



# ANDOVER

## EDUCATION ASSOCIATION

# Educational Technology Report

A Critical Analysis of Ed Tech in the Classroom

2018/2019

## Executive Summary

Over the past decade the proliferation of technology in Andover's classrooms has rapidly changed the dynamics of the learning environment. A veritable deluge of electronic toys, tablets, laptops, books, e-readers, interactive games, and applications have become inextricable from students' daily lives. Much of this technology is specifically marketed to young people, and much of it serves to harvest user data for private sector marketing and research purposes. The considerable effects of this technological eruption and its intersection with the accumulation of data and individual information is changing the experience of education before our eyes. Additionally, what seems clear from the research is that the ubiquity of these technologies in our learning environments poses serious health and safety implications for both students and educators in schools.

The Andover Education Association charged the Technology Study Committee with researching how Andover Public Schools utilizes technology, how AEA members experience technology, what research exists on the use of various technologies on student learning, and on the physical and psychological impact of technologies on students and educators.

We first solicited general feedback from faculty regarding three essential questions:

1. **What concerns do you have about the current technology initiatives and how they impact teaching and learning?**
2. **What concerns do you have regarding the roll-out and implementation of technology in the district?**
3. **What do you see as the strengths of technology in instruction and student learning?**

After reviewing this feedback, we crafted a survey which categorized and pinpointed issues that emerged across the district. We received a statistically significant sample (about 100 respondents/approximately 15-18% of our membership) representing every level of instruction. Thirty percent of respondents were Educational Support Personnel. Among other data, the survey reveals particular concern regarding how student wellness is impacted by technology in the classroom. The complete survey data can be found in the Appendix of this report. Some highlights:

\* 72.8% of respondents "agree" or "strongly agree" with the following statement: **"I am concerned about the amount of screen time students are exposed to at school."**

\* 81.5% of respondents "agree" or "strongly agree" with the following statement: **"I am concerned about the effect screen time has on the social/emotional health of students."**

\* 70.6% of respondents "disagree" or "strongly disagree" with the following statement: **"I am satisfied that adequate safeguards are in place to protect students' social and emotional health as technology use increases."**

**Included in the committee's report are the following findings:**

\* Excessive screen time is linked to an increase in visual problems, anxiety, and depression among children and adolescents.

\* Extensive use of a touch-screen tablet has a negative effect on the fine motor development of children age 5 and under.

\* The academic effectiveness of online and blended learning programs on K-12 students is negligible.

\* Cloud file-sharing programs provided through APS enables Google to mine data from students and faculty members without due compensation for their intellectual property

We hope the following analyses and recommendations open a broader and deeper dialogue between the faculty, management, and the community at-large regarding the understudied, but nevertheless ubiquitous, impacts of educational technology in the classroom.

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## Student Wellness and Learning

As technology has rapidly expanded into almost every conceivable facet of our day-to-day lives, the same holds true for many K-12 classrooms in the United States. While the debate about smartphones and screen time in schools rages both in the U.S. and abroad--one notable European legislature overwhelmingly supported banning students' access to smartphones during the school day<sup>1</sup>--Andover Public Schools has opted to increase student exposure across the board despite evidence indicating the alarming risks of technology to both student health and achievement. In particular, our Bring Your Own Devices (BYOD) initiative has continued to bulldoze ahead with little to no consideration of the potentially harmful effects of ever-increasing student exposure to screen time both at school and at home. In light of an abundance of research that indicates serious cause for concern regarding technology use by young people, it would behoove the Andover Public Schools to conduct a thorough, multi-lateral, and meaningful review of its technology initiatives.

Andover's BYOD initiative has been supported under the auspices of "aim[ing] to enhance student learning by creating a personalized, student centered learning environment where every student has a laptop to use in school and at home. Students will leverage these tools in the classroom to learn how to collaborate, analyze data, and be effective members of a team."<sup>2</sup> In fact, if one were to peruse the *iAndover BYOD Pilot Report* from 2015, the only noted concerns were related to troubleshooting potential network connectivity issues and the financial burden placed on families. Nowhere in this document is there any reference to student health and well-being outside of a passing comment on student complaints re: the weight of their devices. There is, however, an abundance of anecdotal commentary about the purported educational benefits of an increased technology presence at the middle and high school levels. This seems rather odd when one considers that 95% of school administrators across the country feel that students spend too much time on screens at home.<sup>3</sup>

A cursory exploration of recent research indicates that an over-exposure to technology in both academic and social contexts can actually do more harm than good. A 2014 study of 450 undergraduates conducted at West Point indicated a statistically significant decrease in students' performance on exams in classrooms where laptops were allowed<sup>4</sup> compared with classes that did not allow laptops. A more recent undergraduate study from 2017 indicated that an over-reliance on devices/screens as a method of reading leads to poorer student comprehension, particularly with specific textual details.<sup>5</sup>

The impact of technology on students' social and emotional development is considerably more concerning than its effects in an academic context. A 2014 study of college students who had to go without using their phones found that the heaviest phone users experienced the greatest spike in self-reported levels of anxiety.<sup>6</sup> Another 2014 study conducted by the University of California, Los Angeles

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<sup>1</sup>Alissa J. Rubin and Elian Peltier, "France Bans Smartphones in Schools Through 9th Grade. Will It Help Students?" *The New York Times*. Sept. 20, 2018. <https://www.nytimes.com/2018/09/20/world/europe/france-smartphones-schools.html>.

<sup>2</sup>[https://www.aps1.net/DocumentCenter/View/6491/iAndover1to1-Learning-Initiative\\_Final-06-11-15?bidId=](https://www.aps1.net/DocumentCenter/View/6491/iAndover1to1-Learning-Initiative_Final-06-11-15?bidId=)

<sup>3</sup>Christina A. Samuels, "School Principals Overwhelmingly Concerned About Children's Screen Time," *Education Week*. April 17, 2018 <https://www.edweek.org/ew/articles/2018/04/18/school-principals-overwhelmingly-concerned-about-childrens-scree.html>

<sup>4</sup>Susan Payne Carter, Kyle Greenberg, and Michael Walker, "The Impact of Computer Usage on Academic Performance: Evidence from a Randomized Trial at the United States Military Academy" SEII Discussion Paper #2016.02, May 2016. <https://seii.mit.edu/research/study/the-impact-of-computer-usage-on-academic-performance-evidence-from-a-randomized-trial-at-the-united-states-military-academy/>.

<sup>5</sup><https://www.tandfonline.com/doi/abs/10.1080/00220973.2016.1143794?journalCode=vjxe20>

<sup>6</sup><https://www.psychologytoday.com/us/blog/rewired-the-psychology-technology/201706/the-anxiety-epidemic>

found that young people were spending more time than ever before in front of screens, and that it may be limiting their ability to recognize emotions.<sup>7</sup> Young people today are also less socially active in-person than previous generations, and shockingly, 12th graders in 2015 spent even less in-person time with their friends than 8th graders in 2009.<sup>8</sup> A study from The National Institute on Drug Abuse found that, “Teens who spend more time than average on screen activities are more likely to be unhappy, and those who spend more time than average on non-screen activities are more likely to be happy....Eighth-graders who spend 10 or more hours a week on social media are 56 percent more likely to say they’re unhappy than those who devote less time to social media...those who spend six to nine hours a week on social media are still 47 percent more likely to say they are unhappy than those who use social media even less.”<sup>9</sup> A 2017 study from Florida State University found “compelling evidence that the more time teenagers spend on smartphones and other electronic screens, the more likely they are to feel depressed and think about, or attempt, suicide.”<sup>10</sup> When viewed comprehensively, these studies and findings at the very least indicate a need for a much more in-depth examination of the district’s technology policies and procedures, as well as the short and long term effects of technology use on student and faculty social/emotional and physical health.

### **Recommendations**

**1. Screen time guidelines and limits for the school day should be established at all levels:**

These should be grounded in sound academic and medical research, and clearly communicated to all stakeholders.

**2. APS technology initiatives must be thoroughly vetted by a multi-lateral committee of stakeholders that includes parents, students, teachers, and administrators before they are implemented.**

**3. APS technology initiatives should support our stated mission of “providing creative and quality instruction that educates the whole child so that they are prepared for success in college, career and life.”**

**4. APS technology initiatives should be regularly reviewed to assess:** A) The effects on student academic achievement and B) the effects on students’ social and emotional health, as well as compatibility with the district’s educational mission statement.

**5. APS technology initiatives should be supported by sound academic and medical research, as well as demonstrate a measurable benefit to both student academic achievement and student/faculty social and emotional health.**

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<sup>7</sup><https://www.sciencedirect.com/science/article/pii/S0747563214003227>

<sup>8</sup><https://www.theatlantic.com/magazine/archive/2017/09/has-the-smartphone-destroyed-a-generation/534198/>

<sup>9</sup> Ibid.

<sup>10</sup> <https://www.sciencedaily.com/releases/2017/11/171130170212.htm>

## Online and Blended Learning

### Overview

There are numerous K-12 online and “competency-based” learning products available. The driving forces behind Andover Public School’s investment in these products include:

- Perceived improvements in learning outcomes, student motivation, and student engagement
- Cost-savings of online, largely self-directed course content
- Accountability mandates tied to state benchmarks
- Limits on course offerings and credit accumulation in the 7+H schedule
- State and federal grants tied to technology integration and digital learning

Currently the district invests in the following online and blended learning products:

- **Virtual High School**
- **edX**
- **Brigham Young University Online**
- **Keystone High School Online**
- **Folett Destiny**
- **Study Island**
- **Language! Live**
- **PebbleGo!**
- **Read Naturally**
- **Learning A-Z**
- **XtraMath**
- **Dream Box**
- **Prodigy**
- **Lexia**

Included in APS’s Digital Learning Strategic Plan is:

- the expansion of online and blended learning offerings
- online and blended learning PD for teachers
- expanded use of cloud-based applications
- The purchase and use of online textbooks
- and the development of ePortfolios.<sup>11</sup>

### **Student Learning Outcomes**

Scholarship on the impacts of online and blended learning environments on student achievement is limited. A 2010 meta-analysis of research regarding online and blended learning practices was published by the U.S. Department of Education. In its key findings, the report determined that “few rigorous research studies of the effectiveness of online learning for K–12 students have been published...

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<sup>11</sup> “Andover Public Schools Digital Learning Strategic Plan 2013 - 2016” (Updated June 20, 2014). <http://www.aps1.net/Search?searchPhrase=APS%20Digital%20Learning%20Strategic%20Plan>. Accessed on November 7, 2018.

When learners' age groups are considered separately, the mean effect size is significantly positive for undergraduate and other older learners *but not for K–12 students* [Italics added].<sup>12</sup>

The report further cautions that the majority of the published research “that has found blended learning or part-time online learning to be effective has been produced by organizations that promote this strategy.” Additionally, it states that although “claims are made about the relative effectiveness of various blended learning models relative to more traditional forms of instruction...thus far little evidence has been collected to back these claims.”<sup>13</sup>

In fact, scholarly research and the reality of distance learning in higher education provides evidence to the contrary. Professor David Noble, “a critical and highly influential historian of technology, science, and education,”<sup>14</sup> provides cautionary evidence in his book *Digital Diploma Mills: The Automation of Higher Education*, a comparative study of 21st century digital learning and industrial revolution era correspondence instruction. He notes striking parallels between the corporate/profit-driven rhetoric of both correspondence courses and online courses, and the impact of this influence on student-teacher relationships and our understanding of education in a democratic society.

