

# **WHERE HAVE ALL THE TABLETS GONE? AN EXAMINATION OF THE TECHNOLOGY PURCHASING HABITS OF SUBURBAN TEXAS SCHOOL DISTRICTS**

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**ABSTRACT:** The rapid growth of technology has left many schools scrambling in search of the best technology to implement in their classrooms. Tablet devices such as iPads have seen their popularity rise quickly and dramatically. Teachers want their students to have the ability to be more mobile and engaged in the learning process. However, even with the rapid growth of iPad and tablet use, more recent trends are demonstrating that school districts are slowly moving away from tablet devices to cheaper, more cost-effective laptop options, specifically Chromebooks. We employed an instrumental and multiple case study design to examine the technology directors' tablet or laptop purchase choices at several suburban and public-school districts in the Southern US. We collected data through interviews and surveys. The within-case and cross-case analyses revealed that technology directors often consult district decision makers, but not the students when making purchasing decisions. In one example, a curriculum director chose the district's technological purchases based on personal preference, rather than technology that would best benefit the district long-term, giving the technology director no choice. We recommend further research in what methods are most effective in determining long-term success when purchasing large amounts of technology.

**Keywords:** iPads, tablet computers, chromebooks, technology

## **INTRODUCTION**

As demands for technology in the classroom increase, district technology directors are faced with a daunting task: choosing the right hardware for their districts. For those outside of education, this may appear to be a simple decision: choose what everyone likes and learning will occur. However, this idea ignores the reality many technology directors face daily. Issues include hardware and software costs, old and new equipment compatibility, and the working together of technological components to prevent network failure. A correct choice can lead to a district's technological future, supporting greater student engagement and learning; the wrong choice can leave a district burdened with technology that is not successfully integrated and costs the district both economically and educationally for years to come. This thin line between success and failure is what drove this study, as we examined the importance of proper technology purchases in suburban school districts in the Southwestern United States (Montrieux et al., 2015).

The demand for technology has never been higher as the educational industry has seen significant growth over the last twenty years. Connections created by the Internet are a significant driver of that growth. Students can interact not only with their classroom teachers and peers but have the opportunity to connect to other students worldwide. Students can now take courses online which has increased the urgency for technological growth. Postsecondary institutions' online enrollments grew from 9.6% in 2002 to 32% in 2011 in regard to their total enrollment (Allen & Seaman, 2013). Researchers have been designing educational programs to determine better methods of learning and increased their sample size by having students log in from their homes across their country to participate (Shute & Rahimi, 2017). While some of these ideas are trickling from post-secondary to area high schools, technology itself has practically invaded all school levels down to pre-school.

## **GROWTH OF TECHNOLOGY**

The growth and importance of technology was illustrated by the U.S. Department of Education spending millions in grant awards for those incorporating technology in innovative ways (U.S. Department of Education). The goal to cultivate '21<sup>st</sup> Century Skills' is becoming more prevalent in schools as students are expected to think critically

while using technology as an aid to solve problems (Tweed, 2013). Post-secondary researchers have been examining the benefits of technology use in classrooms and how it has begun to change the ‘traditional classroom environment’ (Diemer, Fernandez, & Streepey, 2012; Demski, 2012; Johnson, Adams, & Cummins, 2012; Mango, 2015; Meyer, 2015; Montrieux et al., 2015). Research was conducted in Denmark where a growing phenomenon called ‘iPad-schools’ has been appearing across the country (Meyer, 2015). School districts have invested in a 1:1 student to iPad program to ultimately limit overhead costs. The deciding economic factor was the considerable amount of money spent on paper copies and textbooks. With iPads, neither was thought necessary because both could have been easily transitioned and used in a digital format. Meyer (2015) went on to argue, “this mobile and personalized tablet support is transforming learning spaces that will allow schools to be more inclusive of different learners and learners’ needs, including children with cognitive challenges” (p. 27).

The idea of ‘freeing’ students by unplugging them from walls and allowing them to use mobile devices was supported by the New Media Consortium’s report (Johnson, Adams, & Cummins, 2012) which pointed out that tablet computing offered new opportunities not offered by more ‘traditional’ devices. Tablets were seen as less cumbersome tools than their predecessors and could have functioned more readily in the field and lab. Johnson et al. (2012, pp. 4-5) went on to point out the following trends in education:

1. People expect to be able to work, learn, and study whenever and wherever they like.
2. The technologies we use are increasingly cloud-based, and our notions of IT support are decentralized.
3. The world of work is increasingly collaborative, driving changes in the way student projects are structured
4. The abundance of resources and relationships made easily accessible via the Internet is increasingly challenging us to revisit our roles as educators.
5. Education paradigms are shifting to include online learning, hybrid learning, and collaborative models.
6. There is a new emphasis in the classroom on more challenge-based and active learning.

