

5-2020

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### Publication Information

Baldwin, Sally J. and Ching, Yu-Hui. (2020). "Guidelines for Designing Online Courses for Mobile Devices". *TechTrends: Linking Research & Practice to Improve Learning*, 64(3), 413-422. <https://dx.doi.org/10.1007/s11528-019-00463-6>

This is a post-peer-review, pre-copyedit version of an article published in *TechTrends: Linking Research & Practice to Improve Learning*. The final authenticated version is available online at doi: [10.1007/s11528-019-00463-6](https://doi.org/10.1007/s11528-019-00463-6)

# Guidelines for Designing Online Courses for Mobile Devices

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## Abstract

College students frequently use mobile devices (e.g., smartphones and tablets) to access online courses yet online course designers often do not design courses with mobile learning in mind. This research identified seven national and statewide online course design evaluation instruments and examined the criteria that guide course designers designing online courses for learning with mobile devices. Currently, minimal guidance on course design for mobile learning is offered in most of the national and statewide online course design instruments. Research-supported design tips that promote device compatibility, content readability, format optimization, and mobile-friendly navigation are suggested in this paper to guide future online courses design for mobile delivery.

## Introduction

The *EDUCAUSE Horizon Report 2019 Higher Education Edition* identifies mobile learning as one of the most important developments in online learning (Alexander et al., 2019). Mobile learning is typically defined as an ability to learn anywhere, any time through the use of mobile computing devices (e.g., smartphones, tablets, and laptops; EDUCAUSE, 2019). Research indicates that most college students have mobile devices. For example, a survey of college students (N=64,536), from 130 higher educational institutions, found that practically all college and university students (95 %) have smartphones (Galaneck et al., 2018). A 2016 survey of 1,474 University of Central Florida (UCF) students revealed that 99 percent of the respondents owned a smartphone and 63 percent owned a tablet (Seilhamer et al., 2018a).

College students are using mobile devices for their educational pursuits. A 2018 survey of 1,500 online undergraduate and graduate students discovered 67 percent of online students conducted some or all of their course work on their mobile device (Magda & Aslanian, 2018). And, even though 91 percent of college students own laptop computers (Galaneck et al., 2018), college students may choose to leave their laptops at home, mainly because they find it cumbersome to carry a laptop (Kobus et al., 2013) and worry about theft (Attenborough & Abbott, 2018; Kobus et al., 2013). Smaller mobile devices (e.g., smartphones and tablets) are portable, easy to use, provide relatively strong computing power, and offer web access (Attenborough & Abbott, 2018; Hsu & Ching, 2012; Viberg & Grönlund, 2017). Students value the portability of mobile devices and the ability to work any place and any time. In 2018, the University of Central Florida (UCF) surveyed students (N=4,134) and similarly found 99.8 percent of students owned mobile devices, *and* 86 percent of students use the Canvas Mobile app to access online courses (Seilhamer et al., 2018b). This paper is focused on the use of smaller mobile devices (smartphones and tablets) to access online courses that have been built within learning management systems (LMS).

Accessing learning on mobile devices presents challenges to students. Researchers surveyed university students (N=252) and found that even though *all* of the surveyed students used mobile phones to access the LMS, the students expressed concern over the LMS limitations and felt courses were cluttered on small screens (Hu et al., 2016). The smaller screen size can create usability limitations for students attempting to complete course work. As a result, students often rely on their phones to complete easy, low-stake tasks through the LMS, such as retrieving and accessing learning materials (Hu et al., 2016). In the past, LMSs were designed primarily for desktop and laptop use and were “functionally limited in their potential to be accessed through mobile devices” (Viberg & Grönlund, 2017, p. 359). In a study conducted to evaluate faculty (N=220) and students’ (N=181) experiences with Canvas LMS at a public higher education institution, Wilcox et al. (2016) found that “faculty design their courses for delivery on laptops, but students use smartphones to access Canvas” (p. 1163). Recently, LMS companies have been working towards improving the functionality of their mobile applications (apps) (Alexander et al., 2019; Blackboard, 2019; Canvas, 2018c; Moodle, 2019) to address students’ needs.

