

Meaningful Use and Application of Mobile Computing Devices in ODFL Teacher Education Programs

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Abstract

There is a shortage in the capacity of current open distance flexible learning (ODFL) institutions that provide teacher education and training. There is a teeming population that is not able to gain admission to full time tertiary education programs, and teacher education and training in ODFL is becoming more necessary. Partly to blame for this deficit is the reliance on outdated instructional delivery methodologies. Innovations in Internet communication technology (ICT) make it possible to reach underserved populations in remote areas that have wireless-enabled mobile computing devices, such as tablet PCs and smartphones. ODFL institutions should exploit tablet PC and smartphone favorability ratings among students make use of mobile learning (mLearning) as a strategy that is very relevant in technocentric 21st century. Instructional design principles that inform about mLearning, such as agile design, rapid prototyping, and successive approximation, take into account learning activities that engage and challenge learners. They provide opportunities for practice and rapid development of instructional materials unlike obsolete instructional design theories of the past. In this paper, the 4 C's App model is put forward, which when applied, will assist teachers in making informed decision regarding mobile application selection for classroom activities. Making the transition from developing teacher websites to developing teacher mobile applications is easy with free, intuitive, and open-source integrated development environments (IDE). Mobile Access to Supplemental Learning Objects (MASLO) and MIT Apps Inventor, two simple tools that can empower teachers in the classroom, are discussed. Finding ways to engage students with these powerful devices, tablet PCs and smartphones should be considered an important undertaking on the part of teachers and teacher training institutions in order to catalyze 21st century skill acquisition.

INTRODUCTION

"If we teach today as we taught yesterday, we rob our children of tomorrow." This statement is credited to John Dewey, an eminent American philosopher and 20th century education reformer. This statement epitomizes the challenges teachers currently face. Technological challenges are occurring more often for teachers; students that are more technologically savvy than teachers is a common feature of our education system. As schools and students become more technocentric, there is a need for teachers to adapt and use innovative technology resources that will offer rich learning experiences for improved student outcomes. To be successful in the 21st century, every teacher should continually reflect on John Dewey's statement and its implication for today's classrooms. Many challenges confronting teacher education and training revolve around creating curriculum structures that ensure teachers are proactive in the face of a constantly changing technology terrain. It is equally important for teachers to be able to integrate technology in their classroom instruction and know how to use it correctly. Above all, offering distance education and flexible learning opportunities to teeming population of qualified citizenry who are not able to gain admission to full time tertiary teacher education programs.

During the mini and personal computing periods of the 1970s and 1980s, computer-based training was popular as means of providing distance learning. With desktop Internet computing in the 1990s, web-based training took center stage and eLearning, a type of distance learning and teaching delivered and supported by digital electronics tools and media, emerged. Innovations in ICT saw the emergence of wireless networking and the birth of mobile communication devices such as mobile phones, Wi-Fi enabled laptops, tablet PCs, and smartphones. Internet access was no longer fixed or limited by proximity to telecommunication switching stations; Internet became ubiquitous.

There has been significant increase in Internet usage since wireless Internet became available. Nigeria witnessed a significant increase in the percentage of people using Internet (from 16% in 2008 to 33% in 2012). In the same period, mobile communication subscriptions increased from 63 million to 113 million, whereas fixed wire Internet subscription from 2011 to 2012 was negligible (ITU, 2013). This means that people transitioned to mobile devices to meet their Internet needs. As Wi-Fi enabled

computing devices such as laptops, tablet PCs, and smartphones are becoming readily available, they become the preferred choice for Internet computing. This picture is typical of worldwide usage of wireless Internet-enabled devices with mobile broadband subscriptions on a steady rise. Five billion mobile phones are in use all over the world, of which 1.05 billion are smartphones; in the US, the country with the largest number of smartphones (91.4 million), those between 25–34 years have the highest penetration rate of 62% (Pew Research, 2013; Nielsen Research, 2013; ITU, 2012).

