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# Using connectivism to guide information literacy instruction with tablets

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## Abstract

Connectivism provides a lens for librarians to design meaningful information literacy (IL) instruction because it integrates student learning with the digital age and with the constantly-evolving nature of information. The purpose of this paper is to extend the discussion on connectivism and IL to the use of tablet devices. Mobile devices, such as smartphones and tablets, are popular on college campuses and are gaining ground as an educational tool. However, prior to implementing new technology in the classroom, educators should be able to explain the instructional purpose of the technology and how it will enhance or enable learning. This article presents an overview of connectivist theory, the theory's relationship to IL, and the use of tablets during instruction. The author provides examples of a connectivist approach to IL instruction that incorporates the use of iPads.

## Keywords

tablets, connectivism, United States, pedagogy, library instruction, higher education, mobile literacy, digital literacy

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## 1. Introduction

Information access has become increasingly mobile in the last decade with smartphones and tablets providing immediate and simultaneous connections to news, social media, and other information tools. The abundance of applications (apps) available to facilitate research and assist with personal and professional information needs has turned mobile devices into a learning network for today's college students. Using multiple apps on one device, students will connect to Facebook; find an article for class; receive a current event notification; text a professor; check the bus schedule; and order a textbook. All this might be accomplished in less than an hour. As this technology continues to evolve, and students become more engaged with information on these devices, libraries and library instruction programmes can leverage such devices as a tool to teach students about the complex nature of information.

The Internet and web tool technologies have long allowed students to interact, collaborate, and connect with information in such a way that "learning landscapes are networked, social, and technological" (Dunaway 2011, p.678), and the increasing mobility of information is further enhancing this connectivity. Connectivism, a learning theory that has gained attention as it acknowledges the impact of the digital age, suggests that learning occurs within a shifting personal network of information sources and emphasises the learner's ability to make connections between those sources (Siemens 2005). Siemens' seminal work outlining connectivism has received more than 2,500 citations on Google Scholar and, to a lesser extent, has been discussed as a pedagogical approach to information literacy (IL) instruction (Dunaway 2011; Transue 2013). Meanwhile, mobile devices are overwhelmingly present and popular on college campuses, but few examples highlight how or why these devices might be used to advance IL.

This article suggests that the theory of connectivism provides a relevant perspective to consider the practical use of tablets in the IL classroom. Librarians “play a valuable role in shaping students’ learning networks” (Dunaway 2011, p.682), and tablets further enhance students’ abilities to make connections between multiple information sources. Here the author presents a brief overview of the theory of connectivism, the theory’s ties to IL and the use of mobile devices during instruction. The author will highlight how a connectivist approach to IL instruction might be designed using tablet devices.

## 2. Connectivism and IL

Connectivism has emerged as an explanation of student learning in the 21<sup>st</sup> century. The theory, advanced by George Siemens in 2005, argues that traditional learning theories are no longer relevant in a digital age where information and knowledge are constantly in flux. The theory also challenges the traditional notion that learning occurs solely within a person, and emphasises the importance of connections between various sources of information, or nodes. These nodes make up an always-expanding and evolving knowledge network (Siemens 2005). Building on Siemens’ work, Downes (2009) described connectivist learning as learning that is built on conversation and interaction within one’s personal network and that has evolved from “being a transfer of content and knowledge to the production of content and knowledge” (p. 12). Several of Siemens’ (2005) main principles of connectivism have clear ties to IL:

- Learning and knowledge rests in diversity of opinions
- Learning is a process of connecting specialised nodes/information sources
- Capacity to know more is more critical than what is currently known
- Ability to see connections between fields, ideas, and concepts is a core skill
- Currency is the intent of all connectivist learning activities
- Decision-making is itself a learning process