He points out, in referring to 19th century correspondence schools, that the “growing demand for vocational and professional training, generated by increasingly mechanized and science-based industrial activity...devolved into what became known as diploma mills.” He discusses the university response to adopt these same programs, focusing on the leaders of this push for Home Study programs, The University of Chicago, Columbia University, University of Wisconsin, and University of California, Berkeley. In an attempt to protect “traditional academic turf from commercial competition” and with the intent “to tap into a potent new source of revenues, these institutions marketed distance learning programs as “a genuinely progressive movement for democratic access to education.” They invested capital and branding, and led the way in legitimizing home study programs on college campuses.<sup>15</sup>

Similar to the current language of distance learning and digital education products in general, “[t]he chief selling point of education by means of correspondence...was personalized instruction” in which the student “works at his own tempo set by himself and not fixed by the average capacities of a large number of students studying simultaneously.” Home Study programs were commercially promoted to be a more efficient, more democratic, more personalized way to deliver education. But the profit driven character of these programs allowed schools to reduce instructional costs and increase student enrollment, thus increasing the student-teacher ratio.<sup>16</sup>

Today, “the promoters of online instruction” and, by extension, digital education products in general, are finding that the costs of maintaining the technology infrastructure to maintain these multi-media learning initiatives which take students “beyond the classroom and the textbook” prohibitive. Thus, schools are shifting budgets to prioritize technology over staffing and working conditions. Gregory Farrington, president of Lehigh University, observed that “unless the new technologies can be used to

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<sup>12</sup> Marianne Bakia, Kala Jones, Barbara Means, Robert Murphy, Yukie Toyama. *Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Accessed on December 27, 2018.

<sup>13</sup> Ibid.

<sup>14</sup> “UMarmot, the Catablog of SCUA : The Archive of Social Change.” *Double Consciousness [DuBoisopedia ]*, [scua.library.umass.edu/umarmot/noble-david-f/](http://scua.library.umass.edu/umarmot/noble-david-f/).

<sup>15</sup> David F. Noble. *Digital Diploma Mills: the Automation of Higher Education*. Monthly Review Press, 2002.

<sup>16</sup> Ibid.



increase the average teaching productivity of faculty, there is virtually no chance that those technologies will improve the economics of traditional...education.”<sup>17</sup> Noble explains that:

[I]ncreasing the “teaching productivity of faculty”-- whether through job intensification, outsourcing, or the substitution of computers for people--essentially means increasing the number of students per teacher and this invariably results in an undermining of pedagogical promise of the method, as the experience of correspondence instruction clearly demonstrates.<sup>18</sup>

Documenting the conclusions drawn by Abraham Flexner, the general secretary of the Rockefeller-funded General Education Board, who published a series of lectures on the state of higher education in 1930, Noble notes that these lectures:

[D]evoted considerable attention to the unsatisfactory working conditions of instructors...in accounting for the failure of the method, which depended ultimately upon ‘the willingness of the instructor to give a generous amount of attention to the student’. When that fails...the special merit of the correspondence method, individual instruction, remains individual chiefly on the student’s side alone’ and leads to ‘perfunctory reading of reports, lack of helpful suggestions, and delay and neglect by over-burdened’ instructors.<sup>19</sup>

As today’s K-12 educators know well, “the degradation of the quality of the education invariably destroys the incentive and motivation of students.”<sup>20</sup> Rather than create the democratic vision of expanded access to quality, personalized education, the Home Study programs of the 19th and early 20th centuries experienced “remarkably high drop-out rate[s]” that “averaged seventy to eighty percent.”<sup>21</sup>

The “Future Ready Schools” campaign, co-sponsored by the U.S. Department of Education and the Alliance for Excellent Education<sup>22</sup> heavily incentivized the implementation of online learning in public schools. According to a 2015 report by the non-profit organization *Network for Public Education* the expansion of technology in classrooms was accelerated by organizations like the Bill & Melinda Gates Foundation, which “spent \$300 million dollars on developing online learning programs.”<sup>23</sup> In its discussion of part-time blended and personalized learning schools, this same report concludes that “while these school models may be effective at obtaining grants and gaining positive media exposure, there is no consistent evidence that they are advancing student learning or creating other benefits.” Surprisingly, despite this lack of evidence, Andover Public Schools is included in the districts that have taken the “Future Ready Schools Pledge.”<sup>24</sup>

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<sup>17</sup> qtd. in Noble

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

<sup>21</sup> Ibid.

<sup>22</sup> The AEE is a policy institute in Washington D.C. whose top funders include the AT&T Foundation, the Bill and Melinda Gates Foundation, and the Carnegie Corporation. For full list go to: [all4ed.org/take-action/alliance-supporters/](http://all4ed.org/take-action/alliance-supporters/)

<sup>23</sup> “Online Learning What Every Parent Should Know[1].” *Scribd*, Scribd, [www.scribd.com/document/373411455/Online-Learning-What-Every-Parent-Should-Know-1#from\\_embed](http://www.scribd.com/document/373411455/Online-Learning-What-Every-Parent-Should-Know-1#from_embed).

<sup>24</sup> Keisha Hartley. “Future Ready Pledge Districts.” *Future Ready Schools*, [futureready.org/future-ready-pledge-districts/](http://futureready.org/future-ready-pledge-districts/).

## Social-Emotional Well-Being

The available research of the impact of screen time and increased technology use on adolescent psychology is troubling. Although the district has committed considerable resources to SEL (Social-Emotional Learning), the aggressive implementation of digital learning may very well be undermining the effort to create more nurturing, humane learning environments for Andover students. A 2018 study published by the American Psychology Association (APA) provides compelling evidence of significant correlation between the amount of time teens spend on electronic communication and their sense of well-being and general happiness (See Figure 1 at the end of this section). The data studied comes from a wide range of research, including “Monitoring the Future,” a large, nationally representative annual survey of American 8th, 10th and 12th graders since 1991. The report reads: “After staying steady or rising between 1991 and 2011, adolescents’ psychological well-being dropped noticeably between 2012 and 2016.”<sup>25</sup> *Well-being* includes measures of self-esteem, self-satisfaction, life satisfaction, and “general happiness,” all showing a sharp decline after 2012. The report continues:

Adolescents who spent more time on electronic communication and screens (e.g. social media, texting, electronic games, internet) were less happy, less satisfied with their lives and had lower self-esteem, especially among 8th and 10th Graders. In contrast, adolescents who spent more time on non-screen activities such as in-person social interaction, sports/exercise, print media, and homework had higher psychological well-being. Among 8th and 10th graders, every nonscreen activity was correlated with greater happiness, and every screen activity was correlated with less happiness.<sup>26</sup>

Given this evidence, the need for more face-to-face interaction with peers and adults seems essential in the pursuit of more humane and emotionally healthy learning/teaching environments. The growing number of critics from across the political spectrum cite the lack of personal interaction in electronic learning as cause for alarm. Education historian, and former Asst. Sec. of Education Diane Ravitch points out in a March, 2018 report published by the non-profit *Network for Public Education* the irony of online instruction marketing when she suggests the more apt description of “depersonalized learning.”<sup>27</sup> And, in his comparison of online learning to processed foods, Michael Petrilli of the Fordham Institute has warned, “Let’s not double-down on the old industrial model [of education], by turning it into the robotic model.”<sup>28</sup>

## The Role of Classroom Teachers

While parents, educators, and psychologists understand and value the essential role teachers play in guiding young people’s intellectual development, evidence suggests that policy makers and the education market does not. The *Network for Public Education* report notes that “in the online learning context, the ‘teacher’ may or may not be a certified teacher. Even if the ‘teacher’ is certified, he or she

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<sup>25</sup> J.M. Marten Twenge, G.N., & W.K. Campbell. “Decreases in Psychological Well-Being Among American Adolescents After 2012 and Links to Screen Time During the Rise of Smartphone Technology.” *Emotion*. Advance Online Publication. Accessed on January 22, 2018.

<sup>26</sup> Ibid.

<sup>27</sup> “Online Learning: What Every Parent Should Know.” *Scribd*, Scribd, [www.scribd.com/document/373411455/Online-Learning-What-Every-Parent-Should-Know-1#from\\_embed](http://www.scribd.com/document/373411455/Online-Learning-What-Every-Parent-Should-Know-1#from_embed).

<sup>28</sup> Michael J. Petrilli. “Don’t Let Personalized Learning Become the Processed Food of Education.” *The Thomas B. Fordham Institute*, [fordhaminstitute.org/national/commentary/dont-let-personalized-learning-become-processed-food-education](http://fordhaminstitute.org/national/commentary/dont-let-personalized-learning-become-processed-food-education). Accessed on November 7, 2018.

may not have expertise in the subject matter in which the student needs assistance.”<sup>29</sup> The report continues:

In advocating for the transition to full-time or part-time blended learning, proponents such as Michael Horn and Clayton Christensen have proposed eliminating policies or laws that regulate class size and student-teacher ratios, as well as those that require classes be supervised by certified teachers. They propose that supervision by para-professionals would be sufficient, thereby increasing profit.<sup>30</sup>

Allan Collins, retired Professor Emeritus of Education and Social Policy, and Richard Halverson, former high school teacher and administrator, co-authored the 2018 Teacher’s College Press publication *Rethinking Education in the Age of Technology: The Digital Revolution and Schooling in America*. Collins and Halverson lay out the technology-driven vision in detail:

After eighth grade students might follow different educational paths depending on their own and their parents’ choosing. For example, as an alternative to continuing to a traditional high school, a student might take online courses at home or at a Learning Center, enter an apprenticeship program...or attend a Career Academy that organizes curriculum around particular career interests, such as medicine or technology.<sup>31</sup>

This re-structured “educational system” requires fewer seats in classrooms, fewer brick and mortar buildings to house educational communities, and quite clearly, requires far fewer educators. It also suggests a highly stratified society of workers and intellectual elites. The authors end with a strong call to action:

These examples show how educational leaders need to think about changing schools from within...We are not going to fix education by fixing the schools...This is the time for a new Horace (or Leticia) Mann to step forward and lead the nation toward a new education system.

They continue with a detailed policy solution to serve this vision:

If our society is going to support new alternatives for pursuing education, states are going to need to rethink their mandates of keeping kids in comprehensive school until they are 16 years old...For example, the state might mandate that students acquire a specific set of certificates, such as an ability to read and do math at an eighth grade level, before they can pursue a full time job.<sup>32</sup>

A chilling vision which reintroduces adolescent/child labor of a hundred years ago into the 21<sup>st</sup> century should require a critical response from the AEA, and other institutions charged with protecting faculty, students, and the very notion of public education in a democratic society.

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<sup>29</sup> “Online Learning”

<sup>30</sup> “Online Learning”

<sup>31</sup> Allan Collins & Richard Halverson. *Rethinking Education in the Age of Technology: The Digital Revolution and Schooling in America*. Teachers College Press, 2018, p. 142.

<sup>32</sup> Collins & Halverson, p. 144

## **Conclusion**

The most striking takeaway from our reading was the clear lack of objective research on the actual learning outcomes of the “learner-centered” environments of online and digital learning. Even a leading researcher of the conservative *Rand Institute*, John F. Pane, concludes that the evidence for personalized learning is still “very weak.”<sup>33</sup> Furthermore, the evidence that the drive to technologize public schools is funded and marketed by for-profit education companies is compelling. This fact alone is cause for reflection and critical dialogue regarding the use and scope of these products in our classrooms. Professor Noble’s research provides strong evidence of the negative impact on the quality of education, on the motivation and achievement of students, and the commodification of students and learning. While his study addressed digital learning at the college level, the U.S. Department of Education’s finding in 2010 that K-12 student learning was *negatively impacted* by digital and blended learning strategies.

## **Recommendations**

1. To fully inform these discussions, **the committee recommends the AEA request and/or compile the following data:**
  - iXL yearly student enrollment (2015 - present)
  - Virtual HS yearly student enrollment (2015 - present)
  - Completion rate/# of credits awarded via online courses
  - Explanation of how the district monitors and measures student success
  - # of Andover teachers monitoring online courses (and percentage of their instructional day devoted to this activity)
  - # of Instructional Assistants monitoring online courses
  - # of “screen” minutes per class/day (by grade level)
  - # of “nonscreen” minutes per class/day
  - # of online text subscriptions with titles
  
2. **Online courses should be considered as AEA unit work, and our educators and district administrators should control content and quality of instruction-** outsourcing is clearly not appropriate to public education and is not supported by current research.
  
3. **The committee further recommends that we spearhead a “day without technology” campaign. There is currently a “National Day of Unplugging” Friday, March 1 that could serve as a kickoff.**

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<sup>33</sup> Benjamin Herold. “6 Key Insights: RAND Corp. Researchers Talk Personalized Learning.” *Education Week*, Editorial Project in Education, 20 June 2018, [www.edweek.org/ew/articles/2017/11/08/6-key-insights-rand-corp-researchers-talk.html](http://www.edweek.org/ew/articles/2017/11/08/6-key-insights-rand-corp-researchers-talk.html). Accessed Jan. 1, 2019.

