Analyzing the Impact of BYOD in Secondary School English Classrooms

by

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Abstract

There is limited research on Bring Your Own Device (BYOD) programs. This study explored the impact of a BYOD program on secondary school students’ engagement, learning process, and learning performance in English classrooms. Five grade 9 English classes (n = 80) from a suburban high school, with students between the ages of 13 and 16 years old, participated in the study. A mixed-methods design was used, with quantitative and qualitative data collected from four surveys administered throughout the course. The results indicated that students were positive about the impact of the overall BYOD program. Students reported that computer use positively-impacted engagement, but also asserted that computer use resulted in some distraction. Students indicated that the learning process improved in a BYOD setting, with contributing factors including increased accessibility, understanding, communication, management, collaboration, and feedback. Some students noted that several technical issues impeded their learning process. Finally, students reported that computers enhanced learning performance, including student productivity, the overall quality of student work, and student writing. Future research should explore the impact of specific teaching and learning strategies in a BYOD program on students’ engagement, learning process, and learning performance in K-12 classrooms in a broader range of subject areas.
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1 Introduction

1.1 Overview

Bring Your Own Device (BYOD) programs in education involve the practice of students bringing personal laptops, tablets, or smartphones to school (Delgado et al., 2015; Johnson et al., 2014). Course resources and applications are typically accessible online, allowing students to engage in course activities (Delgado et al., 2015; Johnson et al., 2015). There is little research on the impact of BYOD programs on students in the K-12 environment (Ross, 2013). There has, however, been extensive research on one-to-one (OTO) programs, where schools provide devices for students to use in the classroom. For the literature review in current study, only two of 78 studies focused on the use of BYOD programs in a K-12 setting (Delgado et al., 2015; Ross, 2013). However, there is extensive research in OTO programs. While BYOD and OTO programs possess several similarities, there are also differences.

There are at least four dimensions where BYOD and OTO programs differ. These dimensions include student selection of the device, student personalization of the device, equity among students, and student access to the device. The first difference between BYOD and OTO programs involves the selection of devices. BYOD programs require that students select and purchase the computer they will be learning with (Johnson et al., 2014). These are often laptops but may include tablets or smartphones (Ross, 2013). OTO programs often purchase and provide devices for students (Bebell, 2005; Bebell & Kay, 2010; Donovan, Green & Hartley, 2010; Howard & Rennie, 2013; Niles, 2006). OTO programs typically use laptops chosen by the school, the board, or the government (Bebell, 2005; Bebell & Kay, 2010; Briggs & Blair, 2014; Donovan, Green & Hartley, 2010; Dunleavy & Heinecke, 2007; Howard & Rennie, 2013; Hoyer, 2011).
Second, the ability to personalize the devices differs between the BYOD and OTO programs. In BYOD programs, students choose which applications they wish to use with their device; rarely do devices share the same content or settings (Johnson et al., 2014). When students have their own devices, they save time and effort because they are accustomed to their devices and can use them efficiently (Delgado, 2015; Johnson et al., 2014). In OTO programs, students may not get the same device from year to year (Amankwatia, 2008). Software applications are selected and included on devices before students begin using the laptops for learning (Mills, 2010).

Third, there are issues of equity between students and devices in BYOD and OTO programs. Students often purchase their own devices in BYOD programs; devices may differ in type, cost, brand, quality, and capability (Delgado et al., 2015). Issues of equity arise when some students cannot afford their own devices (Ross, 2013). All students use the same devices in OTO immersion programs, limiting issues with equity (Almasaeid, 2014; Bebell, 2005; Bebell & Kay, 2010; Briggs & Blair, 2014; Donovan, Green & Hartley, 2010; Dunleavy & Heinecke, 2007; Howard & Rennie, 2013; Hoyer, 2011; Keppler, Weiler & Maas, 2014).

Finally, there are differences in student access to the devices between BYOD and OTO programs. In BYOD programs, students can use personal devices both inside and outside of class, thereby increasing engagement, motivation, and technology skills (Gurung & Rutledge, 2014). BYOD programs also enable the use of the device for homework (Delgado et al., 2015). Some OTO programs allow students twenty-four-hour access (Dunleavy & Heinecke, 2007; Howard & Rennie, 2013; Lei & Zhao, 2008; Mills, 2010; Spektor-Levy & Granot-Gilat, 2012; Standley, 2012), while others do not make devices available outside of class time (Amankwatia, 2008) or over the weekend (Dunleavy & Heinecke, 2007). Shapley et al. (2010) found that
student use of technology outside of school was the strongest implementation predictor of achievement. Teachers in some OTO programs act as gatekeepers, deciding whether students can take the devices home and when students are allowed to use them in the classroom (Amankwatia, 2008).

In conclusion, there are four differences between BYOD and OTO programs. They include the selection of devices, student personalization of devices, equity between students, and access to devices. Due to the differences between the two programs, the impact on learning, engagement, and performance may differ. The purpose of this study is to explore the impact of the BYOD program on students in the secondary school English classroom.

See Figure 1 for a comparison of characteristics found in BYOD versus OTO programs.

Figure 1 – Venn Diagram Comparing and Contrasting BYOD Programs to OTO Programs
1.1.1 Previous Research

As stated previously, while there is limited research in BYOD programs (Adhikari, Scogings, Mathrani, & Sofat, 2017; Ally & Tsinakos, 2014; Grant & Barbour, 2013; Janssen & Phillipson, 2015), there are considerable similarities between BYOD and OTO programs. Consequently, that is what is being focused regarding previous studies. The substantial body of research on OTO computing programs cites numerous benefits related that can be organized based on three themes: student engagement, learning process, and learning performance. Participation in OTO programs can improve student engagement (Delgado et al., 2015; Downes & Bishop, 2015), motivation (Keengwe et al., 2012; Zaka, 2013) and attitudes towards learning (Rosen & Beck-Hill, 2012; Spanos & Sofos, 2015). These benefits can lead to improved attendance and better behaviour (Owusu-Ansah, 2015; Rosen & Beck-Hill, 2012; Warschauer & Grimes, 2005).

The use of OTO computer programs in the classroom also impacts student learning. Students are more organized when using their devices for learning (Broussard et al., 2014; Silvernail & Lane, 2004; Warschauer & Grimes, 2005) and can conduct research and access information using technology (Harper & Milman, 2016; Spires, Oliver, & Corn, 2012; Suhr, Hernandez, Grimes, & Warschauer, 2010). Computer use offers students a variety of tools to demonstrate their learning and understanding of concepts (Harper & Milman, 2016; Standley, 2012; Warschauer et al., 2005). Technology benefits students by facilitating specific learning tasks, such as preparing for a presentation or writing an essay (Lei & Zhao, 2006; Lowther et al., 2012). Students’ learning skills also improve with the use of technology (Solhaug, 2009; Trimmel & Bachmann, 2004; Warschauer & Grimes, 2005). Finally, student communication increases and improves (Broussard et al., 2014; Harper & Milman, 2016).
Lastly, considerable evidence indicates that OTO programs can have a positive impact on performance. Student efficiency increases when using computers in the classroom (Broussard et al., 2014; Hatakka, Andersson, & Gronlund, 2012). When students use their computers, it makes school work easier to complete (Keengwe, Schnellert & Mills, 2012; Lowther, Strahl, Inan, & Bates, 2007; Silvernail & Lane, 2004). Quantity (Silvernail & Harris, 2003) and quality (Mouza, Cavalier, & Nadolny, 2008; Shapley et al., 2009) of student work increases in OTO computer programs. Finally, the quantity and quality of student writing can improve when students have their computers in the classroom (Grimes & Warschauer, 2008; Silvernail & Gritter, 2007; Warschauer et al., 2014).

1.1.2 Gaps and/or Problem Areas

There are at least four gaps in research examining OTO computer use. They include limited research on educational institutions with mature OTO programs, a need for mixed-methods research, the absence of longitudinal studies, the lack of subject-specific research.

Few studies focus on established technology immersion programs (Bebell & Kay, 2010; Broussard et al., 2014; Donovan, Green & Hartley, 2010; Spires, Oliver & Corn, 2012; Suhr, 2010; Williams & Larwin, 2016). The majority of studies focused on programs that were less than five years old (Bebell, 2005; Broussard, et al., 2014; Donovan, Green & Hartley, 2010; Grimes & Warschauer, 2008; Lei & Zhao, 2008; Lowther, Ross & Morrison, 2003; Storz & Hoffman, 2013). While schools are transitioning to a technology immersion model, teachers are still learning how to use the technology themselves (Bebell & Kay 2010), and their practice is evolving as a result (Broussard et al., 2014; Burns & Polman, 2006). Consequently, they are not yet ready to take full advantage of the affordances of having OTO computer access in the classroom (Burns & Polman, 2006). Relatively new programs do not reflect the potential for
teaching and learning compared to a fully-realized technology immersion program (Bebell, 2005; Bebell & Kay, 2010).

Most OTO studies used quantitative survey data exclusively (Bebell, 2005; Gray, 2010; Hatakka, 2012; Keengwe, 2012; Standley, 2012). This narrow methodology does not give respondents an opportunity to explain their perspectives on teaching and learning in technology immersion programs (Cresswell, 2013). A combination of qualitative and quantitative research would help to provide a more thorough understanding of technology immersion programs (Cresswell, 2013; Hew & Brush, 2007; Inan & Lowther, 2010; Jones, 2013; Oliver & Corn, 2008; Spears, 2011).

Few studies have focused on the impact of OTO programs over time (Blackley, 2015). Longitudinal research, though, is helpful in avoiding the novelty effects of introducing new technology and understanding the potential long-term impacts of OTO program research (Harper & Milman, 2016; Howard & Rennie, 2013; Lei & Zhao, 2008; Storz & Hoffman, 2013).

Finally, there is a need for research on the use of OTO programs for specific school subjects (Dunleavy & Heinecke, 2007; Zuber & Anderson, 2012). The use of technology to teach in subject areas may differ (Drayton et al., 2010; Zuber & Anderson, 2012). Some studies have focused on areas such as mathematics (Blackley & Walker, 2015; Rosen & Beck-Hill, 2012; Spears, 2011) and science (Drayton et al., 2010; Zucker & Hug, 2008), while few have exclusively studied the subject of English (Towndrow & Vaish, 2009). Several studies explored the impact of technology on reading (Rosen & Beck-Hill, 2012) and writing (Lowther, Ross, & Morrison; Penuel, 2006; Silvernail & Gritter, 2007).
1.2 Research Questions

This study focused on a school with an established BYOD program that has been running since the 2010-2011 school year. It involved students from five different classes, explicitly focusing on students in grade 9 academic English who were new to the BYOD program. It involved a mixed-methods approach, taking place over an entire school year. The purpose of this study was to explore the impact of a BYOD program in secondary school English classrooms. This study addressed three research questions:

1. What is the impact of a BYOD program on secondary school student perceptions of engagement in the English classroom?

2. What is the impact of a BYOD program on secondary school student perceptions of the learning process in the English classroom?

3. What is the impact of a BYOD program on secondary school student perceptions of learning performance in the English classroom?
2 Literature Review

2.1 Overview

Research on BYOD programs in a secondary school environment is limited (Delgado et al., 2015; Johnson et al., 2014; Ross, 2013); however, OTO computer programs have been examined extensively for at least 20 years. BYOD programs are similar to OTO access programs in that each student has a mobile device available throughout the school day. The primary difference is that students select, own, and bring their computers to a BYOD program. Ownership and management of the device allow students to choose one that suits their learning preferences, adjust settings to suit their preferences, select or access applications that enhance their learning, and become more responsible for their learning. These affordances may lead to increased student engagement, learning process, and learning performance. This literature review focuses on learning and teaching in OTO computing environments in the K-12 classroom. Key areas covered include student engagement, student learning process, and student learning performance.

2.2 Student Engagement

2.2.1 Benefits of One-to-One Access on Student Engagement

Previous research has examined the impact of OTO programs on student engagement and motivation. Several literature reviews indicated student engagement increases in OTO programs (Bebell & O’Dwyer, 2010; Delgado et al., 2015; Schnellert & Keengwe, 2013). Bebell and O’Dwyer (2010) looked at five studies examining existing OTO programs in K-12 schools in 2010 and noted that laptops had a positive impact on student engagement. Similarly, Delgado et al.’s (2015) literature review of technology integration in K-12 classrooms, including ninety articles ranging from 1986 to 2014, reported that OTO programs increased engagement. Finally,
Schnellert and Keengwe’s (2012) review of K-12 schools with OTO programs, consisting of 26 articles from 1996 to 2010, reported that the implementation of these programs improved student engagement.