Connectivism has been considered as an approach to IL education, and has been acknowledged as a potentially more relevant learning theory than traditional learning theories such as constructivism, because of its emphasis on thinking about information in a networked society (McBride 2012). Transue (2013) mapped each of Siemens’ principles to the *Information Literacy Competency Standards for Higher Education*, published by the Association of College and Research Libraries (ACRL) in 2000. Transue suggested many connectivist principles were already embedded in IL instruction, but suggested librarians should be more intentional in their application of the theory. Dunaway (2011) also highlighted connections between ACRL’s standards and connectivism; however, both Dunaway and Transue acknowledged the limitations of the ACRL standards in aligning with connectivist pedagogy. Interestingly, connectivism is not mentioned in ACRL’s (2015) *Framework for Information Literacy for Higher Education*, but the framework’s attention to the “dynamic and often uncertain information ecosystem” (p.1) certainly aligns with Siemens’ (2005) emphasis on “our ability to learn what we need for tomorrow is more important than what we know today” (p.6). Further, Dunaway (2011) tied connectivism to critical IL models of transliteracy and metaliteracy, the latter being an influential underpinning of the framework.

Teaching from a connectivist perspective, librarians should acknowledge students’ learning networks, which are likely to include user-generated content and social media resources. In doing so IL instruction enhances students’ abilities to add and connect additional resources, such as databases, as nodes to their existing network (Dunaway 2011). Traditional library instruction models privileged resources like subscription databases, online catalogues and books within the collection (Swanson 2004). A connectivist approach to IL instruction does not dismiss those, but suggests library resources should complement other information resources, because learning occurs when “connections between ideas embedded in various communities and technologies” (Dunaway 2011, p.682) are made.

In addition to expanding students' learning networks, a connectivist approach to instruction should emphasise the student as a creator of information. Connectivism suggests knowledge development is a cycle with each individual creating a personal network, "which feeds into organisations and institutions, which in turn feed back into the network" (Siemens 2005, p.6). When outlining a connectivist approach to IL instruction Transue (2013) emphasised the importance of directing students to information management tools such as RSS readers and social bookmarking. Using these tools, students can not only "create and maintain networks within the connectivist framework" (Transue 2013, p.192), but also consider how they might become active contributors to their networks as they use tools to share their own research and knowledge. Mallon (2012) also relied on connectivist principles tied to student-as-creator in the design of online research support, which included the use of collaborative and social tools to enhance connections between teachers, students, librarians, content and networks. Mallon argued using tools like YouTube, Twitter, blogs, and podcasts to deliver online instruction provides students the opportunity to learn autonomously, but then share new knowledge with peers. Finally, the idea that students are producing information and contributing knowledge and ideas to existing networks is also reflected in ACRL's (2015) revision on the definition of IL:

"IL is the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning" (p.3).

A connectivist approach to IL instruction should also emphasise evaluation of information sources. As the amount of information within and outside of one's network continues to increase, and new information and resources are continually introduced, "the ability to draw distinctions between important and unimportant information is vital" (Siemens 2005, p. 5). Of course, evaluation is a cornerstone to IL instruction and has been for many years. As noted above, connectivism has been linked, with reservations, to ACRL's (2000) *Information Literacy Competency Standards for Higher Education*, and most often, connected with the third standard which emphasises an individual's ability to evaluate information (Dunaway 2011; Transue 2013). Recent developments and revised definitions of IL move evaluation abilities beyond a set of skills to better emphasise one's ability to conceptualise information in a digital age by considering authority, publication processes and context. This shift in emphasis more clearly recognises the relevance that non-academic sources, including user-generated content, blogs, or wikis may have on decision-making or problem-solving inside or outside the classroom, and better aligns with a connectivist teaching approach. For example, the concept of authority as constructed and contextual, found in the ACRL *Framework*, emphasises an individual's ability to evaluate all types of evidence and ask relevant questions within the context of an information need (ACRL 2015). The *Seven Pillars of Information Literacy* from the Society of College, National, and University Libraries (SCONUL) includes an evaluation pillar that incorporates one's ability to recognise the "information and data landscape" of the research context as a foundation for analysing information sources (2011).

In summary, connectivism has been discussed as a potential lens for designing IL instruction. Further, while not explicitly mentioned in ACRL's 2015 *Framework*, connectivist ideas do align with the definition of IL presented in the *Framework* and some of the underlying theories behind the *Framework's* development. Although explored to a lesser extent in this paper, connectivist ideas may also be connected to IL frameworks beyond the ACRL document. From a practical standpoint, librarians interested in connectivist teaching should consider how to develop and enhance students' personal learning networks, and students' abilities to interact within that network, as well as helping students develop a conceptual understanding of information in a variety of contexts so that critical analysis of information sources can occur. Mobile devices offer a practical solution to provide meaningful instruction in these areas.