Figure 1:

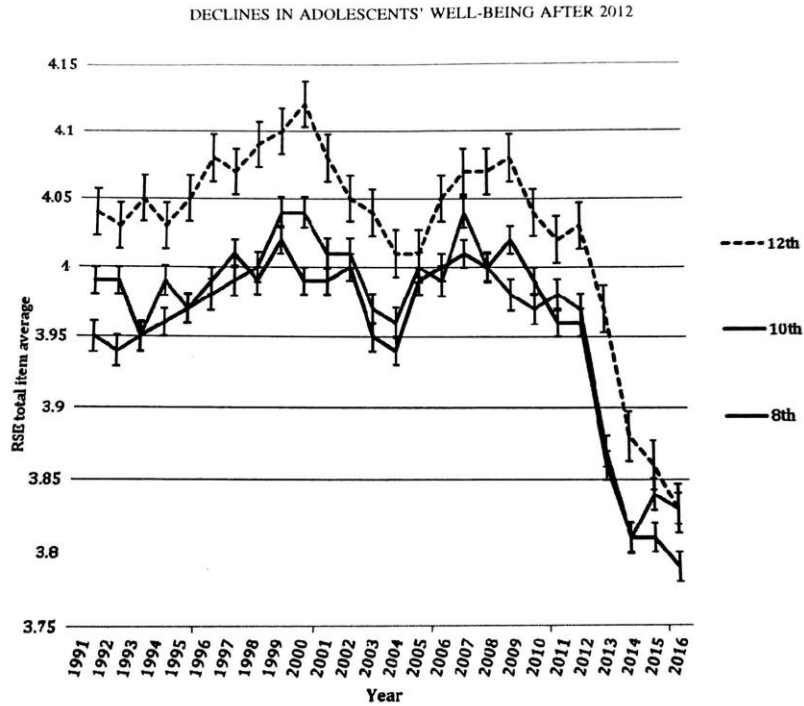


Figure 1. Total self-esteem, 8th, 10th, and 12th graders, 1991–2016. Error bars represent  $\pm 1$  SE. The y-axis is truncated to illustrate the changes. The potential range of self-esteem was 1–5, with an SD of approximately .97. More detail given in Table 1.

Source: Twenge, J.M. Marten, G.N., & Campbell, W.K.. “Decreases in Psychological Well-Being Among American Adolescents After 2012 and Links to Screen Time During the Rise of Smartphone Technology.” *Emotion*. Advance Online Publication, 22 Jan. 2018, <http://dx.doi.org/10.1037/emo0000403>.

## Student Data and Surveillance Analysis

The questions around student and faculty data fall within three broad categories; privacy, use, and ownership. The first two categories likely provoke concern among parents, educators, and the *Andover Education Association* regarding the natural urge to protect students and the labor of faculty at *Andover Public Schools* (APS) while the latter category has more complexity in the emerging educational technology industry that seeks to promote data as a currency. Starting with concerns around protecting privacy and the use of student and faculty data, this report will separate the two constituencies and areas of concern into the following sections:

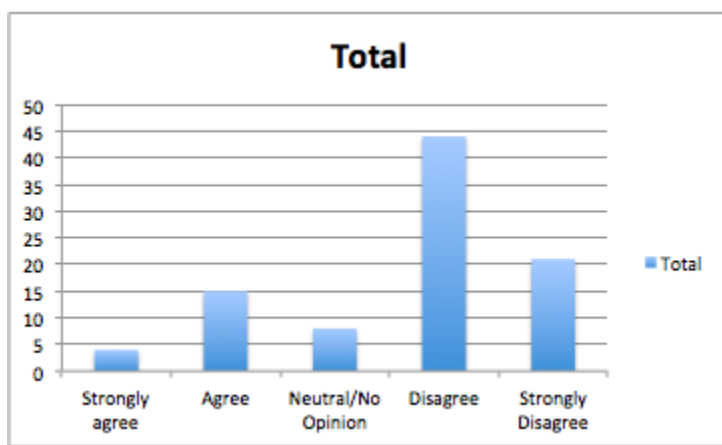
- **Student Data Collection- Privacy and Protection in Context**
- **APS Student Faculty Data Collection- Intellectual Labor and Property Protection**
- **Data Ownership- Toward a New Currency of Education**

Although this report is not meant to review all of the research exhaustively, there is a section of recommendations included in the final section. These recommendations are not meant to conclusively or ultimately resolve the problematics around educational technology, but rather provide some guiding principles for the *Andover Education Association* (AEA) as a democratic and representative body of the educators at Andover.

### **Student Data Collection- Privacy and Protection in Context**

The *AEA* first inquired how the educators felt about current protections around student interactions with educational technology in Andover through survey responses. [Figure 1] indicates a strong sense of anxiety among the Andover educators regarding any type of safeguards or protections structured to address student social/emotional well-being in relation to intensified technology usage. The collection of student data may seem indirectly related to the concerns around student emotional health and technology (and other sections of this report address the correlation of these issues more specifically), however the construction of exhaustive data profiles of children is newly evolving. Although most professionals may not have a clear vision of where this evolution is headed, the qualitative data shows an indisputable concern.

Right: Faculty survey responses to the prompt: **I am Satisfied that there are adequate safeguards in place to protect students social/emotional health as technology use increases.**



This concern is certainly well founded in the broader context of student data collection and the third party entities that are seeking to capture, commodify, and monetize student information. How *APS* fits within this context will follow a brief overview of the clear and present “gold rush” on student information.

Beneath any surface layer of our economy is the accumulation of raw materials; whether looking at the role fossil fuels play in powering factories, or how cobalt mines provide essential raw materials to companies like Apple and Microsoft, the fundamental truth about data is that it is a raw material with tremendous potential to create and control wealth. It’s the new oil. Consider the recent charter school hearing in Haverhill this past November: a national chain of “Montessori” schools called *Wildflower* submitted an application to open two schools in neighboring Haverhill. This type of educational approach was appealing to some parents in the district for apparent progressive and individualized philosophy around student learning. However, a look at the application to DESE revealed that the company would be utilizing

...Sensei Technology: This technology will offer Teacher Leaders a broader view of the Montessori classroom using sensors that may be placed on Montessori materials or attached to classroom furniture, essentially “seeing” students the Teacher Leaders did not deeply observe on any given day. This additional data will help teachers check their observations against the sensors’ information, which will provide data (accessible in a web dashboard) on more students than teachers are able to physically observe at any one time. Sensei is deployed in other WF schools. User studies have shown that the system enhances teachers’ capabilities and helps discover insights that would have otherwise been lost. Sensei augments teachers’ manual observations, helps them plan individualized curriculum for each student, and identifies the need for more interaction with some children.<sup>34</sup>

The sensory technology would most likely be in students’ shoes or harnessed around waists, and then would connect with other objects in the room to create data profiles for what objects attract students repeatedly. One teacher at the hearing suggested that this seemed appropriate for tracking criminals on probation, but why elementary students? The application of this type of data accumulation is already being explored by multiple large scale investors such as Jeff Bezos “of Amazon [who] announced plans to direct \$2 billion, in part, to the creation of a “Day 1 Academies Fund,” which would underwrite the costs of full-scholarship “tier one” Montessori model preschools in low-income communities” to directly inform “sliding prices” on Amazon’s educational products.<sup>35</sup> Other products for intense classroom data collection at this early level, while not specifically touted in *Wildflower’s* application, may include: *LENA* screening- Each child must wear a vest with a recording device for a full day; *We Play Smart Tables*-surveillance play table; and upon enrollment, each family may be issued a device programmed with behavior-tracking games geared to early literacy development and executive function training in the home. Third party vendors almost always provide the services of collecting, organizing, and distributing the accumulated data, whether in charters or public schools such as Andover. The *Wildflower* charter used a company called *Transparent Classroom*, which pledges on its website to use the data “appropriately,”<sup>36</sup> whatever that means, and has support from venture capital investors such as *Omidyar Network*. The

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<sup>34</sup> DESE *Wildflower* Final Application for a Massachusetts Public Charter School: Proposed Commonwealth Charter School by a New Operator (2018-2019), 45.

<sup>35</sup> Allison McDowell, *Wrench in The Gears*, September 2018.

<sup>36</sup> *Matt Kramer’s Blog*- CEO, *Wildflower* Charters, 2016. [incidentally, it’s worth noting that the founder of this charter school chain, Sep Kamvar, was the head of Google’s “personalized learning” department- a group fixated on turning education exclusively into online activity]

venture fund is particularly interested in the data accumulation, stating that “One of the most exciting innovations in the works is wearable and classroom-embedded technologies that will support teachers’ extensive observation efforts...” and identifying their priorities as “Digital Identity, Education, Emerging Tech, Financial Inclusion, Governance & Citizen Engagement, Impact Investing, Property Rights, Tech and Society Solutions Lab.”<sup>37</sup> Impact Investing is a phrase often associated with educational technologies and venture funds. This type of investment is meant to accomplish some new things: create optics which characterizes investments as advancing humane endeavors, provide nonprofit and altruistic cover for hedge-fund investors, allow for greater tax rebates on investment returns, create new markets in (SROI) Social Returns on Investments (i.e. create a market for private public partnerships in formerly public realms like education), and finally, capture human capital- such as student or teacher activity- which has yet to be realized in the form of profit.

The corporate desire for, and the governmental oversight and legislation around student data should not be construed as necessarily antagonistic in relation to each other. As a matter of fact, data collecting/reporting at the state level was first strongly encouraged by the federal government when *No Child Left Behind* “introduced widespread accountability requirements, prompting the federal government to begin awarding grants for the creation of statewide longitudinal data systems.”<sup>38</sup> Student Longitudinal Data Systems, or *SLDS*, at the state level are now required by the federal government, mostly due to heavy lobbying and partnering from the Gates Foundation. The purposes for this are clearly articulated by the Gates Foundation’s *Data Quality Campaign* rationale: “Fully develop high-quality longitudinal data systems in every state by 2009; Increase understanding and **promote the valuable uses of longitudinal and financial data** to improve student achievement; and Promote, develop, and use common data standards and **efficient data transfer and exchange** [my bolding of text].”<sup>39</sup> Gates had moved too quickly with “... inBloom in 2012, the \$100 million corporation funded by the Gates Foundation. Because of intense parent opposition, inBloom closed its doors in 2014, but in the process, parents discovered that inBloom was only the tip of the iceberg, and that the federal government and the Gates Foundation have been assisting the goal of amassing and disclosing personal student data in many other ways,”<sup>40</sup> as the movement continues forward. Even the government’s protective legislation often opens up loop-holes to allow corporate exploitation of student data for product development. The Family Educational Rights and Privacy Act (*FERPA*), the Protection of Pupil Rights Amendment (*PPRA*), and the Children’s Online Privacy Protection Act (*COPPA*) appear to have robust regulatory authority just by their titles, however *PPRA*, for one example, “contains a broad exception to [restrictions on collecting student personal information] where ‘educational products or services’ including district testing, are involved.”<sup>41</sup> Government agencies like the Department of Education also seem to find ways to evade regulatory oversight: “Though the federal government is barred by law from creating a national student database, the U.S. Department of Education has evaded this restriction by means of several strategies, including funding multi-state databases, which would have been illegal before *FERPA*’s regulations and guidance were rewritten by the Department in 2012.”<sup>42</sup> Additionally, the right-wing and corporate

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<sup>37</sup> “Why We Invested: Wildflower Schools,” *Omidyar Network*, 2018.

<sup>38</sup> Sonja Trainor. “Student Data Privacy is Cloudy Today, Clearer Tomorrow,” *The Phi Delta Kappan*, v 96, no 5 (February 2015), 14.

<sup>39</sup> Valerie Straus. “The Astonishing Amount of Data Being Collected about Your Children.” *The Washington Post*, WP Company, 12 Nov. 2015, [www.washingtonpost.com/news/answer-sheet/wp/2015/11/12/the-astonishing-amount-of-data-being-collected-about-your-children/?utm\\_term=.cb219f687a57](http://www.washingtonpost.com/news/answer-sheet/wp/2015/11/12/the-astonishing-amount-of-data-being-collected-about-your-children/?utm_term=.cb219f687a57).