These trends are still evident today in schools and seem to be growing each year. Diemer et al. (2012) found that the use of iPads in the classroom increased students’ sense of engagement and in turn had a positive effect on students’ active and collaborative learning. Additionally, Hargis, Cavanaugh, Kamali, and Soto (2014) reported that students who used iPads gained empowerment as they became researchers and more independent learners. This ‘empowerment’ was highlighted by increased levels of lesson engagement and a noticeably positive effect on students’ active and collaborative learning (Mango, 2015). Karsenti and Fievez (2013) found the following benefits to touch screen use in Canadian classrooms:

1. Increases motivation (see Kinash, Brand, & Mathew, 2012; Sachs & Bull, 2012; Wainwright, 2012);
2. Facilitates access to, management of, and sharing of information (see Babnik et al., 2013; Fri-Tic, 2012; Hahn & Bussell, 2012; Martin, Berland, Benton, & Smith, 2012);
3. Fosters student learning and performance (see Churchill, Fox, & King, 2012; Fernández-López, Rodríguez-Fórtiz, Rodríguez-Almendros, & Martínez-Segura, 2013; Isabwe, 2012; Lau & Ho, 2012; McKeach & Ellis, 2012; Ostler & Topp, 2013; Rossing, Miller, Cecil, & Stamper, 2012);
4. Allows a wider range of teaching strategies (see Fernández-López et al., 2013);
5. Fosters individualized learning (see McClanahan, Williams, Kennedy, & Tate, 2012; Wasniewski, 2013);
6. Improves the reading experience (see Fernández-López et al., 2013; Huber, 2012; Sloan, 2012; Zambarbieri & Carniglia, 2012);
7. Encourages communication and collaboration among students and between teachers and students (see Geist, 2011; Henderson & Yeow, 2012; Hutchison, Beschorner, & Schmidt-Crawford, 2012);
8. Improves computer literacy skills (Huber, 2012; Killilea, 2012);
9. Nurtures students’ creativity (Sullivan, 2013);
10. A highly portable tool (see Henderson & Yeow, 2012; Hill, Nuss, Middendorf, Cervero, & Gaines, 2012; Kinash, Brand, Mathew, & Kordyban, 2013; Villemonteix & Khaneboubi, 2012; Williams, Wong, Webb, & Borbasi, 2011);
11. Facilitates student assessment (Alberta Education, 2012; Isabwe, 2012; McKeach & Ellis, 2012);
12. Improves the quality of pedagogical support (Murray & Olcese, 2011);
13. Facilitates learning how to write (Murray & Olcese, 2011);
14. Makes it easier to organize schoolwork and assignments (Churchill et al., 2012);
15. Students can make versatile and vivid multimedia presentations (Murphy & Williams, 2011);
16. Significant benefits for students with learning problems (McClanahan et al., 2012).

When selecting a tablet, districts have a variety of options, but the majority select Apple iPads. If technology directors are searching for an alternative tablet, options such as the Microsoft Surface Pro line, HP Pavilion, Samsung Galaxy Tab, or the Kindle Fire are also available at different price points. Some school districts are

choosing to move away from tablet computers all together, instead opting for the Chromebook line of internet-based laptops. The original Chromebook, which received its name from the Linux-based Chrome OS that runs as its operating system, hit the market in January of 2011. Since its introduction, its fast boot up speed, reliability, and low cost have made it a highly sought-after tablet alternative. Today, Chromebooks are making large strides in education as they have become the tool used most frequently by students and educators in the classroom per a survey conducted by *Education Week* (see Figure 1). Chromebooks provide greater mobility to students, much like iPads, but have more of the laptop feel that tablets lack. Each Chromebooks can cost from \$229 to \$259 for a school district (Herold, 2014) versus the more expensive iPad which costs anywhere from \$250 to \$830 per unit (Molnar, 2014) depending on the included features. The cost of Chromebooks is a huge draw for school districts as they are making their device selections (Sandford, 2013; Schaffhauser, 2013). As of 2017, the Google operating system, installed on devices made by different companies, represents 58 percent of the U.S. market, an increase of 20 percent from just two years ago (Cavanagh, 2017). The remaining 42 percent of the US market is shared by Windows, Mac OS, Linux, iOS, and Android. A recent Edweek Market Brief, *Amazon, Apple, Google, and Microsoft Battle for K-12 Market, and Loyalties of Educators* (Cavanagh, 2017), highlighted the growth of the Google operating system and Chromebook sales further. In Figure 2, teachers were surveyed to determine which ed-tech productivity suite they use most frequently in their districts and classrooms (Cavanagh, 2017). These results demonstrate a shift away from touchscreen tablets, back to a lighter, quicker laptop.