Two studies indicated that OTO laptop programs positively impacted student motivation (Standley, 2012; Trimmel & Bachmann, 2004). Trimmel and Bachmann (2004) examined high school students (n=47) over three months and observed that students using laptops demonstrated greater interest in learning, participated more and demonstrated increased motivation. Standley (2012) conducted focus groups for 30 high school students in five different OTO laptop programs. Students were motivated when allowed to pursue their interests, find content, increase their knowledge, collect social information, and engage in extracurricular learning (Standley, 2012).

2.2.2 Challenges of One-to-One Access and Engagement

Students can exhibit a variety of off-task behaviour in OTO programs with technology including playing video games, using social media, and accessing inappropriate and unrelated online materials. At least five studies reported that students engage in off-task behaviours when in an OTO program (Broussard et al., 2014; Harper & Milman, 2016; Hatakka et al., 2012; Spires et al., 2012; Tallvid et al., 2015). Hatakka et al.’s (2012) noted that grade 4 to 12 students (n=827) in an OTO program played games and accessed social media. Broussard et al.’s (2014) study, based on observations and interviews of more than 300 high school students over seven months, observed that the OTO tablet program sometimes led to in-class distraction. Tallvid et al.’s (2015) mixed-methods study of high school students (n=500) over three years claimed that student off-task behavior in the OTO laptop program was significant and included downloading materials unrelated to schoolwork and surfing the Internet. A literature review (Harper &
Milman, 2016) of forty-six articles on OTO programs in K-12 classrooms from 2004 to 2014 noted that student engagement and motivation when using computers in the classroom decreased over time after initial engagement dissipated. Finally, Spires et al.’s (2012) literature review of thirty-nine articles from 1989 to 2010 on OTO computer programs in K-12 schools reported that off-task student behaviour when using laptops included discussing other topics and using computers for unassigned purposes.

2.3 Student Learning Process

2.3.1 Benefits of One-to-One Access on Student Learning Process

Previous research has reported a number of benefits to students’ learning process associated with OTO programs including improvements in understanding, research skill, accessibility, communication, collaboration, feedback, self-management, and technological skills.

2.3.1.1 Understanding

At least five studies suggested that OTO laptop programs support student understanding, learning, and the development of 21st-century skills (Harper & Milman, 2016; Keengwe et al. 2012; Lowther et al., 2007; Lowther et al., 2012; Solhaug, 2009). Solhaug (2009) reported that critical reflection, classroom discussion, and knowledge development improved in OTO programs for high school students (n=719). Keengwe et al.’s (2012) survey of grade 10 to 12 students (n=105) found that technology integration led to greater learning over the school year. Lowther et al.’s yearlong study (2007) of K-12 students (n=5770) indicated that laptops in the classroom had a positive impact on learning. Lowther et al. (2007) noted that K-12 students (n=5770) in an OTO program exhibited greater 21st-century knowledge and skills including the ability to access resources, give computer-based presentations, and problem-solving. Lowther et
al.’s (2012) follow-up study reported that students exhibited greater 21st-century skills, including independent inquiry, research, and problem-based learning. Finally, Harper and Milman (2016), in a literature review of forty-six articles from 2004 to 2014 about K-12 OTO programs, observed that the depth and quality of learning increased, with students having more powerful learning experiences when using computers.

2.3.1.2 Research Skill

Another advantage of OTO programs reported in the research is the ease of researching due to access to Internet information. Harper and Milman’s (2016) literature review focused on OTO programs in K-12 settings, with forty-six articles from 2004 to 2016. Laptops and tablets allowed students to use web browsers frequently and conduct online research (Harper & Milman, 2016). Spires et al.’s (2012) review of thirty-nine articles from 1986 to 2011 on OTO computing environments indicated that students used content and information online for research (Spires et al., 2012). Penuel (2006) reviewed thirty articles from 1990 to 2005 focusing on OTO wireless laptop initiatives in K-12 schools and noted that web browsers were a distinct advantage when conducting research (Penuel, 2006). Finally, Delgado et al. (2015), in a study of ninety articles from 1986 to 2014 focusing on technology integration in K-12 schools, found that that computer use in OTO programs improved research skills.

2.3.1.3 Accessibility

OTO programs increase in access to technology and use of technology. Students who have a dedicated computer and Internet connection can access subject-specific materials and applications that support learning.

OTO computer programs increase accessibility to the course and subject-related materials (Broussard, 2014; Drayton et al., 2010). Drayton et al. (2010) conducted a mixed-methods study
of high school students (n=136) using an OTO program. Students were able to engage in self-directed learning, partially because the teacher websites provided access to class materials and assignments (Drayton et al., 2010). Broussard et al. (2014) conducted a seven-month study of a high school’s OTO program using observations and interviews. Almost all of the approximately 650 students at the school interacted with primary or supplemental content delivery occurring via computer, enabling the learning of subject-specific skills and concepts (Broussard et al., 2014).

OTO programs also offer access to a variety of applications students can use for specific learning purposes (Niles, 2006; Standley, 2012). Standley’s (2012) mixed methods study of OTO laptop programs in rural high schools involved five focus groups from different schools, with four to eight students in each group participating over three months. Students used a variety of software applications and stated that online content was invaluable, as it was of higher quality and more relevant when compared to the content provided by teachers or textbooks (Standley, 2012). Niles (2006) conducted a case study of grade 10 to 12 students (n=18) over several months where OTO access offered students a wide variety of tools to demonstrate their knowledge.

2.3.1.4 Communication

Concerning communication in OTO settings, previous studies indicated that OTO programs were associated with an increase in overall student communication, communication between students and teachers, and communication between students. Four studies noted that OTO programs increase overall student communication in secondary school environments (Broussard et al., 2014; Hoyer, 2011; Standley, 2012; Trimmel & Bachmann, 2004). First, Standley’s (2012) mixed-methods study of student focus groups from five high schools with OTO programs found that technology increased the number of interactions between people.
Students reported having more contact with the community, the region, and other organizations because of laptop use (Standley, 2012). Broussard et al.’s (2014) study of high school students in an OTO tablet program, involving observation and focus group interviews of more than 300 students, reported that classroom computer use increased student communication (Broussard et al., 2014). Trimmel and Bachmann’s (2004) examination of secondary students (n=49) reported that participation in OTO programs was higher than control groups, with laptop use enabling communication. Finally, Hoyer’s (2011) four-year phenomenological case study of secondary schools with OTO laptop programs indicated that participation among students increased, partially because of the speed of interactions when communicating.

Four studies reported that OTO computer access led to increased communication between teachers and students (Broussard et al., 2014; Harper & Milman, 2016; Niles, 2006; Spires et al., 2012). Niles (2006) found that technological affordances changed the way teachers and high school students (n=18) communicated with each other, increasing the speed, frequency, accessibility, and assignment assistance. Broussard et al.’s (2014) study of a high school adopting an OTO laptop program, using observations and interviews of more than 300 students over seven months, noted that computer use led to more communication. Harper and Milman’s (2016) literature review, involving forty-six articles from 2004 to 2016, observed that OTO programs in K-12 classrooms enabled more communication between teachers and students. Finally, Spires et al.’s (2012) literature review of OTO programs, including thirty-nine articles ranging from 1986 to 2011, indicated that technology increased student and teacher interaction; students had more opportunities to ask questions and could even communicate outside the school day.
Three studies reported that students in OTO access programs increase *peer-to-peer communication* (Broussard et al., 2014; Penuel, 2006; Spires et al., 2012). Broussard et al., (2014) after observing high school classrooms for seven months, found that technology allowed greater student communication with peers. Penuel’s (2006) literature review of thirty-nine articles about OTO programs from 1986 to 2011 reported that laptops enabled peer-to-peer communication. Finally, Spires et al.’s (2012) literature review of thirty-nine articles from 1986 to 2011 noted that students quickly learned how to use email and chat features for formal and informal peer communication.

### 2.3.1.5 Collaboration

There is some evidence to suggest that OTO access can increase collaboration. Five studies reported that OTO laptop programs increased collaboration (Delgado et al., 2015; Hoyer, 2011; Lee et al., 2013; Niles, 2006; Spanos & Sofos, 2015). Spanos and Sofos (2015) surveyed more than 600 elementary and secondary students in an OTO initiative over two years and found that collaboration was much easier with laptops. Niles’ (1994) case study working with focus groups of high school students (n=18) observed that students enjoyed learning together and learning from each other in an OTO laptop program. Hoyer’s (2011) phenomenological case study of OTO laptop programs in secondary schools across four districts reported that OTO laptop use provided more opportunities for collaboration. Delgado et al.’s (2015) literature review of technology integration in K-12 classrooms, including ninety articles ranging from 1986 to 2014, claimed that OTO programs had a positive impact on the improvement of collaboration skills (Delgado et al., 2015). Lee et al. (2013), in a literature review involving fifty-eight studies between 1998 and 2011 focusing on learning and teaching in K-12 settings
with technology, concluded that collaboration was an effective strategy for students learning with computers and increased their confidence in learning tasks.

2.3.1.6 Feedback

OTO access programs appear to increase teacher feedback on student work (Drayton, 2010; Hoyer, 2011; Keppler et al., 2014). Drayton’s (2010) mixed-methods research into three high schools’ OTO laptop programs over three years found that email improved the ability to provide feedback. Keppler et al.’s (2014) mixed-methods study of OTO programs involved teachers and students in grade 5 to 12 classrooms. Teacher-to-student feedback with laptops was easier and occurred more often, and students had a greater audience for their work (Keppler et al., 2014). Finally, Hoyer (2011) found that secondary school student behaviour in OTO classrooms partially improved due to the speed of digital interactions between teachers and students regarding assignments and feedback.

2.3.1.7 Self-Management

OTO programs in K-12 classrooms can provide opportunities to increase independence, responsibility, and choice. Keppler et al.’s (2014) mixed-methods study of grade 5 to 12 classrooms using an OTO model reported that laptops enabled greater independence from the teacher as students managed aspects of their learning, becoming self-reliant, solving their problems and making decisions. Standley (2012) noted that having a computer in an OTO program gave them the freedom to create and organize work online (Standley, 2012). Niles (2006) found that high school students (n=18) spent more time engaged in self-directed learning. Niles (2006) also observed that students played the role of a teacher, acting as a source of instruction across subject areas. Sultan et al. (2011) added that K-12 students who shared control of critical decisions in the class had a positive impact on student’s perceived outcomes.
when learning with technology. Ilomaki and Rantanen’s (2007) reported that intensive use of laptops by high school students (n=18) in an OTO program over three years, led to self-selection of specific learning skills. Finally, Harper and Milman (2016), in a literature review of forty-six articles about OTO programs in K-12 settings from 2004 to 2016, reported that students had greater ownership of their academic progress and demonstrated more responsibility by engaging in self-paced learning.

2.3.1.8 Technological Skills

At least three studies indicated that OTO laptop programs in secondary classrooms lead to the improvement of students’ technological skills (Ilomaki & Rantanen, 2007; Mouza et al., 2008; Trimmel & Bachmann, 2004). Mouza et al. (2008) conducted a mixed-methods study of high school students (n=29) and reported that student-directed use of technology improved due to OTO access. Ilomaki and Rantanen’s (2007) observed that technological skills of secondary school students participating in a three-year OTO program improved over time. Ilomaki and Rantanen (2007) added that the use of tools by the more proficient students created two subgroups: the technically-oriented and the socially-oriented. Finally, Trimmel and Bachmann’s (2004) survey study of secondary students in an OTO laptop setting demonstrated greater computer skills than students who did not participate in this program.

2.3.2 Challenges of One-to-One Access on Students’ Learning Process

Students’ learning process in an OTO program faces several challenges. Technical issues, inconsistent computer availability, and student attitudes can negatively impact effectiveness. At least two studies reported that one of the most common drawbacks K-12 students experienced in an OTO setting involved technical issues (Broussard et al., 2014; Trimmel & Bachmann, 2004). Broussard et al. (2014) used classroom observations and
interviews to assess one high school’s OTO program over seven months. Students noted poor recharging of devices and lost time as they transitioned from one classroom to another (Broussard et al., 2014). Trimmel and Bachmann (2004) studied high school students (n=49) in an OTO program and observed that students using laptops experienced technical difficulties some of the time.