<sup>40</sup> *Ibid*.

<sup>41</sup> Trainor, 16.

<sup>42</sup> Straus.



lobbying group *The American Legislative Exchange Commission (ALEC)*, has developed model legislation for every state around “Innovation Schools and School Districts” that would give public-private partnership schools (presumably ed-tech charters that embrace online instruction) a “greater degree of autonomy,” allowing the schools to “waive some statutory requirements.”<sup>43</sup> Therefore, it’s probably better to view government/the state and private investor interests in the corporate world as working more in concert than against each other when it comes to data surveillance and data mining.

### **APS Student Faculty Data Collection- Intellectual Labor and Property Protection**

So where does *APS* fall within the national context outline above? Everyone is certainly familiar with the drudgery of *ASPEN*, our *SLDS* provider, but where else is student data being collected, mined, and potentially exploited for commodification or profit? Obviously, the Google “Educational Suite” comes to mind, as every student and teacher has been automatically given an account to access *G-Mail* and *Google Classroom*, among other educational services. Attractive to districts because it’s mostly “free,” teachers because it’s seems convenient, and students because most have not known school without Google, the “Education Suite” is prolific and pervasive. Now, the first question that should immediately materialize in an even mildly skeptical mind is: “Why is Google providing this cloud-based service for free or minimal fee?” Well, as recently as 2016 “Online-services giant Google has acknowledged that it collects and data-mines for some commercial purposes a wide range of personal information on student users who log in through its popular Apps for Education service, then venture to the company’s search engine and other products,”<sup>44</sup> admitting that although Google may agree to guidelines around student data on the “Education Suite” Google Apps for Education service (*GAFES*), once a student moves on to another online location, their data is fair game. In 2014 “the company [Google] found itself in hot water after Education Week reported that it had acknowledged “scanning and indexing” student email messages sent using... GAFE[s]. Google officials say the company has since stopped that practice,” however, once a student logs on and veers off the *GAFES*, the regulations on what data is acceptable to utilize don’t seem to apply anymore.<sup>45</sup> Within the *GAFES* apparatus, the Google terms of service with *APS* does articulate some of the ways Google may still use student and teacher data:

When you upload, submit, store, send or receive content to or through our Services, you give Google (and those we work with) a worldwide license to use, host, store, reproduce, modify, create derivative works (such as those resulting from translations, adaptations or other changes we make so that your content works better with our Services), communicate, publish, publicly perform, publicly display and distribute such content. The rights you grant in this license are for the limited purpose of operating, promoting, and improving our Services, and to develop new ones. This license continues even if you stop using our Services...<sup>46</sup>

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<sup>43</sup> “The Innovation Schools and School Districts Act,” *The American Legislative Exchange Commission*. [www.alec.org](http://www.alec.org). accessed 2018.

<sup>44</sup> Benjamin Herold, “Google Acknowledges Data Mining Student Users Outside Apps for Education,” *Education Week*. February 17, 2016. [http://blogs.edweek.org/edweek/DigitalEducation/2016/02/google\\_acknowledges\\_data\\_mining\\_GAFE\\_users.html?c](http://blogs.edweek.org/edweek/DigitalEducation/2016/02/google_acknowledges_data_mining_GAFE_users.html?cmp=SOC-SHR-TW)

<sup>45</sup> Ibid.

<sup>46</sup> Googles Terms & Privacy - <https://policies.google.com/?gl=US&hl=en>. (These were provided by the APS district’s director of digital learning).

The students and teachers essentially create content and products for Google by accessing *GAFES*, utilizing the “Educational Suite,” and -it’s important to note from the *AEA* (labor) perspective- that neither teachers nor students are compensated by Google for their daily intellectual labor.

The question of uncompensated/exploited labor will be discussed further below, but Google also seems to have found a way around some of their own policies and federal laws regarding the use of student data to generate products, wealth, or just plain data currency that can be transferred to other parties. When looking at FERPA, Director of the National School Boards Association Council of School Attorneys Sonja Trainor says that the federal government “prohibits educational institutions from... disclosing education records or personal identifiable information (PII) contained in them except in specific circumstances... we could fill pages with discussion of whether and to what degree student data used by schools for scores of purposes- academic tracking and tailoring, school administration, studies, state and federal reporting- technically amounts to educational records or PII contained in them is subject to *FERPA*...” and that the ambiguity of the law is furthered by numerous exceptions outlined within it when she states that “FERPA and its regulations set out numerous exceptions to the general prohibition on release of student records and PII without parental consent. Two key exceptions are for a ‘school official’ and ‘directory information.’”<sup>47</sup> The most widely accepted definition of a “school official” would probably include reference to faculty and administration, but Trainor states that the term also includes “a vendor providing a service, such as online grading,” and she further stipulates that “the district must inform parents and students in its annual notification who it considers a ‘school official.’”<sup>48</sup> Moreover, the terms of use between *APS* and Google states that “7.4 FERPA. The parties acknowledge that (a) Customer Data may include personally identifiable information from education records that are subject to FERPA (“FERPA Records”); and (b) to the extent that Customer Data includes FERPA Records, Google will be considered a “School Official” (as that term is used in FERPA and its implementing regulations) and will comply with FERPA.”<sup>49</sup> It’s not clear to what degree students and parents in Andover are aware of the wide leeway Google has in collecting, commodifying, monetizing, and transferring student data.

A look at the *APS* technology user agreement leads to further questions around Google’s usage of student- and teacher, for that matter- data and PII. First, the user agreement between *APS* and Google puts the responsibility of acquiring parental consent around the use of student data and information squarely upon the district:

2.5 COPPA and Parental Consent. If Customer allows End Users under the age of 13 to use the Services, Customer consents as required under the Children’s Online Privacy Protection Act to the collection and use of personal information in the Services, described in the G Suite for Education Privacy Notice, from such End Users. Customer will obtain parental consent for the collection and use of personal information in the Additional Products that Customer allows End Users to access before allowing any End Users under the age of 18 to use those services.<sup>50</sup>

I take the terms “Customer” and “End User” to mean the *APS* district and students respectively, so acquiring “consent” should probably be part of the technology user agreement that parents and teachers are required to sign when utilizing technology in the *APS* district. Unless there is a separate “consent” form, neither the district’s “Student Agreement for Participation in an Electronic Communications

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<sup>47</sup> Trainor, 16.

<sup>48</sup> Ibid.

<sup>49</sup> Terms of service between Andover Public Schools and Google:  
[https://gsuite.google.com/terms/education\\_terms.html](https://gsuite.google.com/terms/education_terms.html) (provided by APS Director of Digital Learning).

<sup>50</sup> Ibid.

System,” nor the “Employee Agreement for Participation in an Electronic Communications System,” which aside from minor language are the same document, have any section regarding consent or information as to what third-party vendors are collecting and utilizing student or faculty data. Section IV-B. does indicate that third-party “electronic classrooms” may be used as instructional tools, but requires users to provide log-in passwords to the APS district. Aside from that, a great deal of the policy and agreement seems to be in need of updating as statements such as Section II-B.’s statement that “Access to the system and network is a privilege and is not a right or entitlement” may be out-of-date in today’s digital society where electronic activity is expected and required in so much of the individual student’s life. Another statement from the “Regulations of Use by Students”-26 says “No privately owned computer(s) and/or computer equipment will be permitted to be installed and/or operated on the Andover Public Schools’ network without the express written permission of the Director of Digital Learning,” and since this was published in 2013, the students have been required to bring their own hardware to school as part of the “One-to-One” program.<sup>51</sup>

### **Data Ownership- Toward a New Currency of Education**

The above information really only looks at the most widely used “suite” of educational applications provided to all students and faculty by the Google corporation, and does not account for other applications such as interactive electronic textbooks provided by companies such as *Pearson* or *Houghton- Mifflin Harcourt*, to name a few. These publication companies most likely will be just as aggressive at capturing student/teacher data as they make the transition into the new digital economy Google is pioneering. So, the perplexing questions around privacy and ownership of student/teacher data will probably become more challenging as APS pushes to adopt more educational technology to cut costs, to appear on the cutting edge of educational technology, and to follow trends in public education. However, one vision of user owning their data, and actually utilizing it as a form of “competency-based” currency (like a “Bitcoin) is just as- if not more- troubling.

Take, for instance, *The Ledger* vision for education: first, the problem of alienation of teachers from their practice, and their students, turns upon the concept of what I call the “freelance learner;” a student no longer part of a constituency and with little agency, wandering through a web of market alternatives to public education. As students are trained to produce data through constant exposure to technology in and outside of what is traditionally considered the “school day,” this data product extracted from students’ captured labor is commodified to essentially bifurcate the student from any sort of educational community. The individual student may in fact trade or sell personal competencies for competitive advantages or advancement in the educational marketplace, but essentially at the expense of a connection to a collective process of learning. “Personalized learning,” “online education,” “competency based” digital tracking, and other educational technologies expropriate what is common in learning from the student, and define teachers- alienated from any learning community- as merely managers of this captured student online data. For instance, *The Institute for The Future* promotes *Edublocks*, a *Blockchain* form of educational currency, as a credit hour measurement tracked by an online *Ledger*. An individual may trade this currency for education, temporary employment, or an equity loan on future occupational training.<sup>52</sup> This scenario perpetually exploits the student and potential laborer through constant capture of

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<sup>51</sup> Andover Public School District “Student Agreement for Participation in an Electronic Communications System,” 2013. <http://www.aps1.net/DocumentCenter/View/359/Employee-Ltr-Pol-reg-ArgmntAUP?bidId=>.

<sup>52</sup> Kathi Vian, “Own Your Achievements: Three Ways Blockchain Tech is Disrupting Education,” Posted March 16, 2016, <https://blockchainfutureslab.wordpress.com/2016/03/16/own-your-achievements-three-ways-blockchain-tech-is-disrupting-education/>.

data and activity, rendering the educational process highly circumstantial, occupationally oriented, and completely alienated from any sort of communitive pedagogical experience. See the alarming infomercial for *Edublocks* and *The Ledger* at this link:

[https://www.youtube.com/watch?time\\_continue=1&v=DcP78cLPGtE](https://www.youtube.com/watch?time_continue=1&v=DcP78cLPGtE)

### **Recommendations For AEA**

- 1. Demand to update and negotiate/bargain district technology “Agreement for Participation”:** This should include the student version because so much of the online work the faculty engages in is directly tied to student data and mutual labor in some cases. This negotiation should emphasize faculty/student data security, faculty and parent/guardian consent to any third-party data collection, and disclosure of any data collection by third-party vendors to faculty/students (parents/guardian). The negotiation should also investigate intellectual property claims the district has made regarding the work faculty complete while employed by Andover, as well as Academic Freedom policies- or lack thereof- in the *School Committee Policy Handbook*.
- 2. A declaration of faculty and student rights regarding online data and activity should be developed and disseminated by the AEA working in concert with the MTA.** See Tim Berners-Lee and his work on the *Magna Carta of the Internet*.
- 3. Further research needs to be conducted on programs other than Google which regularly collect student and faculty data, such as electronic textbooks, Virtual High School online classes, Avid, Online Survey Data collected during (AHS) H-Block...etc.**
- 4. The AEA may want to consider meeting with the PAC and hold a community forum on educational technology and student well-being in the near future.** This is probably in the best interest of the AEA and the community, in any eventuality, to build a stronger relationship with parents and develop a vision for bargaining for the common good.
- 5. While the AEA has contract language regarding the surveillance and recording of members in the classroom, it may be time to press the school district/school committee to establish stronger policies regarding the use of smart phones to record or photograph teachers and students. Additionally, a more protective policy around data surveillance should be established by the district.**

## Fair Use and Intellectual Property in the Digital Classroom

Laws governing fair use of materials for educational practice were first revised in 1976, as photocopying machines replaced mimeographs, allowing educators to reproduce numerous copies of reading material with the touch of a few buttons. With the proliferation of digital classrooms and cloud file-sharing in educational institutions, the 1998 Digital Millennium Copyright Act was written to address these issues, but mainly sidestepped them and declared them “unsettled.” Thus, what constitutes copyright infringement in the digital age remains murky, and guidelines for fair use of digital materials should be explicitly addressed in a school district’s technology policy.<sup>53</sup>

