

## Solutions to the health problems induced by increased technology use in classrooms

Technology is part of our everyday life. Not a day goes by for most people without opening a laptop or checking a smartphone. In most school districts, old overhead projectors are being replaced with new wireless ones, teachers each have their own laptop, and rows of computers are available for use in the library and IT classes. With the recent surge in smartphone and other portable device use, many schools have jumped on the bandwagon of incorporating technology in the classrooms with Bring Your Own Device (BYOD). But is this a healthy trend? With teenagers already spending so much time staring at a screen, some argue that introducing laptops and tablets in the school curriculum can be severely detrimental to their health. As multiple studies have associated prolonged periods of computer use with many health issues – including myopia, Computer Vision Syndrome (CVS), musculoskeletal (MUSC) disorders, lower fertility rates, lower cognitive abilities and many others – still-growing teenagers are likely to have damaged eyes, MUSC discomfort and according to Devra Davis, Founder and President of Environmental Health Trust and award winning writer and scientist, irreversible biological damage caused by electromagnetic field frequencies (EMF) (1). These health problems, exacerbated by laptop or tablet use at home, must remain the subject of ongoing debate as they can have a lasting impact on a teenager's developing body. Nevertheless, technology will be in our future, and with a few minor changes, BYOD can be a healthy part of the modern high school curriculum.

It may seem as if high school students are not susceptible to severe visual impairment in youth, but statistics clearly show its prevalence. Dr. Blehm Clayton, a renowned ophthalmologist with 14 years of practice, and many others in the same field collaborated in the 'Computer Vision Syndrome: A Review' to find all the symptoms associated with CVS which include eyestrain, tired eyes, irritation, redness, blurred vision, double vision, and dry eyes (1). Pei-Chang Wu along with two other colleagues contributed their study: 'The Long-Term Results Of Using Low-Concentration Atropine Eye Drops For Controlling Myopia Progression In Schoolchildren.' In a survey conducted in the start of their research, Wu and colleagues confirmed the theory that Myopia is now extremely common among high-schoolers, with a high percentage of 84% patients in Taiwan (Wu 1). With so many high school students susceptible to or already patients of ocular disorders, BYOD needs to be wisely integrated into the curriculum. As administrators think it impossible to decrease the duration of laptop use, changes must consequently be made in the working environment to render BYOD

safer for students. Jeffrey S. Combs, who has made commercially available many other useful products, can make custom changes to a laptop screen by turning it into one with refractive power capabilities (Combs). Changing the screen would allow a more fitting display for students who wear contacts/glasses, and decrease the prevalence of myopia or CVS as personalized glare and display is implemented. Additionally, having a better lighting in the work environment can also better accommodate laptop users. Arne Aarås, an expert in applied epidemiology, also presents compelling evidence. In his collaboration with other experts in their expose titled ‘Musculoskeletal, Visual and Psychosocial Stress in VDU Operators before and after Multidisciplinary Ergonomic Interventions,’ he demonstrates that by changing the lights in the work environment, myopia and CVS severity in laptop users stayed the same or increased more slowly than before the changes were made (1). Computer glasses and special contact lenses are also commercially available for purchase, although many ophthalmologists including Allen Peter, who has conducted a series of three studies on this subject, are still debating their effectiveness in preventing myopia, CVS or the worsening of these conditions (1). Addressing this serious concern of visual impairment through such research is one crucial step to address the dangers of BYOD.

MUSC disorders can be another noxious result of long periods of laptop use. Although MUSC disorders can derive from remaining in any static position for a long duration, recent studies have shown that by adding ergonomic aiding accessories to a laptop, the user will be less prone to MUSC and radiation-related problems. Administrators should recommend or provide add-ons to electronic devices if BYOD is to become a permanent part of the classroom. Dr. P Tittiranonda and other renowned researchers conducted a study involving four commercially available geometric keyboards: Apple Adjustable Keyboard, Comfort Keyboard System, Microsoft Natural Keyboard and a placebo keyboard. The results indicated that there is “an improving trend in pain severity and hand function following six months of keyboard use” (1). In this same study, however, results ultimately indicated that ‘no corresponding consistent improvement in clinical findings in the alternative geometry keyboard groups to the placebo group’ (Tittiranonda et al. 1). This further highlights the fact that more research needs to be conducted in order to pinpoint the MUSC health effects of the computer in an era where these devices will be more and more integrated into high school classrooms.

Compounding these issues of visual impairment and MUSC is the threat of toxic levels of radiation. Helke Ferrie, a Canadian medical science writer who has over 15 years of experience states in ‘Our World Is Electropolluted

(Part II): Dirty electricity, EMF radiation can be removed or introduced?’ that radiation in very low, non-thermal levels can cause “neurological damage, flu-like symptoms, cardiac problems, respiratory distress, dermatological symptoms, ophthalmological distress” (1). In our technology-filled world, the school could become an ‘EMF Central’ that induces fatigue, headaches, infertility and ADHD, as this type of radiation penetrates the skin and affects people on a cellular level (Ferrie 1). EMFs are also believed to be the cause of tumors (Ferrie 1), and acute lymphoblastic leukemia (ALL). In a study conducted by Martha S. Linet and colleagues titled ‘Residential Exposure to Magnetic Fields and Acute Lymphoblastic Leukemia in Children,’ the initial results showed no strong evidence that “living in homes characterized by high-measured time-weighted average magnetic-field levels or by the highest wire-code category increases the risk of ALL in children” (1). However, further research refuted this claim with evidence from several studies that shows a direct link from exposure to strong magnetic fields to ALL and other disorders. Although more research needs to be conducted with EMF radiation from electronics to arrive at a consensus, most scientists believe that it does indeed affect one’s health in a negative manner. For administrators concerned with EMF radiation, there are numerous purchasable products that can negate effects of laptop use. Radiation blocking pads are a great option. These pads are portable and interchangeable for any device – tablets and laptops alike. One particular anti-radiation pad, SafeSleeve, decreases the radiation on the bottom of a MacBook from >100mG to <3mG. Perhaps as people spend an increasingly large amount of time on laptops, some will start contemplating the effects of such prolonged periods of use. Whatever the cause, more products should be invented – for example, one that would allow no EMF radiation from laptops to reach any part of the body – and safer computer use should be encouraged if BYOD is to become a part of the school curriculum in our high-tech era.