The availability of mobile cellular and broadband Internet connectivity has brought about another form of distance learning that is steadily gaining traction. A scion of eLearning, mLearning is mediated through portable handheld wireless computing and communication devices (Quinn, 20002). It has also been defined as learning supported by mobile technologies “involving mobility of human subjects who can be physically/geographically far from each other and far from formal educational physical spaces, such as classrooms, training/graduation/qualification rooms or workplaces” (Barbosa, Reinhard, Saccol, and Schlemmer, 2010, p. 262). Examples of popular mobile devices include tablet PCs (iPads, Samsung Galaxy Tab, Microsoft Surface, Nexus, etc.), and smartphones (iPhones, Samsung Note Blackberry, etc.). Tablet computing, as noted in the most recent Horizon report,

has carved its own niche in education as a portable and always-connected family of devices that can be used in almost any setting. Equipped with Wi-Fi and cellular network connectivity, high-resolution screens, and with a wealth of mobile apps available, tablets are proving to be powerful tools for learning inside and outside of the classroom. (Horizon Report, p. 6)

The worldwide mLearning growth rate by region indicates that the highest growth is occurring in Africa, with Nigeria being number six among countries experiencing a high growth rate in 2010–2015 (Ambient Insight Report, 2011). The challenge with teacher training is how to harness the computing power, popularity, and affordances of these versatile mobile computing devices in innovative ways that ensure sustained technology integration practices relevant to 21st century pedagogy.

TEACHER EDUCATION AND TECHNOLOGY IN 21ST CENTURY

21st Century skill standards and frameworks

Due to rapid innovative and technological advancements of the 21st century affecting education, several stakeholders and interest groups have collaborated with the industry to put forward different frameworks to guide educational policy makers in formulating curriculum for the 21st century learning environment. Such frameworks also address competencies expected of teachers as facilitators for classrooms that are becoming increasingly technology centered. UNESCO's – The Treasure Within, a report of the International Commission on Education for the 21st century, highlights the four pillars of learning: (a) learning to know, (b) learning to do, (c) learning to live together, and (d) learning to be (UNESCO Report, 1998). The European Framework sets out eight key competencies considered essential: (a) communication in the mother tongue; (b) communication in foreign languages; (c) mathematical competence and basic competences in science and technology; (d) digital competence; (e) learning to learn; (f) social and civic competences; (g) sense of initiative and entrepreneurship; and (h) cultural awareness and expression (European Framework, 2006). The International Society for Technology in Education (ISTE) developed five standards, called National Educational Technology Standards (NETS), which address all ramifications of learning, teaching, and leading in a technocentric world. The five standards include (a) ISTE.NETS for students (NETS.S), (b) teachers (NETS.T), (c) administrators (NETS.A), (d) coaches (NETS.C), and (e) ISTE.NETS for computer science teachers (NETS.CSE). It is widely acclaimed all over the world, and many schools model their educational technology policies along these standards (ISTE, 2009). NETS.S and NETS.T deserve further elaboration. NETS.S delineates the skills students need to be successful into six broad areas: (a) communication and collaboration, (b) creativity and innovation, (c) critical thinking and problem solving, (d) research and information, (e) digital citizenship, and (f) technology operations. To empower students in acquiring these skills, NETS.T makes it the responsibility of teachers to consider NETS.S standards when designing lesson plans and activities. NETS.T is divided into five broad categories: (a) digital age work, (b) digital age learning, (c) digital citizenship, (d) student learning, and (e) professional growth. Partnership for 21st Century, a U.S. organization committed to improving education in a technocentric world, summarizes student outcomes that will ensure student success in an increasingly digitally connected world. The 21st century outcomes are (a) core subjects and 21st century themes, (b) learning and innovative skills, (c) information media and technology skills, and (d) life and career skills. (Partnership for 21st Century, 2002).