### 3. Mobile Devices and IL Instruction

Nearly two-thirds of Americans now own a smartphone, and the numbers are even higher for young adults, according to a report from the Pew Research Centre (Smith 2015). A separate report

showed 42% of adults own a tablet computer, such as an iPad, and this number had jumped 8% in a four-month period (Zickuhr and Rainie 2014). While still a growing area of research in the IL instruction field, the use of mobile devices is emerging in the literature. Some studies have examined the impact of mobile devices on students' information-seeking behaviors (Walsh 2012; Lee and Song 2015). After exploring the different ways an individual may use and access information on the go versus in a fixed environment, Walsh (2012) concluded there is a difference in information-seeking behaviour, and that IL models should "reflect how people relate to the world of information outside of libraries." (p.67). Focusing on the practical use of tablets, Dodds et al. (2014) examined how faculty and students used, or might use, iPads for teaching and learning. Researchers found agreement that ebooks, the ability to view web pages during a lecture, educational apps and note-taking were all thought to have potential for classroom use, and the size and mobility of the device were cited as advantageous for a classroom setting (Dodds et al. 2014). Other publications provide examples of librarians integrating mobile phones into the classroom, such as using the polling application Poll Everywhere, to gauge student information habits (Burkhardt and Cohen 2012) and to measure affective learning during instruction (Rimland 2013).

Examples are also emerging that describe mobile IL classes, in which librarians rely on mobile phones or tablets throughout the entire class. Havelka (2013) used a combination of smartphones, tablets and iPod Touches to guide students through apps and mobile sites that aided the development and refinement of research topics, and also in searching for information sources. A 2012 issue of *Library Technology Reports* was dedicated solely to the use of tablets in reference and instruction, in which Miller (2012) shared results from a case study after various disciplinary and library faculty integrated iPads into semester-long courses and one-off IL sessions. After collecting student feedback Miller reported that students agreed the iPads contributed to learning, and most strongly agreed that the iPad helped them "connect ideas in new ways" (p.58). In the same issue Canuel et al. (2012) described designing workshops for students, faculty, and staff that highlighted the variety of mobile tools available for research beyond the Internet, and emphasised the changing nature of information searching and access. Johnston and Marsh (2014) gathered feedback from faculty after using iBooks and iPads to help students in a foundational English course develop IL concepts, and found the activities benefitted the students in completing projects. While the findings also suggested students may have learned the material regardless of the iPad, the authors found agreement that the interactive nature of the apps contributed to student engagement. In addition to enhancing student engagement, librarians have also suggested the use of tablets help to facilitate inquiry-based learning and collaboration during IL instruction (Sullivan 2014; Moore et al. 2015).

As with any instructional technology, a teacher needs to consider *why* he or she is using the tool in class and *how* it contributes to learning outcomes. Burkhardt and Cohen (2012) described their use of mobile devices in the classroom as "a deliberate pedagogical approach" (p. 196), and Johnston and Marsh (2014) warned of the danger in using technology simply because it is popular or novel. Further, Bayne (2015) critiqued the idea that technology will enhance or support learning and encouraged researchers and practitioners to not isolate technology from the individual or consider technology as a tool. Instead, Bayne emphasized the "need to move away from our over-emphasis on how technology acts on education, or how education can best act on technology...the two are co-constitutive of each other, entangled in cultural, material, political and economic assemblages of great complexity" (p. 18). Lea and Jones (2011) also cautioned against focusing solely on technology when considering how students engage with digital texts. The authors took an ethnographic approach to better understand how students read, write, create and negotiate digital texts. The findings suggest there is a "constant flow and interplay between texts, technologies and practices as students engage in their area of study" (Lea and Jones 2011, p. 386).

The idea that technology should be considered within a broader network of individuals and learning has common ground with connectivism where "the real point of interest lies not in the tools themselves, but in what the growth of the tools represents and what the tools enable" (Siemens 2006 p. 33). With technology, connectivism suggests the rapid acquisition of information and

knowledge can be spread across a network composed of humans and technology (Siemens 2006). For librarians, a connectivist lens not only provides a how and a why for using tablets to approach IL instruction, but such an approach might also enhance the relationship between an individual and a mobile device within a broader learning network.

