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Laptop/Tablets or Textbooks? Which is The Right One?

Watching *Star Trek* back in the early 2000's and even now, the future painted by Gene Roddenberry depicted a society where technology has taken the place of books. Easily accessible, and all of the information someone needed could be read aloud by an artificial intelligence. This might sound incredible, but sometimes, progression isn't always beneficial. As schools begin to enter the technological age, textbooks are now being replaced for laptops and tablets. Replacing textbooks with laptops and tablets would be harmful to a student's education because they would be a distraction, they would create health concerns, and they would not be cost effective.

Students are already distracted in classrooms with their phones and thinking about what to eat for lunch. The addition of laptops and tablets will only make it worse, and this will hinder their education. One study at a prominent university in the Northeast involved 44 Communication major students, 22 males and 22 females. They were issued Dell laptops and were monitored through a proxy server which allowed researchers to collect data. Students had to monitor their own computing activities during lecture, discussion, and lab activities. Immediately, the researchers found that:

It became apparent that while students used their laptops during lecture to explore lecture topics in greater detail on the Internet as well as the library databases, they were also engaging in other forms of computing, such as unrelated browsing, email, and synchronous forms of communication such as CHAT and IM. As stated earlier, it was

this high-tech "doodling" that provided the impetus for the current study. (Hembrooke) Students were placed into a typical lecture where they were encouraged to use their laptops. When the lecture ended, they were sent to a lecture hall and heard an identical lecture, but were told to close their laptops. After both lectures, students were given a quiz consisting of 20 questions on the content, "half of the questions were multiple choice (recognition), while the rest were short answers (recall)" (Hembrooke). While scores were higher during the closed tests, researchers dove into the proxy log to find out what the students were browsing during the open laptop lecture. They looked for sites like Web mail, entertainment sites, E-commerce sites, News sites, and business sites. Analysis concluded that the majority of time spent on class related content, did not correlate with better test performance. Longer browsing sessions throughout the course resulted in lower class performance, while many and shorter browsing sessions, regardless of content, led to higher class grades.

The sustained distraction seems to be the downfall for multitaskers since they allocate the majority of their attention towards the laptop screen instead of the lecturer. Comprehension and having the ability to actively listen to a lecture is influenced severely when technology is introduced. Students are then distracted and those without laptops or tablets will also be distracted through peripheral vision. All of this will lead to poor class grades and low test performance due to having the inability to recall information learned. Sana states that "comprehension was impaired when they performed multiple tasks during learning, one being the primary task of attending to the lecture material and taking notes, and the other being the secondary task of completing unrelated online tasks." Comprehension was also impaired for students who sat in peripheral range of those multitasking on laptops. Technology has proved to

bring some positive features to the classroom, but students who are easily distracted are harming themselves and those around them when trying to multitask. However, harm doesn't only come in the form of retention, laptops and tablets may also cause health problems.

Certain health problems are becoming ever more relevant as we as a society start to be more technologically-savvy. One physical health issue is carpal tunnel syndrome (CTS) which occurs when the nerve running from the forearm into the palm is pressed of squeezed. The symptoms may cause numbness, weakness, or pain in the hand and wrist ("Carpal Tunnel Syndrome Fact Sheet."). Other problems might include posture problems and articular degeneration in the thumb joint and index fingers due to smartphones and tablets. One survey conducted by the Department of Rehabilitation Sciences of The Hong Kong Polytechnic University (PolyU), involved 465 adults aged between 18 to 50 years old. 221 were full-time workers and 244 were college students. They responded that, "90% were daily smartphone users, 74% used desktop computers, 61% laptop computers, and 35% used tablet computers. 70% of respondents reported having experienced neck pain, 65% had shoulder pain, 46% with wrist and finger pain" (The Hong Kong Polytechnic University). Another survey covered a primary and secondary school, with 582 students in total from ages of 10 to 15. The results showed that, "161 persons (27.6%) reported musculoskeletal discomforts related to the use of electronic devices. Close to 80% (127 persons) reported neck pain, 30% (55 persons) had shoulder pain, and 51% (85 persons) had wrist and finger pain symptoms" (The Hong Kong Polytechnic University).

As the surveys have shown, these health problems aren't just relevant with the higher ages, but they are also showing an increased impact for younger ages. School is supposed to be a place that fosters growth and positive influence. The younger ages already spend most of their day on phones, tablets, and laptops as is, therefore implementing a technological focused

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curriculum in school will only support further injuries. Just basing off of the surveys, 46% of adults and 51% of children are already experiencing a form of articular degeneration in the thumb joint and index fingers. CTS might develop for the laptop and tablet users due to repetitive motion of the wrist and hand which are caused when typing, clicking, or moving the mouse and/or keyboard. As time goes on, symptoms will show themselves in forms of numbress in the palm and fingers, especially the thumb, and the index and middle fingers. Favoring laptops and tablets over textbooks will result in a rise of injuries due to more time spent using the technology. Textbooks are more relaxing for the hands since it doesn't require the more intensive motion of typing, clicking, or touching which causes tension in the wrists and hands. Children and adults need a break from technology since their lives are already filled with it. If anything, school should be a place that has minimal usage of technology and allow our body to take a break, before we reach a health crisis. Textbooks already provide information we need, and they are better for our nerves and overall musculoskeletal health. If we don't see that prolonged use of technology is going to be a problem, medical bills won't be the only thing we're paying as a society.