The traditional classroom instructor model of teacher education is limited in terms of structural and instructional capacities. As a result, many student teachers embrace the distance and flexible learning approaches. In this paper, I argue that these frameworks, when properly aligned with mobile computing devices, will be the platform to offer opportunities to train more teachers with mindsets that reflect 21st century skillsets. When it comes to distance and flexible learning, mLearning offers distinct advantages. An important mLearning feature is that it is relatively inexpensive to setup compared to legacy systems. With mLearning, it becomes possible to reach remote areas that have largely remained underserved (Shuler, 2009). For example, study centers of the Nigerian Teachers Institute (NTI) are located in cities. If NTI implements mLearning, it will make it possible for teachers in remote regions to take NTI classes. Social interaction through collaboration and communication is an important 21st century skill sets and mLearning encourages it. However, mLearning is not without shortcomings; different platforms pose serious challenges, it is relatively new, and the absence of supportive learning theories makes design of suitable pedagogy difficult (Shuler, 2009).

Instructional design for mLearning.

Instructional materials are largely governed by more established instructional design models that focus mainly on traditional learning, which may not apply to innovative learning systems mediated by technology, such as eLearning and mLearning (Wang & Shen, 2012). While the objective of this paper is not to discuss instructional design, it is pertinent to state that teacher education and training in the 21st century should strive to put more emphasis on newer instructional design principles. Agile design, rapid prototyping, and successive approximation take into account learning activities that engage and challenge learners by providing opportunities for practice and rapid development of instructional materials.

MAKING SENSE OF MOBILE DEVICES IN TEACHER EDUCATION

It is important to distinguish between mobile website and mobile applications (apps). Mobile websites are HTML websites reconfigured for the small display size of mobile devices. They are instantly available, compatible across different computing platforms, easily upgradeable, can be found easily, and have a broader outreach. Mobile apps are platform specific; Android apps only run on the Android operating system. Apps are installed on the device for specific purposes and do not require an Internet connection.

Apps are the fuel driving mLearning. The problem teacher education and training faces is that the curriculum is not designed for computational thinking, and yet the instructional environment is now requiring this skill. Teachers are confronted with decisions regarding app choice for classroom activities.

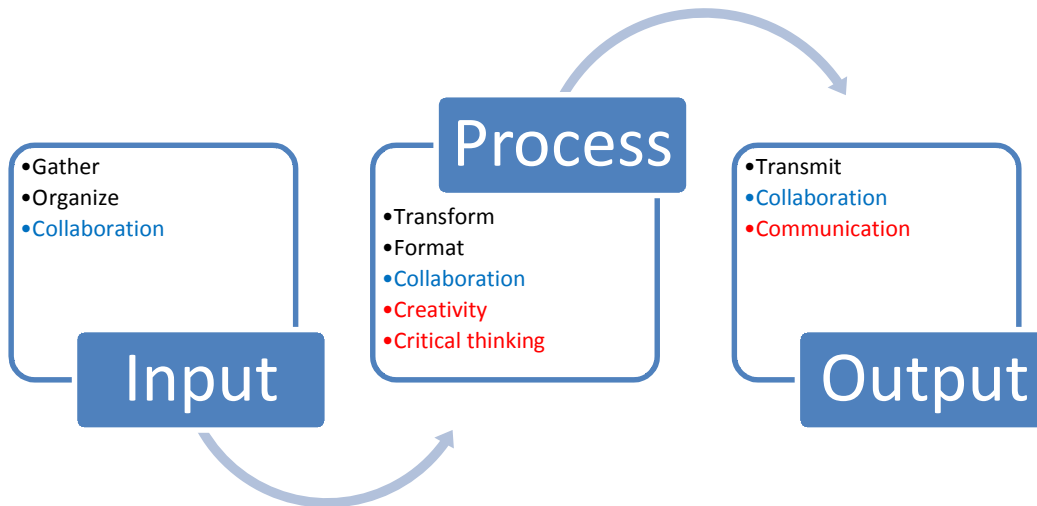
The teacher of the 21st century must be able to make informed decisions regarding what apps to use for classroom activities. Teacher training institutions must acknowledge this fact and build competencies into their curriculum that address the meaningful selection and use of apps in the classroom. In this paper, I will share approaches I find effective to address these concerns.