For OTO programs to positively impact the learning process, students must have computers available to use in the classroom. Two studies found that students were not consistently bringing computers to or using computers in the classroom (Briggs & Blair, 2014; Zuber & Anderson, 2012). Zuber and Anderson’s (2012) mixed-methods study of five high schools during the second year of an OTO laptop program found a gradual decline of students bringing laptops to school. Briggs and Blair’s (2014) study surveyed students (n=1451) from 32 secondary schools where the majority of students never brought their laptops to school. One reason for not bringing computers was a concern about laptop security (Briggs & Blair, 2014).

Student attitudes can also negatively impact computer use in the classroom. In at least one study, students demonstrated a preference for pen and paper approaches (Broussard et al., 2014). In a seven-month study of one high school’s OTO program involving observations and interviews, students demonstrated an unwillingness to use their computers because they preferred paper-and-pencil (Broussard et al., 2014).

2.4 Student Learning Performance

2.4.1 Positive Impact

2.4.1.1 Productivity

Previous research indicated that productivity improved in OTO settings with increased student efficiency and organization. Three research studies indicated that a benefit of OTO
programs is that students were more efficient when working with computers (Broussard, Hebert, Welch, & VanMetre, 2014; Hatakka, Andersson, & Gronlund, 2012; Lowther, Strahl, Inan, & Bates, 2007). Broussard et al. (2014) reported that high school students’ use of computers led to increased efficiency in the classroom and for homework. Hatakka et al. (2012) surveyed 23 K-12 schools and observed that laptop access resulted in increased schoolwork efficiency. Finally, Lowther et al. (2007) in a large scale mixed-methods study of K-12 students (n=5770) in an OTO program noted laptops made schoolwork easier.

At least two studies indicated that OTO computer access in the classroom led to improved student organization (Broussard et al., 2014; Hoyer, 2011). Broussard et al.’s (2014) seven-month, qualitative study of high school students in an OTO program asserted that using laptops at school led to the increased organization of schoolwork. Hoyer (2011) also observed increased organization in a phenomenological case study of secondary schools participating in an OTO initiative.

2.4.1.2 Overall Quality

Five studies reported that OTO programs helped to enhance the overall quality of student work (Drayton et al., 2010; Keengwe et al., 2012; Keppler et al., 2014; Mills, 2010; Mouza, Cavalier, & Nadolny, 2008). Keengwe et al. (2012) noted that secondary school students in OTO programs remarked that computers enhanced the quality of their work. Keppler et al. (2014) added that grade 5 to 12 students in an OTO program stated that laptop access improved the quality of their work. Drayton et al. (2010) claimed that the use of word processing software improved the quality of work for high school students (n=136) working in an OTO environment. Mills (2010) reported that grade 10 to 12 students (n=81) in an OTO initiative asserted that using
laptops improved the quality of their work. Finally, Mouza et al. (2008) observed that high school students (n=29) produced more sophisticated work when using laptops.

2.4.1.3 Writing

At least four studies reported that OTO laptop access led to an improvement in students’ writing skills (Keppler, Weiler, & Maas, 2014; Penuel, 2006; Spires et al. 2012; Standley, 2012). Keppler et al. (2014) found that grade 5 to 12 students, participating in an OTO program for three years, wrote more with laptops, took greater risks with their writing, and had a wider audience, all of which led to greater student effort in their writing. Standley (2012) noted that secondary school students remarked that the benefits of OTO programs included writing clarity due to the use of word processing programs. Spires et al. (2012) added, in a review of thirty-nine articles from 1986 to 2011 focusing on K-12 classrooms, that the positive effects of OTO computing environments included an improvement in literacy and writing skills.

2.4.2 Limited Impact of One-to-One Access on Student Performance

A number of studies reported that that OTO access has a negligible impact on student achievement and student performance in English. Three literature reviews on studies of OTO initiatives in K-12 classrooms found insignificant gains in overall student achievement (Bebell & O’Dwyer, 2010; Delgado et al., 2015; Spires et al., 2012; Weston & Bain, 2010). Bebell and O’Dwyer’s (2010) reported that computer use in the classroom had an insignificant impact on student achievement in mathematics. Spires et al.’s (2012) review of thirty-nine articles between 1986 and 2010 noted insignificant student achievement gains in a study of K-12 OTO computing environments. Finally, Weston and Bain’s (2010) literature review of OTO laptop initiatives in K-12 settings, involving 134 articles between 1977 and 2009, stated that OTO computing had an insignificant impact on achievement, learning, and teaching.
Three studies reported a lack of improvement in student performance when participating in an OTO program for secondary school English (Dennis, 2014; Grimes & Warschauer, 2008; Lowther et al., 2007). Dennis (2014), in a large-scale study of more than 20,000 high school students, found no significant difference in academic achievement for English between the OTO treatment and control groups. Grimes & Warschauer (2008) reported little or no improvement in English test scores for elementary and junior high school students (n=900). Finally, Lowther et al. (2007) observed English standardized test scores were not significantly different between the treatment and control groups in a study of almost 6000 K-12 students in OTO laptop classrooms.

2.4.3 Negative Impact of One-to-One Access on Student Performance

One study focusing on K-12 students participating in OTO immersion programs reported that using laptops negatively affected student performance (Harper & Milman, 2016). Harper and Milman’s (2016) literature review of 401 articles from 2004 to 2016, noted that in some cases the use of OTO technology in K-12 classrooms had a detrimental effect on student achievement.

2.5 Methodological Limitations

The review of the research on OTO programs in K-12 settings revealed at least seven methodological limitations. These included limited research on BYOD programs, variability in access to computer devices, focusing on newly-established programs, gathering quantitative data exclusively, small sample sizes, lack of depth in student responses, and few studies targeting secondary school English classrooms.

First, a notable limitation of current research is that there are very few studies focusing exclusively on BYOD programs (Gulek & Demirtas, 2005; Ross, 2013). The majority of studies focus on OTO programs usually involving learning with laptops (Amankwiatia, 2008; Burns &
OTO access programs may be significantly different from BYOD schools for several reasons. OTO initiatives may not allow students the same level of access to the computers, students may not select devices, students cannot personalize devices using settings and adding applications, and students may lack comfort and familiarity with the device. One or more of these factors may lead to substantial differences between OTO and BYOD programs.

Second, a problem with the limited existing research on BYOD programs is that there is considerable variability concerning student access to devices in the classroom. Very few studies focused on a BYOD program where all students brought laptops or had them provided (Gulek & Demirtas, 2005). It is worthwhile, then, to examine BYOD programs where all students have access to computer devices on a consistent basis.

Third, many research studies on OTO access programs focused on the first or second year of the program where the learning model was still developing. It is challenging to evaluate a program’s effectiveness in its infancy (Bebell, 2005; Bebell & Kay, 2010; Broussard et al., 2014; Oliver & Corn, 2008; Silvernail, 2003; Zuber & Anderson, 2012; Warschauer & Grimes, 2005). The quality and consistency in an established OTO program may be different from a relatively new program. Initial practical, administrative, and technical problems may be resolved, allowing students to take part in a more engaging program where the focus is on learning and learning performance.

Fourth, several studies of OTO programs focused primarily on quantitative data using surveys, leading to a lack of explanation or depth in the participants’ responses (Briggs & Blair, 2014; Dunleavy & Heinecke, 2007; Gu et al., 2013; Inan & Lowther, 2010; Spanos & Sofos,
2015; Wastiau, 2013). The emphasis on quantitative responses limits students’ ability to elaborate on the impact of computer use on their learning, engagement, and performance.

Fifth, some OTO access studies used small sample sizes of students, making it difficult to generalize the findings to the overall age group or level of school (Burns & Polman, 2006; Ilomaki & Rantanen, 2007; Jones, 2013; Niles, 2006; Ross, 2013; Zaka, 2013). When there is an insufficient number of participants, the results may not provide a complete or applicable portrayal of the population studied.

Sixth, some OTO research studies do not offer student participants an opportunity to provide detailed feedback evaluating the effectiveness of immersion in a computer-based program or suggestions on how to improve the teaching and learning in the program (Alijani, 2014; Amankwatia, 2008; Burns & Polman, 2006; Murphy, 2007; Stanhope & Corn, 2014).

Finally, research focusing on OTO programs for secondary school English classrooms is rare (Amankwatia, 2008; Dennis, 2014; Williams, 2016). Several studies focused on English at the middle school level (Blackley & Walker, 2015; Burns & Polman, 2006; Dunleavy & Heinecke, 2007; Gulek & Demirtas, 2005); however, the results may not translate to high school classrooms.

The current research study addresses these limitations. First, this research study focused exclusively on an established BYOD program at a school where students of all grades were expected to bring a device to school on a daily basis (Gulek & Demirtas, 2005; Ross, 2013). Second, the BYOD program examined in this study allowed students to access their devices continuously and consistently, both inside the Grade 9 English classroom and at home. Students who were unable to provide a personal device had one provided for them so that every learner could fully participate in the program (Gulek & Demirtas, 2005). Third, the secondary school in
this study offered a mature BYOD program to students, initiated in 2010, unlike many research studies that focused on nascent OTO programs often less than a few years old (Bebell, 2005; Bebell & Kay, 2010; Broussard et al., 2014; Oliver & Corn, 2008; Silvernail, 2003; Zuber & Anderson, 2012; Warschauer & Grimes, 2005). Fourth, a mixed-methods approach was used to provide a more thorough and complete insight into computer integration programs (Inan & Lowther, 2010; Spears, 2011). Fifth, this study involved a sample size of 80 participants across five Grade 9 academic English classes who provided qualitative and quantitative responses concerning the BYOD program five times throughout the semester. Sixth, this study allowed students to provide in-depth data on the learning model. Finally, this study focused exclusively on the delivery of a BYOD program in the subject area of English at the secondary level (Amankwatia, 2008; Dennis, 2014; Williams, 2016).

2.6 Research Questions

1. What is the impact of a BYOD program on secondary school student perceptions of *engagement* in the English classroom?

2. What is the impact of a BYOD program on secondary school student perceptions of the *learning process* in the English classroom?

3. What is the impact of a BYOD program on secondary school student perceptions of *learning performance* in the English classroom?
3 Method
3.1 Design Philosophy

Constructivism, according to Creswell (2014) relies “as much as possible on the participants’ views of the situation being studied” (p. 37). As such, this study incorporated elements found in a social constructivist philosophy. Context played a vital role in this study; all data gathered during the study came from the same course, where students used technology on a daily basis. Constructivist researchers use broad, open-ended questions to enable participants to construct meaning in qualitative research (Creswell, 2014). Therefore, open-ended research questions were used, focusing on the benefits and challenges of learning using technology, the impact of technology on student performance, as well as student engagement relating to the use of technology. Through the lens of social constructivism (Vygotsky, 2012), the students worked to gather, reflect on, and construct meaning and understanding concerning how the BYOD program currently performs, its strengths and weaknesses, and potentially how it could be improved.

This study also aligned with aspects of the transformative worldview, which suggests that research leads to change in participants, institutions, and the researcher (Creswell, 2014). By participating in this study, students responded to data collection tools, knowing that the data collected would be analyzed and that conclusions would be determined based on the results. The transformative philosophy honours the voice of participants, raises their awareness, and provides an opportunity for change or improvement (Creswell, 2014). This study focused on the relationship between technology, student engagement, the learning process, and learning performance as an emerging partnership in new educational pedagogy. Students responded to data collection tools on an ongoing basis as they completed each unit of study. Finally, students
had an opportunity to sum up their reflections on the use of technology in grade 9 academic English as a whole, provide feedback on the overall effectiveness of the BYOD program, and make suggestions to enable improvement.

Additionally, this study employed grounded theory to develop an understanding of the benefits and challenges of learning in a BYOD program from students’ perspectives. Grounded theory focuses on an area of study to explore and allows findings to emerge (Fraenkel, Wallen, & Hyun, 2012). Grounded theories evolve during the length of a study as participants provide data over time (Fraenkel, Wallen, & Hyun, 2012). Responses were collected five different times throughout the eighteen-week semester. The responses to open-ended questions were coded thematically, with positive, negative, or neutral labels applied, depending on the descriptors used by students in their responses. After analysis of the data, benefits and challenges of the BYOD program, according to student perspectives, became apparent.

