School-Age STEM App Suggestions

Overview

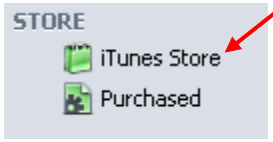
The following iPad apps have been selected for use by students in the middle school grades to support Science, Technology, Engineering and Math (STEM) education. The Computer Explorers' focus on STEM education is ongoing. We have built our reputation on providing students with technology-based education that integrates science, engineering and math concepts. Tablets such as the iPad allow teachers to bring interactive STEM-based education with a twist to students everywhere. The iPad becomes a highly portable science lab where problem solving, creative thinking and trial and error are just a touch away. The key to success for students is hands-on learning and fully involved thinking. While these apps seem like games to the students, teachers recognize them as hands-on learning experiments. This winning combination of fun and learning motivates students to think harder and problem-solve more deeply.

Each of these apps was analyzed using the Computer Explorers iPad App Evaluation Matrix. By using the matrix, we ensure that the apps are fully evaluated for their educational, logistical and technical attributes. Even more importantly, the matrix standardizes the evaluation process. Each app is given a score that gives greater weight to its educational value but also takes into consideration the app's design and how well that design functions. To meet the STEM goals for middle school age students, we searched for apps that provided the students with experimental and hands-on learning experiences with physics, engineering and construction concepts, math practice and experimentation, novel approaches to learning about scientific concepts and hands-on interaction with technology applications. These fifteen apps represent some of the best learning that the iPad has to offer.

Downloading iPad Apps

How to Download the App from a Computer using iTunes

1. Start iTunes on your computer – **Start/All Programs/iTunes**.
2. Plug the supplied data cable into the iPad and then into the computer. (Note: if desired, slide the arrow on the Sync in Progress screen to cancel the Sync procedure.)
3. Click on the **iTunes Store** icon.

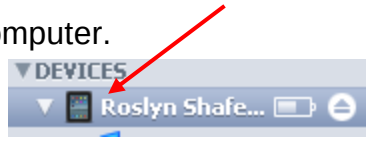


4. Click on the **Apps Store** button.

5. Confirm that the **iPad** button is selected.

6. Click in the Search Store box and type **the app's name**.

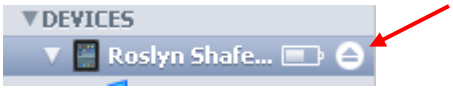
7. Press the **Enter** key or click on **the app's name** in the Suggestions list.
8. Click on the **app's image** in the iPad Apps box to see a description.
9. Click on the **price** and then click on the **Install** button.
10. You may need to enter your iTunes password. *Note: The App Store is part of iTunes. iTunes is set up with a password and credit card information during the first startup. Click on Store/View My Account* to view and change this information.
11. The app icon will begin to install on your computer.
12. Click on your iPad in the Devices list.



13. Click on the **Apps** tab on the right side of the screen.

14. Click and drag the **new app** from the list to one of the images of your iPad screens. You may place it on any screen.
15. Click on the **Apply** button.

16. When the syncing process is complete, click on the **Eject** button to disconnect the iPad.

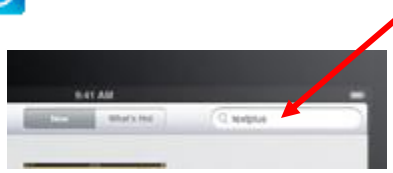


17. Locate the **new app's** icon on your iPad and tap on it to start the app.

How to Download the App on the iPad using WiFi or 3G Connection

1. Tap the **App Store** button on the iPad Home Screen. 

2. Tap ***in*** the Search bar on the top right of the iPad.



3. When the keyboard appears, type **the app's name.**
   Note: Tap the X in the search box before typing to erase any text in the Search box.

4. Tap **Search** on the keyboard or tap **the app's name** in the Suggestions list.

5. Tap on the **app's image** in the iPad Apps box to see a description.

6. Tap on the **price** and then tap on the **Install** button.

7. Enter your iTunes password.
   Note: The App Store is part of iTunes. iTunes is set up with a password and credit card information during the first startup. Tap on Settings/Apps Store to change the account information.

8. The app's icon will be shaded on the screen and will show the downloading progress while it is loading.

9. When the downloading process is complete, tap on **the app's** icon to start the app.

Apps, Recommendations and Skill Progression

1. **Bobo Explores Light by Game Collage LLC -** $4.99 – Although not a game, this award-winning app is a highly interactive and fun book! Bobo Explores Light contains over 100 pages of original content, edited by a team of educators with decades of collective teaching wisdom. Students will experience 21 in-depth topics including lasers, telescopes, lightning, reflection, bioluminescence, and sunlight. Meet Bobo, your friendly robot companion.

