Choosing iPad Apps With a Purpose

Aligning Skills and Standards

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Ms. Green, a teacher in an inclusive kindergarten classroom, has five students with developmental delays in her class. She recently went to an in-service training about how to incorporate technology into her 21st-century classroom. After the in-service, Ms. Green was enthusiastic about using more technology in her classroom, so she decided to apply for a grant for new technology. Shortly after submitting the application, Ms. Green was notified that she received the grant. She was excited to purchase new technology but then realized that she did not know how to select the best tools. Ms. Green collaborated with her technology support team, which suggested that because she was a kindergarten teacher who had students with and without disabilities in her class, she might want to consider purchasing some mobile touchscreen technology that would be easy for her young students to use. She was intrigued by that suggestion because she had successfully implemented the use of computers and had adopted district-approved computer games to supplement her mathematics instruction. Ms. Green felt that the software tools that she was using in mathematics allowed her students additional practice opportunities. However, the major roadblock to more technology use was scheduling time to take her class to the computer lab, because she only had one computer in her classroom. In addition she had to continually support some of her students with disabilities in the computer lab because they had difficulty using the mouse and keypad. As she started to think about purchasing iPads for use in her classroom, she wondered what tools she would use on it to influence her students' learning, especially in the area of mathematics, where she was struggling to make adequate yearly progress.

The use of digital technologies in the classroom allows teachers to take advantage of students' interest and willingness to use technology, to assess the benefits of learning through an array of devices (Sharples, 2003). Due to the relatively low cost of mobile learning technologies, districts can more easily access these types of tools to provide digital equity among students (Melhuish & Falloon, 2010). Many schools are choosing iPads specifically, because it is a customizable mobile computer with a touch-controlled interface and an abundance of software tools (Shuler, 2009a). The iPad accounts for nearly 99.8% of all tablets used, with nearly 20 million sold in the United States (Etherington, 2011). The iPad's size fits naturally into various learning environments (Chiong & Shuler, 2010); it can be embedded into the classroom environment; and its content can be customized to meet the individual learning needs of all students (Shuler, 2009b). In addition the iPad includes desirable features, such as size, weight, ability for audio, and various ways to present text and images (Melhuish & Falloon, 2010). The mobility and adaptability of the iPad made the device ideal for Ms. Green to consider for her kindergartners, but what goes onto the iPad for learning is what every teacher, including Ms. Green, has to consider (Kearney, Schuck, Burden, & Aubusson, 2012).

After selecting her mobile technology, Ms. Green needed to load the devices with mobile applications, or apps. The district curriculum recommended several apps that were aligned with grade-level standards; however, Ms. Green wanted apps that provided supplemental instruction or practice for students who needed it. She wanted to utilize the iPads as a tool to complement and enrich her instruction, as opposed to having the students using the iPads as a toy. Seems like a simple search of the iTunes store should provide her with several options for the best apps . . . or so she thought.

Selecting an App

So what is an app? Purcell, Entner, and Henderson (2010) defined *apps* as "end-user software applications that are designed for cell phone operating systems and which extend the phone's

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capabilities by enabling users to perform particular tasks" (p. 2). Similarly, the content for an iPad is delivered in the form of an app (NPD Group, 2010). Mobile technology, such as the iPad, has significant potential in improving individuals' learning outcomes through the use of apps (Murphy, 2011) that are aligned to the curriculum goals and standards (Finegan & Austin, 2002). In addition, some iPad apps allow a teacher to track learning while providing the student feedback (Gee, 2008). For example, 24 × 7 Digital's TeachMe apps track student learning across content areas. These apps allow students to earn coins for accuracy, which can then be used to make purchase in a store within the app.

