Integrating the iPod Touch in K-12 Education: Visions and Vices
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Abstract: Advocates of ubiquitous computing have long been documenting classroom benefits of one-to-one ratios of students to handheld or laptop computers. The recent sophisticated capabilities of the iPod Touch and iPhone have encouraged further speculation on exactly how K-12 teaching and learning might be energized by such devices. This paper summarizes the research-to-date on mobile learning for K-12 students, and then delineates specific features and applications available on the iPod Touch that might impact student learning across the curricula. Finally, caveats are offered regarding the introduction and assimilation of these handheld computers into K-12 schools.

Introduction
Various interest groups, including state and national accreditation bodies, continue to expect that students (K-16) learn to effectively use computer technologies (ISTE, 2004; Swain & Pearson, 2002a, 2002b). Tremendous resources have been dedicated to equip teachers, as they attempt to integrate a variety of digital technologies into their classrooms. The recent outcry for ubiquitous computing has led to a focus on handheld devices in schools (Alexander, 2004; Garthwait & Weller, 2005; Rose, 2001; Van 't Hooft & Swan, 2004; Zucker, 2004). Handheld devices in K-12 education have evolved from Palm Pilots and PDA’s in the past decade (Baumbach, Christopher, Fasimpaur, & Oliver, 2004; Lary, 2004; Norris & Soloway, 2003; Penuel, 2005; Rose, 2001), to cell phones and mp3 players more recently (Bomar, 2006; Greifner, 2007; Hastings, 2005; Hirsch, 2007; , "Lit Cheat Sheets for iPods", 2005; , "Putting Podcasts to Work", 2006).

In addition to viewing these devices as mechanisms to encourage the development of technology skills, proponents have seen the integration of handheld computers as a pathway to increase student learning and achievement. Evidence of K-12 handholds use in such curricular areas as reading (Bomar, 2006; Patten & Craig, 2007; Shoemaker, 2007), mathematics (Lary, 2004), social studies (Dixon, 2007; Royer & Royer, 2004; Vess, 2006) and science (Roschelle, Penuel, Yarnall, Shechtman, & Tatar, 2005; Tinker, 2007) demonstrate promising practices in this domain. As PDA’s, cell phones and mp3 players have converged and morphed into more sophisticated mobile devices, the iPod Touch has emerged as a pocket computer with multiple K-12 classroom possibilities.

The iPod Touch (and the iPhone?) is equipped to perform a multitude of complex tasks, many of which can be commanded to accomplish a myriad of educational objectives. These devices are inexpensive, compared to classroom laptop carts or computer labs, and their portability and durability provide students with potential learning tools that traverse the classroom, bus stop and home (Auchincloss & McIntyre, 2008; Petroski, 2008; Swan, 2007; van 't Hooft, 2008; Zukowski, 2007). Such use, however, is not without challenges for students, teachers, and parents (French, 2006; Motiwalla, 2007; Tomasino, 2007; Weinstock, 2007). This paper identifies some of the methods that teachers might use in integrating the iPod Touch into their curricula; these “visions” are possibilities, many untested to date. Additionally, probable “vices,” or concerns of iPod Touch availability in classrooms are delineated and explored. This discussion of visions and vices is hoped to encourage educators to critically evaluate their own classroom practice and to adopt only the types of digital devices that will effectively meet the needs of their learning communities.
The iPod Touch: Visions for K-12 Learning Opportunities

The iPod Touch, as its name implies, evolved from Apple’s earliest mp3 player, the iPod. This evolution necessarily equips the iPod Touch with a variety of media capabilities (though some would argue that these are the least compelling features of the device). The handheld computer manages and plays/displays audio, image, and video files. The external, built-in speaker allows the content to be shared with others in a group setting, or accessed by individuals through headphones. Headphones, with microphones, are available, allowing recording features to also be used.