Student use of mobile devices for online learning should be taken into account when online course designers design course materials (Viberg & Grönlund, 2017). It is unclear what resources online course designers (instructors and instructional designers) use to advise their design of mobile compatible courses; however, online course designers may rely upon established course design evaluation instruments to guide the design and assess quality (Kleen & Soule 2010). This paper examines the national and statewide course design instruments to understand the guidance online course designers are being provided on this important topic when designing or evaluating online courses.

### **Accessing Learning on Mobile Devices**

Students find that using mobile devices is a convenient way to do certain online learning activities/tasks. For example, students tend to use mobile phones for viewing timetables and notes (López & Silva, 2014; Seilhamer et al., 2018a), accessing course readings (Asiimwe & Grönlund, 2015; Magda & Aslanian, 2018), checking course messages, participating in course discussions and checking grades (Asiimwe & Grönlund, 2015; Magda & Aslanian, 2018; Seilhamer et al., 2018a). There appears to be a correlation with the device size, pages viewed and time spent in the system. Students using mobile devices visit less pages and spend less time in the system compared to students using laptops or desktop computers (López & Silva, 2014; Mödritscher, Neumann, & Brauer, 2012; Seilhamer et al., 2018a). Students using mobile phones are also apt to visit only one page on the site, before leaving it (López & Silva, 2014). López and Silva (2014) suggested this may be a result of the small screen size of the device, or because students are taking advantage of the portability of the device to get singular information (e.g., announcements). Test taking can also be hampered on mobile devices. Research suggests that it takes longer to load pages and read questions on mobile devices (Hwang & Tsai, 2011).

Despite user challenges, students express a strong desire to access the LMS via their mobile devices (Asiimwe & Grönlund, 2015). Students tend to adopt mobile devices into their learning as a result of their positive attitudes toward technology, which often correlates with general self-efficacy in technology, and an increased perceived usefulness of mobile devices in their learning (Han & Shin, 2016). However, researchers cautioned that confidence and openness towards mobile devices does not assure learning effectiveness (Joo et al. 2016; Shin & Kang, 2015) and stressed the importance of positive support from instructors and institutions to increase the usefulness of mobile devices in online learning.

Demographics also make a difference in the use of mobile devices. Galanek et al. (2018) found that smartphones were owned by the vast majority of higher education students, yet “non-white, first-generation college students, students whose families have lower incomes, and those with disabilities” (p. 11) viewed mobile devices as more important for academic success than white, wealthier students. Twenty percent of the students Magda and Aslanian (2018) surveyed completed *all* of their coursework on mobile devices. It is important that instructors realize students are accessing online courses in this manner and design courses to meet the needs of students.

### **Mobile Devices and LMS**

The U.S. higher education LMS market is dominated by Blackboard, Canvas, Desire2Learn (also known as Brightspace, D2L), and Moodle, which account for 90.3 percent of institutions and 92.7 percent of student enrollment (Edutechnica, 2019). These companies continue to improve their mobile-friendliness (Alexander et al., 2019). The Blackboard app helps students complete coursework (Blackboard, 2019). And, a separate Blackboard Instructor app allows instructors to view course content, grade assignments, connect with students in discussions, and interact with the class in Blackboard Collaborate (Blackboard, 2018b). Also, Blackboard offers responsive themes (e.g., the Learn 2016 Theme, and Blackboard Ultra) that improve the learning experience for mobile users (Blackboard, 2018a; 2018c).

Canvas applications (i.e., apps) afford “a limited set of features on mobile, but the apps don't cover all Canvas functionality” (Canvas, 2018c, para. 2). Canvas provides information on features for the Canvas Teacher Mobile app and the Student Mobile app available for iOS and Android users (see [https://s3.amazonaws.com/tr-learncanvas/docs/Mobile\\_CanvasTeacher.pdf](https://s3.amazonaws.com/tr-learncanvas/docs/Mobile_CanvasTeacher.pdf)). Canvas also offers a Canvas Mobile Users Group to support mobile learning and offers suggestions for mobile friendly design (Canvas, 2019). Desire to Learn (D2L) is designed to work on mobile devices but some materials and resources work better or only on desktop/laptop computers (Brightspace, 2018). Moodle acknowledges that it is “increasingly important to ensure...courses are mobile friendly (Moodle, 2019, para. 1). Students are encouraged to install the Moodle mobile app and instructors are provided tips for optimizing course materials for those students using the app on mobile devices (Moodle, 2019).