Finally, this study incorporated a pragmatic approach to research. This approach acknowledges that research occurs in a specific context (Creswell, 2014). Pragmatic use of methodology focuses on the research problem, which was exploring the effectiveness and impact of this program, as well as the contributing factors (Creswell, 2014). Additionally, pragmatic researchers include many approaches in data collection and analysis, which may involve both quantitative and qualitative techniques, leading to a mixed-methods approach where multiple worldviews may be incorporated (Creswell, 2014). This study employed a mixed-methods approach, with qualitative and quantitative data collected throughout the course. Mixed-methods research can clarify relationships between variables, explore the relationship between variables in depth, and, when using qualitative and quantitative methods, be used to confirm relationships between variables (Fraenkel, Wallen, & Hyun, 2012).
3.2 Participants

3.2.1 Teachers

Two secondary school Grade 9 teachers agreed to participate in this research study. Hereafter they will be referred to as Teacher A and Teacher B.

Teacher A in this study had taught for four years in the York Region District School Board, three in the BYOD program at the secondary school where this research study was conducted. She had taught Grade 9 Academic English in the BYOD program offered at the secondary school focused on in this research study. She was comfortable teaching English and extremely proficient with technology. Teacher A was comfortable delivering professional development to school staff using technology as a tool for content delivery. She was the assistant head of the English department and the school’s literacy teacher, a member of the school’s leadership and professional learning committees, and in charge of overseeing and preparing students for the EQAO Ontario Secondary School Literacy Test.

Teacher B in this study had taught for five years, and 2015-2016 was her first school year teaching Grade 9 Academic English at the secondary school focused on in this study. She had previously taught English in different grades and levels at other schools in the York Region District School Board, but this was her first year teaching high school English in a BYOD teaching and learning program. She demonstrated a growing comfort level with the use of technology in her teaching practice and had attended several targeted professional development sessions focused on the use of technology delivered by senior members of the school’s English department.

Both teachers had a laptop provided by the school, an LCD projector, a SMART Board, and ubiquitous wireless Internet access. Teacher A used Google Classroom as her daily learning
management system to house resources, share activities and assignments, and create opportunities for learning, collaboration, and co-construction. Teacher B used Moodle for the same purposes. Both teachers used the majority of the Google Apps for Education, as well as Google Sites (web-page design software), throughout the Grade 9 Academic English course for course materials in each unit, assignments, and for the creation, delivery, evaluation, and assessment of the final exam.

3.2.2 Students

Eighty grade-nine students (32 males, 48 females), 13 to 16 years old, selected from five classes in a medium-sized suburban secondary school, participated in this study. The school had a population of approximately 1190 students, with approximately 290 enrolled in grade 9. Of the total school population, 3% of students spoke English as a second language, and 27% of students had special needs (Cowley & Easton, 2015). The average income for families at this school was $102,900 (Cowley & Easton, 2014). All students participating in this research study enrolled in grade 9 academic English for the 2015-2016 school year. Of the five grade 9 academic English classes taught by Teacher A and Teacher B during this school year, 80 of 140, or 57% of eligible grade nine students participated after their parents or guardians provided written consent and students assented to participate in the study. See Table 1 for an overview of the five class participation numbers.

Table 1 – Student Participants

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Semester</th>
<th>Class Size</th>
<th>Participants</th>
<th>Participation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher A</td>
<td>Semester 1</td>
<td>29</td>
<td>18</td>
<td>62%</td>
</tr>
<tr>
<td>Teacher A</td>
<td>Semester 2</td>
<td>26</td>
<td>12</td>
<td>46%</td>
</tr>
<tr>
<td>Teacher B</td>
<td>Semester 2</td>
<td>29</td>
<td>22</td>
<td>76%</td>
</tr>
</tbody>
</table>
Students provided personal devices as part of the BYOD program at the school. Devices brought by students to school were predominantly laptop PCs, with some MacBooks, netbooks, Chromebooks, and tablets. Students who were unable to provide a device, or whose device was malfunctioning, could access a laptop using the school loaner system.

### 3.2.3 Context of Teaching

According to the two teachers, all classes used their devices for teaching and learning almost every day throughout the eighteen weeks of the course. Teachers provided every resource to students electronically, usually using the learning management system (LMS). Google Apps for Education, used in all five classes by teachers and students, was the primary online tool, with one or more of Google Documents, Slides, Forms, and Drawings used on a daily basis.

The BYOD program employed both technological and traditional means for teaching and learning. A typical 75-minute period would include activities where the teacher would deliver instructions orally, share lesson-related material electronically, use the LCD projector. Students regularly accessed the course learning management system during class. Students engaged in a whole class discussion or activity, before transitioning to individual and group activities involving the use of student digital devices. Technology-based activities required students to demonstrate knowledge, understanding, and critical thinking related to the course’s curriculum expectations. When daily lessons involved students using technology, teachers gave initial
instructions about the activity, then circulated throughout the classroom, assisting students as needed.

The grade 9 academic English course at this school was designed to incorporate characteristics of social constructivism (Vygotsky, 2012) and inquiry-based learning (Dewey, 1997), which were enhanced and supported by the use of technology, specifically through Google Apps for Education. Students’ social interaction in small groups and as a whole class was facilitated using Google Apps, gathering relevant knowledge using the Internet, co-constructing learning using various web-based applications, and sharing findings with the class. To enable inquiry, students selected texts, developed inquiry questions, explored topics, gathered evidence, constructed meaning while creating multimedia texts, shared work with peers, and reflected on the process and product on an ongoing basis throughout the units of the course.

3.3 Data Collection

3.3.1 Overview

This study collected two types of data: quantitative survey data using Likert statements and qualitative data using open-ended questions. The Likert statements were used to gather student perspectives towards specific criteria relevant to the BYOD program relating to engagement, the learning process, and learning performance. Each of the four surveys administered during the course used seven Likert statements after the unit of study ended, and relevant assignments were complete. The surveys used a seven-point Likert scale. The Likert statements measured specific aspects in the use of computer devices to complete assignments, such as ease of use, speed in use, peer communication during the unit of study, preparation of and for the assignment, quality of the assignment, as well as student engagement.
The surveys at the end of each unit and the written online course reflection included open-ended response questions. These questions addressed benefits to learning, challenges to learning, impact on student performance, and engagement associated with the BYOD program.

Table 2 provides a summary of how each of the data collections tools addressed the three research questions.

Table 2 – Overview of Data Collection Tools

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data Collected</th>
<th>Appendix and Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is the impact of a BYOD program on secondary school students’ perceptions of engagement in the English classroom?</td>
<td>Unit Reflection Survey Online Exit Interview</td>
<td>Appendix B (questions G6, G7, H1-H3) Appendix C (questions I1-I6)</td>
</tr>
<tr>
<td>2. What is the impact of a BYOD program on secondary school students’ perceptions of the learning process in the English classroom?</td>
<td>Unit Reflection Survey Online Exit Interview</td>
<td>Appendix B (questions G3, G4, H1-H3) Appendix C (questions I1-I6)</td>
</tr>
<tr>
<td>3. What is the impact of a BYOD program on secondary students’ perceptions of learning performance in the English classroom?</td>
<td>Unit Reflection Survey Online Exit Interview</td>
<td>Appendix B (questions G1, G2, G5, H1-H3) Appendix C (questions I1-I6)</td>
</tr>
</tbody>
</table>

3.3.2 Unit Reflection Surveys

Students completed the same survey after each of the four units of study in the course. The survey (Appendix B) contained seven statements using a seven-point Likert scale. The Cronbach internal reliability coefficient was 0.94 for the unit reflection surveys. The survey also contained three open-ended response questions. These surveys required participants to reflect on their learning experiences during the unit, specifically relating them to the assignments completed during each unit and how the BYOD program impacted learning during that unit. The
Likert scale statements focused on ease of use and efficiency, relating to the personal device, peer communication, preparation, quality of the assignment, and engagement relating to the use of the personal device in the unit of study. The open-ended response questions asked about the impact the device use on learning, quality of the assignment, and student engagement.

3.3.3 Course Reflection Responses

Students completed a final course reflection (Appendix C) at the end of the course. This reflection consisted of six open-ended response questions. The topics of the questions included the benefits to learning in the BYOD program for the course as a whole, the challenges to learning, the impact on academic achievement, and the impact on student engagement. The final two questions gave students an opportunity to evaluate the overall school’s BYOD program and provide suggestions about how aspects of the BYOD program could be improved.

3.4 Procedure

3.4.1 Overview

This research study examined the secondary school’s BYOD program during both semesters of the 2015-2016 school year. Five grade-nine English classes participated. This study was situated in the grade 9 academic English course because these students were new to both the secondary school and the BYOD program. Teacher A taught one class in semester one and one class in semester two. Teacher B taught three classes in semester two. Table 3 provides details and the approximate duration for each step in this research study.
Table 3 – Overview of the Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Time</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Week 1 to 2</td>
<td>The students and students’ parents completed, signed, and returned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the parental consent and student assent forms.</td>
</tr>
<tr>
<td>2</td>
<td>Week 2 to 4</td>
<td>Students completed Unit #1: Forms of Writing (Types of Paragraphs)</td>
</tr>
<tr>
<td>3</td>
<td>Week 5</td>
<td>Students completed Unit #1 online survey (Appendix B)</td>
</tr>
<tr>
<td>4</td>
<td>Week 5 to 9</td>
<td>Students completed Unit #2: Mythology (Types of Fictional Narratives).</td>
</tr>
<tr>
<td>5</td>
<td>Week 6</td>
<td>Students completed Unit #2 online survey (Appendix B)</td>
</tr>
<tr>
<td>6</td>
<td>Week 10 to 12</td>
<td>The students completed Unit #3: Media (Persuasion, Song &amp; Poetry)</td>
</tr>
<tr>
<td>7</td>
<td>Week 13</td>
<td>Students completed Unit #3 online survey (Appendix B)</td>
</tr>
<tr>
<td>8</td>
<td>Week 13 to 16</td>
<td>The students completed Unit #4: Drama (One or more Plays).</td>
</tr>
<tr>
<td>9</td>
<td>Week 17</td>
<td>Students completed Unit #4 online survey (Appendix B)</td>
</tr>
<tr>
<td>10</td>
<td>Week 18</td>
<td>Students completed the online course reflection (Appendix C)</td>
</tr>
</tbody>
</table>

3.4.2 Consent and Assent Forms

At the beginning of the study, a prepared script of recruitment was read to and discussed with the grade 9 students. On the same day, students received the parental consent form (Appendix A) and the student assent form (Appendix A). Only students who had the parental consent form signed and who chose to sign the student assent form, were allowed to participate in the research study.

3.4.3 Unit Reflection Surveys

There were four units of study in the Grade 9 Academic English course: forms of writing, mythology, media, and drama. Each unit of study was between three to four weeks in duration. Each unit included one or two summative assignments to complete. After each of the four units of study and the corresponding assignments for that unit were submitted, participants completed a unit reflection survey (Appendix B). The survey took approximately 10 minutes to complete.
3.4.4 Course Reflection Responses

The course reflection responses (Appendix C) consisted of a series of six open-ended questions; students completed their responses at the end of the Grade 9 Academic English course. Students composed their responses to the six questions using their device during class time. Completion of the course reflection took approximately 10-15 minutes.

3.5 Research Design and Data Analysis

Table 4 provides a summary of the data collection analysis used to answer each of the three research questions.

