



BYOD Program Literature Review and Resources

Executive Summary:

Ultimately, when considering the implementation of a BYOD program, there are **many factors** that should be considered. A few of the key factors included in this literature review are summarized below:

- **Computer labs** will always be one of the ways we can ensure that we provide a place for **equitable access to managed IT resources**. Given the constant change that is a part of everyday life exacerbated by the pandemic, our institution may need to redesign computer labs to better fit students' evolving digital needs this may mean redesigning the computer labs to facilitate both individual and collaborative learning.
- A key **benefit** to a BYOD program includes the use of specialized personalizing functions. This can be particularly helpful for students with disabilities who would be empowered to use their existing assistive technologies. Additionally, there has been a **positive effect found on students' academic achievement in blended classrooms that have demonstrated an improvement in test scores and final grades, quality of work on projects, strengthening in collaboration, communication, and research skills, an increase in student motivation, involvement in their learning and growth, and course satisfaction**. BYOD can help increase participation for all students; however, it is not an overarching solution for everyone. It is extremely important to provide support for how to properly integrate technology into teaching activities.
- **Challenges** associated with a BYOD program include faculty concerns related to the presence of electronic devices promoting distraction when accessing non-school related material during instructional time. Additionally, **concerns related to the possibility of contributing to already existing equity gaps between students from high- and low- income households**. Furthermore, due to the variety of personal devices that may be brought to our institution through this program it is important to recognize that support for a BYOD program may be complex. Therefore, as an institution we need to consider whether our technology infrastructure can accommodate the anticipated support that will be required for successful implementation.
- Among **best practices** discussed securing support from faculty was noted as pivotal to the successful implementation of a BYOD program. Suggestions for how to provide support for faculty who would like to integrate technology into their classrooms included **providing professional development by those colleagues who are already using technology in their classrooms as well as providing specialized professional development by discipline**. Special focus on how to best integrate mobile devices with instructional strategies/designs of learning activities is critical to maximizing the impact on learning outcomes. Furthermore, to address the issue of digital divide in learning special focus is needed related to the equality of those learning outcomes among our students.

As this literature review highlights, **implementing a successful BYOD program will require considerable amounts of planning, critical thinking, communication, and collaboration among appropriate stakeholders** (e.g., campus leadership, faculty and staff, IT department, etc.) in discussions and throughout the development of an action/rollout plan. This literature review and accompanying resources are provided to inform and assist appropriate stakeholders in their decision making while leading these discussions and in the potential development of an action/rollout plan.

Purpose:

The Vice President of Instruction (VPI) submitted a research request for the Office of Institutional Effectiveness, Research and Planning (OIERP) to conduct a literature review that can provide information on the following:

- If we remove desktops in computer labs and have laptop carts, bring your own device, check out device in library, how is this related to course success?
 - Is one approach more effective than the other?
- Are there access issues for students or for different demographics?
- Are there challenges with students being able to access software for classes?

Findings:

Note, there was no specific research found that specifically compared how course success would be impacted if an institution removed desktops in computer labs, had laptop carts (with possibility to check out a device), and a bring your own device (BYOD) program. However, the researcher focused mainly on the proposed plans for the results to inform the decision on whether to move to a bring our own device program. Taking this approach, this literature review is structured in the following way to inform discussion and help appropriate stakeholders in their decision making:

- Reasons why computer labs should still be kept opened
- Review of benefits, challenges, and best practices associated with a BYOD program
 - Legal considerations
 - Guides on implementation of a BYOD program
 - Examples of BYOD informational webpages
- Review of Crafton students' feedback related to technology needs

Reasons why computer labs should still be kept opened

Cooke (2020) and Davis (2019) highlight key reasons as to why computer labs are still needed in today's educational environment, these included:

- provide a place for equitable access to managed IT resources
- greater computing power
- more screen space compared to other mobile devices (i.e., laptops, tablets, and smartphones) which can also help with ergonomic health and safety

Davis (2019) also highlighted the benefits of redesigning traditional computer labs that facilitated more individual learning into modern computer labs where there are spaces that still facilitate individual learning but also include collaborative spaces and social learning spaces. In the past similar reasons have been cited for why computer labs are still essential on campus including (EdTech, 2012):

- not all students have the financial resources to buy the latest technology (consider students in technical fields with needs of specialized applications)
- students need to access computer labs for functions such as printing
- and the convenience of a space provided for students to socialize, collaborate, or simply work on computers with better capabilities.