As much as Ms. Green's solution to choose an app sounds easy, browsing the iTunes store can become overwhelming for any teacher, with the number of apps available today. In addition, a teacher can quickly try free apps, but to have full access, cost is often involved. Purchasing numerous apps can be expensive and time-consuming and, most important, may not produce an outcome of acquiring tools that are well aligned with content or easy for students to use, especially younger students. This article provides seven steps designed to help teachers focus their efforts to successfully select apps with targeted content and grade-level learning outcomes for students with and without disabilities.

Step 1: Identify Learning Objective

Define learning objectives and begin the app search by using the standard iTunes categories: "Best New Apps," "Top Free Apps," or "Top Paid Apps." Searching these three areas will highlight what others are finding helpful in a targeted area. Keep in mind, these category results can occasionally be influenced by publishers or large district purchases and may not accurately reflect purchase trends. Many apps in the iTunes store vary in content and grade level, so to focus their search efficiently, teachers should have a clear understanding of their targeted content and outcomes for the app. Ms. Green narrowed her search to include only one content area: mathematics.

Step 2: Select Targeted Apps

First, select five to 10 apps that meet the target criteria, and begin to review them; a good way to start is to ask other educators to share their experiences using the selected apps. There are numerous blogs and websites online that identify apps for iPads. One of the websites, http://appshopper.com, provides iOS news and reviews of apps, in addition to allowing the user to sort apps by cost. Richard Byrne has an award-winning blog, http://www.freetech4teachers.com, which addresses technology in general; in addition, he has created a specific blog, http://ipadapps4school.com, which provides an RSS feed that reviews individual iPad apps. This site allows teachers to sort apps by grade-level categories. The blog http://www.adigitalkindergarten.com/p/my-favorite-apps-for-ipad.html identifies iPad apps specifically for kindergarten, separated by content. It also provides suggestions of how to schedule technology use in the classroom.

The iTunes store provides a brief description and a few screen shots of most apps, which allow for an initial overview but may not allow a teacher to determine the breadth and depth of the content covered. To further investigate an app, the teacher can download the app, which is easier when it is free. The question remains how a teacher can systematically determine an app's quality or its alignment to the curriculum and standards.

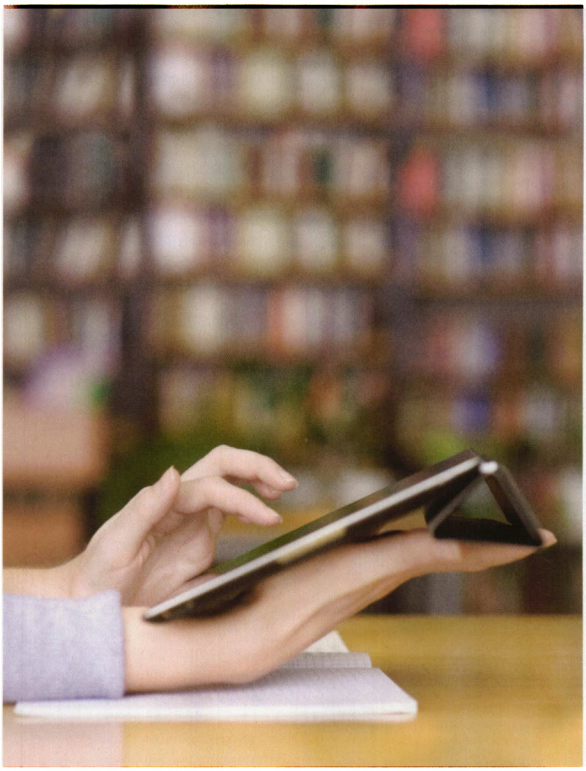
Step 3: Select Standards to Align With the App

The difficulty becomes choosing a pedagogically sound app among the hundreds of educational apps available in the iTunes store. Schuler (2009b) analyzed the top 100 education apps sold in iTunes, and the results indicated that 35% of the apps targeted preschool children, 12% targeted elementary school children, and 4% targeted middle school students. A large number of apps often include common characters from children's television shows and movies or are created by large commercial companies that may attract the consumer but may not be aligned to the content standards of the targeted audience.