Table 4 – Overview of Data Collection Analyses

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data Collection Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is the impact of a BYOD program on secondary school students’ perceptions of engagement in the English classroom?</td>
<td>• The unit reflection surveys were analyzed using descriptive statistics. • The open-ended responses from the four-unit reflection surveys and the course reflection responses were analyzed using thematic analysis.</td>
</tr>
<tr>
<td>2. What is the impact of a BYOD program on secondary students’ perceptions of the learning process in the English classroom?</td>
<td>• The unit reflection surveys were analyzed using descriptive statistics. • The open-ended responses from the four-unit reflection surveys and the course reflection responses were analyzed using thematic analysis.</td>
</tr>
<tr>
<td>3. What is the impact of a BYOD program on secondary students’ perceptions of learning performance in the English classroom?</td>
<td>• The unit reflection surveys were analyzed using descriptive statistics. • The open-ended responses from the four-unit reflection surveys and the course reflection responses were analyzed using thematic analysis.</td>
</tr>
</tbody>
</table>

3.5.1 Qualitative Data – Coding

A coding scheme was developed to organize student responses to open-ended questions into three topics relating to the three research questions: engagement, learning process, and
learning performance. Categories for open-ended responses relating to engagement included attention and distraction. Categories for comments relating to the learning process included accessibility, collaboration, communication, feedback, management, program, technical issues, and understanding. Finally, categories for comments related to learning performance included productivity, overall quality, and writing. Comments were assigned a positive (1), negative (-1), or neutral (0) rating, depending on the words students used to describe their response. Examples of positive descriptors used by students in their responses to open-ended questions included “easier,” “faster,” “better,” “more,” and “helped.” Examples of negative descriptors used by students included “unresponsive,” “distracting,” “prevent,” “unable,” and “challenge.” The primary researcher for this study was the sole rater of student responses. Appendix D provides a description of each of the terms used to code open-ended responses by students relating to the categories of engagement, learning process, and learning performance.
4 Results

4.1 Overview

4.2 Student Perceptions of Engagement

4.2.1 Likert Questions

Table 5 displays students’ perceptions of engagement based on four unit reflection surveys (Appendix B). Approximately sixty percent of students agreed or strongly agreed that using their computer increased engagement during the unit and for the unit assignment.

Table 5 – Students’ Responses relating to Engagement in the Unit Reflection Surveys \( (n = 259) \)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean (^1)</th>
<th>SD</th>
<th>Disagree(^2)</th>
<th>Agree(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Using my computer device increased my engagement during this unit.</td>
<td>5.3</td>
<td>(1.6)</td>
<td>9%</td>
<td>58%</td>
</tr>
<tr>
<td>2. Using my computer device increased my engagement while working on the unit assignment.</td>
<td>5.5</td>
<td>(1.6)</td>
<td>7%</td>
<td>63%</td>
</tr>
</tbody>
</table>

\(^1\) Seven-point Likert Scale (1-Strong Disagree to 7- Strongly Agree)
\(^2\) Both Disagree and Strongly Disagree
\(^3\) Both Agree and Strongly Agree

4.2.2 Open-Ended Questions

Based on student responses to the open-ended questions from each of the four units (Appendix B) and the end of course survey (Appendix C), a total of 277 comments, organized into two categories, were related to the impact of the BYOD program on engagement (Table 6).

Table 6 – Summary of Qualitative Comments on Engagement \( (n = 277) \)

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
<th>Negative</th>
<th>%</th>
<th>Neutral</th>
<th>%</th>
<th>Positive</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>199</td>
<td>12</td>
<td>6%</td>
<td>25</td>
<td>13%</td>
<td>162</td>
<td>81%</td>
</tr>
<tr>
<td>Distraction</td>
<td>78</td>
<td>75</td>
<td>96%</td>
<td>3</td>
<td>4%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
Attention was the largest category (n = 199, 72%) and referred to the impact that computer use had on student interest in their English course. Students credited computer use with enhancing attention (n = 108), focus on the lesson (n = 27) and enabling them to do their school work (n = 15). Sample comments included:

“It made me pay more attention because I was able to the work on my computer as well as the screen the lesson was on.”

“It was fairly good because I was able to follow along with the class with ease and was able to go back and look at the teacher’s examples for guidance of what to do.”

“Using my computer device in the unit helped me to be more interested in the unit and explore how to use the technology.”

“I was more focused on what was going on in class, and I was aware of what I had to work on.”

Distraction was the second largest category related to engagement (n = 78, 28%). Comments about distraction referred to how students perceived that computer use was undermining their attention in the English course. Students stated that computer use (n = 49) was the biggest factor leading to distraction, followed by access to the Internet (n = 8) and playing games (n = 7). Sample student responses included:

“You can sometimes get distracted while on your computer because you can search [for] anything you want.

“There were many distractions from other students in the class from their computers.”

“The challenges when using my computer were that there were other websites and distracting things that could prevent me from completing my work in a certain time period. I tried multi-tasking, but it wasn’t [very] effective.”

“Being completely honest here, computers were the cause of many distractions which kept myself from being on track and completing my work in class. This is also a problem outside of school when I get distracted by games or go online and surf the Internet.”

“Sometimes, I would get distracted and go a bit off-task from my work, but this didn’t happen much.”
4.3 Student Perceptions of the Learning Process

4.3.1 Unit Reflection Surveys

4.3.1.1 Likert Statements

Approximately seventy percent of students agreed or strongly agreed that using a computer enabled effective communication and prepared them for unit assignments (Table 7).

Table 7 – Students’ Responses to the Learning Process in the Unit Reflection Surveys (n = 259)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
<th>Disagree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Using my computer device enabled effective communications with my peers about schoolwork.</td>
<td>5.7</td>
<td>1.5</td>
<td>6%</td>
<td>68%</td>
</tr>
<tr>
<td>2. Using my computer device enhanced my preparation for the unit assignment.</td>
<td>5.7</td>
<td>1.4</td>
<td>6%</td>
<td>69%</td>
</tr>
</tbody>
</table>

1 Seven-point Likert Scale (1-Strong Disagree to 7- Strongly Agree)
2 Both Disagree and Strongly Disagree
3 Both Agree and Strongly Agree

4.3.2 Open-Ended Questions

Based on student responses to the open-ended questions from each unit (Appendix B) and the end of course survey (Appendix C), a total of 843 comments, organized into eight categories, were offered about the impact of the BYOD program on the learning process (Table 8).
Table 8 – Summary of Qualitative Comments on the Learning Process (n = 843)

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
<th>Negative</th>
<th>%</th>
<th>Neutral</th>
<th>%</th>
<th>Positive</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>293</td>
<td>14</td>
<td>5%</td>
<td>2</td>
<td>1%</td>
<td>277</td>
<td>95%</td>
</tr>
<tr>
<td>Understanding</td>
<td>194</td>
<td>15</td>
<td>8%</td>
<td>24</td>
<td>12%</td>
<td>155</td>
<td>80%</td>
</tr>
<tr>
<td>Communication</td>
<td>102</td>
<td>3</td>
<td>3%</td>
<td>1</td>
<td>1%</td>
<td>98</td>
<td>96%</td>
</tr>
<tr>
<td>Technical Issues</td>
<td>82</td>
<td>79</td>
<td>96%</td>
<td>0</td>
<td>0%</td>
<td>3</td>
<td>4%</td>
</tr>
<tr>
<td>Program</td>
<td>80</td>
<td>17</td>
<td>21%</td>
<td>11</td>
<td>14%</td>
<td>52</td>
<td>65%</td>
</tr>
<tr>
<td>Management</td>
<td>43</td>
<td>9</td>
<td>21%</td>
<td>0</td>
<td>0%</td>
<td>34</td>
<td>79%</td>
</tr>
<tr>
<td>Collaboration</td>
<td>29</td>
<td>1</td>
<td>3%</td>
<td>0</td>
<td>0%</td>
<td>28</td>
<td>97%</td>
</tr>
<tr>
<td>Feedback</td>
<td>20</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0%</td>
<td>20</td>
<td>100%</td>
</tr>
</tbody>
</table>

Accessibility was the largest category (n = 293 comments, 35%) and referred to how devices enabled students to connect to resources with technology. Students stated that technology allowed them to access course materials (n = 47), locate research (n = 44), conduct searches (n = 36), and work with documents (n = 34). Ninety-five percent of the comments in this category were positive. Sample comments included.

“Some benefits of using my computer device for learning [were] having access to all of my assignments whenever I wanted the Internet, having access to Moodle, and [being] able to send emails for help.”

“[My device] allowed me to effectively research topics for the assignments that took place, allowing me to hand in well-written and researched work.”

“Using my computer device had a positive impact on the quality of my assignment. I could get accurate information by looking it up.”

“My computer made it easier to have access to the songs, definitions and other things used in this unit that needed Internet or needed to be accessed by my computer.”
“In order to access the document, you need a wi-fi connection which is why it is inconvenient at times.”

The second largest learning impact category was understanding (n = 194, 23%). Understanding refers to how the use of computers enhanced student understanding. Students stated that computer use improved their learning (n = 79), that their devices enabled comprehension (n = 36), and technology usage assisted in clarifying learning expectations (n = 23). Eighty percent of the comments about understanding were positive. Representative comments were:

“[My device] helped me understand the unit better by looking up examples and more clear definitions of terms.”

“[My device] impacted the way I learned. I used technology like Moodle and Google Drive for everything.”

“[My device] helped a lot when reading Shakespeare’s play Twelfth Night and reading the modern text and the original text to help me better understand what I was reading so I could easily participate in group work.”

“Using the computer allowed me to feel more confident in my learning because we could learn in more interesting ways.”

“Some people don’t know how to work program[s] that well and don’t know how to properly use apps, sites, and laptops.”

Communication was the third largest category (n = 102, 12%). Communication involved the use of computers to communicate with others about the English course. Students asserted that their computers enabled peer to peer communication (n = 56) and teacher communication (n = 21). Ninety-six percent of the responses about communication was positive. Sample comments included:

“I think it had a good impact as I could communicate easily with my classmates.”

“Getting help from the teacher without being in the class was much easier especially when something was due the next day.”
“The benefits of using my computer during this course was that we could talk with our classmates and get help very easily on Google Docs, Drive, and Slides. I really liked using my computer as well because I could always get in touch with my teacher.”

“It helped a lot when my group member[s] and I were working on a project, and we could easily communicate with each other.

“It did allow me to communicate with group members without them being at school, although since a few people did not complete or go into the document, it was difficult to communicate.”

The fourth largest category (n = 82, 10%) of responses belonged to technical issues. This category included technical issues that impacted learning. Students primarily focused on the quality of the internet (n = 45), problems with computers (n = 15), and problems related to charging their computers (n = 12). Ninety-six percent of the comments about technical issues were negative. Sample comments included the following:

“To improve the blended learning program, I suggest having chargers for computers, or somewhere we could charge our computers at lunch or something, so if you forget to do it the night before, you don’t have to worry.”

“There are also not enough outlets to charge your laptop in.”

“Block every website but Google Apps and Moodle.”

“Some challenges of using your computer for learning in English is computers take a long time to load, so you do not have as much time to work on your assignments.”

The fifth category relating to learning included comments about the overall BYOD program (n = 80, 9%). Students commented on the program’s effectiveness (n = 45), their attitude toward the program (n = 11), and issues of equity (n = 7). Approximately sixty-five percent of responses were positive, and twenty percent were negative. Here are several sample comments:

“I personally like the blended learning program. It benefits students’ learning through Google and other classroom tools. It has helped me by making work easier to complete.”
“I think the use of computers is effective in the blended learning program, but if there was a way to eliminate distractions from the outside work aspect of the computer it would help all of the students work and learn better.”

“The school’s overall blended learning program at our school is very effective. Using computers and other devices helps with so many things, such as helping us be more organized and easier research.”

“I think [the BYOD program] is very effective and works well with people who are very techy and good with computers.”

The sixth category connected to learning was management (n = 43, 5%). Management refers to the management of the computer and school work. Students primarily focused on how the computer enabled them to manage the course material and their documents (n = 33). Approximately eighty percent of comments were positive, and twenty percent were negative. Sample comments included:

“It’s harder to lose notes since you have them saved on files on your computer.”

“All my assignments were online, so nothing was ever misplaced.”

“[The] second reason is using Google Drive. Using Google Drive is great because all the documents save every time you make a change.”

“It really helps with organization because you have to be organized to put things in files and remember to charge and bring your computer to school.”

“Sometimes I put my assignments in a different document, and I forgot to submit it in the right one.”

The seventh category relating to learning was collaboration (n = 29, 3%). Within collaboration, students commented on the use of the computer to work with their peers (n = 22). More than ninety-five percent of comments about collaboration were positive. Comments from students included:

“They [peers] could help me with offering new ideas for group projects and being able to create group chats helped to agree with project choices and helped us get it done faster.”
“The benefits of using my computer device for learning in the Grade 9 Academic English course are being able to type fast (faster than I could write), it was easy to research for assignments, and simple to collaborate with peers on group assignments using Google Drive.”