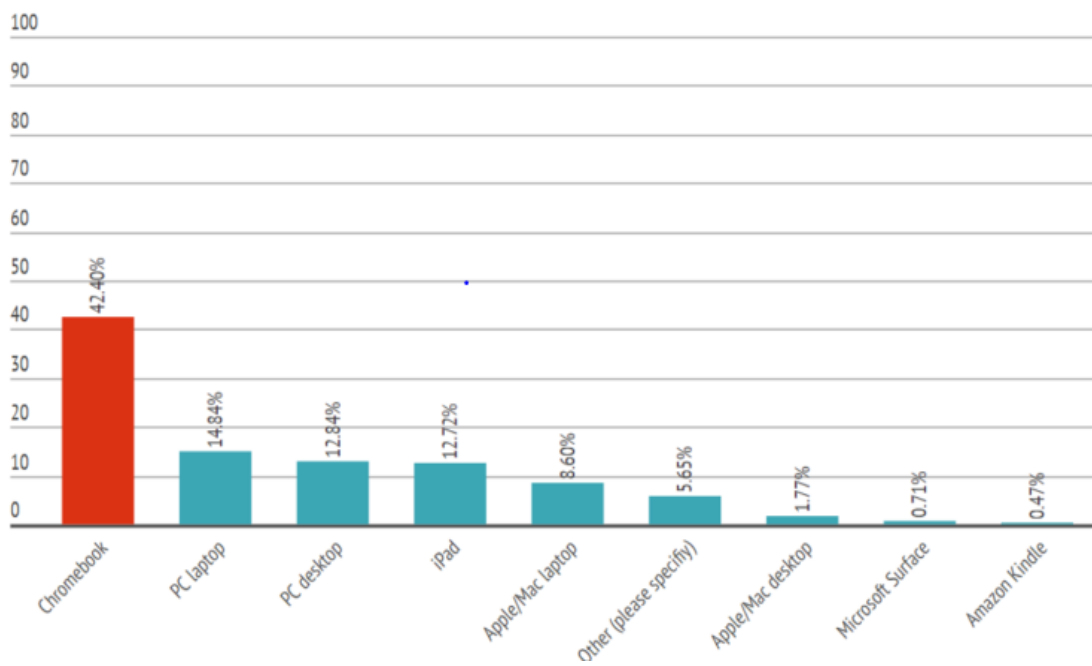


Figure 1. The tools most frequently used for instructional purposes in classrooms surveyed by *Education Week* (Cavanagh, 2017)

Some of the reasons for this shift are listed in the Technotes Blog (2017) from the Texas Computer Education Association (TCEA):

1. Save money (anywhere from \$50-\$600)
2. Simple is good
3. Long battery life
4. Easy sharing
5. More security
6. A gentle learning curve

While every piece of technology has its downside, Figures 1 and 2 illustrate that an increasing number of Chromebooks have been purchased by schools instead of iPads since 2012 (Herold, 2014).

Microsoft, traditionally more of a computer software company, has recently announced its entry into the educational computing market with its ‘Surface Laptop’ which runs on a lighter, faster version of Windows 10, called Window 10 S. While the \$999 price tag targets college students, the company is endorsing new devices made by their partners Acer, Dell, HP and Toshiba. These partner companies’ devices, priced at \$189, are aiming at the school market. (Cavanagh, 2017). The cost-efficient price point of the new partner devices would put them

on par with current versions of Chromebooks and at half the price of iPads. No matter what choice is made, student learning opportunities can be multiplied when technology is applied properly (Clark & Luckin, 2013)