To utilize iPads as a tool for learning, teachers need to focus their initial search of apps using a more narrow focus. For example, Ms. Green wants to find quality mathematics apps to use as a tool for repeated practice for her students. She wants to utilize mathematics apps that support standards-based instruction because, like many school districts, her district emphasizes the need to focus on state and national curriculum and learning standards. The National Council of Teachers of Mathematics (NCTM; 2000) standards were developed for prekindergarten through Grade 12 and are organized into four grade bands. These standards include five areas of mathematics instruction: number and operations, algebra, geometry, measurement, and data analysis and probability. Along with these five content standards, the NCTM identified the five process standards that are basic precepts fundamental to high-quality mathematics education. These process standards include problem solving, reasoning and proof, communication, connections, and representation. To guide their selection of apps, teachers such as Ms. Green should focus on the grade-level bands to match the age range of the students they are teaching. The sheer number of process and instruction standards from the NCTM can be overwhelming; therefore, teachers can target the focus on the focal points. The focal points provide a framework for instruction by identifying the key mathematical ideas and content that should be emphasized per grade level (NCTM, 2000). The concepts emphasized with the focal points develop a solid foundation by each grade-level band for more challenging mathematics in later grade levels. The Common Core State

Standards CCSS; National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) adopted by 45 states and the District of Columbia are organized by domains, clusters, and five content standards: counting and cardinality, operations and algebraic thinking, number and operations in base 10, measurement and data, and geometry. The CCSS are divided into five strands that students should learn: number and operations, algebra, geometry, measurement, and data analysis and probability.

A starting point for obtaining apps aligned to standards is to utilize resources from organizations that may have a limited number of apps already so aligned (e.g., NCTM, http://illuminations.nctm.org). To increase the number of apps that are aligned, teachers can utilize the focal points from the NCTM standards as an initial framework for evaluating iPad apps, given that there are fewer focal point standards. For a more thorough analysis of apps, teachers can include the CCSS and the NCTM focal points to analyze the apps available on iTunes. One method to analyze the app is to create tables with all the NCTM focal points and the CCSS in mathematics for the grade level they teach. These tables determine the alignment of the content of the apps to NCTM focal points and Common Core mathematics standards (see Tables 1 and 2).



Step 4: Identify Limitations and Essential Features

An iPad can be used to provide personal learning environments for students by downloading different types of content, games, apps, and videos to supplement instruction and address individualized education program (IEP) goals for students with disabilities. Utilizing apps as personal learning environments for students and to meet IEP goals allows students to have ownership of their learning while establishing diverse and individualized learning and assessments (Gee, 2008). To be effective as a part of a child's personal learning environment or IEP, an app's content should be pedagogically sound and should foster interaction (Melhuish & Falloon, 2010), and its use should address any limitation that a student with a disability might have (e.g., physical, social, emotional, learning). For example StudyPad Inc.'s Splash Math apps allow teachers to set up an account for each user on one device. This type of individualization can provide for immediate and ongoing feedback and progress monitoring for all students. The feedback is for students in any tier of the response to intervention model or on an IEP.

When choosing iPad apps, teachers need to identify the individual strengths and weaknesses of the students in the class and align the choice of the apps to meet the needs of all learners. Also consider how the app will address any physical, sensory, behavioral, or learning limitations of students with disabilities and the unique needs of very young children, such as those in Ms. Green's class. Some of the factors to consider before choosing apps include the student's need for reinforcement, fine-motor ability, ability to follow multiple-step directions, reading ability, attention span, frustration level, or hearing ability. This list is not exhaustive but can be used as a starting point before selecting any technology. Other items to be considered can be found on the checklist in Table 3 related to potential limitations in using various technology tools.