The simplest way of all to make prolonged laptop use viable in schools is to educate students on safe computer use. A simple one-hour class to high school students will make a world of difference to these frequent laptop users. The first very important point is posture. According to Marcus Michele and colleagues in their article ‘A Prospective Study of Computer Users: II. Postural Risk Factors for Musculoskeletal Symptoms and Disorders,’ anything from changing the angle of inclination of the wrist, the resting position of the hand, the tilt of the head or changing the space between the student and the laptop can lessen the severity of MUSC, CVS, and myopia (1). In terms of EMF radiation, placing the laptop farther away from the lap will lessen the impact of laptop radiation. Just like sound waves, radiation waves decrease

in intensity immensely as the distance between a person and the emitting source increases. Lastly in two separate studies conducted by Christina Lassen and Waldemar Karwowski, the same conclusion was obtained: the easiest way to make laptop use bearable for our bodies is to use it in moderation (1, 1). Regularly taking short breaks will decrease the negative impacts of computer use (Karwowski 1), reflecting Aristotle's simple but effective concept of 'everything in moderation.'

Technology is a vital part of humanity's future, but there is no denying that health problems can arise with long periods of computer use. To set a foundation for a future without glasses-wearing, complaining-of-back-and-neck-pain, unable-to-conceive-offspring adults, changes need to be made to the current learning environment so that BYOD won't be detrimental to students' health. As this essay has demonstrated, there are already effective products and ergonomic changes that can better accommodate safe classroom computer use. With more research, some minor changes, and newer and better products, safe laptop use in classrooms can move from possibility to reality.

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### Reflection

Before starting individual research or even choosing a group, our class watched videos and read articles on education in general. We were then assigned different sides and split into groups to debate about the benefits and downsides of using technology in the classroom. This exercise not only sparked my interest in the health effects of electronics, but also taught me how to research a different side of an argument that I don't necessarily agree with. Exploring all the different elements of a controversial topic not only allows us to understand these issues more completely and thoroughly, but also encourages us to avoid being narrow-minded towards all other controversial subjects. If we can analyze all the possible perspectives, we can feel more confidence that our final position on an important issue will be impartial and hopefully the correct one.

After every group finished debating the pros and cons of having technology in classrooms, my group thought that the topic of health effects of technology use in classrooms, especially bring your own device, was a topic that interested us. We clicked like magnets after that and were unstoppable. **Narrowing down the topic was a simple process of determining what related topic everyone was interested in, and how much information is available on the topic. After deciding on three main health implementations of BYOD, we divided the topics for the individual essays** while I asked to present whether it is proven that there are negative health effects and the potential solutions. Although one group member struggled to find what health issue he/she wanted to research, in a matter of days we helped to determine a better fit for him/her. All in all, the planning phase of the project went along very smoothly with a mutual respect between all the partners that allowed us to hit the ground running.

The individual reading process was also a pleasant experience. As our team's subtopics are closely related, **when a teammate came across an article that could potentially be useful for another, he or she would send it to the appropriate person.** This is a portion of the collaboration process that I found absolutely stellar. Receiving numerous excellent resources from a partner really made the experience into a 'team' atmosphere and made us all feel like we were on the journey as a unified force. The experience was further improved when I decided to approach the reading portion of the task as a voluntary reading assignment instead of a necessary evil, and so by slowing down and taking the time to fully appreciate the information, it simply replaced the relaxation time I would normally spend reading novels. I did still,

however, take the reading process seriously, as I knew that it could make all the difference in my research. I saved quotes with a brief line underneath stating what ideas they could be used to support, so that they would be easier to integrate into my paper. I felt as if I did a good job selecting and using evidence as a result of spending a lot of time researching.

The writing and editing portion of this research paper was also rewarding, but far more challenging for me. My writing skills have never been as strong as my reading skills; as a result, I spent most of my time researching and working on analysis and evaluation than anything else. I experienced some trouble explaining why the evidence is relevant and analyzing it more in detail to truly reflect the evaluation I made regarding my topic. I also had difficulties relating the health issues back to the effect on students in classes. I sometimes could go off on tangents about the health issues that arise with prolonged hours of laptop use; I rarely actually explain or theorize about the health problems in relation to BYOD at school. Although many attempts have been made to better the structure of my research paper, I still feel as if it could be structured more smoothly. It was extremely difficult trying to make the statements flow logically and not feel like it was just listing a series of related facts without explaining sufficiently all the connections between them. In particular, having so many sources that I had to identify made it seem like making a grocery list at some points. I had three main problems that arise with laptop use in schools and many different solutions. Should I organize them by categorizing the solutions or the problems? It was a continual struggle to make sure that everything was as cohesive as it could be, so that the final result was an engaging and impressive research essay and not just a collection of confusing ideas and unproven statements.