Informal Learning with Educational Apps

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**Introduction**

As a father of two young boys, ages 4 and 6, I discovered the overwhelmingly vast and complicated world of educational apps shortly after purchasing my children’s first iPads. As I browsed the thousands of child apps on iTunes, I, like so many others, was utterly confused about what makes an app “educational”, what educational standards (if any) exist for educational app content, and how educational apps are classified. Reading educational app reviews and top 10 lists only added to my confusion because of the lack of consistency in educational standards and quality benchmarks used to evaluate apps. This paper draws upon information in peer reviewed publications, financial news, and the author’s experience to provide the reader with the definition, history, theory, classification, context, success, engagement, and attraction of educational apps used for informal learning.

**Definition of Educational App**

Cherner et al. (2014) define app as “a small computer program that can be quickly downloaded onto a mobile computing device, (such as a tablet or smartphone) and immediately engaged without rebooting the device”. Apps are generally designed to run on one of two operating systems belonging to the two dominant global app providers. They are Apple iOS and Google Android.

Hirsh-Pasek et al. (2015) define educational apps as “apps designed to promote active, engaged, meaningful, and socially interactive learning – four ‘pillars’ of learning – within the context of a supported learning goal”. The authors arrived at this definition using the “science of learning” framework developed by Bransford et al. (1999) to describe the human learning process. The aim of Cherner et al. (2014) was to develop an evaluation system, based upon scientific principles, to gauge the educational quality of educational apps.

Clough et al. (2008) use Livingston’s (2006) definition of informal learning as a basis to explore informal learning with PDA’s and smartphones. According to Livingston (2006), informal learning is “any activity involving the pursuit of understanding, knowledge or skill which occurs outside the curricula of institutions providing educational programs, courses, or workshops”, and “all forms of intentional or tacit learning in which we engage either individually or collectively without direct reliance on a teacher or externally organized curriculum” (Clough et al., 2008).

By drawing upon Cherner et al. (2014), Hirsh-Pasek et al. (2015), and Clough et al. (2008), we develop our own working definition of educational apps. For the purposes of this paper, educational apps are defined as quickly downloadable small computer programs that engage users in learning activities through a variety of engaging physical and mental tasks. These apps can be used to support formal, non-formal, and informal learning.

**History of Educational Apps**

 In 2008, Apple opened its App Store with 500 apps available to download on to iPads, iPods, and iPhones. By May 2013, over 50 billion apps had been downloaded by Apple customers (Cherner et al., 2014). Similarly, Google Play (Android Market) began to offer app downloads for Android smartphones and tablets in 2008. Over 20 billion apps were downloaded to Android devices by June 2012 (Cherner et al., 2014).

Despite the tremendous surge in app sales during the past decade, the origin of educational apps is rooted in early educational software and gaming. In 1986, The Learning Company released what would become one of the world’s most popular educational games. Reader Rabbit teaches children to read and spell with the guidance of an animated rabbit. Thirty years later, new versions of Reader Rabbit are available for download from Apple’s App Store.

 Another example of a hugely successful educational app that originated in the 1980’s is Davidson’s Math Blaster. The 1987 release had players assume the role of Blastronaut as they zapped numbers while solving math problems. There are currently three versions of Math Blaster available for download on Apple’s App Store.

Released in the same year as Davidson’s Math Blaster, MECC’s Number Munchers became another highly successful learning game with current versions still being developed and released. The game has players munch numbers by solving math problems in order to advance forward and avoid being eaten by the purple monster. There are currently three versions of Number Munchers available for download on Apple’s App Store.

There are many other examples of successful educational games that inspired and laid the foundation for development of today’s highly engaging educational apps. They include games like Simcity (1989), Civilization (1991), Dr. Brain (1991), Mario’s Time Machine (1993), Storybook Weaver (1994), Amazon Trail (1994), Museum Madness (1994), and many others. These games changed how children and adults learned new information through a fun interactive computer-based experience.

The recent app boom would not have occurred without the World Wide Web, which makes it possible to easily access and install apps from virtually anywhere. Since its launch in 1991, the World Wide Web has entered and influenced many aspects of our daily lives including how we obtain information and communicate.

**Theory**

 A thorough initial search of peer reviewed publications revealed a lack of research regarding educational apps. Two publications provided potential explanations for this observation. Cherner et al. (2014) characterize the current state of educational app classification as a “mess”, while Hirsh-Pasek et al. (2015) reveal the lack of educational standards for the development and evaluation of educational apps.

**Classifying Educational Apps**

 With tens of thousands of educational apps available on App Store and Google Play, it is daunting for most users to sort and chose an app that suits their needs. This is due to a limited ability to sort educational apps on App Store and Google Play, and a lack of common classification scheme for educational apps. Cherner et al. (2014) provide the following example of a common confusion-causing scenario experienced by parents searching for educational apps for their children.

Parents who search for educational apps for their children are presented with menus and categories of apps that may or may not deliver the desired educational content, and may use very different approaches. For example, two popular educational apps designed to improve children’s reading skills are available on the App Store. They are both categorized as reading apps for young children; however, that is the extent to which they are differentiated in the app categories. The two apps use very different approaches to practice reading and build reading skills. One app uses a strategy to foster users’ love of reading without the use of assessments. The other app uses timed reading exercises to assess users’ fluency and comprehension (Cherner et al., 2014).