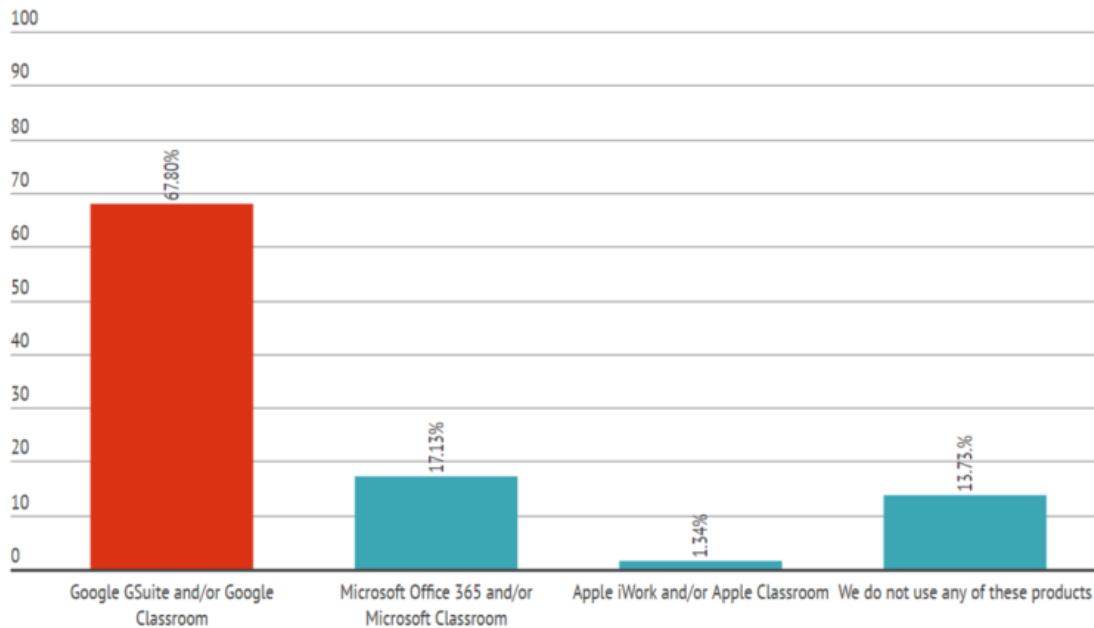


Figure 2. The productivity suite used most frequently by teachers in their districts and classrooms (Cavanagh, 2017)

### Technology Application and Integration

The proper application of technology has been examined by researchers explaining how teachers and their development are central in properly applying technology in the classroom. In 2004, Clifford, Friesen, and Lock declared:

Preparing teachers for the 21st century requires a close look at what it means to teach and learn in increasingly networked, technology-rich, digital classrooms. Teacher preparation programs need to create intentional learning environments, where pre-service teachers can explore issues that are relevant and develop pedagogies that are effective for a knowledge era. They need to develop new images and expertise to design and facilitate meaningful learning with technology. (p.19)

However, Tweed (2015) highlighted the belief that the real key to proper technology application and success is not professional development but teacher self-efficacy. Schools considering transitioning to 1:1 student to iPad programs or increasing additional technology investment should first confirm that their teachers are as open to the idea of technology in the classroom as district leadership. Without teacher acceptance, as supported by Tweed (2015) and somewhat by Clifford et al. (2004), districts will find their expensive technology quickly becoming unused. Abrahams (2010) explained that to fully incorporate technology, the issues of the teachers must be addressed, otherwise there will be push back and the technology will remain unused.

With research showing proper technology integration and use improving student engagement and achievement, why are school districts not immediately going to a 1:1, student to iPad program? As stated above, this idea ignores the reality of most school districts. When it comes to selecting an appropriate device for students in a school district, several factors must be examined.

### Selecting a Device

Each school district across the country has unique technological needs. Demski (2012) highlighted three main foci when making hardware decisions (listed in no specific order): instructional needs, management, and cost. Each person interviewed in the study held a leadership position within their district, most were superintendents and the rest technology directors. District leaders discussed the need for research and the process involved in making such a critical decision. Many formed stakeholder committees, visited nearby districts, read current research on which

devices were more effective, and finally, compared the cost of the different hardware/software packages. The demand for proper planning and research has grown to such an extent that there are now websites district leaders can go to find current research and pricing information. These websites were developed to 'help provide guidance to administrators and educators in the selection of instructional materials' (Rationale, 2017). District leaders can visit these websites and find breakdowns dealing with planning, budget and funding, selection, and implementation and effectiveness.

## **STUDY PURPOSE, QUESTION, AND METHODS**

The purpose of this study was to explore the technology directors' tablet or laptop purchase choices at several suburban and public-school districts in the Southern US. To guide our study, we posed the following main research question: What methods do district technology directors employ when choosing a type of computer, tablet, or laptop for their district? We employed a multiple case study design (Stake, 2013) to explore technology directors' choices of purchasing either tablet computers or laptops.

### **Participants and Their Selection**

When selecting technology directors to interview, we chose six different districts in a fairly close geographical area. We used a convenient sampling strategy (Creswell, 2013) in which researchers selected the interviewees according to their proximity and accessibility to the researchers. Additionally, each district represented one of three popular technology implementation methods: 1:1 laptop computer program, 1:1 iPad program, or bring your own device (BYOD) program.

### **Study Instruments**

#### **Interviews**

We created a questionnaire (see Appendix A) seeking to establish the technology directors' backgrounds, why their districts selected a particular technology, and where they believed technology was heading in the near future.