The following paragraphs discuss the ways in which the media features of the iPod Touch might be used in K-12 classrooms, as well as the additional applications that are bundled with the device. These include Notes, Clock, Calculator, Maps, Weather, and Internet access through the Safari browser. Once these built-in software applications are presented, a variety of additional “web apps” will be outlined. These optional applications may be downloaded and installed from the “Apps Store,” accessed via WiFi connections from the iPod Touch. Many of these applications are free and those that aren’t can be purchased at a price range of $0.99 and higher. All the applications presented in this manuscript are currently available for less than $10.00.

Classroom Media Uses: Photos, Music, Movies & YouTube

Multimedia resources in education are well-documented teaching and learning supports. Filmstrips, diagrams, sketches, photographs, animations, slideshows, audiocassettes, CDs, video tapes, and DVDs have all been used in classrooms to engage students and enhance conceptual understanding. The iPod Touch affords teachers and students opportunities to access these resources digitally, individually and in a “just in time” fashion. Using the Photos, Music, Movies, and even the YouTube applications included on the iPod Touch, a plethora of pre-made educational media are available for K-12 classroom use, including podcasts, audio books, and video clips. Additionally, and perhaps more powerfully, teacher- and student-created media may be included on classroom iPod sets, customizing learning content to specific curricular needs.

K-12 Uses for Notes, Clock, Calculator, Maps & Weather

The iPod Touch features a variety of applications that move beyond media distribution providing a mobile “digital toolkit.” Notes provides users with a quick way to enter text for future review; lists or paragraphs can be emailed directly within the application, if a wireless connection is available. Students could use this app to take class notes, collect field notes, and author creative writing assignments.

Clock allows students to easily determine the time in any area of the globe. Classes with international “epals” may use this app to decide when an online chat would be possible. The timer and stopwatch within the Clock app could be used by students to time individual and group academic drills and curricular games.
**Calculator** is a fairly recognizable application and provides teachers and students with a quick and easy way to double-check paper/pencil calculations or complete more complex mathematical problems. Many project-based and problem-based classroom activities have components that require quick mathematical figuring, and **Calculator** provides such assistance.

With available wireless Internet connection, both **Maps** and **Weather**, allow students and teachers access to real world information. **Maps** (mobile Google Maps) can map out the user’s current location in a street-map view, with road, town and country labels or in a satellite view, providing images with buildings, trees and powerlines. A “hybrid” view may also be selected, which combines the information included within each mapping option. With the multitouch screen on the iPod Touch, students can zoom in and out of a mapped area, to examine the location more closely. Students may use the traffic feature in **Maps** to learn about traffic patterns in other parts of the world, or determine if they might have a delay in traveling to an afternoon field-trip venue. Searching multiple locations around the world and using the “directions” feature, students can obtain information on distance and travel time from their exact location to a location of choice. **Maps** is an application that has a wealth of possibilities for use in any K-12 social studies classroom.

Similarly, **Weather** offers users the ability to select cities from a database to retrieve 7-day forecast information. K-12 students, armed with this data, could conduct comparisons on weather patterns for various locations and speculate (predict) changes in temperature, precipitation and wind speed for the areas studied. The application also links to Yahoo Weather for more detailed weather data, as well as local news. Again, this application would integrate well in problem-based learning environments.

**Safari**

The Internet in Your Pocket

Finally, when reviewing the applications included in the iPod Touch, the Safari browser provides limitless possibilities for classroom use. With a wireless connection, students and teachers can access most web content. Some media files (Flash, video, audio) may not be available, but the text, graphics, and hyperlinks can be quickly accessed. Of course the speed of access is dependent on the wireless connection provided and the number of users, but students have the potential of keeping several pages open on their device and toggling back and forth between the pages to read and evaluate the information. Currently teachers find that students often copy/paste content directly from the Internet into their multimedia reports or papers. It is possible that if students completed Internet research using mobile devices, such as the iPod Touch, they would be more likely to take notes and consolidate the information in their own words.