## **Disconnect: Mobile Devices and Course Design**

Although several LMSs have improved interface, navigation, and available features to be used on mobile devices, there is still a disconnect when students use mobile devices to participate in online learning, primarily because instructors and course designers may be unaware of how students view the course, how they navigate the course, and how they use the course. Instructors design online courses based on what they know (i.e., face-to-face instruction), through the process of assimilation (Baldwin, 2019). Designing courses that will be consumed via mobile devices—which trends indicate a greater number of students do—adds a new layer of complexity to course design. It is not enough to click on “student view” (an option in most LMS settings); instructors must also review the LMS mobile app to understand the course from the student’s perspective when accessing course materials using a mobile app. Wilcox et al. (2016) explained the problem: “Instructors are not designing their courses for the target platform used by students: smartphones. As a result, students are not able to engage fully with the course content in the manner envisioned by the instructor” (p. 1167).

The effectiveness of online learning varies according to how the online course is designed and taught (Jaggars & Xu, 2016). Liu, Chen, Sun, Wible, and Kuo (2010) found, “the greater the online learning experiences of users, the stronger their intention to use an online learning community” (p. 603). Studies show a correlation between perceived usefulness and user satisfaction in online learning (Asiimwe & Grönlund, 2015; Lee & Lehto, 2013). When students are dissatisfied, they are less motivated to learn (Asiimwe & Grönlund, 2015). In a study surveying university students (N=34) using mobile devices to access the LMS in an online course, students suggested a need for contents to be optimized for small screens, chunked, with questions formulated to incur short answers, and multiple-choice assessments (Bogdanović, Barać, Jovanić, Popović, & Radenković, 2014). While course delivery platforms should not dictate the learning activities and assessment formats, it is critical that online course designers ensure that “the student’s learning experience is equivalent regardless of the delivery platform” (Wilcox et al., 2016, p. 1168).

## **Online Course Design Evaluation Instruments**

Online course design evaluation instruments have been created to help instructors design and assess quality (Baldwin et al., 2018). These tools can be used to encourage improvement in online courses through course design consistency and foster a dialogue about quality in online courses (Legon, 2015). This paper turns to national and statewide online course design evaluation instruments to identify the guidance online course designers are being provided to design online courses for mobile delivery. The following research questions guided our study:

- How do national and statewide online course design evaluation instruments address learning using mobile devices?
- What do national and statewide online course design evaluation instruments identify as common standards to guide the design of online courses for learning using mobile devices?

## **Method**

Publicly available national and statewide online course design evaluation instruments are potential data sources for this study. To be included, the online course design evaluation instrument had to be (a) used to evaluate higher education online courses, (b) published or revised within the last five years, (c) used to support student success, (d) used at the national or statewide level, and, (e) currently in use. Previously, a study reviewed six online course evaluation instruments to understand common criteria for quality online course design (see Baldwin et al., 2018). Since that time, Canvas (LMS) introduced a national course evaluation instrument (see Baldwin & Ching, 2019b). The most updated copies of these potential instruments were obtained and reviewed. Based on the inclusion criteria, we identified the following seven instruments for this study:

- Blackboard Exemplary Course Program Rubric (Blackboard; Blackboard, 2017b),
- Canvas Course Evaluation Checklist (CCEC; Canvas, 2018a),
- CVC-OEI Course Design Rubric (OEI; California Virtual Campus-Online Education Initiative, 2018),
- Open SUNY Course Quality Review Rubric (OSCQR; Online Learning Consortium, 2019b),

- Quality Learning and Teaching Instrument (QLT; California State University, 2019)
- Quality Matters Higher Education Rubric (QM; Quality Matters, 2018),
- Quality Online Course Initiative (QOCI; Illinois Online Network, 2018).

We reviewed these seven instruments that met our criteria to specifically examine if and how the instruments address online course design for learning using mobile devices. Both researchers individually reviewed the selected instruments, identified the standards related to mobile learning in each instrument, and analyzed mobile learning related standards for commonality. We then discussed our analysis to reach agreement.