Establishing copyright of one’s intellectual property is fairly simple; in fact, “Copyright owners don’t have to record their copyright. Copyright can simply be asserted once the work is fixed in a tangible medium.”<sup>54</sup> This standard is inclusive of written works, whether print or digital, audio-visual work, computer programs, and even paintings. Any work that illustrates originality and/or creativity is protected as the creator’s intellectual property under current copyright law, and thus confers on the owner of the work the right to control the reproductions, distribution, and display of the work.<sup>55</sup> The Fair Use Doctrine allows for exceptions to a copyright owner’s exclusive rights, if certain conditions are met; however, these guidelines are deliberately broad, and fair use is something that needs to be determined on a case-by-case basis.<sup>56</sup> Moreover, while there are specific limits to how much may be excerpted from written work, what constitutes as a “copy” on the Internet is unclear; for example, would retrieving something from a digital file, under the direction of the teacher, be considered a copy?<sup>57</sup>

While many educational institutions include fair use guidelines in their technology policies and/or faculty handbooks, these guidelines do not necessarily address the intellectual property rights of those *within* these institutions. With the increased use of cloud file-sharing, not clearly addressing these rights may inadvertently lead to copyright violations of faculty members’ intellectual property. As noted by Counselor Anne Springer, “it has been the prevailing academic practice to treat the faculty member as the copyright owner of works that are created independently, and at the faculty member’s own initiative for academic purposes.”<sup>58</sup> Additionally, Springer states: “Unilaterally imposed policy [by an administration] cannot legally take away your copyright ownership of your work.”<sup>59</sup> Therefore, it would seem to be a violation of educators’ intellectual property rights if an administration assumed copyright ownership of faculty-produced works, and directed them to be shared on the cloud, reproduced, or modified, without express permission of the faculty member, and within the guidelines of the Fair Use Doctrine.

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<sup>53</sup> Howe-Steiger, Linda, and Brian C. Donahue. "Technology Is Changing What's "Fair Use" in Teaching - Again." Education Policy Analysis Archives. January 12, 2012. Accessed December 26, 2018. <http://epaa.asu.edu/epaa/v10n4.html>.

<sup>54</sup> Springer, Ann. "Intellectual Property Issues for Faculty." On Freedom of Expression and Campus Speech Codes | AAUP. November 2004. Accessed December 26, 2018. <https://www.aaup.org/issues/copyright-distance-education-intellectual-property/resources-copyright-distance-education-and/intellectual-property-issues-faculty>.

<sup>55</sup> Ibid.

<sup>56</sup> U.S. Copyright Office. "Chapter 11: Subject Matter and Scope of Copyright." U.S. Copyright Office. Accessed December 26, 2018.

<sup>57</sup> Howe-Steiger, Linda, and Brian C. Donahue. "Technology Is Changing What's "Fair Use" in Teaching - Again." Education Policy Analysis Archives. January 12, 2012. Accessed December 26, 2018. <http://epaa.asu.edu/epaa/v10n4.html>.

<sup>58</sup> Springer, Ann. "Intellectual Property Issues for Faculty." On Freedom of Expression and Campus Speech Codes | AAUP. November 2004. Accessed December 26, 2018. <https://www.aaup.org/issues/copyright-distance-education-intellectual-property/resources-copyright-distance-education-and/intellectual-property-issues-faculty>.

<sup>59</sup> Ibid.

### **Recommendations For AEA:**

- 1. District technology policy should specifically address copyright provisions and guidelines for fair use in regards to digital works. This policy should be shared with faculty, students, and relevant staff.**
- 2. As institutional policy regarding copyright evolves, faculty should be included in discussions about the development and establishment of such policies.**
- 3. The district's Technology Policy and Staff Handbook should note the intellectual property rights of educators, concerning their independently-produced academic material.**
- 4. The district should place reasonable restrictions to access of copyrighted materials distributed digitally, such as coursepacks, allowing only students of the relevant class to obtain said materials.**

## Technology Occupational/Health Concerns

Millennials are experiencing considerably different childhoods than their previous generations did on the world-wide information/communication highway, and through their general access to research engines and their abilities to choose alternative “online” education opportunities in place of “live” education classes, forums and workshops. As a result, a global explosion in the use of technology devices both in and out of schools in the past 20 years has been remarkable. An onslaught of electronic toys, tablets, laptops, books, e-readers, board games and interactive games by apps continues to grow and flourish, marketed significantly to young people. Despite the availability and ease with which devices are acquired and information can be accessed swiftly and effectively, the eruption of technology in the form of devices has impacted children and teens considerably in recent years and the trend continues to amass at an astounding rate. The continued upsurge of technology has also changed the work and potentially, the health and safety of both students and their educators in schools world-wide.

Recent and countless studies now prove that the longer children and teens spend looking at screens, tablets, laptops and phones, the risks of damaging their brain structure and function increase. In a landmark study being conducted by the *National Institutes of Health in the United States*, the impacts on the adolescent brain of excessive screen time is significant; it affects the physical structure of the brain, emotional development and mental health.

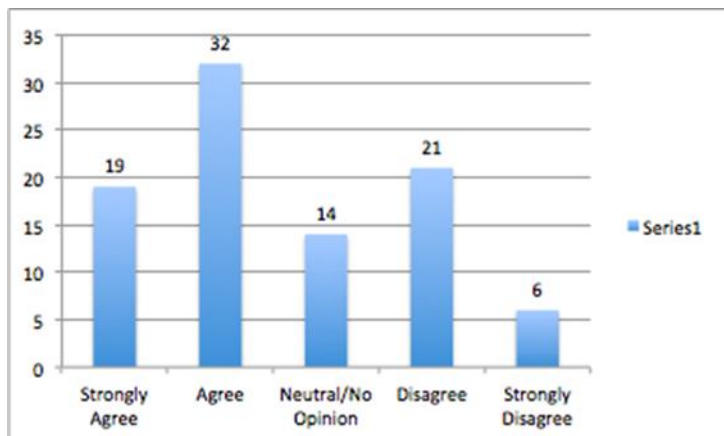
This study includes the interpretation of MRI brain scans of more than 11,000 9 and 10-year-olds who are presently being evaluated and will take more than a decade for results to be conclusive. However, initial results prove that parts of the brain already studied in 4,500 children/teens thus far via MRI scans display significant differences in brains of children and adolescents who used tablets, phones and other screens for 7+ hour per day. For those who spend more than 2 hours/day, it is also noted that their performance is lower on thinking and language tests. Additionally, premature thinning of the *brain cortex* and *frontal lobe* has also been evident in the initial research data. The results further reveal that parts of the brain are beginning to atrophy earlier in children because children are not receiving the human interactions that develop these specific areas and affect attention, executive function and impulse control. The natural atrophy in these specific parts of the brain typically occurs in adolescents between puberty and age 21. Damage also occurs to the *insula region* of the brain, which houses the capacity to develop empathy and compassion for others and allow children/adolescents to integrate physical signals with emotion. This change in the brain affects skills that dictate the depth and quality of personal relationships for children and teens. With an increase in social and emotional issues amongst teenagers across the U.S. is steadily on the rise, it is theorized that excessive screen time is playing an active role in this increase.

Excessive screen time is also observed to be a stimulant through documented MRI scans because it results in the production of Dopamine in the brain. Dopamine is the chemical that stimulates cravings and desire, therefore causing children and adolescents to be more prone to an increase in high-risk behavior at earlier ages. As a result, **digital addiction** is a significant real and legitimate concern from health professionals, doctors, emotional health specialists and educators. **Digital Addiction** and the resulting excessive exposure to screens by adolescents and children also contribute to general sensory overload, lack of restorative sleep and hyper-aroused nervous systems. Children experiencing these challenges are observed to be more moody, impulsive and have difficulty maintaining attention as a result of excessive screen time.<sup>60</sup>

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<sup>60</sup> "Groundbreaking Study Examines Effects of Screen Time on Kids." CBS News. December 09, 2018. Accessed February 20, 2019. <https://www.cbsnews.com/news/groundbreaking-study-examines-effects-of-screen-time-on-kids-60-minutes/>.

An additional growing health concern related to the excessive use of screen devices in children and adolescents include vision-related issues. A recent study by the *National Eye Institute* found that the frequency of myopia (near-sightedness) has increased exponentially in Americans over the past couple decades. Two clear reasons for this spike in vision changes are due to an increased amount of time that children spend looking at things up-close, combined with a decrease in outdoor activity choices where distance vision is more frequently and naturally recruited by the eyes. It is recommended by pediatric



optometrists and pediatricians that there should be a reduction in prolonged exposure of up-close work (such as reading) by children/adolescents on laptops, tablets and other screen devices. Small breaks during prolonged screen reading sessions must be allowed.<sup>61</sup> The

Left: APS teachers were asked if they agree with the statement “I am concerned about the impact of technology on student vision.”

American Academy of Pediatrics recently revised the recommendations for screen time in childhood and these should be respected and translated into school district plans in order to reduce potential damage due to excess screen exposure time:

- **18 months and younger: no screen time is still best. The exception is live video chat with family and friends.**
- **18 months to 2 years: limit screen time and avoid solo use. Choose high-quality programming, and watch with kids to ensure understanding.**
- **2 to 5 years: limit screen time to an hour a day. Parents should watch as well to ensure understanding and application to their world.**
- **6 or older: place consistent limits on the time spent and types of media. Don’t let screen time affect sleep, exercise or other behaviors.**

A separate study recently conducted proved that excessive screen time usage in adolescents was associated with development of acute onset of *Esotropia* (crossing of the eyes) and that limiting usage of devices with screens decreases the degree of eye-crossing in young patients. A portion of the children in this study had to undergo surgery to correct *Esotropia*. Further, excessive screen time can also lead to “Computer Vision Syndrome” which is a combination of headaches, eye strain, fatigue, blurry vision for distance, and excessive dry eyes.

**Suggested recommendations that can help avoid these symptoms are as follows:**

- **Check the ergonomics of workstations. Screens should be placed 20 - 28 inches away from students’ eyes.**
- **Align the tops of screens at eye level so that users look down at screens while they work.**
- **Restrict entertainment-related screen time to 2 hours or less per day.**

<sup>61</sup> National Eye Institute. "Myopia: A Close Look at Efforts to Turn Back a Growing Problem." National Eye Institute. October 03, 2017. Accessed February 20, 2019. <https://nei.nih.gov/content/myopia-close-look-efforts-turn-back-growing-problem>.



- **Practice the 20-20-20 rule: Following every 20 minutes of screen time, users should take a 20-second break and look 20 feet away.**
- **Remind children to blink regularly to avoid excessive dry eyes.**<sup>62</sup>

### Occupational Health and Safety in the Workplace

Several U.S. government agencies and international organizations work cooperatively to monitor research on the health effects of Radio Frequency (RF) exposure in the workplace. According to the *FDA* and the *World Health Organization*, among other organizations, to date, the weight of scientific evidence has not conclusively linked exposure to radio frequency energy from mobile devices with any known health problems. The [FDA maintains a website on RF issues](#). The *World Health Organization*, which has established an International Electromagnetic Fields Project (IEFP) to provide information on health risks, establish research needs and support efforts to harmonize RF exposure standards, provides [additional information on RF exposure and mobile phone use](#). At this link view [more information on the IEFP](#).

Many occupational health and safety interest groups interpreted reports that suggest wireless device use may be linked to cancer and other illnesses, posing potentially greater risks for children than adults in the workplace. These groups include the *National Institute for Occupational Safety and Health*, the *Environmental Protection Agency*, the *Federal Communications Commission*, the *Occupational Safety and Health Administration*, and the *National Telecommunications and Information Administration*. Furthermore, studies by these groups have also suggested that wireless devices may interfere with patients who have implanted cardiac pacemakers if such devices are used within eight inches of a pacemaker.