Web Apps: Customizing the iPod Touch to Specific Classroom Needs

The previous section of this manuscript described how educators might use the iPod Touch “right out of the box,” and these features certainly have multiple possibilities that could positively impact teaching and learning. However, the most compelling reason for
integrating these devices in K-12 teaching environments relates to the ability to customize the iPod Touch through the addition of “Web Apps.” Web Apps are downloadable applications that can be added to the devices via a wireless Internet connection. Many of these applications are free, and many more are available at minimal cost (99 cents or so). The following paragraphs examine only a few of the current Web Apps available for K-12 classrooms. The number of these applications is growing each day, so it is fitting to say that this discussion reflects only a microcosm of activities that could be implemented with these devices.

Web Apps in Early Childhood Education

While skeptics may find the premise of young children benefitting from the use of mobile devices to be far-fetched, small ones (as young as 21-months, as pictured in the image on the left) are demonstrating that they can understand and interact with Web Apps such as PreSchool Adventures, At the Zoo, ABC Letters, and iDoodle. These applications are well aligned with the spirit of early childhood education and technology use, as articulated by the National Association for the Education of Young Children (NAEYC). Children are encouraged to play and discover, as they engage with these applications.

PreSchool Adventures provides an interface for exploring concepts of colors, shapes, sounds, and body parts. Users select a topic represented with visual and auditory cues, and continue to receive feedback in this way as they make selections. At the Zoo provides children with images of about 20 animals that they will encounter in many zoos. Using these fingertip-sized images, users may choose to hear the sounds that each animal makes, or hear and see the spellings of the animal names. ABC Letters quizzes little ones with blocks of letters (three presented at a time), aurally asks them to select a particular letter, and provides feedback after the response; users can elect to hear the letter name again, even when they provide a correct answer, reinforcing the letter name with the visual image of the letter. Digital audio books, such as The Little Pine Tree, present images and text, one page (screen) at a time, with audio, allowing young learners to hear and see the story, and flip through the pages with a flick of a finger. Shadows Never Sleep is a “Zoom Narrative” which entices readers to explore the story by using the multi-touch zoom feature to discover the story line. Applications like iDoodle2 provide a way for children to draw with their fingertips selecting a variety of colors, lines, fills and thicknesses. Double-clicking to zoom in and out of these sketches provides young ones with choices of how to view their creations. Each of these Web Apps could potentially be integrated into the curricular content of the early childhood classroom, providing teachers and students resources to support learning and achievement.
Upper Elementary and Secondary Level Web Apps

Mathematics

In the area of mathematics education, Web Apps for the iPod Touch provide many ways for students to practice and explore computational problems. *Flash Math* is a basic drill program that presents the user with a set of timed problems. Settings for addition, subtraction, multiplication, and division, as well as choices for the number of place values to include in problems (up to at least 1,000,000,000), the number of problems to present, the time for each problem, and progressive time adjustments makes this application very customizable for the student. Teachers could certainly use this application to provide individual students with the types of arithmetic practice that they need to become more proficient in their mathematics classroom. *Math Quiz* expands this type of work to include squares and square roots and includes controls for presenting problems in random or sequential order. The problems are answer via a “slot machine” type spin wheel with audio clicks, which could be entertaining for the students using the app. *Math Quiz* continues to provide problems to the user for the duration of the experience, so one is never finished. The lack of a stopping point could be a frustration for some students, but others could find that they enjoy the continual challenge.

In upper level mathematics, students could take advantage of Web Apps such as *Grafunc* or *GraphCalc*. *Grafunc* is a function plotting application in which users may touch the graphing area to translate equations. Supported operations of addition, subtraction, multiplication, division, absolute value, arc cosine, logarithm, secant, and hyperbolic tangent (among many others) are included. Students may adjust the colors of the lines representing the equations plotted to compare and analyze the effects of changing either the visual plot of the equation or the numerical equation. This type of real-time exploration could support greater conceptual understanding of advanced mathematical operations.