### Findings

Table 1 presents the general characteristics of the seven selected national and statewide online course evaluation instruments.

Table 1

#### *Characteristics of Evaluation Instruments*

Organization	Audience	Current Version	Purpose	Is Mobile Mentioned?
Blackboard	Blackboard LMS users	2017	Identify and disseminate best practices for designing high quality courses.	No
CCEC	Canvas LMS users	2018	To elevate the quality of Canvas courses.	Yes
OEI	California Community College online course instructors & instructional designers	2018	Establish standards to promote student success and conforms to existing regulations.	No
OSCQR	Instructors, peers, & instructional designers	2018	To support online course quality and continuous improvements to the quality and accessibility of online courses.	Yes
QLT	California State online course instructors & instructional designers	2017	To help design and evaluate quality online teaching and learning.	Yes
QM	Course developers & instructors	2018	Guide users through the development, evaluation, and improvement of online and blended courses. Also, “certifies course as meeting shared standards of best practice”(Maryland Online, Inc., 2014, slide 8).	No
QOCI	Higher education faculty in the state of Illinois	2018	To help colleges and universities improve accountability of their online courses by identifying best practices and help the development of quality online courses.	Yes

After analyzing the seven national and statewide online course design evaluation instruments, we found only four instruments—CCEC, OSCQR, QLT, and QOCI—include guidelines for mobile learning. We discuss those guidelines to understand how the instruments are directing online course designers.

### **Canvas Course Evaluation Checklist**

The CCEC includes a “mobile device consideration” notation under four criteria. The two criteria that are noted as a “mobile device consideration” and are deemed “essential and a standard design component” (Canvas, 2018a, p. 1) in online courses are:

- Items not used are hidden from Course Navigation
- Content is “chunked” into manageable pieces by leveraging modules (e.g. organized by units, chapters, topic, or weeks)” (Canvas, 2018a, p. 1).

In addition, the CCEC suggests, “Text Headers and indentation are included within modules to help guide student navigation” (p. 2) and “Tables are only used for tabular data” (p. 3) as a best practice that adds value to the course for learners using mobile devices.

Furthermore, the CCEC directs users to “Visit the [Mobile App Design Course Evaluation Checklist](#) blog post to access an additional resource!” (Canvas, 2018a, p. 1). The Canvas Course Evaluation Checklist: Mobile App Design Considerations tool serves as an addendum to the CCEC. Of the eight criteria on the checklist, the following are indicated as essential and standard design components:

- Text headers are included within modules to help guide student navigation.
- Chunk content into smaller parts (2000 words max) and use the module tool to organize Canvas Pages into a table of contents.
- When possible, Canvas Pages are used to present content, instead of linking to external URLs or files in the flow of the module (Canvas, 2018b, pp. 1-2)

In addition, the following are considered “best practice” and add value to online courses:

- Instructions and prompts are platform neutral to minimize student confusion.
- Students are alerted and given alternatives when an unsupported file type is used.
- Assessment design takes into account the additional tools students have when working on a mobile device - camera, video, audio, file upload, GPS (Canvas, 2018b, p. 1)

The CCEC indicates including the following criteria are “exemplary and elevate learning” (Canvas, 2018b, para. 1):

- Use Requirements within Modules to give users a visual bookmark of their progress.
- Assessment design takes into account the ability for students to use the Mobile Annotations tool on an assignment that uses an uploaded PDF (Canvas, 2018b, pp. 1-2).

### **Open SUNY Course Quality Rubric**

OSCQR, the evaluation instrument created by the OPEN State University of New York (SUNY) staff and campus stakeholders, mentions mobile learning in Standard 8, “Appropriate methods and devices for accessing and participating in the course are communicated (mobile, publisher websites, secure content, pop-ups, browser issue, microphone, webcam)” (Online Learning Consortium, 2019a, para. 1).

In addition, Standard Eight is explained further on the “Explanation, Evidence, and Examples” page on the OSCQR site:

- Explore your course on your own mobile device to see which features work well, and which features can be troublesome (Online Learning Consortium, 2019a, para. 6).
- Ask learners at the end of the term for feedback on their frustrations with technology. This can guide the information you share out the next time you teach the course (Online Learning Consortium, 2019a, para. 10).
- Include this information in your course welcome video, or create a separate screencast overview video detailing what devices and access methods will work best in the course (Online Learning Consortium, 2019a, para. 11).