In a recent report on top IT issues for 2021 emerging from the Pandemic (Grajek & Educause IT Issues Panel, 2020), one of the main issues highlighted underscored the importance of understanding students' digital equity needs based on their circumstances and educational goals. For instance, students in programs that require laboratory access or other learning environments that many not be possible to replicate online and need different accommodations. The widening of digital inequities and the need to reflect on the use of digital technology in the learning environment was also highlighted in another report (Pelletier et al., 2021) and evidenced by the digital divide observed in Los Angeles County where 25% of households with school aged children lack access to broadband internet, laptop, and/or desktop computer (Galperin et al., 2020). Researchers also found black and Hispanic students were significantly less likely to live in a household with both a computer

and broadband internet, regardless of their family's income (Galperin et al., 2020). **Given the constant change that is a part of everyday life exacerbated by the pandemic, our institution may need to redesign computer labs to better fit students' evolving digital needs, however, computer labs will always be one of the ways we can ensure that we provide a place for equitable access to managed IT resources.**

Review of benefits, challenges, and best practices associated with a BYOD program

BYOD is defined by the Oxford English Dictionary as "the practice of allowing the employees of an organization to use their own computers, smartphones, or other devices for work purposes." For the context of this literature review this definition is applied to an educational setting, where this practice would allow students at our institution to bring their own mobile electronic devices on campus for educational purposes. When considering the implementation of a BYOD program, there are many factors that should be considered. In this section we break down some of the benefits, challenges, and best practices to consider, review some legal considerations, provide literature to reference as guides for the implementation of a BYOD program, and examples of how BYOD policies are communicated to the campus community from two institutions.

Benefits to providing students with a BYOD environment that is well-supported and integrated into long-term academic and technology strategies include:

- **BYOD facilitates the use of special personalizing functions, as devices are usually used by one single person and can therefore be customized to individual needs** (Bass & Haghighi Movahed, 2018; Disterer & Kleiner, 2013).
 - This can be especially helpful for students with disabilities, who are empowered to use their existing assistive technologies to access learning resources (Ivus et al., 2020).
- **Positive effect on students' academic achievement in blended classrooms** such as (Safar, 2018)
 - Improving test scores and final grades
 - Improving quality of students' work
 - Strengthening students' collaboration, communication, and research skills
 - Increasing students' interest, motivation, and involvement in their own learning and growth
 - Increasing course satisfaction
- **BYOD can help increase participation for all students** (Bass & Haghighi Movahed, 2018)
 - BYOD is not an overarching solution for everyone and there is a need for technology to be properly integrated into teaching activities.
 - Students felt that the option of bringing their own device improved their flexibility and integration within the classrooms, enabling them to participate more and find information that corresponds to the task quicker.
 - For socially disadvantaged students' (low socio-economic, disabled learners, learners from ethnic minority groups etc.) mobile technology is a support mechanism that when combined with childcare, financial support, and the provision of time to complete their studies will enable them to be able to participate in higher education steadily.
- **Increases student engagement in classroom activities**
 - He and Zhao (2020) found that BYOD improved undergraduates' engagement in a blended classroom. The researchers also suggest that BYOD may promote learning outside the classroom therefore expanding the learning environment.
 - Educators that support BYOD believe that it encourages more participation in the classroom (Resilient Educator Editorial Team, 2020)
 - Collaborating more fully with classmates (CDWG, 2012)
- **Users only need one device to access anything, anywhere, and anytime** (Disterer & Kleiner, 2013)
 - The comfort offered by BYOD leads to a higher level of user satisfaction and productivity