“I was able to get access to my documents from any of my electronic devices, as well as being able to share the documents and work with my classmates on the same documents.”

“The second challenge I faced was counting on the peers I worked with to finish their job. Other than that, I never really faced many challenges.”

Feedback was the smallest category relating to learning (n = 20, 2%). Feedback meant information that students received about their school work. Students stated that they received constructive feedback from peers (n = 13) and the teacher (n = 5) using their computers. Comments about feedback were one hundred percent positive. Sample comments about feedback included:

“My group members were able to comment on my work and give me ideas about how to improve it.”

“Using my computer device allowed me to easily have my peers and teacher help to edit and make my work better. [Using my computer device] improved the quality of my assignment.”

“It was easy to participate and be engaged when working with my group because it was easy to see each other’s work and give each other feedback.”

“[My computer] let me communicate with other classmates in this unit, allowing me to receive and give feedback as well as being able to use Google Docs.”

4.4 Student Perceptions of Learning Performance

4.4.1 Likert Questions

Table 9 shows student responses to three Likert-scale statements about students’ perceptions of the impact that technology had on learning performance. Approximately eighty percent of students agreed or strongly agreed that computer use made their assignments easier
and faster to complete. More than seventy percent agreed or strongly agreed that computer use improved the quality of their assignment.

Table 9 – Students’ Responses to Learning Performance in the Unit Reflection Surveys (n = 259)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
<th>Disagree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Using my computer device made the unit assignment easier to complete.</td>
<td>6.0</td>
<td>1.4</td>
<td>5%</td>
<td>81%</td>
</tr>
<tr>
<td>2. Using my computer device made the assignment faster to complete.</td>
<td>6.0</td>
<td>1.4</td>
<td>5%</td>
<td>81%</td>
</tr>
<tr>
<td>3. Using my computer device improved the quality of the unit assignment.</td>
<td>5.8</td>
<td>1.4</td>
<td>5%</td>
<td>73%</td>
</tr>
</tbody>
</table>

1 Seven-point Likert Scale (1-Strong Disagree to 7- Strongly Agree)
2 Both Disagree and Strongly Disagree
3 Both Agree and Strongly Agree

4.4.2 Open-Ended Questions

Students offered 929 student comments relating to learning performance. After analyzing the comments, three categories emerged: productivity, overall quality and writing (Table 10).

Table 10 – Summary of Qualitative Comments on Learning Performance (n = 929)

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
<th>Negative</th>
<th>%</th>
<th>Neutral</th>
<th>%</th>
<th>Positive</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity</td>
<td>602</td>
<td>39</td>
<td>6%</td>
<td>11</td>
<td>2%</td>
<td>552</td>
<td>92%</td>
</tr>
<tr>
<td>Quality</td>
<td>172</td>
<td>1</td>
<td>1%</td>
<td>24</td>
<td>14%</td>
<td>147</td>
<td>85%</td>
</tr>
<tr>
<td>Writing</td>
<td>155</td>
<td>1</td>
<td>1%</td>
<td>2</td>
<td>1%</td>
<td>152</td>
<td>98%</td>
</tr>
</tbody>
</table>

The largest category relating to learning performance was productivity (n = 602, 65%). Productivity related to student use of their devices to do daily schoolwork, including assignments. Some areas where the use of technology impacted productivity included school work (n = 86), speed of work with technology (n = 69), the appearance of student work (n = 66),
organization (n = 53), the use of the computer (n = 50), and the ability to edit (n = 28). More than ninety percent of productivity responses were positive. Sample comments included:

“I also found using the computer was helpful for presentations because it was easier to make them engaging and interesting.”

“Using my computer in this assignment had an impact on how quickly I got my work done and how it was easier to find proof.”

“[My computer] engaged me to work and learn because it was easier to do it on a computer than do it by hand. Also, I could check all of my errors and correct them and also my grammar.”

“I am able to access my resources as I write essays and other pieces of work. I am also able to type much faster than I can write, so I have become a more efficient worker.”

“Maybe have a paper option, because I have had laptop issues several times and was unable to do tasks I was given.”

Quality was the second largest category relating to learning performance (n = 172, 19%). Quality referred to students’ perceptions of the overall quality of their assignments, which included writing, multimedia, oral, and group work during the English course. Students stated that the use of technology influenced the quality of their work (n = 121), that computer use was related directly to their performance (n = 30), and that it impacted their achievement (n = 20). Eighty-five percent of student comments were positive. Sample student responses included:

“The use of technology increase[d] my academic performance in Grade 9 English.”

“I found that being able to use my computer made my assignments so much better. I wouldn’t be able to do it without a computer.”

“[My device] allowed me to plan out and prepare for assignments while giving me extended amounts of time to complete my work, which helped ensure the proper quality of my work.”

“My device impacted the quality of my assignment because I was able to edit my work efficiently. It also impacted my assignment by allowing me to use the same organizer my classmates utilized to write their essay.”
“I think the quality of my work could have been better because a lot of the time when I was on my computer I would get distracted by some of the other things that are on it.”

The third largest category relating to learning performance was writing (n = 155, 17%). Writing referred to students using computers in daily writing tasks and unit assignments. Students claimed that the use of their computers improved their spelling (n = 53), their grammar (n = 28), the legibility of their work (n = 19), and their ability to edit (n = 16). Ninety-eight percent of student responses were positive. Student responses included:

“My computer helped me do research and answer the questions, write the paragraphs and essay, and complete assignments.”

“As a person whose handwriting is not that good, I think that my computer does a great job of maintaining the looks of my assignment as well as the quality.”

“The impact of technology on my performance was [that] I was able to organize my work and was able to create organized paragraphs.”

“My computer helped me do research and answer the questions, write the paragraphs and essay, and complete assignments.”

“[My device] allowed me to edit my work and expand my ideas with programs available on a computer.”
5 Discussion
5.1 Overview

The purpose of this study was to explore the impact of a BYOD program in secondary school English classrooms. This study addressed three research questions:

1. What is the impact of a BYOD program on secondary school student perceptions of engagement in the English classroom?
2. What is the impact of a BYOD program on secondary school student perceptions of the learning process in the English classroom?
3. What is the impact of a BYOD program on secondary school student perceptions of learning performance in the English classroom?

5.1.1 Student Perceptions of Engagement

Student perceptions of engagement while learning in the BYOD program were assessed in two ways in this study: Likert scale statements and open-ended questions (Appendix B and C). The majority of student responses about engagement were positive about using computers to learn in a BYOD environment, while 28 percent of student comments relating to engagement focused on distractions caused by the use of computers in the classroom. Additionally, the majority of students stated that their engagement increased when using their devices in each course unit and when using their devices to work on assignments.

In this study, secondary school students asserted that their engagement increased when using their computers to learn English in the BYOD program. Approximately 58 percent of comments stated that computer use positively impacted attention and engagement. Previous research indicates that student engagement and interest increased when students in K-12 classrooms have access to computers while learning in an OTO environment (Bebell &
O’Dwyer, 2010; Drayton et al., 2010; Harper & Milman, 2016; Hoyer, 2011; Keengwe, Schnellert & Mills, 2012; Mills, 2010). The majority of student responses agreed with these findings. It is possible that engagement increased because of student autonomy. The BYOD program allowed students to choose what work to do, when to do it, and how they would do it. Previous research indicated that students have a greater sense of independence when they use computers (Keengwe et al., 2012) which may positively impact student engagement, attitude, and motivation toward learning.

Students identified several factors positively contributing to their engagement. These included the use of computers to learn, the ability to focus on the lesson during class time, completion of their school work using laptops, appeal of the format versus the pencil and paper approach, the ease of accessing course materials, and online interactions with peers. These responses are consistent with research on OTO programs in secondary school, where attentiveness and motivation increased when using technology (Keengwe, Schnellert & Mills, 2012; Lowther et al., 2003; Lowther et al., 2007). Students’ ability to access course materials during the in-class lesson may lead to increased engagement, making it easier for students to follow, ask questions, and understand, which, in turn, may enhance efficiency when using class time to complete work.

Some student responses indicated that computers were a distraction in the BYOD environment. Students affirmed that having access to their computer during class time, including access to the Internet, playing games, and watching videos, sometimes undermined their focus on learning. Niles (2006) found that OTO access in a secondary school setting created new challenges for maintaining student engagement in the learning process. Previous research suggested that OTO access to laptops caused student distraction (Tallvid et al., 2015). Research
also indicated that sometimes students are distracted by using social media and playing games (Hatakka, Andersson & Gronlund, 2012). When students are using technology to learn and construct products in the classroom, they are less likely to be distracted, but off-task behaviour may increase when teachers do not alter classroom management strategies to suit a BYOD program or teach students about self-regulation when using their devices. Spires, Oliver, and Corn (2012) found that off-task behaviour with computers was less harmful in constructivist, project-based tasks, as students could still finish their work over time.

Finally, students in this study of a BYOD program stated that engagement increased while working on learning tasks within an English unit of study and that engagement increased while students worked on summative assignments. Previous research indicates that student engagement may increase when studying with laptops in an OTO access program (Bebell & O’Dwyer, 2010; Delgado, 2015; Drayton, 2010; Harper & Milman, 2016; Hoyer, 2013; Keengwe et al., 2012; Keppler et al., 2014). However, there is little existing research indicating that engagement increases when secondary students use their computers to work on summative assignments in the subject of English. Several factors may lead to increased engagement when students use computers to work in a BYOD program, including engaging in learning tasks that are designed to take advantage of computer affordances, having opportunities for differentiation, being able to collaborate with peers and receive ongoing feedback from the teacher, and having the option to edit and improve digitally-constructed products easily. Multimedia elements, the ability to work on the assignment at any time in any place, and more student autonomy in the process may also be contributing factors leading to increased engagement when working in a BYOD learning model.
5.1.2 Student Perceptions of the Learning Process

Student perceptions of the learning process in the BYOD program were assessed in two ways in this study: Likert scale statements and open-ended questions (Appendix B and C). This study found that a majority of students responded positively to BYOD programs regarding access, understanding, communication, management, collaboration, and feedback. Overall, approximately 80 percent of student comments about the learning process were positive, and 16 percent of the comments about learning were negative. Previous research on OTO access programs found that students’ overall attitudes towards the learning process with technology were positive (Gurung & Rutledge, 2014; Lowther et al., 2012; Rosen & Beck-Hill, 2012; Schnellert & Keengwe, 2013; Solhaug, 2009; Zucker & Hug, 2008). Unsurprisingly, student attitudes toward technical issues were predominantly negative, as shown in 96 percent of student responses about technical issues, while 65 percent of the responses about the effectiveness of the overall BYOD program were positive.

Accessibility to information in the BYOD program was the most substantial perceived benefit to student learning process by the secondary students in this study. Students asserted that their devices enabled greater access to the Internet, allowed them to search and conduct research online, and provided access to course materials and student documents. Previous studies found that OTO laptop programs also enabled increased access to information (Hatakka, Andersson & Gronlund, 2012; Silvernail & Lane, 2004; Spires, Oliver & Corn, 2012; Suhr et al., 2010). Research reported that accessing the Internet is one of the most frequent uses of devices in the classroom (Drayton et al., 2010; Grimes & Warschauer, 2008; Spires, Oliver & Corn, 2012; Suhr et al., 2010; Trimmel & Bachmann, 2004). Previous studies also found that when using the Internet, students often engaged in searches and gathered research (Grimes & Warschauer, 2008;
Harper & Milman, 2016; Spires, Oliver & Corn, 2012). Students recognize the benefits of easily accessing information online in a classroom setting.

Many secondary students in the BYOD program asserted that the use of their devices to learn increased their understanding of the course curriculum. Technology use enhanced their learning process, their devices helped to improve comprehension, and learning expectations were clarified. Previous research also found that the use of computers enabled middle school students in OTO programs to do their work and understand what they were learning (Silvernail & Lane, 2004; Silvernail & Gritter, 2007). In traditional teaching without technology, teacher explanations often occur first while students are passive, and the students become active when asked to do work related to the lesson. BYOD programs may be different as students can use their devices as teaching and learning occur, creating a different dynamic between students and the teacher.