OSCQR has a mobile standards section. The standards in this section state:

- Hyperlinks are provided for embedded content.
- The course avoids the use of tables and multiple levels of indents.
- Text is not placed to the left or right of images.
- When specifying width, percentages are used instead of pixels.
- The course is tested on multiple mobile devices.
- Any apps that are required for students are available on both Android and iOS mobile platforms.
- Efforts are made to minimize the use of content that does not work on mobile devices (such as Flash and Java).
- When file attachments are necessary, PDF is used as much as possible.
- Content is divided into small, manageable chunks (Online Learning Consortium, 2019b, lines 69-77).

Individual standards are linked to explanations of how instructional design practices justify the standard.

### **Quality Learning and Teaching Instrument**

QLT, the course evaluation instrument developed out of the California State University Office of the Chancellor, is the only instrument to have a separate section that addresses the accessibility of course content on mobile devices, although the section is deemed “optional” (California State University, 2019, Section 10). Users are informed, “Not all course components must be tailored toward mobile devices (e.g., online exams)” (California State University, 2019, Section 10). The components of this section state:

**10.1** Course content was easy to read on multiple platforms such as PCs, tablets, and smartphones.

**10.2** Audio and video content displayed easily on multiple platforms such as PCs, tablets, and smartphones.

**10.3** The number of steps users had to take in order to reach primary content was minimized.

**10.4** The visibility of content not directly applicable to student learning outcomes was minimized. (California State University, 2019, para. 2)

### **Quality Online Course Initiative Rubric**

QOCI, developed by the Illinois Online Network, University of Illinois Springfield, addresses design for mobile devices at two places. First, QOCI indicates, “Scrolling is minimized or facilitated with anchors to improve usability for desktop and mobile devices” (Illinois Online Network, 2018, p. 5) in the Instructional Materials and Technologies

section, subheading, “Structure and Design.” Second, in the Accessibility section, QOCI indicates under the Documents (HTML, Word, PowerPoint, Excel, etc.) subheading, “Content is readable on mobile devices” (Illinois Online Network, 2018, p. 25).

### **Common Standards in the Rubrics**

Among the four online course design evaluation instruments that include standards concerning online course design for mobile devices, only two common criteria were identified (Table 2).

Table 2

#### *Common Criteria on Evaluation Instruments*

<b>Element</b>	<b>CCEC</b>	<b>OSCQR</b>	<b>QLT</b>	<b>QOCI</b>
Instructor/Course designer should look at the course on a mobile device.	X	X	X	X
Content is chunked.	X	X		

Four evaluation instruments (CCEC, OSCQR, QLT, and QOCI) have a common criterion indicating that the user (i.e., instructor/course designer) should look at the course on a mobile device (Table 3).

Table 3

#### *Common Criterion on Four Evaluation Instruments*

<b>CCEC</b>	<b>OSCQR</b>	<b>QLT</b>	<b>QOCI</b>
“It’s always best practice to review your course(s) in the app” (Canvas, 2018b, para. 3)	“The course is tested on multiple mobile devices” (Online Learning Consortium, 2019b, line 73).	“Course content was easy to read on multiple platforms such as PCs, tablets, and smartphones” (California State University, 2019, Section 10).	“Content is readable on mobile devices” (Illinois Online Network, 2018, p. 25).

In addition, two instruments (CCEC and OSCQR) have a common criterion indicating that content should be chunked or divided into manageable chunks (Table 4).

Table 4

#### *Common Criterion on Two Evaluation Instruments*

<b>CCEC</b>	<b>OSCQR</b>
“Content is “chunked” into manageable pieces by leveraging modules (e.g. organized by units, chapters, topic, or weeks)” (Canvas, 2018a, p. 1).	“Content is divided into small, manageable chunks” (Online Learning Consortium, 2019b, line 77).

The four evaluation instruments do not share *any other* criteria to guide the design of online courses for learners using mobile devices.