   Recommendations: This amazing app is filled to the brim with information, experiments, videos, and holograms. Encourage your students to explore each page in this unique book before moving on to the next topic. Remind them to tap Bobo's blinking antenna to start an interactive hologram. Also encourage discussion of the content. The more they talk about what they see the more they will learn. Have props such as binoculars, flashlights, colored cellophane, glow in the dark toys, glowsticks, and mirrors available so that students can experiment with the light and color concepts in this book.

   Skill Progression: The topic of light is introduced in the following sequence – Space Flight, The Sun, Lightning, Fire, Thomas Edison, Lasers, Reflection, Refraction, Telescopes, Color, The Human Eye, Glow in the Dark, Bioluminescence, Photosynthesis, Sunset/Night/Sunrise/Twilight, and Auroras. As each topic, is introduced, the students' knowledge and understanding about the interrelationship of light, color and science will grow and develop.

2. **Casey's Contraptions HD by Snappy Touch -** $2.99 - Help Casey get his toys back by building crazy contraptions. The students will create Rube Goldberg-like machines with toys and everyday items to solve puzzles. The puzzles become more complex with each solution.

   Recommendations: Encourage the students to problem-solve together. Suggest that they trace the path of action in a contraption before they press play. Explain that planning how these contraptions will function is very similar to how engineers plan and design machines to do a variety of jobs. Suggest that they use pencil and paper to design their own machine or contraption using common objects as well as simple machines.

   Skill Progression: This app is designed to build problem solving skills using physics-based scenarios. The students begin by learning how Casey's contraption works. As they learn how to use new tools, they experiment with how to incorporate them in their own contraptions. As the levels of play become more

complex, more tools and more obstacles are introduced. With each board, the students analyze, hypothesize and experiment. Students visualize how the placement of tools and the movement of obstacles will affect the desired outcome.

3. **Color Uncovered by Exploratorium –** Free - Explore the surprising side of color with Color Uncovered, an interactive book that features fascinating illusions, articles, videos and fun experiments.

   Recommendations: This app is a nice follow-up piece to the Bobo Explores Light app. Each page features a new fun fact about color and an article to read, a video to watch or an experiment to perform. No materials are needed for this app's experiments. Encourage the students to discuss how the color theory they are learning relates to the colors they see in their everyday life. Also discuss how it will affect their interaction with color in the future.

   Skill Progression: The students will explore and discover how color works in a variety of situations and how it affects their perception of the world around them. Their knowledge will build as they learn how colors are affected by their surroundings, illumination and perception.

4. **Construction Zone HD by Digital Concepts** - $2.99 - This is a classic physics-based puzzle game. Build, test, and complete a variety of challenges with the contraptions that you build. Variables may be changed through the Game Info section. Some students may want to continue longer with this app. It's very addicting!

   Recommendations: Encourage teamwork, brainstorming and a lot of discussion. Some students may want to zip through this app to see how far they can go. Explain that the more they discuss and problem-solve together, the more they will be acting like real-life engineers.

   Skill Progression: Students use building materials to construct structures that meet specifications. Students will learn through trial and error how each material functions and how they interact. The complexity of the projects builds as the students acquire more advanced tools and skills.

5. **Contre Jour by Chillingo LTD -** $.99 - Use your finger to morph the landscape, propelling the mysterious creature Petit to safety. Pull, swipe, and tap gadgets such as tendrils, air geysers, and pulleys to complete clever puzzles. This app is very special but students who are looking for action may need a bit of encouragement to keep them involved. No directions are available and CE

recommends letting the students problem-solve from the very beginning.

The basic premise of the game is to control a blob named Petit that mainly consists of just an eye. Students need to manipulate the ground at Petit's feet to move it in a specific direction. They will use the tentacles scattered around each level to swing or spring Petit to points they'd like him to pass. Each level features three bonus scoring points, represented by little blue, glowing lights. But the ultimate goal is to ensure that Petit reaches the exit, represented by a larger blue haze, without falling off the screen entirely or being munched by one of the many traps.

Recommendations: Some students may be frustrated at the start of the game by the lack of directions. Lead a discussion about why the designers chose to start the game without instructions. Explain that this app brings them into Petit's world of problem-solving from the first moment they start the app. Encourage student teams to brainstorm, experiment and be persistent in finding solutions to the more difficult puzzles. Active thinking and trial and error are the keys to success with Contre Jour. A friendly competition between teams is a fun way to motivate students to continue with the harder puzzles.

Skill Progression: The level of play and complexity of problems increases with each new puzzle. As new components are introduced, the students will need to use trial and error to evaluate how these tools will help them reach their goal.