- Self-reported reasons higher education students' use their mobile devices while at their institution included: everything they need is saved on their device, they know how to use their mobile devices, convenience, and saves them time (Bass & Haghghi Movahed, 2018).
- BYOD program may promote a positive image in the community and may help to attract prospective students (Resilient Educator Editorial Team, 2020)

Challenges have also been noted in a BYOD environment and these include:

- **Faculty concerns surrounding the presence of electronic devices promoting distraction when used to access non-school related material during instructional time** (Ivus et al., 2020; Resilient Educator Editorial Team, 2020)
 - Faculty perspectives indicate a potential concern, but student perceptions indicate that the expected distractions are manageable (Sundgren, 2017)
 - Disruptive effect of device compatibility issues (Adhikari, 2012)
- **Concerns related to the possibility of increasing the already significant divide between students from high- and low-income households** (Resilient Educator Editorial Team, 2020)
 - Costs of devices and data plans can make ownership impossible for certain groups of students (Sundgren, 2017)
 - For socially disadvantaged students the ownership status of mobile devices may be that they must share them among many family members or that they lack the appropriate software for some specialized courses (Bass & Haghghi Movahed, 2018).
- Usability issues caused by small screens and keyboards (Sundgren, 2017)
- Providing access to a smartphone without specific directed learning activities could potentially be detrimental to the learning process (Tossell et al., 2015)
 - Critical that educators participate in ongoing professional development activities to gain the theoretical framework and technical competence necessary for effective development of their teaching practice (Beckingham & Nerantzi, 2015)
- Insufficient bandwidth (CDWG, 2012)
 - Institutions should consider adding more and better wireless access points to provide more coverage throughout the campus.
 - Consider installing additional Wi-Fi access points to bolster coverage in some high-density areas like lecture halls and social spaces (Bass & Haghghi Movahed, 2018)
 - Adopt a unified threat management (UTM) approach to securing network transmissions (CDWG, 2012)
- Higher education institutions are taking different approaches to **securing their networks**. Some of the steps being taken include (CDWG, 2012):
 - Requiring users to register every device
 - Utilizing two-factor authentication (i.e., user and device are verified before access to network is granted)
 - Verifying users' understanding of policies through signature or timestamp
 - Students may be required to sign term agreements restricting device use to certain times in the classroom setting; while consequences for abuse can include loss of privilege to participate in BYOD program temporarily or permanently (Resilient Educator Editorial Team, 2020).
 - Providing antivirus and antimalware software to all student, faculty, and staff computing devices
 - Locking down the core network by adding additional firewalls around critical databases (e.g., financial systems)
 - Relying on virtualization and internal clouds to further protect critical data
- **Support for BYOD may be complex (due to variety of personal devices) and expensive due to the larger scope and increased level of complexity** (Disterer & Kleiner, 2013).
 - Develop written and clear policies that specify the platforms campus IT department will support (CDWG, 2012; Resilient Educator Editorial Team, 2020).

- Technical services staff may consider creating YouTube clips and online guides for how to access the institution's Wi-Fi, remote access of network drives and use of specialist software (Bass & Haghghi Movahed, 2018)

Among **best practices** discussed in the literature (CDWG, 2012; Penuel, 2006), **securing support from faculty** was noted as **pivotal**. This was highlighted as the number one challenge campuses face in their efforts to increase the use of technology in the classroom. It was suggested that **professional development** should be provided by individuals who are using technology in the classroom and to provide sessions targeting the unique needs of specific disciplines (Beckingham & Nerantzi, 2015). To **maximize the impact on learning outcomes**, special focus on **how to best integrate mobile devices with instructional strategies/designs of learning activities is critical** (Sung et al., 2016; Sundgren, 2017). Additionally, to **address the issue of digital divide** in learning there needs to be special focus on the **equality in learning outcomes** beyond just access and skills (Adhikari, 2012).