#### **Data Collection**

The first author interviewed the technology directors from the six districts. Some participants were interviewed in person and others were interviewed by telephone at their convenience. We invited each participant individually by email. Each volunteered and their rights as participants were explained prior to conducting the interview. They also reviewed and signed the human consent forms approved by the University's Institutional Review Board (IRB) for research.

#### **Analysis**

To analyze the multiple case study findings, we used two methods of analysis: a) within-case analysis and b) cross-case analysis.

#### **Within-Case Analysis**

##### *District A*

This district represents the smallest district in the study with a student population of 2,349. They have a predominantly White student population, 1,564, followed by Hispanic, 571, and African American, 81. District A is a 1:1 laptop district that uses MacBook Airs. While they have followed this method for more than 5 years, there are currently plans to shift to the more cost-effective Chromebooks.

##### *District B*

This district is the most technologically advanced district in the group. They offer a number of types of technology to their teachers and the 11,851 students within their district. District B district has chosen the 1:1 iPad method and applies it from grades 4-12. This is the only district in the study in which White is not the dominant demographic. The Asian population represents 4,832 students, while the White population represents 4,540 of the student body.

### *District C*

This district has the most diverse student population of the six districts. White is the dominant demographic at 13,841, with Hispanic at 8,219 and African American at 3,683. This district follows the bring your own device (BYOD) model. They offer a number of technology programs for students to gain certifications prior to graduation. They have decided to focus not just on the devices, but the entire classroom environment. They are spreading their funds to a variety of areas such as classroom redesign, charging stations, and the investment in a more robust network to support the increased device use.

### *District D*

This district represents the largest and fastest growing district of the group. It has a student population of 53,130, which is led by the White demographic at 27,062, followed by Asian, 11,087, Hispanic, 7,313 and African American, 5,547. This district is growing so quickly that there is little money to keep up with the growing technology needs of its students. They have chosen the BYOD model and allow their campus administrators and technology coaches to determine what needs to be purchased instead of making district wide purchases. The belief is that this will support individual student needs more effectively than making district wide decisions.

### *District E*

This district is an established district that is in the initial stages of implementing a 1:1 approach using MacBook Airs. They will complete their laptop distribution to the high school population next year. They fall into the middle of the district populations at 24,626 students. Their largest population is White, 37,062, followed by Hispanic, 6,935, and African American, 3,270. This is the only district to convene a committee of all stakeholders: community members, administrators, teachers, and students, to make the final technology choice. Each group member was able to try out each technology option considered and then weighed in with their choice.

### *District F*

This district is the second smallest district in the study with a population of 8,254. The largest demographic is White, 5,869, followed by Hispanic, 1,032, and African American, 606. This district is in the process of piloting a 1:1 program with Chromebooks. They want to ensure that the correct long-term technology decision is made; however, they are progressing slowly because their growth projections continue to increase dramatically.

## **Cross-Case Analysis**

Each district, except one, came to their technology decisions as part of a group. District E was the most inclusive, bringing in all stakeholders, while the rest focused mainly on the district decisions makers: superintendents, technology directors, administrators, etc. District A was the exception because their path was chosen by one person. Due to the size of the district, this approach was not as much of an anomaly as it would be at the larger districts in this study. All directors believed technology should be a tool for teachers and students, not a replacement for learning. In their search for technology, each director commented that they wanted to select a device that would engage students and allow them to become active participants in their learning. Interestingly, when asked to outline their ‘perfect’ technology path, as if money were not an option in their district, their decisions were all strikingly similar. Each thought students at the Kindergarten level should start with iPads as there are a number of excellent learning apps that will accommodate a number of learning needs. Next, all agreed that students should eventually shift to some form of laptop. While opinions varied on which grade, from 2<sup>nd</sup> to 4<sup>th</sup>, this transition to laptops should take place, the majority of directors believed the Chromebook would be ideal. This would allow students to learn to use a ‘traditional’ laptop device without giving them an incredibly expensive tool. All directors agreed that by high school students should have a fully functioning laptop, with the majority stating the MacBook Air would be their device of choice. Each believed this type of device would properly prepare students for post-secondary education.

