



## Integrating Technology in Teacher Preparation

**Abstract.** *Technology plays a large role for teaching and teacher preparation. Integrating technology and core subjects content enhances the learning environment by actively engaging students. This work includes a statement explaining why integrating technology is an important component for education thus, educator preparation. The following concepts that we include in our teacher preparation program will be introduced and discussed: applications for hand-held devices, the flipped lesson approach and educational game design and development.*

**Key words:** *integrating technology, teacher preparation, use of hand-held device, flipped lesson, educational game.*

### Introduction

Teacher preparation has continually shifted as student learning has evolved in an ever-changing technological world. Mobile technology has affected teacher candidates and curricula in teacher preparation programs. Professors in these programs have a responsibility to teach these soon-to-be teachers how to teach in a technological world. The authors of this article are professors in an East Texas University, which graduates approximately 350 teacher candidates in Curriculum and Instruction. It is our hope this article will increase awareness on how to use technologies in authentic, collaborative, student-centered learning experiences during teacher preparation coursework.

According to Problem-Based Learning researchers students are encouraged to develop deep understanding within a knowledge domain and problem solve by engaging in the learning process with activities in which they solve real world, authentic problems using metacognitive skills. (Duffy & Cunningham, 1996; Hmelo & Evensen, 2000). Times have changed and technology affects almost every part of our lives, in our homes, schools, and communities. Kindergarteners can navigate an iPad and iPod Touch, third graders use their cell phones to text messages to their parents about school events, and middle schoolers with internet access follow on their blog, Twitter, Facebook or You Tube channel. Learners demand quick access to new knowledge. This can be accomplished through a technology-infused learning environment. Appropriate and smart use of technology in the classroom allows students to learn through projects. Effective teachers integrate technology across the curriculum in ways that deepen and strengthen the learning process by active engagement, group participation, interaction and constant feedback, assessments, and real-world experts. Technology should support curriculum goals and serves as an avenue for teachers to reach different types of learners and assess student understanding through different means. Effective integration of technology into subject areas allows the teacher to take on different roles as advisor, content expert, and coach giving students greater responsibility of taking ownership of their learning by doing.

Learning theories identify the ways people learn. Some include behaviorism: learning through frequent examples, interactions and practices; cognitivism: exploiting the working



process of the mind to enhance learning process; constructivism: learning through experiments and problem solving skills; and Vygotsky's Learning Theory: this emphasizes that learning is social and includes arguing, reflecting and articulating to others. The use of mobile devices can provide an anywhere, anytime learning experience to cater to the needs of different learners and augmenting their learning experience addressing the aforementioned learning theories.

### ***Applications for Hand-held Devices***

The mobile device is a small, handheld computing device, displaying a screen with touch input and/or a miniature keyboard weighing less than two pounds. Some manufacturers that produce these devices are Apple, Samsung, Blackberry, Motorola Mobility, LG, HTC, and Nokia. The device has an operating system (OS/IOS), can run various types of application software (known as apps), can be equipped with Wi-Fi, Bluetooth, and GPS capacities, and cameras or media player feature can be found on these devices. Students are using these devices in schools, sometimes against the school rules. In a Fact Sheet by the Pew Report as of January 2014, 90% of adults in the United States have cell phones and 58% of these own smartphones (<http://www.pewinternet.org/fact-sheets/mobile-technology-fact-sheet/>). It is rare a student comes to our classes without a hand-held device. iPads have exploded throughout schools and classrooms. Their flexibility, versatility, and mobility make them a phenomenal learning tool. An unstoppable trend in schools is BYOD – Bring Your Own Device. Teachers integrate these devices in the classroom by allowing students to use different applications, record and edit videos, record and edit audio, read class content, annotate course readings, read audio books, create digital notebooks/note taking, create screencasts, create presentations, create digital stories, respond to questions, pools and assessments, create written content, create and edit images, simulate a language lab environment, and etc. Continuous improvement in handheld devices technologies has led to a new learning paradigm called mobile learning which involves the delivery of learning contents to learners utilizing mobile computing devices.

Teaching and learning has been affected by this improvement. With the features of “wearable” computing and multimedia content delivery via mobile technologies, mobile learning becomes feasible and offers new benefits to instructors and learners (Rashmi Sinha, 2005) providing the enablement for u-learning and the availability of handheld devices and Personal Data Assistance (PDAs) pave the way for mobile learners.

However, the question arises as to how instructional design for mobile learning environments can best be done to improve learning and teaching experience, and how a mobile learner can be motivated for learning and sustained for a long time. Mobile learning occurs when the learner is not at a fixed, predetermined location or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies due to boosting student motivation and engagement.

Currently, there are over 1 million apps in the iTunes Store. Finding apps is not difficult yet finding an app for educational purposes can be a bit more daunting. Apps we Love is a strategy employed where our students have the opportunity to share with the rest of the class a mobile device application related to their content area or teaching in general. It is asked of the students to share a free or low-cost application. After their presentation, these apps are posted on Pinterest to share with the worldwide teaching community. Some examples of apps presented are King of Math, Video Science, Flashcards, and Sock Puppets.