While such assertions of occupational health risks from wireless devices have gained increased public attention, there is currently much debate around the scientific evidence and data that establishes a causal link between wireless device use and cancer or other illnesses in the workplace. Nevertheless, it is imperative that school administrators and educators continue to be aware of current recommendations as future studies are conducted, interpreted, and continue to provide data-based recommendations regarding the safety of adults and/or students in schools. Those researchers who are evaluating the potential risks wireless device use agree that more and longer-term studies should be conducted to determine whether there is a better basis for RF (Radio Frequency) safety standards than is currently used. The *FCC* closely monitors all of these study results. Additionally, the *New Jersey Education Association* recently published some concerning research on smart phones, and other devices emitting radiation:

The National Toxicology Program (NTP) is conducting the largest set of laboratory rodent studies to date on cellphone RF radiation. The studies cost \$25 million and are designed to mimic human exposure. They are based on the cellphone frequencies and modulations currently in use in the United States. The NTP studies are designed to look at effects in all parts of the body.

On May 27, 2016, NTP released a report with partial results of the studies. They found increased occurrence of rare brain tumors called gliomas and increases in nerve tumors called schwannoma of the heart in male rats. The released results are partial because more rat studies and all of the mouse studies will be forthcoming by 2017. The cells that became cancerous in the rats were the same types of cells as those that have been reported to develop into tumors in human cellphone users.

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<sup>62</sup> American Academy of Pediatrics. "American-Academy-of-Pediatrics-Announces-New-Recommendations-for-Childrens-Media-Use." American Academy of Pediatrics. October 21, 2016. Accessed February 20, 2019. <https://www.aap.org/en-us/about-the-aap/aap-press-room/Pages/American-Academy-of-Pediatrics-Announces-New-Recommendations-for-Childrens-Media-Use.aspx>.

The EMF produced by cellphones was classified as possibly carcinogenic to humans by the World Health Organization in 2011. They found that long-term use of a cell phone might lead to two different types of tumors, gliomas and acoustic neuroma, a tumor of the auditory nerve.<sup>63</sup>

In any event, educators and students should be skeptical of any assurances from studies or research institutes that have any connections to industry or have been financially supported by industry. The academic debates around these issues are often difficult for laypersons to decipher, and although management may routinely dismiss any hazards their source material may be highly questionable and subject to scrutiny in the scientific field.<sup>64</sup>

**Current specific guidelines from the FCC for reducing RF exposure from wireless devices in children and adults in the home, school or workplace include:**

- **Use a speakerphone, earpiece or headset to reduce proximity to the head when using tablets and cell phones to reduce radio frequency exposure.**
- **Increase the distance between wireless devices and your body.**
- **Consider the reported SAR (Self Absorption Rate) value of wireless devices. (All wireless devices are certified to meet the FCC maximum SAR standards, which incorporate a considerable safety margin.)**
- **Avoid placing or using wireless devices in close proximity to a pacemaker**

### **Children and Wireless Exposure in the School Environment**

A growing body of scientific evidence suggests that *chronic*, low-level exposure to Radio Frequency (RF) from cell phones, cordless phones, cell towers and wireless connections to the internet may be harmful, particularly to children. As with the monitoring of Radio Frequencies, it is necessary to understand more about the potential risks of exposures and what sources should be assessed with the proliferation of wireless radiofrequency sources in schools. Placing an excess of wireless technologies in school environments may be potentially harmful to the health of both students and their teachers, as theorized following a study conducted by the *BioInitiative Working Group* in 2007.

This group discovered through their research that cell phones, cordless phones, wireless internet, WI-FI, wireless routers for computers and school-based interactive wireless learning devices are among the sources of exposure that worry current researchers the most. The use of cellular and cordless telephones, and specific wireless devices such as *iPhone*, *iPad*, and *BlackBerry*, can lead to excessively high exposures to radiofrequency and microwave radiation that have been associated with increased risk of malignant brain tumors (glioma) and acoustic neuroma (a benign tumor of the auditory nerve in the brain). Even if students are not actively using cell and cordless phones, it is feared that they may be getting “second-hand radiation” from the use of these devices by others in close proximity. The zone of elevated radio frequency and/or microwave radiation may extend up to 5 feet from the user or location of the device in use.

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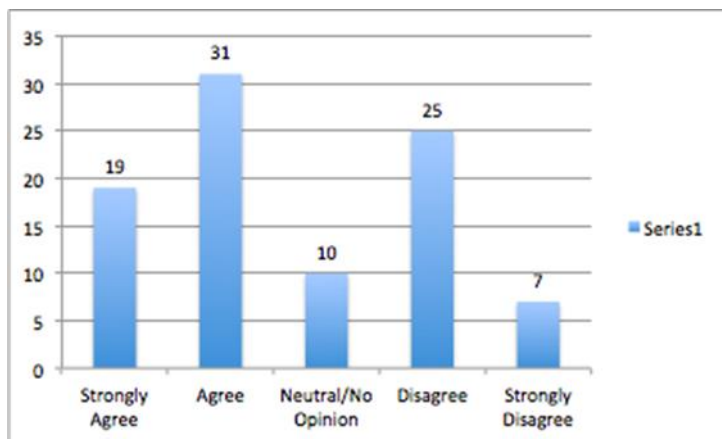
<sup>63</sup> Adrienne Markowitz and Eileen Senn, “Minimize Risks from Electronic Devices.” Published in the September 2016 *NJEA Review*. <https://www.njea.org/minimize-health-risks-from-electronic-devices/>.

<sup>64</sup> “Row over Cancer, Cell Phone Review A Request That It Be Withdrawn,” *The Microwave News*. February 20, 2019. <https://microwavenews.com/short-takes-archive/row-over-review>. This article is just one very recent example of the debate around cancer and cell-phones in the scientific community.

In most classrooms, wireless computer access is the new norm. This requires that wireless internet connections be installed in school work spaces and classrooms. These connections use radio frequency signals to transmit from one or more wireless access antennas which then transmit to each computer in use. In addition, each computer has a built-in antenna that transmits back to the wireless antennas. The wireless internet system therefore exposes students to both the computer source and the wireless access point source of radio frequency. The now antiquated cable modem that preceded today's more modern wireless internet systems involved **no** radio frequency exposure for students and teachers. Additionally, it has been determined that if computers are close together or students gather around one computer in a working group, they may be affected by a significant amount of exposure. Similarly, radio frequency exposures in classrooms where 20 students are working on wireless computers or tablets can, in 1 hour, produce the exposure equivalent to speaking on a cellular phone for 20 minutes. Although this exposure would **NOT** be recommended by responsible adults for **ANY** student, wireless classrooms may now automatically (and unknowingly to teachers and students) be creating high-intensity exposure environments and there are no specific regulatory measures in place to limit such exposure. A similar growing source of exposure comes from the use 'wireless interactive learning systems' in our schools. This network technology provides a wireless connection between students and teachers, allowing teachers to quiz and poll students at any time and receive their responses instantaneously.

It is also evident from the data that exposures to wireless radio frequency are both school-wide and extend from classroom-to-classroom. Cumulative exposures can therefore be substantial over time, affecting all who inhabit the building- students and adults, alike.<sup>65</sup>

### Effects of Tablet Use on Fine-Motor Skills



Left: APS faculty were asked if they agree with the following statement: **I am concerned about the impact of technology on students' fine motor skills and development.**

*Physical & Occupational Therapy In Pediatrics* conducted a study with 80 children (mean age of 5) to

determine the effects of touch-screen tablet use on the fine-motor development (or prevention of adequate development) in preschool children who did otherwise not have any developmental delays. The children were placed in two different groups:

- One group of 40 children who were determined to have used a touch-screen tablet more than 60 minutes/week for at least 1 month prior, received a 24-week home fine-motor activity program using a touch-screen-tablet.

<sup>65</sup> BioInitiative Working Group BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF) Sage C, Carpenter DO, editors. Bioinitiative. 2007 <http://www.bioinitiative.org/table-of-contents/>. Accessed on February 20, 2019.

- The other group of 40 children, matched for age and sex to the first group above but did not meet the criteria for previous tablet use, received a 24-week program consisting of manual play activities.

Following the intervention study, the Bruininks–Oseretsky Test of Motor Proficiency was used to measure fine-motor skills in both groups of children. Data analysis indicated the following results:

- Pre-test analysis showed no group differences in motor performance and pinch strength.
- Post-test scores showed children in the group who did NOT use touch-screen devices made significantly greater progress in the development of fine-motor precision, fine-motor integration, and manual dexterity.

**The researchers of this study concluded that using a touch screen tablet extensively might be disadvantageous for the fine motor development in preschool/Kindergarten-aged children.<sup>66</sup>**

### **Recommendations for the AEA**

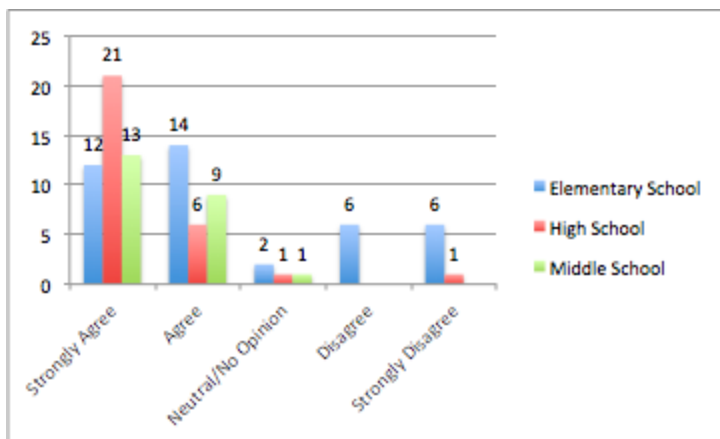
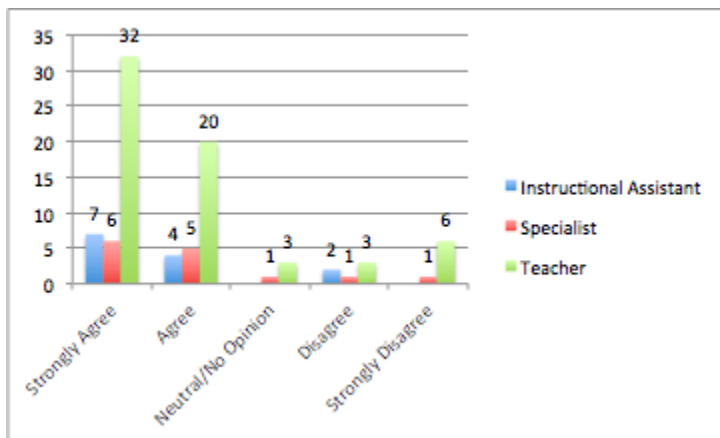
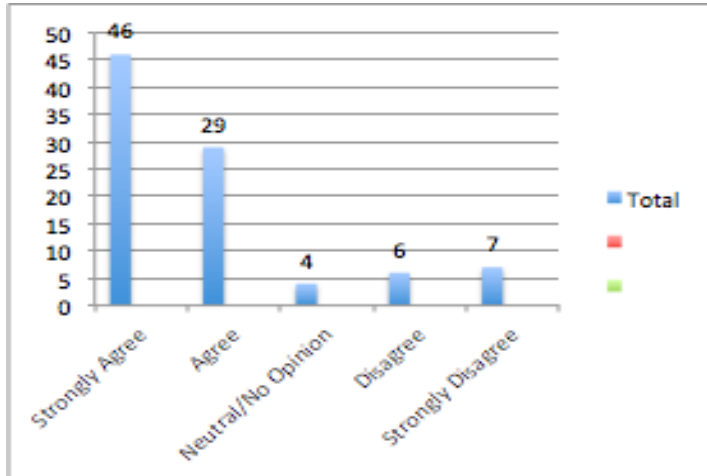
- 1. Now that municipal government workplaces are subject to OSHA requirements, the association should constitute a new division or standing committee to monitor the concerns mentioned above for both students and faculty.** Vigilant attention to the well-being of all APS employees and students should also become part of a broader discussion among management, the association, the PAC, and the community-at large as an ongoing priority. This discussion should be kept current and it may also require management to train a portion of the Human Resources department to be responsive to technology related physical impacts.