Social Studies

Besides the integration of iPod Touch applications of *Weather* and *Maps* mentioned previously for the social studies classroom, a wide range of additional web apps could be used to engage students in the curricular area. *iFlipr* is a type of electronic flash card Web App that encourages users to create their own content, or download the content that matches a particular interest or need. For example, United States state and capital, Bill of Rights, or Presidents flash card content is available with images and text. World flags, the Greek alphabet, and even birdcalls (matched with mp3 audio files) can be downloaded for study. The MCAT Organic Chemistry content has been recently posted, as well as “Chinese 101 chapters 1 & 2.” Clearly this app moves beyond social studies content, to content in science and foreign language. *AllisJigSaw* allows teachers or students to create jigsaw puzzles from visual material (including the iPod Touch’s Photo Library). This provides another type of review or study activity.
Language

While most of the applications delineated thus far support a type of language awareness and development, specific Web Apps exist that more directly target language skills. *Blanks* is a vocabulary-building application, similar to comparisons found on SAT type of tests. Words are presented with multiple choice options and the users receive feedback on their responses. *Mandarin* is an English to Mandarin phrasesbook that breaks down selections into categories, allowing the user to quickly locate a phrase to be spoken or learned, hear the phrase spoken, and view the Chinese and English spellings of the phrase. This type of application is available in multiple languages. *YouNote* contains an interface that allows users to create multimedia messages with text, photos, sketches, webpages, and audio (if a microphone is attached to the iPod). The companion application, *YouNote Desktop*, gives teachers and students the ability to download these creative writing pieces to classroom or home computers for printing or further editing. In other words, using *YouNote*, students could begin their essays or reports about an event while traveling on a bus or sitting outside, and then continue their writing on their computer later on. The images and weblinks (or sketches done on a field trip) would be integrated into this composition.

Science

Similarly, Web Apps in the scientific fields are plentiful and diverse. *Earth3D* provides a visual simulation of the earth’s rotation with the sun and moon positions. Users may stop, rewind, or fast-forward this simulation with a touch of a finger. Metropolitan areas at night can clearly be distinguished from under populated areas by the amount of artificial light that can be seen on the landmasses while using this application. This type of interactive study of the movement of the planets cannot be accomplished through still photos in a text. *Molecules*, in the same way, provides 3D representations of molecules such as DNA, acetylcholinesterase (1EVE), and insulin (1TRZ) in an interface that allows users to zoom in and out, moving the molecules around at all angles. Each molecule (additional molecule types can be downloaded) is linked to its corresponding statistics, including the number of atoms, the journal resource that documented the molecule’s makeup and the authors that were responsible for the representation. In the medical field, *MIM* provides manipulatable MRI, PET, and CT images. Currently sample files are included for student/teacher use, while only doctors can download and view patient files, but soon patients will be able to acquire their own medical files to display on their iPod Touches. *Epocrates*, is a prescription drug Web App that includes a pill ID drug search and features to check for possible drug interactions by inputting a list of select medications. Students could learn a great deal about their bodies and health through the integration of apps like these into their classroom work.

AirSharing: Self-Created Content Transfer

By using the Web App *AirSharing*, users may wirelessly connect from their iPod Touch to their computer and transfer files. The iPod Touch serves as another drive to house multiple file types.
such as word-processed documents, spreadsheet files, images, and pdf files. Students and teachers may place these files on their iPods for classroom and home use, making it possible to further extend the relevant content present on these mobile devices.

Visions & Vices

While this manuscript has detailed a variety of possible uses for iPod Touch technologies for K-12 teachers and students, most of these uses are still in the visionary stage. That is to say, these are untested possibilities that will require time and energy to explore in real classroom situations. Teachers are needed to take up the challenge of integrating these devices in their classrooms and researchers are needed to document the impact. Caution must be taken, as the management and implementation of these devices in the K-12 environment brings risks and challenges.

For example, teachers must have an expedient method of tracking, charging, and managing the content on the iPod Touches. Charging stations exist that will reimage a set of 30 or more devices, while charging, and these stations would most likely be a necessary investment for educators interested in integrating these handheld computers into their classrooms. In addition, classroom management techniques for keeping students on task and using the apps that are deemed supportive of their learning, rather than distractions, would have to be developed and practiced. Yes, making this type of mobile learning a reality will take some time and effort, but this is work that promises to be thought provoking. Why not join the team?

References


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