## Discussion

One of the greatest challenges for online course designers “is to ensure that tasks are suited to the affordances of the devices used” (Stockwell & Hubbard, 2013, p. 3). Earlier in this paper, we showed that mobile devices are used by the majority of students to access online learning (Galanek et al., 2018; Magda & Aslanian, 2018; Seilhamer et al., 2018a); however, well-defined guidelines of how to design online courses for learners using mobile devices are lacking (Viberg & Grönlund, 2017).

After reviewing the various national and statewide online course design instruments, we were concerned to learn that students should be “alerted...when an unsupported file type is used” (CCEC; Canvas, 2018b, p. 1) and asked about their frustrations with technology *at the end of the term* (OSCQR; Online Learning Consortium, 2019a, para.10). As one of the QOCI criteria states, content *should be readable on mobile devices*. Online learning has been heralded as a way for students to learn anytime, any place. Online learning is appealing to non-traditional students who may need greater flexibility due to work and family responsibilities (Zawacki-Richter, Müskens, Krause, Alturki, & Aldraiweesh, 2015). Non-traditional students are more apt to access courses via mobile devices (Galanek et al., 2018). We need to ensure *all* students have equal access to learning. This is supported by the Universal Design for Learning (UDL) guidelines that indicate the importance of changing the environment, rather than trying to change the learner (CAST, 2019).

The stated purpose of the reviewed national and statewide course design evaluation instruments is to inform/guide users of best practices and/or improve the quality of online courses. Evaluation instruments that do this by condensing research-based information into easy-to-understand criteria and provide examples and/or explanations that help to further guide users serve an important function for online course designers and reviewers. Research indicates that the majority of students—67 percent according to Magda and Aslanian (2018)—are using mobile devices to access online courses. Course designers need to be aware of the best practices for designing online courses for all students and utilize these practices to create successful learning experiences. Designing online courses with consideration of learners using mobile devices should not be seen as optional or an addendum. It is a critical factor that should be considered when designing online courses.

Previous research has identified the importance of intuitive navigation, chunked content, and accessibility for all learners (Baldwin et al., 2018). These criteria are critical for online course design and should be considered by instructors and instructional designers designing courses for students using desktop/laptop computers *and* mobile devices. In addition, it seems essential to establish best practices for designing online courses with the understanding that students may be using mobile devices. Instructors need to look at courses with a mobile device to understand their students’ learning experiences better. Based on our research and experience as instructional designers and online instructors, we suggest the following design tips, which encourage device compatibility, content readability, format optimization, and mobile-friendly navigation to guide future online course design.

### Device Compatibility

- Test the course on multiple mobile devices. This tip comes from four online course evaluation instruments examined in this paper (CCEC, OSCQR, QLT, and QOCI). Online courses look different—and may operate differently—depending on the device used (e.g., smartphone, tablet, or laptop). Optimize every page for mobile delivery. And consider *how* students hold their devices to ensure they can view content clearly regardless of their devices’ orientation (i.e., landscape or portrait; Hooper & Berkman, 2018). If necessary, tell students your course content works best in a certain orientation.
- Eliminate content that does not work on mobile devices (found in OSCQR). Mobile courses should be simple to use and avoid software, or applications, that are not mobile friendly (such as Flash and Java).
- Ensure any applications (“apps”) students need are available on both Android and iOS mobile platforms (found in OSCQR). Give students the links to the Google Play Store or App Store for the apps they need in the course.

- Ensure course directions are applicable for all delivery devices (e.g., smartphones, tablets, laptops, or desktop computers; found in CCEC and Krull & Duarte, 2017). Students may use a variety of devices, so it is important to offer directions for all delivery modes.

### Content Readability

- Divide content into small, manageable chunks. This tip comes from two online course evaluation instruments examined in this paper (CCEC and OSCQR). Mobile users are accustomed to consuming material for shorter periods of time. Chunk material on short, easy-to-read pages. Then group pages in a logical way (e.g., by topics). Eliminate excess words and make key information easy for students to access to facilitate reading.
- Avoid unnecessary or irrelevant images. Images should be used to support content and not merely be decorative (QLT). Load times may be longer for mobile devices so it is important to prioritize content.
- Avoid using tables (found in OSCQR). Tables may not automatically resize to the correct width for mobile devices, causing users to navigate across and down the content.
- Minimize or eliminate downloads. Portable document format (PDF) are recommended by OSCQR and by Blackboard (2017a) but PDFs tend to be big and hard to navigate on mobile devices.