Table 1. Aligning Apps to the National Council of Teachers of Mathematics Focal Points

App	Number and Operations/Algebra[a]					Geometry[b]					Measurement[c]	
	1:1	Match Sets	Compare Nos.	Count to 10 +	> and <	Find Shapes	Describe Shapes	2D/3D Shapes	Solve Problems	Above, Below, Next	Identify Object	Length, Weight
Sample 1				×							×	
Sample 2	×					×			×	×		

[a]Developing an understanding of whole numbers, including concepts of correspondence, counting, cardinality, and comparison—1:1 correspondence, matching sets, comparing numbers, counting objects to 10 and beyond, and "more than" and "less than."
[b]Identifying shapes and describing spatial relationships.
[c]Identifying measurable attributes and comparing objects by using these attributes—identify object as same, different, and more or less; length and weight.

Table 2. Aligning Apps to the Common Core State Standards

App	Counting and Cardinality[a]							Operations and Algebraic Thinking[b]					No. + Operation in Base 10[c]	Measurement and Data[d]			Geometry[e]					
	1	2	3	4	5	6	7	1	2	3	4	5	1	1	2	3	1	2	3	4	5	6
Name 1																						
Name 2																						

Note. For each standard, K = kindergarten; CC = Common Core.
[a]K.CC.1: Count to 100 by 1's and by 10's. K.CC.2: Count forward beginning from a given number within the known sequence (instead of having to begin at 1). K.CC.3: Write numbers from 0 to 20. Represent a number of objects with a written numeral, 0–20 (with 0 representing a count of no objects).
K. CC.4: Understand the relationship between numbers and quantities; connect counting to cardinality. K.CC.5: Count to answer "How many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle or as many as 10 things in a scattered configuration; given a number from 1 to 20, count out that many objects. K.CC.6: Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group (e.g., by using matching and counting strategies). K.CC.7: Compare two numbers between 1 and 10 presented as written numerals.
[b]K.OA.1: Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting-out situations, verbal explanations, expressions, or equations. K.OA.2: Solve addition and subtraction word problems, and add and subtract within 10 (e.g., by using objects or drawings to represent the problem). K.OA.3: Decompose numbers less than or equal to 10 into pairs in more than one way—for example, by using objects or drawings—and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1). K.OA.4: For any number from 1 to 9, find the number that makes 10 when added to the given number—for example, by using objects or drawings—and record the answer with a drawing or equation. K.OA.5: Fluently add and subtract within 5.
[c]K.NBT.1: Compose and decompose numbers from 11 to 19 into 10 ones and some further ones—for example, by using objects or drawings—and record each composition or decomposition by a drawing or equation (such as 18 = 10 + 8); understand that these numbers are composed of 10 ones and one, two, three, four, five, six, seven, eight, or nine 1's.
[d]K.MD.1: Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. K.MD.2: Directly compare two objects with a measurable attribute in common to see which object has more of/less of the attribute, and describe the difference. For example, directly compare the heights of two children, and describe one child as taller/shorter. K.MD.3: Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.
[e]K.G.1: Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above, below, beside, in front of, behind,* and *next to.* K.G.2: Correctly name shapes regardless of their orientations or overall size. K.G.3: Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). K.G.4: Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners"), and other attributes (e.g., having sides of equal length). K.G.5: Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
K.G.6: Compose simple shapes to form larger shapes—for example, "Can you join these two triangles with full sides touching to make a rectangle?"

Step 5: Choosing an App

To analyze apps teachers can use a tool similar to Table 1. To begin the evaluation process, read app descriptions on iTunes and download a variety of apps; then play the games and complete the activities within the app. As teachers work through an app, they should identify the standards addressed within each utilizing the NCTM focal points. After identifying apps that address the majority of the standards, teachers can further analyze the alignment of apps using state standards or the CCSS (see Table 2). This step may be completed by a single teacher or as part of a curriculum team. This further analysis may also be appropriate for districts with strict policies and procedures regarding which apps can be loaded on district-owned iPads. The teacher or the district should set a criterion for an app to be considered for use in the classroom—for example, determine that if at least 50% of a set of standards are to be addressed in the app. The criteria of 50% may seem low; however, after the analysis of apps begins, the alignment to standards will emerge and provide guidelines to further ensure that learning outcomes and standards are met. The recommendation is to have a variety of apps that address the same standards so that there is repetition of content for the students and a variety of apps to keep them engaged.