6. **Cut the Rope by Chillingo LTD -** $.99 – This award winning problem-solving app is enjoyed by all ages, as they help Om Nom gobble his beloved candy. If students have played Cut the Rope, introduce them to option number 7, Cut the Rope Experiments.

   Recommendations: The popularity of the Cut the Rope app means that many students may have used it before. Take advantage of the Cut the Rope updates and the Cut the Rope Experiments app to bring your students the newest and most unique puzzles. Encourage them to think about how the developers came up with this award winning idea. Have students brainstorm and share their own problem-solving app ideas with the class.

   Skill Progression: The level of play and complexity of problems increases with each new puzzle. As new components are introduced, the students will need to use trial and error to evaluate how they will help them reach their goal.

7. **Cut the Rope Experiments by Zeptolab UK Limited -** $1.99 – The students will help the scientist study the Om Nom creature as they continue to feed him the candy he craves.

   Recommendations: Many students are likely to have played Cut the Rope in the past. Experience does not change the on-going challenge or the fun. To add another dimension, have each team keep track of their progress with a scorecard. Challenge them to write or present their own review of the app by evaluating the physics knowledge and problem-solving skills needed to succeed. They may want to select a level to analyze and describe for the class as they demonstrate how they solved the puzzle and fed the candy to Om Nom.

   Skill Progression: These 75 new games are divided into 25 game sets. The first 25 games review the tools used in the first Cut the Rope game. The next 25 games introduce the rope shooter and the final 25 introduce the suction cup. The complexity of the game play increases dramatically with each new set. The final set with the suction cup includes some of the most challenging Cut the Rope activities to date.

8. **daWindci by Reality Twist GmbH -** $3.99 – Create your own hot air balloon and then pilot it through sharp cliffs, wind tunnels, dangerous electric fields - and a lot of incredible inventions.

   Recommendations: daWindci inhabits a world from the sky's point of view. While students are challenged by the obstacle courses they need to traverse, they will also be fascinated by the landscape and structures beneath their hot air balloon. As the students create the wind to move the balloon, ask them to take note of the landscape and machines below. Challenge them to make a quick sketch of what they think their world, their home or their city would look like from this same point of view. Discuss which elements in their landscape would present structural problems for their balloon. Ask them to consider how weather impacts a real hot air balloon.

   Skill Progression: The students create the wind to move the hot air balloon through the obstacles in this problem-solving game. The quiet nature of this game stands in stark contrast to frantic atmosphere of many of today's puzzle games. While the controls seem simple, the complexity of the game grows as more lands are explored. Passing through gates and finding pathways that the balloon can follow becomes more difficult as their skill grows in analyzing the obstacles.

9. **Image Blend by Johann Andersson -** $1.99 – This fun app gives students a chance to take and blend images with the iPad. They can use multiple blending modes such as Multiply, Overlay, Screen and many more.

   Recommendations: This photography app helps students explore the iPad's camera and photo editing techniques. The teacher may choose to give the student teams a specific assignment such as blending a landscape image taken from the classroom's window and a student's picture taken inside the classroom. They may also give students the freedom to explore and discover this app's fun features with images of their choice. To use this app, the students should:

   1. Tap the bottom left and right squares to take two pictures with the camera or select one from their library.
   2. Use the slider at the bottom of the page to control how much of each picture is in their final image.
   3. When satisfied with the final projects, tap Blend to try other options. Options include: Multiply, Screen, Overlay, Darken, Lighten, Color Dodge, Color Burn, Soft Light, Hard Light, Difference, Exclusion, Hue, Saturation, Color, Luminosity, Plus Darker and Plus Lighter.
   4. Tap Save to save the newly blended image to the Camera Roll or Other Apps. The Other Apps link will only work if compatible apps are installed. The app will give you a link to more apps that can send and save images if none are currently installed. *(To prevent students from downloading apps without your* permission*, never give students the iTunes password.)*

   Skill Progression: The more the students experiment with this app, the more they will learn about photo editing and how it can be used to manipulate images.

10. **Link! By Darren Gates -** $.99 - Build bridges using wood and steel girders, and in more advanced levels with stone blocks and rope cables.

    Recommendations: Encourage student teams to plan their projects and analyze their failures as well as their successes. Before students begin their first project, have them tap the question mark from the level menu to see directions and tips. At the end of the day, have student teams compare their scores for each level as they share what they learned about physics, materials and bridge building.

    Skill Progression: Students choose their construction materials and then tap the starting anchor point to build their own bridges. Bridges need to be structurally

sound to prevent accidents. The complexity of the physics involved in the build increases with each new challenge. As students build, they will be able to try different construction materials and analyze how each material performs in the build.