Meaningful use of mobile apps in the classroom

The various frameworks that address 21st century learning outcomes were born out of extensive research. Teachers should employ them when making decisions regarding apps for the classroom. It is evident that communication, collaboration, creativity and critical thinking and problem solving (4 C's) are common denominators across all standards and frameworks. Appraising apps to use in the classroom by examining which apps apply to the 4 C's will narrow a teacher's choice to those that can be used meaningfully in the classroom. The concept borders on applying computational thinking, which is analogous to the way computers manipulate information – input, process, and output; the plethora of apps that exist today implicitly are programmed this way (Norwood Z, 2011).

To apply the 4 C's model in selecting suitable apps, the teacher examines the 4 C's apps diagram and asks questions that will result in better selection of apps to address essential skills. The procedure is as follows:

1. Before installing the app, read the app description to learn what it does.



4 C's App Model

2. Check 4 C's app diagram's three main processes – input, process, and output. Determine if the app details address items in each box (input, process, and output). For example, a teacher wants to conduct an activity that will encourage creativity and critical thinking skills. By selecting an app that can transform or create (process) new artifacts, the teacher would have made the right decision. The steps involved in using the app include selecting relevant photos, editing, and file size reductions require creativity and critical thinking and problem-solving skills.

Wisdom of the crowd prevails in the 21st century learning environment, which is why collaboration should appear in all steps. It is essential that teachers collaborate with their colleagues to determine which apps work for any of the steps and share their experiences.

App development for educators using open-source software

If a situation arises where a teacher is unable to find suitable apps, a 21st century teacher will take steps to develop an app suitable for the intended activity so students can still be engaged. In the past, developing websites was a difficult task for teachers because it required specialist skills. Web 2.0 tools made creating and deploying websites a simple task that most teachers can accomplish without writing a single line of HTML.

The first step in introducing mobile app development into teacher education curriculum is converting websites to mobile websites using free online mobile app conversion tools, such as Conduit Mobile. The majority of teachers may think that developing applications or computer programming is a difficult mathematical venture. A 21st century teacher should be adventurous with app development; there is nothing intimidating about it. With new visual integrated design environment (IDE), apps development has become intuitive, requiring no programming language or coding abilities. I will share two open-source learning development platforms that should form part of teacher education and training curriculum: MASLO and the MIT App Inventor.

MASLO is an open-source solution for authoring and distributing content packets to learners on mobile devices. It was developed by the Academic Advanced Distributed Learning Co-Lab at University of Wisconsin-Extension and funded through a Department of Defense Broad Agency Announcement. The MASLO authoring tool previews what the content will look like on a mobile device and content packages downloaded to the device do not require an Internet connection to operate.

The MIT App Inventor mobile is a more intuitive and visual development platform for Android mobile devices developed by MIT professor Hal Abelson. It began as a collaborative effort between Google and MIT in 2009 and is now an open-source Android platform aimed at democratizing apps development. With App Inventor, students build simple apps using Android's text-to-speech capabilities that have the phone ask questions aloud. Elementary and Special education teachers find this very impressive. I am mindful of the fact that I am not teaching Computer Science 101, but empowering my students as 21st century preteachers will help them appreciate these devices as tools for learning, rather than disruptive classroom devices, and help them develop simple classroom activities that engage their students and facilitate learning.

CONCLUSION

Teachers and teacher training institutions face enormous challenges in the 21st century, due to the ever-changing technology terrain that continuously influences education. The different frameworks and standards have delineated skill pathways to ensure teacher readiness and student outcomes for success in a 21st century learning environment. Teachers and training institutions need to realign their curriculum to make innovative technology integration part of the overall instructional strategy. As tablet PCs and smartphones become mainstream ICT platforms, mLearning is gaining ground. Using these devices, teachers in remote areas are able to take advantage of distant and flexible learning programs to improve or further their careers.

Learning how to build mobile apps with these open-source tools is no different from learning how to build a website. The difference, however, is the mindset, which a 21st century teacher can bring to learning in the digital age. Teachers and teacher training institutions must acknowledge the fact that mobile devices have become a part of everyday life for their students. Embracing apps development as an essential part of the curriculum will enable students acquire important 21st century technology skills, such as computer programming, but can also be used to apply computational thinking concepts in educational contexts. Finding ways to engage students with these powerful devices should be considered an important undertaking on the part of teachers and teacher training institutions to catalyze 21st century skill acquisition.

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