct that is generally self-reported via surveys. Therefore, survey data will be collected and focus groups will also be conducted regarding the student's belief of success in gross anatomy. This will allow for testing the first hypothesis which is whether there is a positive correlation between the objective GSR data and the self-efficacy survey data.

Secondly, the context of the research question will explore how a Mixed Reality (MR) learning experience affects a student's self-efficacy to identify gross anatomical structures on a lab practical. The GSR data allows for an observation of the student's subconscious sympathetic response which may correlate more objectively to the student's belief in success. This data can then inform conclusions regarding the value of this learning activity and how it might be improved. The second hypothesis: MR learning experiences will improve a health professional student's self-efficacy regarding performance on a gross anatomy lab practical.

Lastly, the first GSR response data will be collected from Physician Assistant student volunteers as they engage in the MR learning experiences specific to their gross anatomy course Summer 2023. (Note: our department already has the MR equipment and activities.) A second set of self-efficacy data will be collected from Dental student volunteers Fall 2023. This will also allow for testing a third hypothesis: there is no difference between student types in terms of self-efficacy and gross anatomy learning.

Impact/Benefit:

This study will expand the ability to measure self-efficacy into myriad of contexts not limited to pedagogical interventions. There is limited evidence in the literature about using objective data to measure such a powerful motivator as self-efficacy. As stated before, this construct is typically self-reported via surveys. This biophysical connection could be used to measure parameters involving curriculum changes, practical & clinical settings, feedback mechanisms, stress, and fatigue.

The proposed equipment also has other functions to collect and analyze an array of biophysical data. Specifically, while each unit can measure galvanic skin response (GSR), each also can measure motion (accelerometer, gyroscope, altimeter, magnetometer), and heart rate (PPG).

An array of groups benefits from the use of this equipment. First, the education researchers in the new Anatomical Sciences Education PhD program benefit from having equipment to collect data which broadens the types of questions and approaches that the researcher might pursue. Second, the Health Professions Students (PA, dental, medical, etc.) benefit from improved instructional strategies as well as having the equipment available for their own research. Finally, as best practices are explored and confirmed, the academy benefits from the published results.

Sustainability:

If awarded, this project involves a one-time purchase with a 12-month warranty. It includes a software license that is optional to upgrade. The equipment is useful without the software, too. Purchasing thirty units means that 30 participants can be measured simultaneously. For the PA class, that is a potential 50% participation rate; for the dental, one-third; and for the medical class, 20%. This allows for statistically significant data collection.

Timeline:

Upon award, the equipment will be ordered with delivery expected within a month. The first project to collect data from this equipment is slated for Summer 2023. The second set of data will be collected Fall 2023.

References:

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>

Turan, S., Valcke, M., Aper, L., Koole, S., & Derese, A. (2013). Studying Self-efficacy Beliefs in Medical Education. *Procedia - Social and Behavioral Sciences*, 93, 1311–1314. <https://doi.org/10.1016/j.sbspro.2013.10.034>

Budget:

Shimmer3 GSR+ Optical Pulse – USD	\$ 706.00	30.00	\$ 17,912.00
Consensys Base 15 US – USD	\$1,122.00	2.00	\$ 2,244.00
Currency: USD		Subtotal:	\$ 23,424.00
		Discount:	\$ 3,268.00
Tax Rate: 0.00%		Tax:	\$ 0.00
Shipping Provider: TBD		Shipping:	\$ 150.00
		Total Order	\$ 20,306.00

Please, note the pricing difference between the original “concept proposal” and the current “full proposal” reflecting a corrected quote.