## **FINDINGS**

Table 1 describes and contains demographics for each of the six districts included in the interviews. District X did not respond or participate in the interviews. Using a case study design, defined as ‘an intense study of a single

Table 1. District Student and Teacher Demographic Data (Texas Academic Performance Reports, 2016)

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>X</b>
<b>Total Students (K-12)</b>	2,349	11,851	27,296	53,130	24,626	8,254	53,396
<b>Ethnic Distribution:</b>							
African American	81	543	3,683	5,547	3,270	606	5,392
Hispanic	571	1,560	8,219	7,313	6,935	1,032	15,147
White	1,564	4,540	13,841	27,062	12,549	5,869	23,777
American Indian	23	48	197	313	134	48	245
Asian	17	4,832	772	11,087	987	296	6,966
Pacific Islander	0	14	41	42	69	11	50
Two or More Races	93	314	543	1,766	682	392	1,819
<b>Economically Disadvantaged</b>	586	1,048	11,468	5,750	7,548	549	17,421
<b>Non-Educationally Disadvantaged</b>	1,763	10,803	15,828	47,380	17,078	7,705	35,975
<b>English Language Learners (ELL)</b>	149	1,247	4,104	2,650	2,728	280	8,290
<b>Students w/Disciplinary Placements (2014-2015)</b>	24	36	369	187	253	21	772
<b>At-Risk Student Enrollment by Program</b>	560	3,051	9,307	8,590	7,228	1,493	19,150
Bilingual/ESL Education	148	1,496	4,111	2,597	2,886	280	8,942
Career & Technical Education	608	2,593	7,254	10,230	5,676	2,113	9,696
Gifted and Talent Education	133	2,370	2,714	5,810	2,015	764	5,598
Special Education	177	619	2,861	4,619	2,444	599	5,405
<b>Total Staff</b>	307.1	1,100.9	3,127.2	5,117.7	2,544.7	665.1	6,253.4
<b>Gender</b>							
Male	38.2	164.7	493.5	705.8	380.9	112.0	764.4
Female	116.9	596.5	1,485.4	2,813.1	1,289.9	436.1	4,033.0
<b>Degree</b>							
Bachelors	132	552.8	1,406.5	2,480.5	1,181.7	388.2	2,740.0
Masters	22.2	205.4	549.1	972.8	476.2	149.6	988.7
Doctorate	1	3	11.4	10	10.0	2	31.2
<b>Experience</b>							
Beginning Teachers	4	33.4	103.3	238.1	86.7	37.2	158.9
1-5 Years	44	217.0	448.5	996.3	353.3	153.7	866.1
6-10 Years	29.8	188.3	532.2	985.9	433.4	148.3	794.5
11-20 Years	56.2	213.0	630.9	1,002.6	612.0	163.4	1,333.1
Over 20 Years	21.2	109.5	264.0	296.0	185.4	45.4	644.6
<b>Number of Students per Teacher</b>	15.1	15.6	13.8	15.1	14.7	15.1	14.1

unit for the purpose of understanding a larger class of (similar) units...observed at a single point in time or over some delimited period of time' (Gerring, 2004, p. 342), we compared collected demographic data (TAPR, 2016, see table 1) with interview responses.

### Districts' Demographics

Table 1 contains the district populations ranged from the lowest, District A, at 2,349 students to the highest, District X, at 53,396 students. The student to teacher average ranged from 13.8 (District C) to 15.6 (District B). In all

districts, except District B, the largest student population was White; in District B, the White and Asian populations were roughly equal. The percentage of economically disadvantaged students ranged from 7% of the student population (District F) to 42% (District C), and students classified as 'at-risk' ranged from 16% (District D) to 36% (District X). These numbers had a significant impact on how decision makers evaluated which type of technology should be purchased.

The first half of the interviews sought to establish the directors' backgrounds and beliefs about classroom technology. They likewise determined the districts' stances on classroom technology, why the districts chose their technology, and if the directors were part of the ultimate decision. All the directors have been involved in educational technology for over 10 years, except one. Mr. G (pseudonym) had the least experience in the field of education, but prior to entering the school system, he was self-employed in the tech industry. Each director believed technology should be accessible to students and teachers at all times. There was a unanimous belief that the technology should be a tool for engagement and enrichment, not a replacement for instruction. The choices made by each district leader were different, so there was a wide variety of representation of the different technological philosophies currently operating in schools in this part of the state. Districts C, D, and F (see Table 1) support their students and teachers with carts of iPads and Chromebooks. None of their technology is allowed to leave the classroom setting. District D also allows BYOD (Bring Your Own Device) if students would like to bring what they have from home instead of using campus equipment. Districts A and E (see Table 1) are both 1:1 districts using MacBook Airs, and District B (see Table 1) is 1:1 using iPads.

### **Decisions Made by the Districts**

Like the technology purchased, each district came to their decision in a unique way. District A went with MacBook Airs because they received a \$4.1 million grant, and the secondary curriculum director, at the time – not the current director, made the unilateral decision to purchase MacBook Airs instead of other products on the market. District E created a committee with selected students from leadership groups on each campus who tested different options. Some of those options included: MacBook Air, Dell Venue, HP Pavilion, MS Surface, Windows laptop, and Chromebook. After the testing phases, students ultimately chose the MacBook Air, which the district has begun purchasing and will finish distributing next year. District B conducted a great deal of research on the different options and felt the iPad 'led to not only consumption but also creation.' In Districts C, D, and F, one of the major criteria cited by these directors was that the device must be cost effective. Based on this requirement, Chromebooks became both the obvious and preferred choice of technology.