While not a complete paperless classroom, the authors also use various apps for assessment, engagement, and record keeping. QR codes are used to link videos of lectures or other videos demonstrating pedagogy or student behavior; to access information quick-



ly; surveys, assessments, exit slips; digital gallery walks; and scavenger hunts. QR cubes have been developed to help assist students for studying for one of their certification exams – The Pedagogy and Professional Responsibilities EC-12. The practice questions are converted into a QR code, then the QR code is placed on a cube template. This template is cut out and assembled into a 3D cube where the students roll the cube (similar to dice) and scan the code that is on top. The student reads the question and possible answers then a class discussion ensues about the correct answer. This led to powerful and robust discussions with the teacher candidate.

Socrative is used as a student response system during formative assessments. Teachers can ask questions in the moment or as quiz students during class as a means to measure student understanding in real-time. Students are able to respond from their mobile device, smartphone, and laptop.

Remind 101 allows teachers to safely text one-way to students reminders without the teacher having to give out their own phone number. As with normal text messaging, users are limited to 160 characters, including the teacher's signature. Tellagami is another mobile app which allows teacher create and share a quick animated video. This is a creative new way to bring messages to life. In addition, it is a fun way for students to learn by creating their own video.

Our teacher candidates are also required to evaluate educational apps. They review apps and critique them on platform, cost, subject, grade level, accuracy, and use in the classroom. This allows these teacher candidates to learn how to evaluate apps for pedagogy and not just for utility or entertainment purposes.

### ***The Flipped Lesson Approach***

A flipped classroom simply inverts conventional teaching methods to deliver instruction online at home, and move “homework” into the classroom. Instead of teaching standards, teachers are teaching the students. There is no direct instruction (lecturing) during class time and time is spent working with students one-on-one or in small groups. This procedure emphasizes Bloom's higher-order learning objectives. For example, the teacher assigns students to watch a short video at home that introduces the concept of Newton's law of motion. Students come “almost prepared” to apply the concept with homework problems, hands-on experiences, and discussions in collaboration with peers facilitated by the teacher. In the authors' classrooms it increases student-teacher interactions and allows teachers to be readily available for the students as they apply learned pedagogy by creating content-specific lessons and student activities. The benefits are more productive instructional time for application, analysis, and synthesis of the concept

A benefit of the flipped lesson approach is students who do not understand a concept they have studied at home, get the opportunity to discuss what they are confused about and the teacher coach the student to reach mastery. Students are held accountable to watch video lessons at home through time-embedded formative assessments. Flipping also changes the allocation of teacher time. Flipping allows for more opportunities for formative assessment since teachers can learn what students are struggling with. It helps alleviate students getting “stuck” and are not able to complete their homework.

Flipped mastery eliminates two other out-of-class routines: daily lesson planning and grading papers. Assessment happens in the classroom and in person. Replacing lectures with group and individual activities increases in-class activities. Every student has something to do throughout the class. Some students are allowed to choose how to demonstrate mastery (testing, writing, speaking, debating and even designing a related game). Students are also “flipped.” Their learning shifts from passive, teacher-centered to active,



learner-centered. Learning is no longer “sit and get” which is not effective for most students no matter what their age. If the flipped classroom is truly to become innovative, then it must be paired with transparent and/or embedded reasons to know the content (The George Lucas Educational Foundation, 2014). Many educators believe that this approach is a potential model of how to use technology to humanize the classroom.

### ***Educational Game Design and Development***

Educational game development is used as a learning activity for motivating and engaging students in curriculum-related literacy activities (Owston et al., 2007). Game development allows students to build digital literacy skills, including computer and communication skills, understand and learn the content better, and motivate students to do well. Many children like to play video games. Teachers can use students' interest in video games to make them interested in game design for instruction and not just have them play a game. This idea will allow game development exercises into a school computer class and synergistically incorporate different core subjects such as math, science, and technology into the process of the game development. Our approach is based on the way to enhance the students' interest in science, math, and technology in general and to tone down the presentation level of subjects making them more understandable and interesting for the students without missing on the essentials of the basic concepts. This approach integrates the following steps: first, planning and developing an educational computer game; second, creating (visual programming) the game; third, testing and playing the game. Students learn basic concepts of the school subjects and implement the game into the classroom activities on every step. This approach is found to be appealing for the students, not just who developed and created the game but, for the students who actually play the games. Computer games offer a culturally familiar medium to young learners, and present a novel and engaging means of bringing contemporary digital literacies into the curriculum. Prominent theorists argue that digital games provide immersive contexts motivating players to engage in a wide variety of activities that stimulate situated literacy learning (Bevis, 1997; Gee, 2003; Johnson, 2005; Mitchell & Savill-Smith, 2004; Prensky, 2006; Shaffer, Squire, Halverson & Gee, 2005).

Play and developing educational computer games invites students to access and engage with digital media and explore them, both independently and cooperatively. Kafai (2006) emphasizes how computer game development can serve as a productive platform for both learning about technology and learning content with technology; however, his study revealed that students require continuing support: creating challenging multimedia content, finding ways to integrate learning about content and learning about programming, and creating habits of good game design.

