

Undergraduate Thesis Prospectus

Immersive Micro-Vacations for Stress and Anxiety Management

(technical research project in Systems Engineering)

The Controversy over Student Device Use in the Classroom

(STS research project)

by

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem

What conditions lead to more productive environments?

The proliferation of technology in workplaces and schools comes with new concerns, particularly the rise in stress and distractions. Technology is now a part of 90% of jobs in the U.S., including many lower-skilled occupations (Muro, et al., 2017), and is ubiquitous in schools. The technology sector is the largest in the U.S., contributing \$1.8 trillion to the economy (CompTIA, 2019).

Immersive Micro-Vacations for Stress and Anxiety Management

How can virtual reality micro-vacations decrease stress in the workplace?

This capstone project in the Engineering Systems and Environment department is advised by Laura Barnes. We will work with Even Health, an immersive health company focused on promoting emotional strength and stress management in the workplace. The other project team members are Bailey Biber, Max Dodge, Raymond Huang, Olivia Johnson, Zach Martin, Amanda Sieger, Vy Tran, and Sophia Xiao.

Employers are seeking innovative strategies to manage healthcare expenses for employees and their dependents due to rising costs of medical and pharmaceutical treatments. Research shows that 42% of U.S. employees report being stressed at work and consume 15-30% more healthcare services than unstressed employees (Gugger, 2017). This corresponds to \$1,500 to \$3,000 per employee, or \$66 billion for the industry, in potential savings (Gugger, 2017). Many employees struggle to consistently manage stress on their own, suggesting the need for an external aid. Current methods include medications, therapy, and self-care techniques, but these tend to be time consuming or expensive (American Psychological Association, 2018).

Researchers are looking to applications of the Attention Restoration Theory (ART) to attain an inexpensive and efficient outlet.

ART holds that concentration may be restored through micro-vacations, which are short, periodic breaks in nature intended to refocus the mind and regain productivity (Staats, 2013). Micro-vacations have traditionally been taken in real-life environments, however this research will investigate how virtual reality (VR) can replicate and potentially improve the same effects of ART. Stress increases susceptibility to physical and mental illness, leading to higher health service consumption, so this technology will help decrease stress to reduce healthcare costs for employers (Potts, 2017).

Due to project restrictions, we cannot use human images or sounds in our study. We will also have a limited number of participants which will constrain the number of conditions we can test, as treatment groups would become insignificant in size.

Study participants will experience micro-vacations through an enclosed VR booth provided by Even Health. We will measure the physiological and mood changes participants experience pre- and post-therapy, and determine how stress levels are affected. The participants will complete a mood survey and measures of heart rate, blood pressure, and galvanic skin response (GSR) to monitor mental and biological changes, respectively. These preliminary tests will serve as baseline data to compare post-treatment results to.

Participants will then undergo a stressor, consisting of mental math or verbal presentation, to induce minor stress or fatigue. Participants will repeat the mood survey and physiological tests to ensure the effects of the stressor before eliciting the treatment.

One random half of the participant group will be placed in the treatment group and the other half in the control group. The treatment group will be immersed in virtual nature

environments in the VR booth for ten minutes, and the other group will receive a control. We will then repeat the mood survey and physiological tests to measure post-treatment stress levels.

Our team will analyze the data using statistical tests to determine the effects of the VR booth treatment. If successful, results will indicate that immersion in natural VR environments reduces perceivable and physiological stress levels to increase productivity. Even Health's VR booths will be marketed to companies to build emotional strength and stress reduction for employees to ultimately diminish healthcare costs. This research could then be extended to analyze the effectiveness of particular nature environments over one another, sounds, and four-dimensional interaction.

The Controversy over Student Device Use in the Classroom

How are supporters and opponents of classroom technology competing to influence classroom policies and norms that govern device use in the United States?

Device use in U.S. classrooms is controversial. Critics of technology's proliferation in schools have warned of the "Googlification of the classroom" (Singer, 2017). Google, one of the Big Four technology companies, has striven to establish itself in schools, directing much of its marketing to the education sector. While competitors focus on high margin devices and other markets, Google offers low-cost devices, including laptops and tablets, and free apps, including online software such as Google Docs, that support collaboration and offer tools for schoolwork (Singer, 2017). Student users may develop brand loyalty and become accustomed to the interfaces and functionalities of Google tools, increasing the likelihood they will buy Google products in the future.

Many advocates of differentiated instruction, also known as anti-bias education, favor technology in classrooms as a means of adapting instruction to fit the needs, skill levels, and learning styles of individual students (Scharf, 2018). Technology can simplify differentiated instruction and diminish “one size fits all” education (Scharf, 2018). Janice Lintz, founder and CEO of Hearing Access & Innovations, a consultancy that promotes access for the deaf and hard of hearing, addresses that limiting classroom technology can bring unwarranted attention to students whose diagnosed learning needs have earned them special permissions (Lintz, 2017). Nevertheless, only 19% of students attend schools where devices are provided, so students who cannot afford the best products are at a disadvantage (McMahon, 2019).