Step 6: Identify Unique Learning Needs of Students With Disabilities

In addition to aligning the apps to the standards, teachers may want to determine if the use of the iPads has a positive academic impact on student learning and meets unique IEP goals for students with disabilities. One way to consider the needs of students with disabilities is to align the content of the app to comprehensive academic assessments, such as the Test of Early Mathematics Ability–Third Edition (TEMA-3, Gisburg & Baroody, 2003; see Table 4). Before implementation, the teacher can take baseline data of the student's current functioning level via the TEMA-3, a norm-referenced mathematics performance measure for children 3 to 8 years old. The TEMA-3 measures the following concepts: academic numbering skills, number comparison facility, numeral literacy, mastery of number facts, calculation skills, and understanding of concepts. The test contains two parallel forms of 72 questions for pre- and posttest score comparison to show growth in learning. This alignment is particularly helpful for students with IEPs. The TEMA-3 can be a formative assessment system for conducting curriculum-based measurements for students with disabilities in the classroom. Aligning the app to an academic assessment such as the TEMA-3 provides a way to compare students' time in the app (i.e., engaged in relevant skills) to the learning gains made in the assessment (i.e., related to those skills).

Step 7: iPad Setup

Teachers often move towards learning without considering the physical, sensory, emotional, or behavioral needs that must be understood for students with disabilities to successfully use these apps. Before putting iPads into students' hands, teachers need to model how to play with the apps and how to move between screens. Teachers can project a demonstration of the app by connecting the iPad to a projector using a VGA adaper (or *dongle*), or demonstrate the app for a small group of students during learning center rotations. Before using iPads in the class, the teacher can enable restrictions such as discontinuing the use of Safari, Camera, Facetime, iTunes, installing apps, deleting apps, in-app purchases, and Siri, to eliminate unnecessary distractions. To further limit the distractions on the iPad, the teacher can combine all the preloaded apps that cannot be removed into one folder. After doing this, the combined apps will appear on the screen and look like one app, which can then be moved onto a different screen to limit the interaction with the apps in that folder. In addition, if the teacher prefers for students to access only one specific app during their time using the iPads, the teacher can enable the "Guided Access" feature.

Ms. Green identified a variety of mathematics apps that aligned to the standards and met the needs of all the learners in her classroom, especially students with disabilities. After she identified the apps that she wanted to use, she loaded them on the iPads. To prepare the iPad, she restricted some content to limit distractions. The next day, Ms. Green introduced the iPads to the students using the projector. Ms. Green also reviewed the protocol of how to use the iPads appropriately. After her introduction, Ms. Green placed the iPads at the mathematics center for her students to use during their mathematics instruction rotation time. Ms. Green noticed the students productively using the mathematics apps and felt confident the use of the iPads provided practice opportunities for the mathematics concepts that met individual learning needs, and were aligned to standards and the TEMA-3.

Final Thoughts

iPads can supplement learning, but without taking into consideration the range of students with disabilities and strict alignment to learning goals, this evolving technology may not have the desired impact on learning. Even with limited resources, iPads can be incorporated into the learning environment by their inclusion in small-group instruction or by their availability in centers. However, if students use iPads independently, it may be difficult for teachers to monitor their appropriate use. Therefore, it is the teacher's responsibility to set up the iPads with restrictions to focus the students' attention to the desired learning activities. In addition, with more than a half million apps available through iTunes, it is difficult for teachers to find and choose apps that meet the targeted content standards