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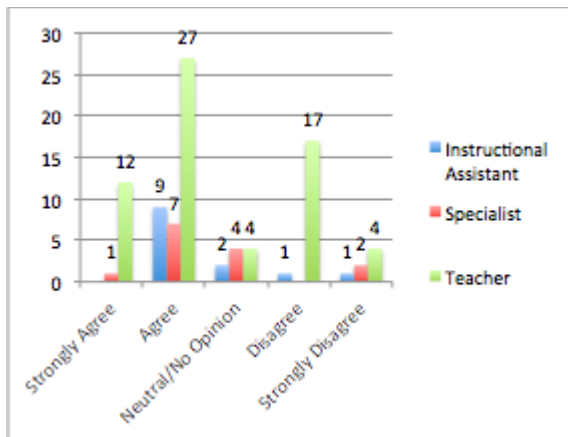
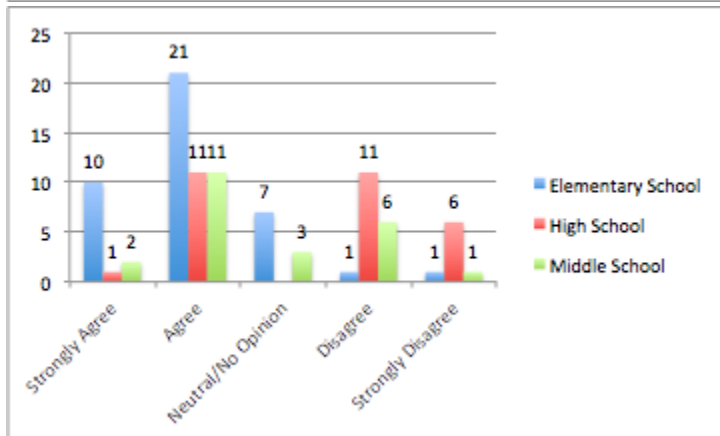
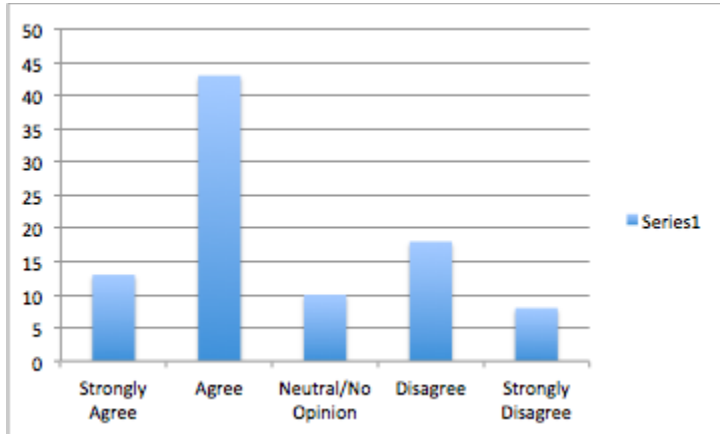
<sup>66</sup> Lin, Ling-Yi, Rong-Ju Cherng, and Yung-Jung Chen. "Effect of Touch Screen Tablet Use on Fine Motor Development of Young Children." [PDF] [www.researchgate.net](http://www.researchgate.net). January 2017. Accessed February 20, 2019. [https://www.researchgate.net/publication/312211810\\_Effect\\_of\\_Touch\\_Screen\\_Tablet\\_Use\\_on\\_Fine\\_Motor\\_Development\\_of\\_Young\\_Children](https://www.researchgate.net/publication/312211810_Effect_of_Touch_Screen_Tablet_Use_on_Fine_Motor_Development_of_Young_Children).

Appendix: Survey of APS District Faculty

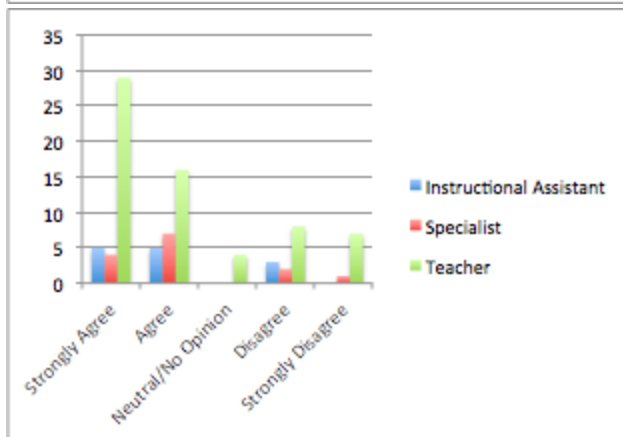
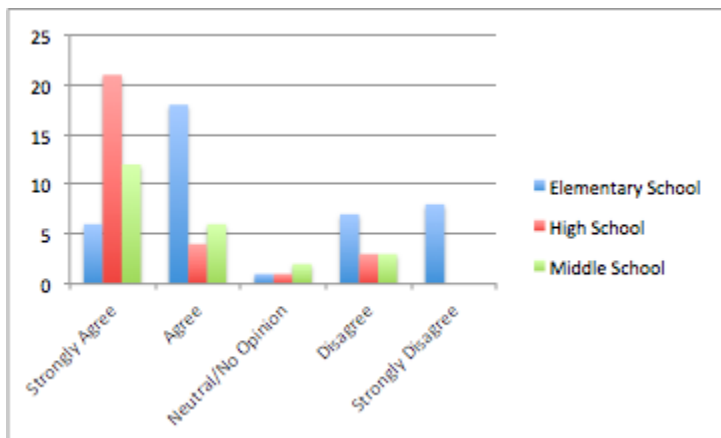
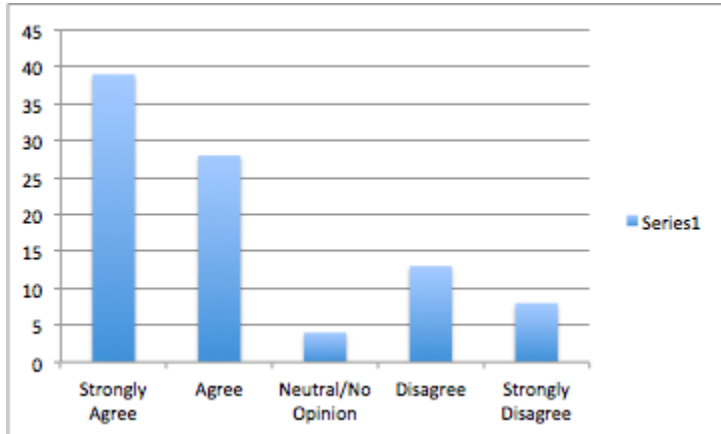
I am concerned about the effects of screen time on social/emotional health of students



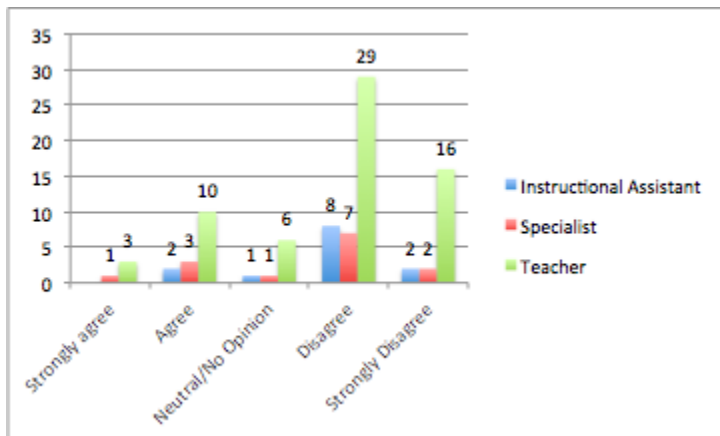
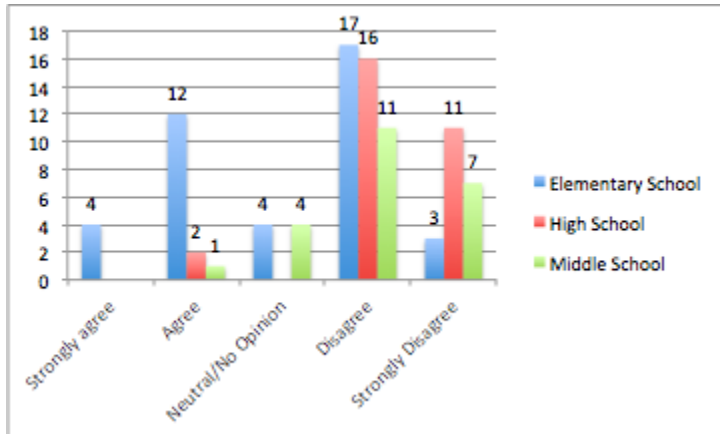
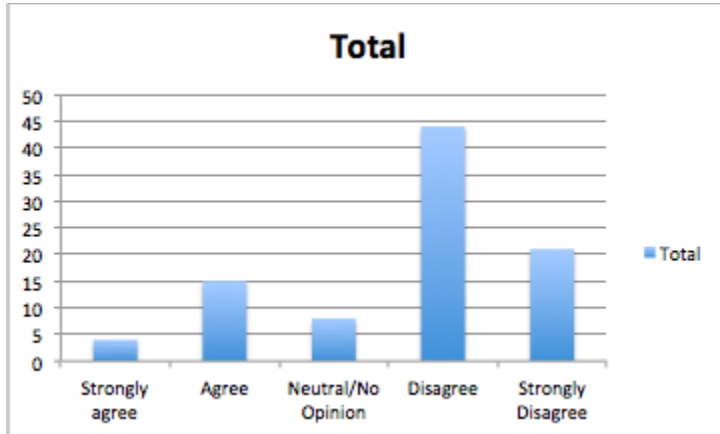
## Technology Initiatives Enhance my Students Learning



**I Am Concerned About the Amount of Screen Time Students Are Exposed to at school.**

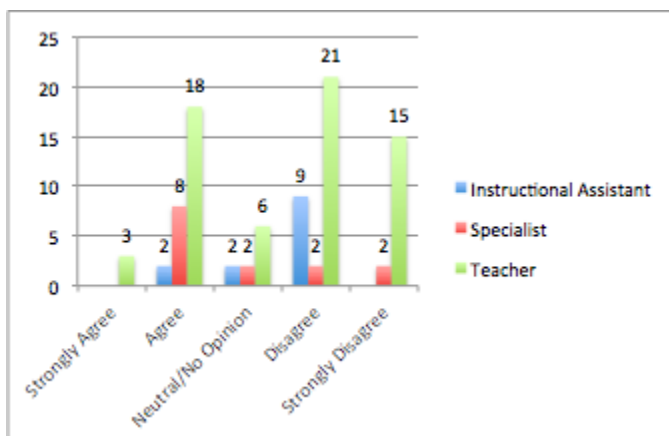
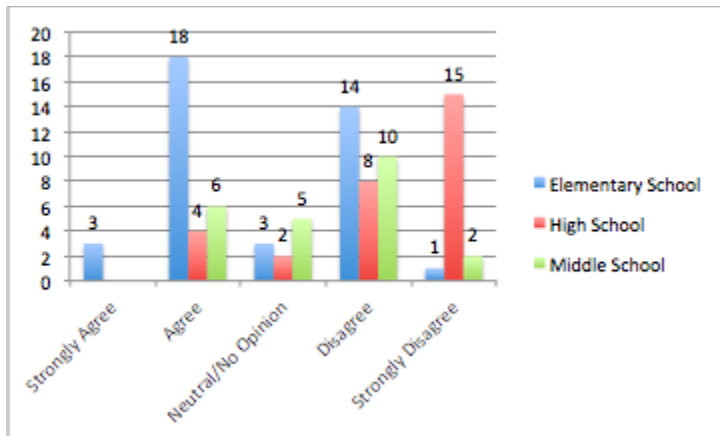
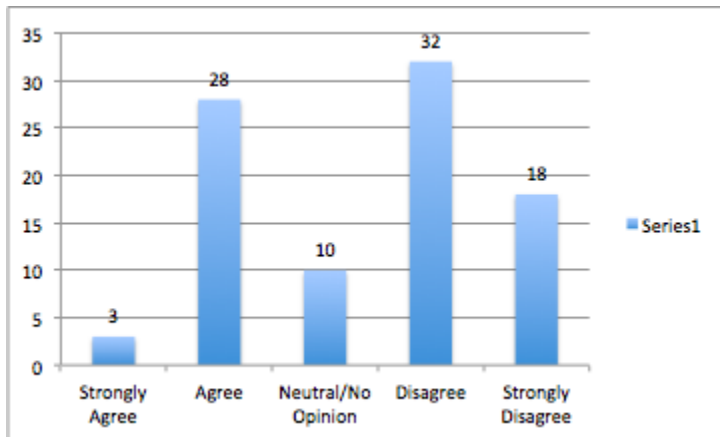