Classroom technology has privacy implications. Privacy International (PI) and the Electronic Privacy Information Center (EPIC) are advocates of privacy and related civil liberties. Parents look to these groups to resist data collection from their children through their device use and to demand that companies be more forthcoming about data collection (Singer, 2017). The Children’s Online Privacy Protection Act (2000) regulates websites’ privacy policies, the data they can and cannot obtain from children under the age of thirteen, and when parental consent is required. ConnectSafely is a nonprofit organization that educates connected technology users about safety, privacy, and security. It created “The Parent’s Guide to Educational Technology” to help parents understand how their children use technology and why they need it (Gallagher & Magid, n.d.).

Pearson Education is a for-profit publisher that financially benefits from classroom technology that supports its digital products. In the Pearson Student Mobile Device Survey 2015, Pearson Education asked students from the fourth through twelfth grades about classroom device use. Students reported that classroom technology made learning more fun, let them learn in a

way that was best for them, and helped them do better in class (Pearson Education, 2015). Most students wanted more mobile device use and felt they knew more about devices than their teachers (Pearson Education, 2015).

Opponents of classroom devices assert that they distract students and impair performance. While many critics agree that technology can be beneficial, they claim most technology is misused and hinders learning. When personal devices are used, it is difficult to discern if students are learning or engaging in other activities. Richmond and Troisi (2018) found that students in lectures with open device use performed half a letter grade lower on the final exam than those with no device use. The researchers attribute this effect to divided attention. Students tend to learn better when they take notes on paper rather than laptops because taking notes by hand requires active interpretation of information (Mueller & Oppenheimer, 2014). Mueller and Oppenheimer (2014) concluded that students using laptops were more likely to take verbatim notes than those who write by hand, and that verbatim notes require less interpretation.

Critics also question the costs of technology and its effects on brain development and students' skills at reading social cues. Continuous updates and maintenance can be expensive (Walker, 2015). Excessive screen time can harm brain development, especially at young ages, so limiting classroom device use could be beneficial long term (Dunckley, 2014). Students who communicate electronically may not learn the norms of effective communication (Layton, 2012).

References

- American Psychological Association. (2018, Oct). Coping with Stress at Work. <https://www.apa.org/helpcenter/work-stress>.
- CompTIA. (2019). *Cyberstates 2019*. The Computing Technology Industry Association. https://www.cyberstates.org/pdf/CompTIA_Cyberstates_2019.pdf
- Dunckley, V. L. (2014, Feb 27). Gray Matters: Too Much Screen Time Damages the Brain. Psychology Today. <https://www.psychologytoday.com/us/blog/mental-wealth/201402/gray-matters-too-much-screen-time-damages-the-brain>.
- Gallagher, K., & Magid, L. (n.d.). The Parent's Guide to Educational Technology. <https://www.connectsafely.org/the-parents-guide-to-educational-technology/>.
- Gugger, E. (2017). *Quantifying the impact of stress on your employee population's health*. IBM Corporation. <https://www.ibm.com/downloads/cas/QNBKLGOE>
- Layton, S. (2012, Jun 14). 3 Big Points in the Technology in the Classroom Debate. <https://www.aeseducation.com/blog/2012/06/technology-classroom-debate>.
- Lintz, J. S. (2017, Nov 29). Banning Laptops Calls Attention to Students with Learning Disabilities. The Chronicle of Higher Education. <https://www.chronicle.com/blogs/letters/banning-laptops-calls-attention-to-students-with-learning-disabilities/>.
- McMahon, W. (2019, Jun 5). Educators See Positive Impact of Mobile Devices in K–12. <https://edtechmagazine.com/k12/article/2018/11/educators-see-positive-impact-mobile-devices-k-12>.
- Mueller, P. A., & Oppenheimer, D. M. (2014). The Pen Is Mightier Than the Keyboard. *Psychological Science*, 25(6), 1159–1168. doi: 10.1177/0956797614524581
- Muro, M., Liu, S., Whiton, J., & Kulkarni, S. (2017, November). Digitalization and the American workforce. <https://www.brookings.edu/research/digitalization-and-the-american-workforce/>.
- Pearson Education. (2015). *Pearson Student Mobile Device Survey 2015*. Pearson Education. <https://www.pearsoned.com/wp-content/uploads/2015-Pearson-Student-Mobile-Device-Survey-Grades-4-12.pdf>
- Potts, J. (2007, Oct 10). Study of Relationship between Chronic Diseases and Stress. Medical News Today. <https://www.medicalnewstoday.com/releases/85162.php>.
- Richmond, A. R. and J. D. T. S., & Troisi, J. D. (2018, December 12). Technology in the

Classroom: What the Research Tells Us. Inside Higher Ed.

<https://www.insidehighered.com/digital-learning/views/2018/12/12/what-research-tells-us-about-using-technology-classroom-opinion>.

Scharf, A. (2018). Critical Practices for Anti-bias Education.

<https://www.tolerance.org/magazine/publications/critical-practices-for-antibias-education>.

Singer, N. (2017, May 13). How Google Took Over the Classroom. New York Times.

<https://www.nytimes.com/2017/05/13/technology/google-education-chromebooks-schools.html>.

Walker, T. (2015, Jan 8). Technology in the Classroom: Don't Believe the Hype. NEA Today.

<http://neatoday.org/2015/01/08/technology-classroom-dont-believe-hype/>.