Table 3. App Features Specific to Student Behavior

Behavior	Feature
Need for reinforcement	Choose apps that have built-in reward systems (e.g., earning coins or stickers) or built-in auditory rewards (e.g., clapping or cheering).
Fine-motor ability	Some apps require the student to drag an image across the screen or write responses with one's finger. This can be more difficult for students with fine- motor limitations. In addition, students may rest the side of their hands on the screen, which will impair the dragging function of a touch screen.
Ability to follow multiple-step directions	When reviewing apps, pay attention to the amount of directions that are given at one time to determine the usability of the audience in your class. If you have students who cannot follow multiple-step directions, choose apps with few-step directions.
Reading ability	When reviewing apps, focus on those that have verbal prompts along with written prompts so that students with lower reading abilities can play the apps independently.
Attention span	Choose apps that have multiple tasks incorporated into them, as opposed to having students practice the same skill repeatedly. Also, be aware of how long it takes to successfully complete a task before advancing in the app.
Frustration level	Choose apps that provide numerous attempts—avoid games that display images such as an *X* to indicate that the answer is wrong or that signal a sound for incorrect responses.
Hearing ability	If students have hearing impairments, verify that apps have visual prompts incorporated into the game as well as auditory ones.

Table 4. Aligning Apps to the TEMA-3

App	Counting and Cardinality[a]								Operations and Algebraic Thinking[b]						No. + Operation in Base 10		Measurement and Data[d]					Geometry[e]							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Name 1																													
Name 2																													

Note. A = . Numbers in parentheses indicate .

[a]A1 (3): How many cats do you see? Why is this not cardinality? If a child counts 1, 2, 3, doesn't the examiner ask how many is that? A2 (3): Show me __ fingers. A3 (1): Count (your fingers) for me. A4 (4): Which side has more? A5 (3): Make yours just like mine (adult puts three tokens on table, covers them). A6 (2): Count the stars. A7 (2): How many stars did you count? A8 (4/5): Make yours just like mine (adult places two tokens, then adds one more).

[b]A9 (3): How many tokens are there? (conservation of number). A10 (2): Give me __ tokens. A11 (3): Hold up __ fingers. A12 (1): 1, 2, 3, now you count by yourself . . . . A13 (3): What number comes next? ___ and then . . . ? A14 (3): What number is this?

[c]A15 (3): Write the number (symbolic representation). A16 (2/3): Word problems: How many altogether?

[d]A17 (4/4): Word problems: __ + 3 = 5, etc. A18 (3/4): Show me how many there are (symbolic representation). A19 (5): Which is more? ___ or ___ ? (1 to 5). A20 (5): Which is more? ___ or ___ ? (5 to 10). A21 (1): Count as high as you can (to 21).

[e]A22 (2): What number comes next: __ and then . . . ? A23 (2): Count these dots with your fingers. A24 (1): Count backward starting from 10. A25 (2): Share 12 between 2. A26 (2/3): How much are __ and __? A27 (4/6): Which is closer to __, __, or __? A28 (1): Give me exactly 19 tokens. A29 (3): What number is this?

and skills that are appropriate for their students. Utilizing a process that aligns the analysis of the apps with focal points, standards, and a norm-referenced test allows teachers to gather data to justify students' use of particular apps. The process of aligning apps to the standards and norm-referenced tests is time-consuming, but can be less arduous if implemented over time and with the support of the school district. The task of aligning apps to standards can be a collaborative effort among a team of teachers, with teachers each aligning just a few apps and then sharing their results to create a pool of aligned apps. After aligning apps to the standards, teacher can share that information with their grade-level teams. Taking the time to analyze selected apps provides justification for teachers to incorporate iPads into the classroom during instructional time. This justification is often necessary for seeking permission from administrators to invest in iPads, but more important, for students, it provides a mechanism to track learning gains from the use of apps as aligned with the skills and standards targeted on students' IEPs.

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