Some students commented that the use of computers enabled communication between peers and between students and teachers. Communication among students and with teachers occurred inside and outside of the classroom. Previous research indicates that use of computers in OTO programs facilitated communication between teacher and students (Broussard et al., 2014; Drayton et al., 2010; Harper & Milman, 2016; Oliver & Corn, 2008; Penuel, 2006). Niles (2006) found that use of technology changed teacher and student communication and enabled students to function in the capacity of the teacher. Similarly, research indicated that OTO access led to more peer communication (Harper & Milman, 2016; Penuel, 2006). It is possible that the majority of student-to-student and student-to-teacher interaction occurred within web-based documents students were using for learning and constructing products demonstrating their
understanding, allowing both timely student and teacher feedback with individualized support for student learning, as well as facilitating peer collaboration.

Students reported that the BYOD program led to better management of their documents and their devices. This result is consistent with Broussard et al.’s (2014) findings that OTO programs led to greater organization and student responsibility. Students in this study stated that computer use improved organization; research supported these findings, indicating that organization increased when students used their computers (Hoyer, 2011; Penuel, 2006; Silvernail & Lane, 2004; Warschauer & Grimes, 2005). Having a sense of control and autonomy (Standley, 2012) in the management and organization of course materials and student work may contribute positively to student engagement and attitudes toward learning with technology.

Students’ ability to collaborate with their peers using their devices was another perceived benefit of the BYOD program in this study. Previous research supports this result in OTO access programs, where technology led to increased collaboration (Hoyer, 2011; Swallow, 2014). Studies found that computer use allowed students to help each other with their work (Dunleavy & Heinecke, 2008; Warschauer & Grimes, 2005). It is possible that collaboration was facilitated not only by having access to the Internet and using web-based documents but also by the types of daily tasks and shared assignments designed by the teachers in the grade 9 academic English course.

Students’ attitudes in this study were positive about the ability to give and receive feedback from peers and their teacher. Previous research found that the ability to provide feedback is a benefit to computer use in the classroom in OTO environments (Drayton et al., 2010; Dunleavy & Heinecke, 2008; Blackley & Walker, 2015; Warschauer & Grimes, 2005). Relatively recent innovations in web-based documents allowing multiple users to work on the
same task simultaneously, as well as commenting and suggesting features that allow timely and specific feedback, may be responsible for students’ positive attitudes toward the benefits of feedback in the learning process.

Approximately 10 percent of student comments about the learning process indicated that technical issues were a problem in the BYOD program. Criticisms in this study focused on the school’s wireless network, issues with their computers, and challenges around charging their devices. The durability of technology, short battery life, device updating and restarting, as well as Internet connectivity have been cited as technical issues in OTO programs (Broussard et al., 2014; Dunleavy & Heinecke, 2007; Standley, 2012; Trimmel & Bachmann, 2004; Warschauer & Grimes, 2005). Technical issues can be frustrating to teachers as well (Grimes & Warschauer, 2008) and may be responsible for teacher reticence to incorporate technology into daily lessons. Improving the reliability of a school’s wireless network, educating students on where they can charge their devices, and allowing flexible seating in the classroom so students can easily plug in their devices as needed may help to mitigate some of the technical issues students experienced in this study.

Finally, the majority of students were positive about the overall BYOD program and its impact on the learning process. Attitudes were positive about the program’s effectiveness. A few students identified issues around equity, including the differences in quality of devices, some students’ lack of laptops, and the loaner system for students who had no laptops, either temporarily or long-term. Proponents of OTO access programs cite the equalization of access when all students have a device (Hatakka, Andersson, & Gronlund, 2012; Lowther et al., 2007; Penuel, 2006). Ross (2013) concurred that BYOD programs could not ignore issues of equity around student access to devices.
5.1.3  Student Perceptions of Learning Performance

Student perceptions of learning performance in the BYOD program were assessed in two ways in this study: Likert scale statements and open-ended questions (Appendix B and C). Previous research indicated that OTO access can positively impact student performance and have achievement-related benefits (Harper & Milman, 2016). Students in this study agreed that the use of their devices positively affected their productivity, the quality of their work, and their writing performance. With regards to student comments about learning performance in the BYOD program, 92 percent of comments about productivity were positive, 85 percent of comments about the quality of student work were positive, and 98 percent of comments about writing were positive.

Student attitudes were consistently positive about the impact of their devices on their performance in the grade 9 academic English course. Students stated that computer use made it easier and faster to complete their assignments. Previous studies also indicated that the use of technology made schoolwork easier (Lowther et al., 2007; Mills, 2010) and faster (Silvernail and Gritter, 2007) to complete and the overall efficiency in the classroom increased when students used computers (Broussard, 2014; Hatakka, Andersson, & Gronlund, 2012). The increased ease and speed when completing work may be partially related to accessibility of work both at school and at home in a BYOD program.

Many secondary students in the BYOD program asserted that the use of technology increased several aspects of their productivity. The appearance of their work improved and their devices also made it easier to make changes to their work, a result that is consistent with previous research with middle school students in OTO immersion programs (Silvernail & Gritter, 2003; Warschauer & Grimes, 2005).
Many students asserted that technology positively impacted the overall quality of their work. Students also stated that the quality of the assignment for each unit was improved because they were using their computers. They commented that technology increased their performance and their achievement in the grade 9 English course. Previous research indicated that quality of student work increases when using computers in OTO settings (Bebell & Kay, 2010; Bebell, 2005; Grimes & Warschauer, 2008; Mills, 2010; Silvernail & Lane, 2004; Silvernail & Gritter, 2007; Warschauer & Grimes, 2005; Warschauer et al., 2014). Few studies found that OTO programs positively-impacted achievement in secondary school English settings. Research in middle school OTO settings indicated an improvement in achievement when students learned with computers (Bebell & Kay, 2010; Gulek & Demirtas, 2007). Studies of high school OTO programs found varying results with one study reporting no difference in achievement (Dennis, 2014), improvement in science (Dunleavy & Heinecke, 2007), and some improvement across all subject areas (Mills, 2010). Improvement in performance for students learning in a BYOD program in the subject may relate to increased engagement, understanding, efficiency, communication, quality and quantity of writing when learning with computers.

Finally, the grade 9 English students commented that writing improved in the BYOD program. Writing improvement when using computers is also supported by previous research in K-12 OTO settings (Keppler, Weiler & Maas, 2014; Penuel, 2006; Russell, Bebell & Higgins, 2004; Warschauer & Grimes, 2005). Students noted that computer use led to better spelling and grammar, improved legibility in their work, and an increased ability to edit their work. This finding is also consistent with research, which found that computers enable student revision of their writing (Bebell, 2005; Grimes & Warschauer, 2008; Keppler, Weiler & Maas, 2014; Suhr et al., 2010; Warschauer et al., 2014).
5.2 Limitations and Future Research

5.2.1 Limitations

This study incorporates two methods of data collection: Likert-scale statements and open-ended questions. Student qualitative responses were carefully organized into themes and rated regarding the degree of positivity or negativity in each response. The sample size was eighty student participants, and the study took place over a school year of ten months. Student responses were collected five times throughout each semester, using four surveys and a concluding course reflection.

However, some methodological limitations are evident. These limitations include the representativeness of the sample, the absence of assessment and evaluation data explicitly relating to student performance, the lack of responses from all stakeholders in students’ learning, the role of the teacher in a BYOD program, the lack of a control group, the exploration of subject-specific use of devices, the design of the Likert scale statements in the unit reflection surveys, and teacher influence on students.

First, although the size of the sample was reasonable and included male and female participants, this study focused solely on grade 9 academic students. While academic students make up the majority of students in grade 9 at this school, the views of at-risk students are also important. Additionally, the secondary school has four grades, and only one was included in this study, making it difficult to generalize findings to all high school students. Future research should focus on a sample of students from grades 9 through 12 at all ability levels.

Secondly, while this study explored student perceptions of learning performance after each unit of study and the final culminating assignment, it did not examine quantitative performance and achievement data. This study relied on student assessment of their performance
throughout the grade 9 English course through reflection using Likert-scale statements and open-ended questions. Future studies could include achievement data such as summative assignments, final examinations, and course grades. Student performance on standardized tests in grade 9 and 10 would also be useful to include in future research to evaluate the impact of the BYOD model on student learning in secondary school.

Third, this study focused on student attitudes and perceptions about their engagement, learning process, and learning performance. The classroom teachers for the five classes played no part in providing data based on their attitudes, perceptions or observations. Including data from teachers involved in the BYOD program would lead to a more thorough assessment of the program’s impact on students and teachers. Future research in BYOD programs should include teacher responses, as well as responses from school administrators and parents, to get a complete view from all stakeholders about the impact of the BYOD model on student learning.

Fourth, several studies on OTO access programs state that the teacher has a vital, if not the most influential role in the effective implementation of technology immersion programs (Bebell & Kay, 2010; Bebell & O’Dwyer, 2010; Shapley et al., 2010). Future studies should explore how teacher experience, teacher expertise with technology, and the use of teaching strategies and pedagogical beliefs impact the effectiveness of BYOD programs.

Fifth, the group of students who participated in the study all entered the BYOD program in grade 9. There was no comparison made between their engagement, learning process, and learning performance while in a traditional classroom during elementary school. Establishing a baseline would allow comparisons to students using their computers in the BYOD program during their first year of high school. Future research should use a control group either at the school where the study takes place or at a similar secondary school. Including a control group
would allow a comparison between samples to determine the impact of the BYOD treatment on students.

Sixth, there is limited research exploring the impact of OTO laptop immersion programs on specific subject areas (Dunleavy & Heinecke, 2007; Zuber & Anderson, 2012). This study focused exclusively on the impact of the BYOD program on students studying the subject of English. Future studies could explore and compare the use of BYOD in multiple subject areas.

Seventh, Likert scale questions could be used more effectively in this study. In the four unit reflection surveys, which were identical in design, there were seven Likert scale statements and three open-ended response questions. The Likert scale statements, while using a seven-point scale to be more precise, were general in their wording, connecting to overall topics such as student engagement, the learning process, and the learning performance in the unit assignments. Additional Likert scale statements, with a specific focus on aspects of engagement, the learning process, and learning performance, could prompt more meaningful and detailed responses from the student participants.

Finally, this group of students was a sample of convenience, as the researcher was a teacher who worked at the same school as the teachers who participated in the study. The researcher’s classes did not participate in the study to avoid the possibility of bias and coercion. However, students participating in the unit reflection surveys and the course reflection may have felt obligated to respond positively to the data collection tools as statements and questions related to engagement, learning, and performance within specific units of the course. Similarly, students were asked to provide constructive criticism on the BYOD program as a whole. Student anonymity in the survey responses should have at least partially mitigated this concern. Future
studies might involve external researchers interacting with students and introducing the data collection tools to the sample.

5.2.2 Future Research

Future research should address the limitations mentioned previously. These include focusing on a sample of student participants that represents all ability streams in secondary school. Following a cohort throughout their four years of high school would also offer a complete description of how the program and its impact on students evolve. At the very least, research should investigate a range of courses in the BYOD program; this would allow exploration of computer use and impact across subject areas. Next, achievement data could be incorporated to assess the impact of the BYOD program on performance, with students from different elementary feeder schools, some of whom do and do not attend a secondary school with a BYOD program, compared to determine how computer use in the classroom impacts achievement. A control group could be established using this method, or within a school with a BYOD program, to allow comparison of treatment and non-treatment groups. Also, future studies should assess the role of the secondary school teacher BYOD programs including teacher comfort and skill with technology, pedagogy, and teaching strategies. Finally, an exploration of teaching and learning across subject areas, including specific uses of devices and frequency of use, should be investigated in future research on the impact of BYOD programs on secondary school students.

At least seven potential future research questions could be investigated:

1. How does a BYOD program impact student engagement, the learning process, and learning performance in academic, applied and essential courses?
2. How does learning throughout the four years of secondary school in a BYOD program impact student engagement, the learning process, and learning performance?

3. How does computer use in a BYOD program impact secondary school students’ achievement?

4. How does the BYOD program impact secondary school teacher attitudes toward teaching, as well as teacher perspectives on student engagement, the learning process, and learning performance?

5. What impact do teaching experience, teacher comfort level, and skill with technology, pedagogy, and practice have on students in a BYOD program?