11. **PhotoShake! by MotionOne.co.Ltd -** $1.99 - With PhotoShake, your students can easily combine one or more photos to make exciting and fun new images. They will create a photo collage and shake to randomize the photo placement. The students will also use editing tools to change graphic elements and add special effects.

    Recommendations: The students will need to take a number of photos to create their own photo collage. Suggest they create a collage about their classmates or discuss other themes they may like. To use this app, the students should:

    1. Tap the New Photo button in the top left corner.
    2. Select one of these themes: Single Photo, Thumb Photo, Multi Photo, Grid Photo, Wide Photo or Wallpaper. To experience the editing features in this app fully, make sure the students select one of the multi-photo themes.
    3. Select either the Camera or Album Import Photo option. Other options include Paste, WiFi, Map, Flickr and Picasa. The Map option lets students select a Google Maps image to use in their project.
    4. Repeat the Import Photo step until the correct number of images for the selected theme has been added.
    5. Select either the Slide or Shake Mode to determine which technique to manipulate the images in the collage.
    6. Shake the iPad or tap the image to see other collage options.
    7. Tap the circle icon on the bottom middle of the screen to move image to the editing section of the app.
    8. Edit options: Frame, Photo Cell Effects, Speech Balloons, Stickers.
    9. Other options include the ability to post the image to a variety of sites and to send photo or album using email, WiFi or Air Print

    Skill Progression: The more the students experiment with this app, the more they will learn about photo editing and how it can be used to manipulate images.

12. **Science360 for iPad by National Science Foundation –** Free - The National Science Foundation's (NSF) Science360 for iPad provides easy access to engaging science and engineering images and video from around the globe. It also contains a news feed featuring breaking news from NSF-funded institutions. Content is either produced by NSF or gathered from scientists, colleges and universities, and NSF science and engineering centers.

    Recommendations: This science-based app gives students the opportunity to explore and discover interesting science facts as they watch videos, read articles and see amazing images. The grid provides 360 degrees of viewing. Pinch, tap or drag the grid to see more. Ask students to keep a list of the stories viewed and challenge each team to explain to the class the story that most interested them. Many of these stories give students a glimpse into the world of a scientist and may inspire them to become involved in a science career.

    Skill Progression: This app is designed to inform and inspire the scientists of tomorrow. Knowledge and enthusiasm will build as the students explore.

13. **Touch Physics by Gamez 4 Touch -** $1.99 - Draw shapes with a crayon that comes to life on the iPad. These shapes interact with the wheel, causing it to move according to physical laws. When it reaches the star, the level is complete. Levels increase in difficulty.

    Recommendations: This app shows an advertisement for another app at the beginning. Make sure students do not select to buy these apps. *(To prevent students from downloading apps without your permission, never give students the iTunes password.)* Have each team create its own user and view the instructions provided for new users. Discuss how objects interact and move depending upon their location, the forces around them and gravity. To challenge students further, have them select the Custom option to create their own level. Make sure they view and discuss the Custom tutorial before starting their own level. This option can easily fill a class of its own.

    Skill Progression: This unique app challenges students to interact with on-screen elements with shapes that they draw. The virtual images follow the laws of the physical world as they move. The puzzles become more complex as the students proceed through the levels.

14. **Where's My Water? by Disney -** $.99 - Where's My Water? is a challenging physics-based puzzler complete with Retina display graphics, Multi-Touch controls, and a sensational soundtrack. To be successful, you need to be clever and keep an eye out for algae, toxic ooze, triggers, and traps.

    Recommendations: As the puzzles become more complex, the students will need to rely more and more on teamwork to find the solutions. If individual teams are struggling with a puzzle, enlist the help of all teams to find a solution.

    Skill Progression: Although this app has a cartoon-like appearance, it is designed to stretch students' minds as they control the flow of water in Swampy's underground world. Students need excavate the dirt to direct the water's flow. Although the concept sounds simple, the levels become more and more complex as new obstacles are introduced. On more challenging levels the water needs to be directed to flow upwards using machines to change the flow. On some levels, the students will need to analyze the order of operations so that the flow follows the correct sequence.

15. **World of Goo HD by 2D BOY -** $4.99 - Drag and drop living, squirming, talking, globs of goo to build structures, bridges, cannonballs, zeppelins, and giant tongues.

    Recommendations: The goo globs with eyeballs should be directed to positions between other globs to build triangle-shaped structures. Encourage the class to share their successes as they complete each puzzle.

    Skill Progression: Students will use basic physics principles to build structures using globs of goo. They will need to build increasingly complex structures that support the goo and direct its movement to the pipes while avoiding dangerous obstacles. As they discover how to build structures that are successful, they will be able to apply these techniques to new challenges.