Legal considerations

According to Dhingra (2016) the top concerns with adoption of BYOD are security, data loss, compliance, personal data, and privacy. Below are some legal considerations and suggestions on what to include in a BYOD policy:

- Inform users of potential privacy trade-offs in an event of security breaches, where private and personal information on devices may be captured.
- Inform users of the implications of data cleaning and blocking caused by software that may be installed on their own devices. These conditions must be specified in the personal device use policy and necessary consent forms.
- Organizations BYOD policy should include policies for:
 - Securing mobile devices
 - Encryption and user passwords
 - Data categorization
 - Antivirus software
 - Wireless accessing
 - Security breach incident and its response
 - Privacy preserving

Dhingra (2016) indicated policies should be clear in the platforms to be used, services provided, potential risks and responsibilities, and minimum device requirements or configurations. Additionally, training and user support through forums, emails, and social networking tools should be offered (Dhingra, 2016). Finally, it is up to the organization to develop a BYOD policy that protects sensitive data and takes care of users' rights.

Guides on implementation of a BYOD program

Afreen (2014) provided an overview of some of the opportunities and challenges of BYOD in higher education, as well as a BYOD policy development guide for schools (Figure 1). When implementing a BYOD program, Afreen (2014) highlighted it is critical that an organization's technical infrastructure is sound enough to support the diversity in personal equipment and that the organization have a sound BYOD policy. According to Afreen (2014) BYOD policies are available for educational institutes and provided by market leaders like [CISCO](#) and others.

Figure I. A BYOD Policy Guideline for Schools

	Action		Resource
RESEARCH	Step 1	<ul style="list-style-type: none"> Build a small BYOD research team. 	Colleagues who are interested
	Step 2	<ul style="list-style-type: none"> Research what BYOD is, what it looks like in the classroom and what the issues are. How have others schools implemented it? What were there challenges? Which model of BYOD are schools using? 	DEC 2013 Literature Review Internet research Twitter #nswdecbiod or #BYOD or #BYOT search
CONSULTATION	Step 3	<ul style="list-style-type: none"> Survey for attitudes/type and quantity of devices Develop own survey instrument or use all or part of existing survey tools Interpret the data Clarify the next steps, if BYOD is going ahead 	Survey to key stakeholders: <ul style="list-style-type: none"> ✓ Staff ✓ Students ✓ parents/caregivers
	Step 4	<ul style="list-style-type: none"> Hold a school staff meeting, P&C meeting, parent/caregiver/student forum after the surveys have been analysed 	Present findings and conclusions to date.
POLICY DEVELOPMENT	Step 5	<ul style="list-style-type: none"> Form a BYOD interest group 	Representation from executive, staff, parents/caregivers (P&C) and, if appropriate, students (SRC for example)
	Step 6	<ul style="list-style-type: none"> Develop a draft BYOD policy for the school 	DEC 2013 Literature Review Other school policy documents
	Step 7	<ul style="list-style-type: none"> Circulate the draft school policy for comment by the school community 	Feedback form
	Step 8	<ul style="list-style-type: none"> Develop the final version of the policy 	BYOD interest group Advice from feedback form
	Step 9	<ul style="list-style-type: none"> Communicate the school's BYOD policy to the school community 	BYOD policy document and accompanying letter

Note. From Afreen, R. (2014). Bring your own device (BYOD) in higher education: Opportunities and challenges. *International Journal of Emerging Trends & Technology in Computer Science*, 3(1), 233-236.

The Alberta Department of Education (2012) also shared a guide that was meant to inform decision making and strategic planning as educational leaders and stakeholders consider a BYOD model at their institutions. In this guide, a framework for determining a school authority's (e.g., district) readiness to adopting and successfully implementing a BYOD model is outlined in three main steps for consideration: the institution's vision for the BYOD program, preparing the institution for success, and means of communication. There are a total of 28 questions included in this framework and they're categorized into the three steps, a few of these questions include:

- What does the school authority hope to accomplish with a BYOD model?
- What has the school established as indicators of success for a BYOD implementation?
- Is the system ready technologically and pedagogically? What evidence is there to support this?
- Will the BYOD model be implemented incrementally or launched system wide? Has the detailed roll out plan been developed and shared?
- Does the school website have information on personally owned devices with a FAQ section?