6. How does student learning in a BYOD program differ from secondary schools without a technology immersion program?

7. What are differences in teaching and learning across subject areas in a BYOD program?

5.3 Educational Implications

The results of this study suggest that BYOD programs in secondary school English classrooms, where students have access to their computers and the Internet on a daily basis, can enhance learning. The BYOD learning environment allows students to access course materials and student documents which are stored online both at school and at home. Students can efficiently manage and organize their work through the manipulation of documents while online. Students are also able to communicate with teachers and collaborate with peers, including offering and receiving feedback. These affordances require that teachers redesign the organization and delivery of daily lessons, course units of study, and summative assignments. Just as students need instruction about the content of specific subject areas, students will also need instruction about how to exploit the affordances having a computer in the classroom.
provides. Additionally, students will need to have their role and responsibility in the BYOD setting redefined to help them become more active participants in managing and directing their learning.

The results of this study also indicate that students may be more productive, produce higher quality work, and improve their writing in a BYOD setting. Increased student productivity, including efficiency and speed, could positively impact class time with regards to teaching and learning, allowing the introduction of supplemental teaching and learning activities, and allowing the exploration of specific subject areas in greater depth. Similarly, if computers allow students to increase the quality of their work, the educational system should adapt by challenging the expectations of students, including increasing the depth of understanding to be demonstrated and increasing the complexity expected in student work. Lastly, while BYOD programs lead to improvement in both the process and products involved with student writing, the use of technology should allow students to engage in more authentic and contemporary forms of writing, incorporating multimedia elements, and engaging an audience beyond the classroom.

There are also drawbacks for students enrolled in a BYOD program, specifically relating to distraction. Access to the Internet allows students to watch videos, play games and interact with peers using social media. Students need explicit instruction with regards to behavioural expectations when using technology. Teachers’ classroom management skills will need to evolve to incorporate omnipresent technology, while the guided development of students’ self-regulation skills will be essential in successful BYOD programs.

Technical issues may occur that undermine learning. Resolution of technical issues must occur in a timely and systematic manner; otherwise, they can lead to a negative perception of BYOD programs for all stakeholders, including students, parents, teachers, and administrators.
BYOD programs require careful planning before being offered at schools, and ongoing review leading to systematic improvements should be a part of continuous program delivery. Additionally, support for student computers is essential in offering and maintaining an effective BYOD program at any school level.

5.4 Summary

This study investigated three areas of education in a BYOD program: student perceptions of engagement, the learning process, and learning performance. The findings in this study about BYOD programs were consistent with previous research on OTO access programs. Students perceived that the use of their devices in the classroom led to increased engagement and attention. They were also aware of the distractions that their device created, looking at the teacher and the overall program to provide solutions to off-task behaviour.

This study suggests that a BYOD program can support and enhance the student learning process and learning performance in secondary English classrooms. According to students, access to the Internet enhances communication, collaboration, feedback, understanding, and provides an opportunity for students to manage web-based course materials and student documents. The use of personal devices can lead to increased student engagement, but teachers must consider classroom management strategies for a BYOD learning environment, while students need to recognize the role they play in minimizing off-task behaviour through self-regulation. Findings in this study and previous research also suggest that the use of technology can lead to increased productivity by students, improved quality of work, and stronger writing in the English classroom.

This study did not focus on the role of the teacher in the BYOD program, and the specific pedagogy and practices that are required to fully realize the potential of teaching and learning in
a classroom environment where every student has a personalized device. Understanding the relationship between the teacher, the students, the content and the technology is essential to thoroughly evaluate the effectiveness of BYOD programs in secondary school settings. Furthermore, the BYOD program at this particular school was called blended learning, and it is necessary to explore the optimal use of technology, as well as when to opt for non-technological teaching and learning strategies, to fully realize what a BYOD program can offer in education.
6 References


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Ross, K. (2013). Teacher implementation of “bring your own device” at a suburban high school serving high SES students. (Doctoral dissertation). Retrieved from https://repository.asu.edu/attachments/110360/content/Ross_asu_0010E_12753.pdf


Spektor-Levy, O., & Granot-Gilat, Y. (2012). The impact of learning with laptops in 1:1 classes on the development of learning skills and information literacy among middle school...


Appendix A – Parental Consent/ Student Assent Form

Dear Parents and Guardians/Students

My name is Derrick Schellenberg. I am the head of English at Sir William Mulock Secondary School. I am also currently completing a master’s degree at the University of Ontario Institute of Technology in the Faculty of Education. Your child, currently enrolled in Grade 9 Academic English for the 2015-2016 school year, is being invited to take place in a research study, described below. This research study has been approved by the University of Ontario Institute of Technology Research Ethics Board #15-002, on September 3, 2015. This research study is a required element of my master’s thesis.

Purpose of Study

In the 2015-2016 school year, in the four Grade 9 English Academic courses that I am teaching, I am conducting a study focused on the school’s blended learning model, where each student brings a computer to class. The purpose of the research study is to explore the benefits and challenges of learning when using technology, and how teaching impacts the use of technology in learning. Sir William Mulock Secondary School is ideal to conduct this study because it is one of few schools where all students have access to technology in the classroom on a daily basis.

Participation

Participation in this study is entirely voluntary. Parents or guardians who wish to withdraw their child from this study may do so at any time. Students may not choose to participate in the study without the approval of their parents or guardians. The choice to withdraw may be made at any time, using any means, and any responses provided by that student before the choice to withdraw will be immediately deleted. This choice may be made by parents, guardians or students.

During the study, which will last the entire semester of the Grade 9 Academic English course, students will complete several surveys (one after each course unit). Students will also respond to questions in a course reflection at the end of the course. The responsibility to the student includes providing opinions and insights about the blended learning model used at the school as it relates to the Grade 9 Academic English course, specifically how technology is used in learning and teaching. All data collection tools can be shared with parents, guardians, and students, in advance, upon request.

Study Description

This study has been approved by the York Region District School Board and the University of Ontario Institute of Technology. This study will fulfill the thesis requirement for my master’s degree of education in technology and resulting papers may be published upon completion of this study. Any student responses collected in the study will be anonymous with all identifiers removed after collection and analysis of the data.

Student names will not be collected in the surveys. All permission forms will be collected by a fellow course team member and kept in a sealed envelope by my colleague until completion of this research study. All responses will be collected electronically with students submitting their responses from their own individual computer during class time. Each survey or response will take approximately ten minutes in class to complete. This study will have absolutely no bearing on any assignments or grades assigned during the course. No audio or video recordings will be conducted as part of this research study. By consenting, participants have not waived any rights to legal recourse in the event of research-related harm.
Risks

Students may feel that they are being coerced to participate in this study, that their teacher may treat them differently if they choose not to participate in the study, or if they choose to withdraw from this study part way through the semester. Students may feel social pressure from their peers with some students choosing to participate and some students refraining from participating in this study. The names of students participating in the study will not be shared with the class. All forms collected to participate in this study will be collected and stored by myself, an English teacher at Sir William Mulock Secondary School, so the classroom teacher will not be aware of who is participating until after final marks have been submitted, report cards printed, and the semesters concluded. Any student feeling pressure as a result of any aspect of this study should immediately communicate with their parents or guardians, who will determine whether to communicate their concerns with one or more of the following parties: the school administration, guidance department and/or the classroom teacher.

Benefits

Potential benefits of this study include improving my personal practice as a teacher, enhancing the implementation of the blended learning project at Sir William Mulock Secondary School, redesigning how teaching and learning with technology is conducted in the York Region District School Board, and sharing the results and implications of the study via published papers and conference presentations. Research findings and results will include no identifiers of the student participants involved. The findings of this research study may be shared with parents, guardians, and students, upon completion of the study.

Student benefits as a result of this study include students being more aware of the different types of technology being used in the school’s blended learning model and how the technological is being specifically used to enhance and complement what is being taught and learned. Students will become more critically conscious of the strengths and weaknesses of specific technological tools, which will help make them better informed when selecting tools for their own work in and outside of the school environment. Lastly, and perhaps most importantly, students will contribute to and shape the blended learning model at Sir William Mulock Secondary School as their insights and observations about the use of technology to support teaching and learning will be shared with the school as a whole.

Once the data has been collected and analyzed, all individual student identifiers will be removed. Beyond student responses and opinions connecting to the topic of this study, no additional personal information will be collected. Responses will be collected using student computers during class time. Data collection for this study will cease on June 30th, 2016.

Contact Information

If you have any questions, concerns or would like further explanation about the scientific or scholarly aspects of this research study, please feel free to contact Derrick Schellenberg at Sir William Mulock Secondary School by phone (905-967-1045) or via email (derrick.schellenberg@yrdsb.ca). For any inquiries regarding the rights of a participant in this study or any concerns you have about this study, please contact the UOIT Research and Ethics Committee Compliance officer (compliance@uoit.ca) and/or 905-721-8668, extension 3693.
Appendix B – Unit Reflection Surveys

Unit Reflection Surveys (using Google Form with data collected in a Google Spreadsheet)

A Likert-like scale of 1 to 7 is being used with the following descriptors: strongly disagree, disagree, somewhat disagree, uncertain, somewhat agree, agree, and strongly agree. Seven scale statements are included in this survey, followed by three open-ended questions. This survey will take approximately ten minutes to complete.

Four of these surveys will be conducted, one after each of the four major units in the course.

*The use of the word “device” refers to the laptop, netbook, or tablet students bring to the classroom on a daily basis for the purposes of learning in the Grade 9 Academic English course.*

Category G: Unit Reflection

G1. Using my computer device made the unit assignment easier to complete.
G2. Using my computer device made the unit assignment faster to complete.
G3. Using my computer device enabled effective communication with my peers about schoolwork.
G4. Using my computer device enhanced my preparation for the unit assignment.
G5. Using my computer device improved the quality of the unit assignment.
G6. Using my computer device increased my engagement during this unit.
G7. Using my computer device increased my engagement while working on the unit assignment.

Category H: Open-ended questions

H1. What impact did using your computer device have on your learning?
H2. What impact did using your computer device have on the quality of your assignment?
H3. What impact did using your computer device have on your engagement in the unit?
Appendix C – Course Reflection Responses

Course Reflection (using an individual Google Document for each student participant)

A course reflection will be conducted at the end of the course. It includes six open-ended questions. Students answer questions in individual Google Documents with typed responses. Completion of the responses to these questions will take approximately ten to fifteen minutes.

_The use of the word “device” refers to the laptop, netbook, or tablet students bring to the classroom on a daily basis for the purposes of learning in the Grade 9 Academic English course._

Category I: Open-ended questions

I1. What were the benefits of using your computer device for learning in the Grade 9 Academic English course?

I2. What were the challenges of using your computer device for learning in the Grade 9 Academic English course?

I3. What was the impact of technology on your academic performance in the Grade 9 Academic English course?

I4. What was the impact of using your computer device on your engagement in the Grade 9 Academic English course?

I5. How effective is the school’s overall blended learning (bring your own device) program at our school?

I6. What suggestions do you have to improve the school’s blended learning (bring your own device) program?
Appendix D – Coding Scheme

Coding Scheme to Categorize Student Comments about Engagement, Learning Process, and Learning Performance

### Engagement

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>Use of a computer leads students to become distracted, off-task, etc.</td>
</tr>
<tr>
<td>Engagement</td>
<td>These comments refer to a specific or general issue with engagement.</td>
</tr>
</tbody>
</table>

### Learning Process

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>The computer enables student accessibility through the Internet.</td>
</tr>
<tr>
<td>Collaboration</td>
<td>The computer allows students to collaborate with peers.</td>
</tr>
<tr>
<td>Communication</td>
<td>The computer enables students to communicate with peers.</td>
</tr>
<tr>
<td>Feedback</td>
<td>The computer facilitates the use of feedback.</td>
</tr>
<tr>
<td>Management</td>
<td>The computer allows students to manage their course documents.</td>
</tr>
<tr>
<td>Program</td>
<td>Program refers to aspects of the BYOD program that impact learning.</td>
</tr>
<tr>
<td>Technical Issues</td>
<td>Technical issues impacting learning include charging, access to the Internet, etc.</td>
</tr>
<tr>
<td>Understanding</td>
<td>Student comments about a specific or general learning or teaching issue.</td>
</tr>
</tbody>
</table>

### Learning Performance

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity</td>
<td>Productivity refers to how students used the computer to complete work.</td>
</tr>
<tr>
<td>Quality</td>
<td>This describes overall assignment quality and student performance.</td>
</tr>
<tr>
<td>Writing</td>
<td>Writing refers to a performance skill integral to the subject of English.</td>
</tr>
</tbody>
</table>