Gaming is an active learning strategy that requires students' participation and decision-making throughout the learning process. The skills they gain enable students to apply what they learn in new and more complex situations. As students learn, they can reflect on their experience, to develop new skills or new ways of thinking. According to our research there is following reasons why education computer games help middle school students to learn:

- Fun,
- Held students attention,
- Made studying easier,
- Helped with foreign language content,
- Helped with math content,
- Desire to win the game made me work harder,





- Help to know the content,
- Students do not even realize that they were studying.

Students also mentioned about the reasons why computer games do not help them to learn.

- Not my learning style.
- Pointless lessons/boring games.
- Games, not educationally organized
- Games were not personal to the students.

All of these negative reasons point to the fact that the games were developed by companies without knowing students' learning styles, differentiation and learning strategies. Based on our experience, we believe that the problem can be solved if teachers and students will become involved in the designing and developing computer games for learning according to their needs and specific wants.

The following basic steps, which we use, in the process of teacher preparation to demonstrate them how to create educational computer games for instruction:

- Choosing the right educational content, find the most important and challenging learning objectives,
- Planning and designing an educational computer game,
- Creating (visual programming) the game,
- Testing the game with the students and correcting it when it is necessary,
- Analyzing if the game can be used to learn objectives and basic concepts of a subject,
- Integrating the games into classroom activities.

As for students and teachers, there are key elements and important skills that are involved in the process of designing and developing educational computer games. We try to develop this knowledge and skills working with our teacher candidates on the projects in the classroom and during their field experience in schools and classrooms.

1. Developing basic idea (imagination, team work, brain storming etc.)
2. Creating a story line (writing skills, reading, and ability to deliver their thoughts, discussion)
3. Visual design (video editing, animation, image editing, 3D design etc.)
4. Audio Design (sound editing, learning music, sound and sound effects) and some
5. Control (understanding possibility remotely manage objects, engineering skills, robotics etc.)
6. Interaction
7. Testing
8. Release, testing and using the computer game in the classroom

Working on the game idea, students have to decide and briefly explain what their game is about.

1. What are the components (objects) and the characters of your game?
2. How does the space look like (what do you see on your screen)?
3. What is the mechanics of the game (actions)?
4. What are the rules?
5. What is/are the goal(s) of the game?

The tools we use are Game Maker 8 or Game Studio that can be found at [www.yoyogames.com](http://www.yoyogames.com). It is free software that has good tutorials, and online resources that help gets students started on the development of their game. Most of the time students



can work independently, asking for the instructor's advice. In addition, the tools can be used from [www.clickteam.com](http://www.clickteam.com):

- The Game Factory 2 – basic level
- Multimedia Fusion 2 – advanced level
- Multimedia Fusion 2 Developer – professional level.

Game Salad ([www.gamesalad.com](http://www.gamesalad.com)) is another option for teachers' and students' projects.

Based on our experience, we found at the primary level, Scratch ([www.scratch.com](http://www.scratch.com)) can be easier to understand and easy to use for developing some entry level games. Scratch can program interactive stories, games, and animations — and students can create with others in the online community. According to the developers, “Scratch helps young people learn to think creatively, reason systematically, and work collaboratively — essential skills for life in the 21st century” (<http://scratch.mit.edu/>).

As teachers spend less time creating presentations and more time crafting powerful learning activities, they will find the material is covered with more depth and retention the first time around, saving time, energy, and planning for learning and student success. By allowing student to explore and design, educators demonstrate they believe in their students' abilities and validate each student's contribution to the class. The new 21<sup>st</sup> century learners are sitting in our classrooms, ready to explore, design, and create. If educators provide the resources powerful and effective technology integration will follow (Nancye Blair, 2012). Using technology as a powerful and exciting educational tool allows students to problem solve, think critically, collaborate, and encourages student creativity and motivation while learning.

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**Опыт и практика инновационных технологий для подготовки учителей**

**Аннотация.** Статья содержит положения, объясняющие важность использования интегрированных технологий в подготовке учителей к урокам. В статье обсуждаются такие вопросы, как использование портативных устройств, проведение «перевернутых уроков» (когда лекции прослушиваются дома в записи (может быть, сразу за 5 занятий), а домашние задания выполняются в классе с преподавателем), проектирование учебных сайтов, создание рабочих листов (которые в русской практике можно сравнить с «распечатками», которые готовит преподаватель к занятиям), создание обучающих игр. Авторы анализируют средства и интернет-ресурсы для учителей и учеников. Все вышеперечисленное способствует созданию благоприятной среды обучения и позволяет вовлечь учеников в учебный процесс, что позволяет им решать поставленные задачи и применять критическое мышление и творческий подход в процессе обучения.

**Ключевые слова:** инновационные технологии, подготовка учителей, информационно-коммуникационные технологии.

**Раздел:** (01) педагогика; история педагогики и образования; теория и методика обучения и воспитания (по предметным областям).

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