## **4. Designing connectivist-based instruction using tablets**

From a connectivist perspective, librarians should enhance the development of personal learning networks as students assimilate new resources into existing networks. Further, emphasising the similarities between resources can help students make connections so that when a student leaves the instruction session he or she is better equipped to continue learning from the expanding network (Dunaway 2011). In addition to highlighting the similarities, connections between resources can be emphasised using tablet devices, such as iPads. As Siemens (2006) stated, “technology is permitting new ways of seeing information” (p.34). Using a tablet, students will be exposed to a variety of information sources and creation tools placed side by side, in a visual network of apps. For example, depending on how the tablet is set up, the Wikipedia app could be next to the EBSCO app, which could be next to the Facebook app, which could be next to the library website app, which could be next to the messaging app, which could be next to the camera app, and so forth. Librarians can, and should, capitalise on this visual network representation during instruction.

After receiving a cart and 28 iPads for instruction, the author began using iPads to teach one-off IL sessions in early 2015. Therefore, the activities presented here are described for use on iPads during such sessions; however, the activities could be translated to other tablet computers and teaching scenarios. In addition, the exercises outlined here do not necessarily have to be conducted with a tablet device, but in doing so, the librarian enhances the sense of students creating and adding to a personal learning network. Each activity is highlighted with a relevant learning outcome and a list of necessary apps.

### **4.1 Activity 1**

Learning outcome: Develop and use keywords relevant to a chosen topic in order to focus and narrow search results

Apps needed: Wikipedia ;a word cloud generator such as Word Salad; search systems, e.g. EBSCO and/or Google Scholar

At the 2012 Georgia Council of Media Organisations Joint Conference, Calhoun (2012) presented a method for using Wikipedia entries and word cloud tools to generate keywords for effective searching. Students are directed to copy a Wikipedia article connected to their topic and paste the entry into a word cloud generator such as Wordle. The resulting word cloud provides keyword suggestions to consider for further searching. This activity can be translated onto a tablet device using a word cloud app, such as Word Salad, and the Wikipedia app. Students can navigate between the applications, including an EBSCO and/or Google Scholar app to visualise how the resources connect to solve an information need. Dunaway (2011) emphasised the importance of incorporating and connecting scholarly resources with widely-known tools such as Wikipedia. Placing and using the Wikipedia app on a mobile device during IL instruction acknowledges the relevance of the resource in conducting research and the relevance within one’s personal network.

### **4.2 Activity 2**

Learning outcome: Explain the impact user-generated content has on one’s ability to gain new knowledge, form opinions and share ideas.

Apps needed: Social media platforms, e.g. Twitter or Facebook; news apps, e.g. CNN, NPR, USA Today

A tablet device, even more so than a laptop or desktop computer, can be used to facilitate creation of information. Instruction librarians using an iPad have a slew of interactive tools which students could use to create information, including video, audio and word-processing capabilities. Perhaps the easiest and most relevant for a one-off session would be Twitter and/or Facebook. The librarian, using a variety of news apps, can direct students to identify a hot topic or controversial issue reported recently in the news. From there, using at least one information source, the student has to post a comment/tweet in response to the issue. This helps students with synthesis of information and identifying the most important points, and allows them to recognise their potential in contributing to a conversation on the topic. In addition, as students are generating content within their network, they are receiving feedback (comments) or learning new ideas from their peers, further enhancing their own network. In order to facilitate this activity the instruction librarian could create a separate Facebook page or Twitter account for all the students to use. In this instance students would not have to log in to their own accounts. As an alternative, the instruction librarian could direct students to use their own accounts, but tag their post/tweet with a designated hashtag (#LibraryName2015). This could lead to further discussion on the organisation of information. However, the main purpose of the activity would be to encourage students to reflect on their own involvement within their personal network and the impact of user-generated content within that network.