Multiple studies sought to address the lack of educational app classification system by proposing their own models. Handal et al. (2013) classified 100 math apps to fit one of nine categories according to the type of learning activities, instructional approach, media richness, cognitive rigor, and degree of user-centered learning provided by the app. Their app classification model was specific to math apps; however, it presented a framework that looked at multiple aspects of user interactions with educational apps (Cherner et al., 2014).

Goodwin et al. (2012) created an educational app classification system based upon the pedagogical approach used in the app. Their system contained three categories: instructive (rote memorization exercises), manipulable (guided discovery), and constructive design (creative learning) (Cherner et al., 2014). They classified 240 educational apps and found the vast majority support instructive learning. Only 2% of the apps supported constructive learning. Goodwin et al.’s (2012) model is valuable if one wishes to use pedagogy as a basis for classifying educational apps.

Cherner et al. (2014) drew upon Handal et al. (2013) and Goodwin et al.’s (2012) models to create an educational app classification system with the following three categories.

1. Skill-based: promotes rote memorization, remembering, and understanding
2. Content-based: promotes guided discovery, applying, and analyzing
3. Function-based: promotes applied learning, evaluating, and creating (Cherner et al., 2014)

The authors note that app rubrics developed to measure the “value” of apps have limited dimensions and draw general conclusions about whether an app is good or bad. Similarly, most app rating systems do not address the educational approaches and pedagogical approach of educational apps. Cherner et al.’s model satisfies the need for a system that provides more specific classifications of an app’s educational value.

**What Makes an App Educational?**

Hirsh-Pasek et al. (2015) reveal that educational value is rarely the primary consideration when designing children’s educational apps. App designers are primarily focused on what captivates young children’s interests and what sells, leaving the educational component of the app design as a secondary consideration. Hirsh-Pasek et al. (2015) created a framework for the development and evaluation of educational apps based upon the theory of the science of learning.

Four pillars of learning serve as the foundation for the Hirsh-Pasek et al. (2015) model of educational app development. Active learning, engagement, meaningfulness, and social interactions can be considered and applied to the development of the educational component of apps to maximize human learning outcomes.

**Active Learning, Engagement, Meaningfulness, and Social Interactions**

Active minds-on learning can be incorporated in to apps using many strategies. App design can include physical activities and reactions to encourage a child’s active engagement with educational app content. Children interact with tablets in multiple ways; however, in order for active learning to occur, the user’s interactions with the tablet must go beyond mindless response to on-screen stimulus (Hirsh-Pasek, 2015).

Effective educational apps must be able to engage children in the learning process. Hirsh-Pasek et al. (2015) list three app design elements that can encourage engagement in learning; contingent interactions, extrinsic motivation and feedback, and intrinsic motivation.

In order to create a meaningful learning experience, Hirsh-Pasek et al. (2015) recommend that designers make sure the educational component of the app requires the child to go beyond rote learning. Apps that impart meaningful learning should draw upon the child’s personal experiences, stimulate prior knowledge, and create rich narratives (Hirsh-Pasek et al., 2015).

Although apps are limited in their ability to react and respond to children, responsivity features and strategies can be applied to imitate or facilitate social interactions while using apps. Multiplayer educational apps encourage social interactions with other humans. Children can also form parasocial relationships with onscreen characters that can respond to players’ actions (Hirsh-Pasek et al., 2015).

**Attraction and Engagement**

The attraction of educational apps, particularly for children, is the game elements, animations, sounds, interactivity, rewards, competition, and the associated fun that users experience while engaged in the app. The attraction goes beyond just the time that children are engaged in using the app. Children’s conversations with friends and classmates about the animated characters, levels achieved, and play strategies fuel children’s interest in educational apps.

 Parents are attracted to educational children’s apps because of the potential for informal learning. Traditional homework and textbook practice is boring for most children. Educational apps make learning and practicing math, language, history, and science fun.

**Context**

Educational apps are widely used in the context of informal learning. The author conducted informal interviews with five of his colleagues to explore parents’ experiences with educational apps to support informal learning. All five of the interviewees had downloaded educational apps on their children’s tablets for use outside of school. The parents indicated that their children play educational apps inside and outside of the home, including in the car, on the bus, in the supermarket, in the living room, in bed, and just about any place where they can take their tablet computers.

**Success**

The app industry is experiencing continued remarkable growth. According to a 2016 end-of-year report by App Annie, app downloads increased by 15 percent, in-app time increased 25%, and app revenues were up by 40% in 2016 compared to 2015 (Perez, 2017). iOS App Store and Google Play downloads reached 90 billion. The App Annie report also revealed that non-game apps made a greater contribution to download growth than games, and in-app time reached approximately 900 billion hours in 2016 (Perez, 2017).

**Conclusion**

 Our adoption and reliance on apps will continue to increase as we use our tablets and mobile devices to manage more aspects of our lives. The educational app trend will likely follow suit as we and our children become accustomed to spending more time on our devices, and as we look for more services and opportunities provided through apps. Although research has shown educational apps lack a standardized educational quality development framework and a rigorous theory-based classification system, some theory-based models like the ones introduced in this paper are being advanced by researchers to guide the development and classification of educational apps. It will only be a matter of time before educational app developers start to align their designs with these new models to differentiate their product from competitors and to promote sales.

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