**I am Satisfied that there are adequate safeguards in place to protect students social/emotional health as technology use increases.**

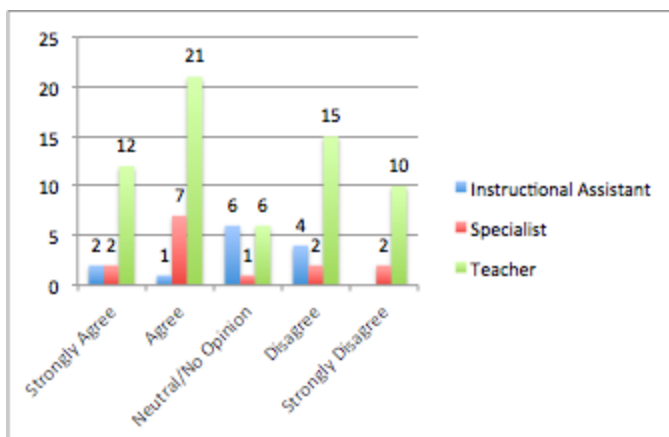
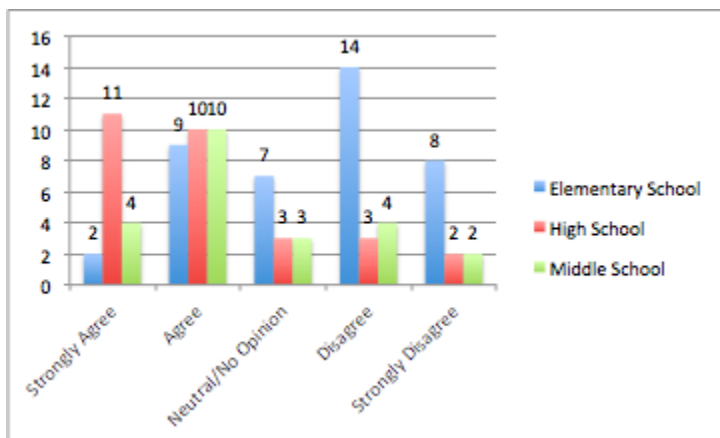
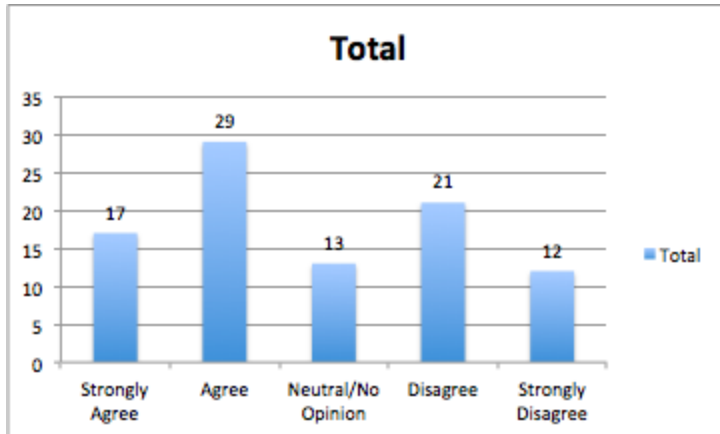




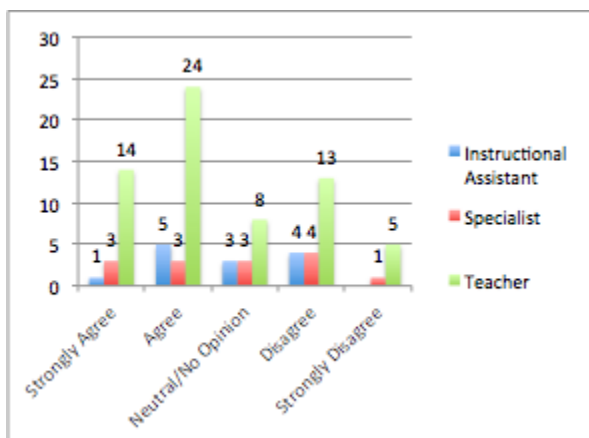
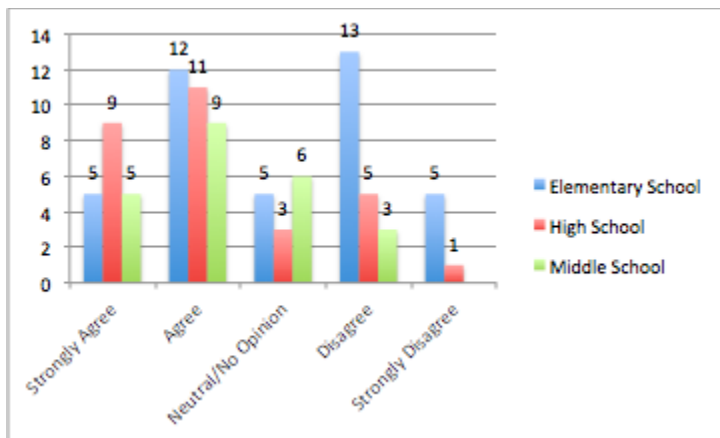
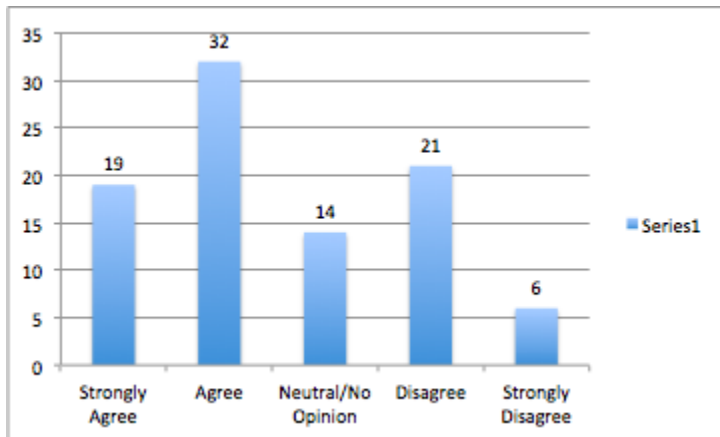
APS provides sufficient evidence and rationale for technology initiatives for classroom use.



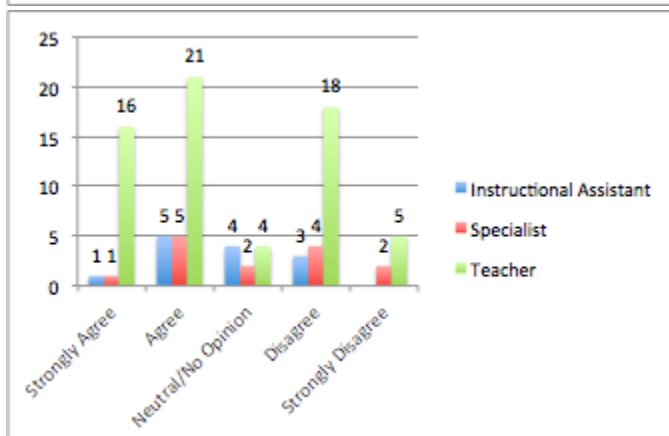
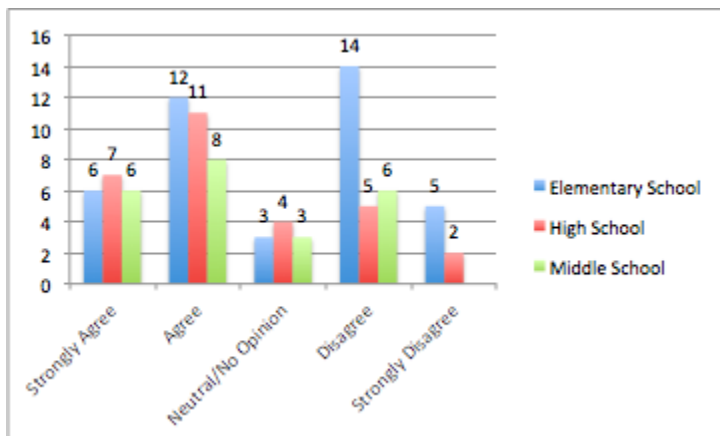
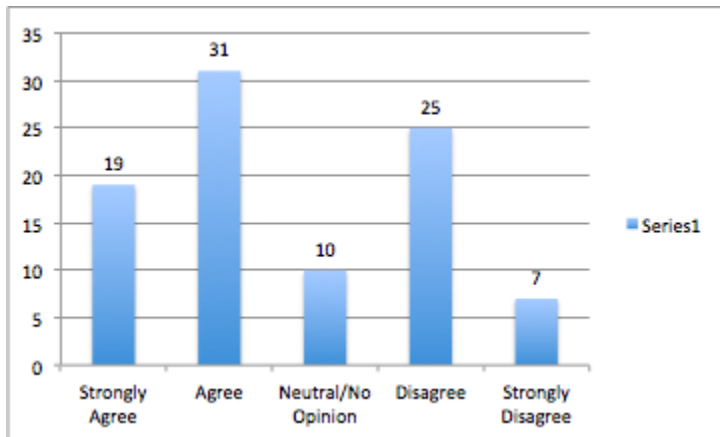
I am concerned about the impact some devices may have on physical health of faculty/students.



**I am concerned about the impact of technology on vision.**



**I am concerned about the impact of technology on students' fine motor skills and development.**



## Contributors

**Julian DiGloria-** has a Bachelor's Degree in History from *The University of Massachusetts, Lowell* and a Master's Degree in Education, Curriculum and Instruction from *The University of Massachusetts, Lowell*. He has taught social studies at Wood Hill Middle School for 10 years and also has taught at Lawrence High School, Lawrence, MA.

**Jen Meagher-** has a Bachelor's Degree in English from *The University of Massachusetts Amherst Honors College* and a Master's Degree in Teaching from *Simmons University*. She has taught English in Andover for 18 years and currently teaches 9th grade English, the intra-disciplinary American Studies course for juniors, and AP Language and Composition for juniors and seniors.

**Matthew J. Bach-** has a Bachelor's Degree in History from *St. Bonaventure University* and a Master's Degree in The History of Art and Architecture from *Harvard University*. He has taught history in Andover for 18 years, and also has taught at *The Gow School*, a preparatory school in New York for students with dyslexia.

**Colette Berard-** *Committee Chair*, has a Bachelor's Degree in History from *Boston University* and Master's Degree in Teaching - Secondary Level Social Studies from *Simmons University*. She has been teaching at Andover for 11 years; 4 years at the high school, where she taught World Civ, Psychology, Anthropology, and 20th Century History; and the past 6 years at Doherty Middle School, where she teaches Ancient Civilizations. She was a co-advisor to the AHS Mock Trial Team for 5 years. Colette is a *National Board Certified Teacher*.

**Lauren McCarron-** has a Bachelor's Degree in Early Childhood Education from *The University of Massachusetts Amherst* and a Master's degree in Creative Arts in Learning, K-12 from *Lesley University*. She is a *Suzuki Association of America* Certified Violin Instructor and Co-Director/Founder of *Andover Suzuki Violin School*, 1998-2003. She Taught Grades K, 1 & 2 for 10 years in Reading Public Schools prior to having taught Grades K & 3 in Andover Public Schools for the past 16 years. Lauren was a 2017 Recipient of *The Manton Fellowship* Scholarship at the Lincoln Center for Education, NYC and represented MA Educators in 2017 at a 1-week graduate seminar focusing on Immersing the Arts into Standard Curriculum, K-12.