### 4.3 Activity 3

Learning outcomes: Evaluate sources by considering authority, type of publication, creation process, purpose, and point of view

Apps needed: A virtual binder tool, such as LiveBinders ([www.livebinders.com](http://www.livebinders.com)); or tablet devices that are synced together with one account.

Evaluating information and the ability to access and recognise diverse perspectives is a key component of connectivism (Siemens 2005). Evaluation of information is also a key component of IL instruction. A more traditional exercise might provide students with a stack of paper sources or printouts from websites. In this exercise librarians may provide students with links and direct them to visit sites on their laptops. Using a tablet and a tool like LiveBinders, students can be exposed to multiple sources at one time. In addition, using a tablet to evaluate information sources better imitates the way students are likely to read and interact with the information on their own.

LiveBinders is a web tool that enables an individual user to collect multiple sources of information and compile them into a virtual binder. The sources can consist of websites, pdf documents, pictures, QR codes, videos, etc. For instruction purposes, the librarian can collect multiple sources for students to view and organise them into a LiveBinder prior to the class meeting. The librarian then shares the LiveBinder with students. This can be done by directing students to the LiveBinder app and logging in with a designated account or sharing a public link with the students in the class using the iPads' syncing capabilities. Multiple iPads can be synced together through a cart and/or using a cloud connection. For example, if the instruction librarian bookmarks a link as a favourite on one iPad that bookmark will also appear on any other iPad that is synced to the same account. In this example, the librarian can bookmark the link to the LiveBinder on one of the iPads. In class, students are then directed to the bookmarks on the iPads and told to select the appropriate link to view the Livebinder.

### 4.4 Activity 4

Learning outcome: Identify general and discipline-specific resources relevant for personal, academic, and/or professional information needs

Apps needed: Mind-mapping tools e.g. Total Recall or Bubbl.us

Couros (2009) integrated connectivist principles into an educational technology course and had each student develop a personal learning network that would extend beyond the limits of the course. A similar approach could be designed for a one-off IL session. Using a mind-mapping app such as Bubble.us students can reflect and describe their own personal learning network. This activity could also be used as an assessment tool, especially if students created a network at the beginning of class and again at the end of class. In order to use a mind-mapping app students will need to create individual accounts. This also allows students to access the tool, and their visual network, at a later time.

## 5. Considerations

Using a tablet for instruction facilitates a connectivist approach to IL, but limitations should be considered before implementation. While a tablet does provide a visual representation of a learning network, it is important for the librarian to acknowledge the representation is not a student's *personal* learning network. Through instruction, a goal of a connectivist approach is to enhance a student's learning network, but it is dependent on the student to add the resources to his/her network. This leads to two obvious limitations, although there may be additional considerations. First, during instruction a librarian may direct students to use a database app, rather than the web version of the database. As Havelka (2013) noted, the authentication process to download and use a subscription mobile database application is cumbersome. Librarians may want to consider providing a handout or short video tutorial describing the procedures to download and authenticate a database app for off-campus use.

The second limitation involves device ownership. At the author's institution, 85% of the student population owns a smartphone and 52% owns an iPad, Windows or Android tablet device (NKU Office of Information Technology 2015). This means that 15% of students do not own a smartphone and nearly half do not own a tablet. Acknowledgement of the digital divide is an important consideration. Helping students to expand their network using mobile devices may not have an impact on those students whose network still consists of more traditional resources. Emphasising the inclusion of traditional resources alongside the mobile applications would be useful.

## 6. Conclusion

Ten years ago, Siemens (2006) stated "We communicate differently than we did even ten years ago" (p.9). This statement continues to echo today, and will likely still be true ten years from now. Mobile devices are more present than ever across college campuses with the vast majority of students owning and navigating applications on at least one such device. The devices are relatively new, and at this point, few examples provide in-depth details about how the use of mobile devices might enhance IL education or the impact mobile information access may have on one's ability to develop as an information-literate individual. This article suggests that designing IL instruction with iPads supports a connectivist approach to teaching and learning. This is not to say that using tablets during instruction will ultimately lead to a connectivist approach, but the use and integration of various applications and the set-up of the tablet device do offer a unique opportunity to approach teaching with a connectivist lens. Future research should delve into this idea further to examine student perceptions of their personal learning network and connections between resources after using tablet devices.



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