The last few questions of the interviews were used to understand what each district offered their teachers. Beyond the specified technology already discussed, we wanted to understand what a 'typical' classroom environment is like and what is available for teacher use. All districts were relatively similar; each classroom had projectors, document cameras, and teacher computers. Districts E and F both had interactive whiteboards, Promethean, and EPSON, respectively. District A offered interactive boards by reservation for teachers, and District B had an offering specific to their technology choice called Reflector. Reflector is a program that allows teachers to project their iPad screens onto the projector.

With the final question, we wanted to obtain input from these decision makers about where they see technology in the classroom heading. Ultimately, these are the people who will have significant input in the purchasing decisions, so we were curious about their thought processes. All agreed that technology should be in the hands of students and teachers and that it should align well with the curriculum and be a useful tool, not a constant distraction. Additionally, teachers should be properly trained so that technology is not just limited to research projects but instead used to enhance the overall educational experience.

There was also a consistency with how they viewed the growth of technology in their own districts. Most believed their elementary students, especially those in K-3, should have iPads. The rationale was that the full-size keyboards are a bit large and bulky for younger students, and there are many great iPad apps to assist students with basic reading, writing, and mathematics. Students in these grades may still associate iPads with 'play,' and the use of them creates a rich, interactive environment for students. Beyond the 3<sup>rd</sup> grade, district directors differed on when to start students on laptop computers. Most directors stated that 4<sup>th</sup> grade would be an ideal stage for this transition and that laptop computers should be used through the 8<sup>th</sup> grade. The belief was that these students should have Chromebooks or a similar type of laptop. The idea behind this move away from iPads is explained by the need to teach keyboarding skills and basic computer usage. The directors of Districts A, C, D, and F all spoke of the ease of managing Chromebooks in contrast to a 'full computer' such as a MacBook air. Their belief is supported by O'Donnell and Perry (2013) who found that, with a high reliability (82%), reducing time spent in managing desktop PCs, laptop PCs, or netbooks, allowed for an increase in the amount of time spent on teaching and



administration. Upon reaching high school, all directors agreed a full laptop would be best; however, only Districts A and E are able to provide 1:1 laptop programs. District B is 1:1 but opted for iPads, and the rest of the districts either do not have the funds to go 1:1 or the number of students is too great to make this type of program possible. The purpose of moving students to ‘full laptops’, as stated by the directors of Districts A and E, is to prepare them for computer usage in college and beyond.

**Where are the Tablets?**

All the directors interviewed stated their district had a number of iPads across every grade. However, most explained they are no longer purchasing as many as they had in the past. When asked why, they all had the same, simple answer — cost. An iPad, on average, costs a district \$400, but a Chromebook costs them only \$200. In District D, teachers were surveyed to determine their technology preferences for students in their classroom, and over 75% asked for Chromebooks. When asked why, they stated that with this technology, students could create, not just consume. This shift is representative of tablet to Chromebook sales across the United States. From 2012-2014, the educational market held by digital tablets declined 7%. According to Futuresource Consulting (Figure 3), more than 729,000 Chromebooks were sold to K-12 schools in the United States in the second quarter of 2014 (Herold, 2014).

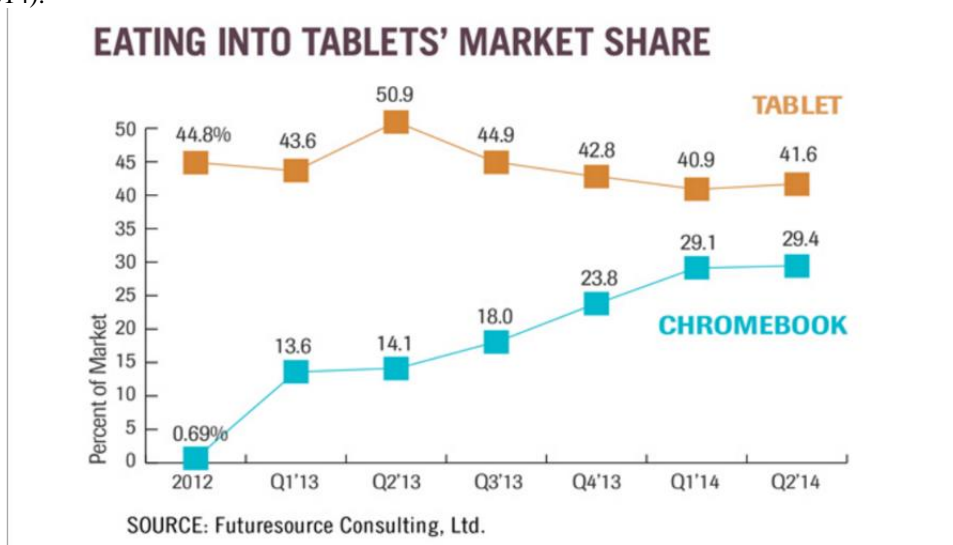


Figure 3. Tablet vs. Chromebook sales 2012-2014.