The transition from textbooks to laptops and tablets is simple on paper, but the real problem, with health and distraction aside, is the cost. According to Wilson, "the average high school has 752 students, 43 teachers, and a total budget of \$7.7 million." Wilson uses Apple as an example since they are supplying most schools with their products and services. When a school buys a textbook, it costs \$60, and schools use it for an average of 5- 7 years for a per student cost of about \$10. However, for Apple iText, this will cost schools \$14.99 per student, per year. Totaling it up, Wilson estimates that it will cost \$10.38 per student for a printed textbook and \$15.24 for digital. Buying iTexts, or digital textbooks from Apple won't work in

your hands if you don't have an iPad or Apple device. When talking about iPads or MacBooks, it has a huge upfront cost, and must be replaced every 4-5 years. There are also added costs like insurance and AppleCare service contracts that must be included in the bill at the end. Wilson stated: "The annual cost per device is \$206, or \$163,300 per year for the average high school. Assuming 5 courses this comes out to \$43.44 per class per student." Books will last until the end of time, or until a student spills black coffee all over the pages, even then it can still be readable, and they are their own device – costing \$0 annual payments.

One major problem that arises for many high schools or primary and secondary schools in general, is the strain on the network. Booting up over 700 devices and adding them on to the already slow school network isn't a plug and play situation. The one problem brought up by Wilson is that schools aren't like an office or college environment. Schools run on a bell schedule, and these over 700 some students will all access their devices at once. This sudden and mass usage of one network will cause slowness or overload, and in turn will not be acceptable for a learning environment. If schools are to invest in the already expensive product and services, they can't just throw one or two Best Buy, \$50 wireless access points into their cart. Across the board, schools will have to invest in industrial grade wireless access points that are capable of balancing the load, and have features that can handle the spikes and lag issues. These highergrade products will cost around \$500 or more, and schools will need about 30 to balance the load for about 800 students. In addition, Wilson adds on 4-5 T1 lines that will handle the network volume, and this will cost around \$400 a month/line which comes down to bandwidth needs. All in all, the infrastructure will cost around \$21,750 a year per school or \$6.94 per student per class. Training teachers to provide these services school wide and in classrooms will also cost more money.

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There are a lot of variables when talking about the transition from textbook to laptops or tablets. A lot goes into it, like Wilson pointed out. As said, the upfront cost of a textbook is only around \$60. While Apple's iText and monthly services can severely cripple a school district's budget with about \$15.24 for digital books per student. This is 34% more expensive than traditional textbooks. In addition to the iTexts, schools must invest in devices to go along with digital textbooks. Apple isn't cheap, and along with their services, the added cost is around \$163,300 per year for the average high school. Books are cheaper since it is a one-time purchase, and the payment is upfront without any long-term commitment. The biggest hit to any school district will be the infrastructure. Because like building a house, the foundation needs to be strong or else you'll be paying a large sum of cash in the near future. An average high school of about 750 students will need over \$21,750 a year per school or \$6.94 per student. This includes everything a school needs to support the load they will receive on their network, and accommodate as many students as possible while providing a fast and reliable internet or WiFi. These prices will only increase as time goes on, and prices will probably be double for bigger cities. Certainly, a rural high school or school in general won't be able to sustain such a big hit towards their school budget. At best, they might have one iPad for every class or something conservative.

Star Trek might just remain a dream if we don't find a way to heal our bodies instantly, or eradicate currency. When schools replace textbooks with laptops and tablets, they will be harmful to a student's education because they will be a distraction, they will cause health problems, and they will cost an enormous amount money. Replacing textbooks with laptops or tablets may not be easy or beneficial. We must as a society realize that school and outside life need to be divided, in the sense of leaving technology outside classroom walls. Because, within

those walls, distraction already runs rampant, and the addition of more technology will result in a decline of student comprehension along with poor class grades. Technology has already caused health problems, and schools should be a break from our phones, tablets, and laptops. Carpal tunnel, articular degeneration in the thumb joint and index fingers, and overall musculoskeletal health problems are already seeing significant increase in reports. These numbers will only increase as we introduce more technology into schools, students will start to see more health problems. Cost of implementing all of these innovative technologies will cost the school boards their arm and leg. The education budget is limited as is, and with the addition of infrastructure, products, and monthly services, schools might not be able to afford it. Even if they do, it would not be as cost effective when compared to textbooks. So, the question is, are textbooks better for students, or will the transition to laptops and tablets in favor of online textbooks be more beneficial? We are a long way from answering that, but the immediate experiences point towards paper, traditional textbooks due to it not being distracting, it not harming anyone, and it being cost effective. Sometimes, the old way is better than the new way.

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