Included below are additional key questions to consider when discussing the possibility of implementing BYOD (Alberta Education, 2014):

- Which stakeholders should be involved in creating a vision for using BYOD models for learning and in identifying the desired outcomes?
- What BYOD model or combination of models would work best?
- What does equitable access look like in your school authority? How can your school authority ensure equitable access for your students?
- Are educators prepared to incorporate BYOD into pedagogy? What will they need to navigate this change successfully?
- Does your school authority's responsible/acceptable use agreement specify expected behaviors and the consequences for inappropriate use?

Examples of BYOD informational webpages

Lycoming College informs their campus community of [guidelines to follow when participating in BYOD](#). These include policies to follow related to the [appropriate use](#) of their technology assets, [data classification policy](#), guidelines on using [your personal computer and the campus network](#) (e.g., minimum specifications for access, device registration, and approved antivirus programs), and best practices for [IT security awareness](#).

Assiniboine Community College informs students choosing to [participate in their BYOD program](#) about specifications, additional requirements, connectivity, and provides a list of frequently asked questions. Examples of pertinent questions included are: “What if I can’t afford to purchase a laptop?”, “Can ITS (information technology services) help me if I’m having issues with my personal device?”, and “How do I print from my device while on campus?”.

These institutions’ BYOD informational webpages can serve as examples of what to include in a BYOD webpage and how to present this information in a clear and easy to understand manner.

Review of Crafton students’ feedback related to technology needs

Findings from three studies are included below to help understand our students self-reported technology needs and to highlight the variability in their needs.

In the Spring 2020 term, a [student needs online survey](#) was disseminated and feedback collected was used to inform the planning of interventions aimed to offer additional student support in response to the coronavirus pandemic. When students were asked to specify the technical support they required, 238 respondents indicated they needed internet access, followed by software access (169 respondents), and hardware access (161 respondents). Furthermore, identified projected needs for the Spring 2020 student population were provided as estimates of potential students in need. It was found that approximately one-third of our student population required technical support in accessing the internet during the Spring 2020 term (Vaichis, 2020).

Additionally, in the Spring 2020 term, the Student Voices 2020 research study was conducted. The study was part of a regional effort to understand how students choose a college, their reasons for leaving, how they select a major or career path, how they access services, and the impact of Covid-19 on student behavior. Although the study did not include website-related questions, students identified the website as the element most needing improvement as it is a gateway to the services and information they need. One of the student suggestions that resulted from this study was the need for multiple modes of communication, evidence that support this need includes the finding that Crafton students do not always have reliable internet, do not always have functioning cameras, and have conflicting demands on their time. An overarching conclusion that stemmed from this study is that our students equate success to access to information and this can serve to highlight the need to be flexible in how students interact with our campus, as there is no one size fits all option that will always work for all students.

As a result of the Student Voices 2020 study findings, a follow-up study focused on enhancing the online student experience was conducted in the Fall 2020 term. The aim of the study was to inform recommendations for improvement to the Crafton Hills College website, using student generated recommendations. One of the findings in this study that can illustrate our students’ variability in needs is that students in career technical education (CTE) programs and older students rely on mobile as a result of working full-time and needing access when away from home.

Conclusion:

In a recent report on the top IT issues of 2021 emerging from the pandemic (Grajek & 2020-2021 Educause IT Issues Panel, 2020), experts emphasized “digital access can now be added to the list of students’ support needs, along with food, housing, transportation, and mental healthcare.” Being mindful of our students’ needs, how much they may vary from student to student, and that our students equate success to access to information can help to guide discussions on how we may be able to implement a BYOD program for the benefit of our student population. Pelletier et al., (2021) advised U.S. community colleges that *flexibility* is what we should keep in mind in serving our students as our student population continues to diversify. **To help our students reach their educational goals we will need to continue to provide**

opportunities for access to tools including technology that fits our students' diverse needs, that may include rethinking how we use computer labs, continuing to offer loaner laptops, and implementing a BYOD program. Lastly, as this literature review highlights, **implementing a successful BYOD program requires extensive and purposeful planning, critical thinking, collaboration, and communication.** Thus, this literature review and accompanying resources are presented to inform and assist appropriate stakeholders in their decision making while leading these discussions and in the potential development of an action/rollout plan.

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