This growth in purchasing, while driven in part by savings, is also due to the platform on which the device runs. For example, the chief technology officer of Montgomery County schools in Maryland was looking for a device that was not only cost effective, but allowed for collaboration between students and teachers. He cited Google’s Apps for education, a collection of word-processing, spreadsheet, email, storage, and other Web-based applications predicated on making it easier for students and teachers to work together (Herold, 2014). The same can be seen with Perris Union School District in California; Chromebooks were given to each of their more than 10,000 students to take home and use. (Herold, 2017).

**Issues**

Due to the visible failure of school districts that are implementing 1:1 iPad programs, a growing number of school districts may find themselves straying away from tablet computers, specifically iPads. The most notable being L.A. Unified which purchased 650,000 iPads and updated networking gear and educational software from Pearson at a total cost of \$1.3 billion dollars. All the funding came from construction bonds, with \$500 going to Apple and Pearson and \$800 going toward the improvement of the existing infrastructure (Newcombe, 2015). Several issues plagued the rollout: lack of teacher training, technology and internet issues, and instances in which students bypassed district security on their devices. Overall, these factors were a major impediment for 1:1 iPad programs. In 2014, another suburb of a southwestern metroplex, District X (see Table 1), attempted their own 1:1 iPad rollout program. The price tag was significantly lower than that of L.A. Unified, coming in at a mere \$103 million dollars. However, District X has experienced their own issues with system crashes, spotty signals, security breaches, and the loss of at least 483 iPads, totaling more than \$79,000. These devices have been reported lost, stolen, or damaged (Hundley, 2014). In each of these instances and the dozens more that have occurred with other devices, it can take years for a school district to recover monetarily.

## RECOMMENDATIONS

Based on the literature and collected data, informed school districts have an obligation to pursue any necessary changes in the purchase of technology after examining the research. Due to the intricacies of school budgeting, spending significant amounts of money on technology can be a difficult, if not a risky proposition and should be approached with the greatest of care. Technology directors, as highlighted above, should take the time to read current research, form exploratory committees of different stakeholders – especially students, and evaluate cost effectiveness versus length of use. In other words, to purchase technology that will be outdated in the next few years would be a significant waste of district resources. Once the decision and purchases have been made, the investment should shift to teacher training. Without teacher approval and training, the technology will not be used to its fullest potential and frustration will set in. Teachers must continue to be supported as their training is completed, either by district personnel, which is recommended for cost saving, or by third-party vendors if necessary.

## CONCLUSION

The use of technology, whether in the form of an iPad, Chromebook, Macbook Air, or other product purchased by a school district is here to stay. Research has shown, when used properly, devices enhance and engage students in a variety of ways (Mango, 2015). District technology directors have the difficult task of selecting the proper devices for their district. Each school district is unique in its make-up and technological needs, and directors will have to find a method for device selection that suits the particular needs of their district. For some districts, tablet computers will be the best option; for others, laptops are more appropriate. No matter what they choose, there seem to be four major criteria for device selection common amongst directors: 1) familiarity, 2) ease of use, 3) cost, and 4) program/app availability. Based on these ideas, directors will make selections that will send their districts down a technological path that meets the needs of their teachers and ultimately, their students.

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## **Appendix A**

### **Interview Questions:**

1. How long have you served in your current position? Did you hold any technology positions in prior districts?
2. What is your belief about technology in the classroom? Why?
3. What is your districts position on technology in the classroom? (BYOD, iPads, Chromebooks, Macs)
4. Why did your district choose its current method instead of an alternative method?
5. Were you part of that decision?
6. What kind of general technology is available to classroom teachers? (projectors, smartboards, etc.)
7. Are the offerings consistent across all grades or does it vary by level? For example, does the elementary level get more of certain technologies than middle schools/high schools, etc.
8. Where do you see districts heading when it comes to purchasing technology? Is there any new technology currently out or coming out that will be particularly interesting? Why?
9. In your ideal world, where money is not an option what type of technology would you find in the classroom?