### Format Optimization

- Use mobile friendly font sizes and typefaces. Aim for font size 14 pixels to accommodate mobile users. A larger typeface requires less focus, enhances readability, and provides a stronger emotional connection (Miller, 2014). Sans serif typefaces (e.g., Arial, Calibri, Helvetica, and Verdana) are cleaner and easier to read on mobile devices (Bureau of Internet Accessibility, 2019). To improve legibility and avoid confusion, pick a font and use it consistently.
- Indent content sparingly (found in OSCQR). Indentation is a good way to draw attention to items but many mobile devices are too small to display more than one level of indentation effectively.
- Take advantage of the LMS header styles. Headings add hierarchical structure and organization to course content (Hooper & Berkman, 2018).
- Use **bold** for emphasis, rather than italics. Italics are harder to read on mobile devices (Hooper & Berkman, 2018).
- Specify width in percentages instead of pixels for inline frame elements (i.e., iframes) (found in OSCQR). Design mobile course content in a way that responds or adapts to the size of the user's screen.
- Avoid placing text to the left or right of images (found in OSCQR). Mobile users tend to focus on the center of the screen. So put the most important information there.
- Provide hyperlinks for embedded content (found in OSCQR). Hyperlinks should describe what students will see when they click on the link (e.g., "For more information, you can look at this [online course design checklist](#)"). Avoid simply stating "click here." Also, use the Validate Links in Content tool in Canvas, the Check Course Links tool in Blackboard, or similar tools in other LMS to ensure that all links work correctly.

## Mobile-friendly Navigation

- Minimize the number of ‘clicks’ necessary to reach content (Rios et al., 2018; Tabuenca et al., 2015). The three-click rule is an unofficial web design strategy that suggests users should be able to find the information they seek within three clicks. While this rule is disputed (see Laubheimer, 2019), it is still optimal to limit the amount of clicks necessary to access key content and complete tasks.
- Provide clear navigation cues and a roadmap for all users. By simplifying menu choices (e.g., eliminating items that are not used or should not be used to navigate directly to an item), users will be nudged to navigate the course in the manner desired by the course designer (Baldwin et al., 2018). Provide a quick video at the beginning of the course that shows students how to navigate the course on all devices. Follow the principles of universal design for learning: when navigation is simplified for mobile users, all users benefit.
- Reduce scrolling (found in QOCI). This tip relates to chunking materials into manageable pieces. Many students will not scroll down or not completely scroll down to the end of the page. On mobile devices, users develop scrolling fatigue (Smith, 2017). As a result, students may miss or overlook important content that cannot be viewed without scrolling.
- Provide hyperlinked email addresses and phone numbers for student services, LMS help, and the instructor (Gove, 2019). By offering click-to-connect points within your course (e.g., on the home page, in the syllabus, and in areas where additional support may be necessary), students will have access to support as needed.

It may not be optimal—or even advisable—to use mobile devices to take tests, write discussion posts, or draft essays. But for some students, mobile devices are a lifeline to education. We need to design courses that offer a welcoming environment to all learners (CAST, 2019).

## Conclusion

Mobile learning is student-driven (Attenborough & Abbott, 2018). There is a need for institutions, course designers, and instructors to acknowledge the use of mobile devices and support learners’ use of these devices to maximize learning. Increasing the usability of mobile learning—or at least encouraging instructors to look at the design of their courses on mobile devices—may improve student perception of online courses and increase online learning satisfaction.

In addition, instructors need guidance in designing online courses. National and statewide online course design evaluation instruments should help instructors and instructional designers understand the course design elements that need to be adapted or changed for mobile course design. Researchers and developers of online course design evaluation instruments can be informed by the gaps identified in this study and possible standards addressing online course design for learning via mobile devices. Personnel at LMS organizations may use this research to consider ways to expand technological features that allow responsive designs.

Future research is encouraged to further identify effective online course design practices that are applicable to all students’ learning needs. Accessing online courses via mobile devices has become commonplace for many college students. By understanding the strategies necessary to provide quality criteria for online courses, we will be able to provide a better online learning environment.

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