Neuromodulation is an emerging area of research and technology development in the medical field. The objective of our collaborative partnership with 3D Pars, Science from Scientists (SfS) and the Bakken Museum is to develop high quality curricula that uses hands-on activities to introduce students to neuromodulation and dTCS in both in and out of the classroom. By supplementing K-12 classroom activities with lessons that focus on neuromodulation and dTCS, we would increase student awareness and comprehension of brain function, of technologies that may be used to externally control those brain functions, and of careers in the field of neuromodulation. In addition to in-class curricula development, the content taught in classrooms will be shared in an outreach capacity to bring public awareness and engagement to emerging neuromodulation technological capabilities and their applications to human health. It is envisioned that this partnership would be a stepping-stone towards modernization of the current STEM education and training programs and the creation of next generation workforce.

Curriculum Development with SfS

The objective of our first pilot lesson, “Healing the Brain with Electric Current”, is to introduce students to the concepts of neuromodulation and dTCS. Students act as doctors to complete a hands-on activity that incorporates hypothetical case studies for students to determine the best course of “treatment” for their “patients” based on their understanding of chemical and electrical solutions to health-related issues. This lesson is geared towards 7th and 8th grade students. This lesson will be taught during the school day, not after school, ensuring that all students are exposed to the same information, not just students that sign up for after-school programs that may have already self-selected as having an interest in STEM. Teaching during school requires that curricula connect with state and/or national science standards. “Healing the Brain” is informed by the Next Generation Science Standards (NGSS) and is aligned with the 5E Model of teaching.

The Outreach with the Bakken Museum

In addition to in class curricula development, outreach activities and ape exhibits are held to bring public awareness and public engagement to emerging neuromodulation technological capabilities and their applications to human health.

The Anticipated Outcome to Promote Regenerative Medicine in Minnesota

The brain is considered the focal point of the human nervous system and can be involved in its own regeneration, as well as regeneration of other parts of the body. The focus in this educational endeavor, dTCS, is a cost-effective technology platform that is becoming more prevalent in clinical research and home-based medical devices as possible preventative and/or ameliorative treatments for trauma and injury, degenerative diseases, and/or aging processes. This endeavor is focused on developing curricula in science, engineering and technology aspects involved in emerging technology to K-12 students, who may later choose to pursue careers in regenerative medicine and neuroscience. Moreover, the future of regenerative medicine in Minnesota depends on the same factors that affect the STEM workforce across the entire country, while the number of career opportunities in STEM across the U.S. continues to rise, the number of students (especially those from low-income and underserved populations) graduating with STEM degrees is decreasing. Research has shown that 3rd – 8th grade students of all backgrounds are beginning to form their interests and identities. By exposing students in elementary and middle school to STEM medicine and regenerative medicine in particular, we believe we can encourage and motivate students to pursue a career related to these fields and increase the number of individuals that pursue a STEM career.

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