i-Pads are used as part of the library STEM program. The following format is followed by the teacher: 1) introduction of content material 2) self-directed inquiry on the i-Pad 3) discussion of what the students have learned; tying student inquiry to the content 4) extended take-home learning (handouts, book/dvd list).

**3D Brain** – junior / senior high educational app on the structures and function of the brain. An index of all the structures is provided at the right with information on each. When one is chosen it lights up on the visual; press T and an overview on that part of the brain is provided, including the ability to magnify by pinching or widening. The brain can be rotated to view structures from other angles.

**3D Cell Stain** – A cross section of a cell is displayed; tap structures to see the name of the parts of a cell. Then touch the name of a structure to read about its role and view an enlargement of the structure. Touch 3D Cell to return the entire cell graphic. Stain parts of the cell with different colors and observe its movement. This is an adult level app.

**3D Sun** – this adult level informative tool includes 1) the current solar conditions, and the latest news about the Sun from a Ph.D. trained astrophysicist, 2) a gallery of satellite images related to the Sun and solar dynamics, 3) STEREO observations of solar storms, 4) an image of the Sun which users can pinch to change size and rotate to view 360 degrees.

**Animals! 100 Lite** – Gives each animal’s scientific name, facts, and the animal makes its sound. There is also a page of all the animals with their sounds, an animal alphabet page, and a quiz.

**Animals Tribal Nova** (Animals!) – To find Wendell players answer questions about animal living habits. To find Bruce, players answer clues about the appearance of animals, and to find Rhonda, players must answer queries about animal habitat. Up to nine series of questions are provided for each section.

**Asia** – students practice answering questions about places in Asia, and then take a quiz. As the question appears, the geographical area becomes red. The free set includes only 20 countries and capitals.

**Be a Martian** – This app allows users to explore Mars through a gallery and information. At the top of the screen users can chose Program & Missions, All About Mars, News, Multimedia, Participate, or Search. Under Programs and Missions choose Overview, Science, Technology, Missions, or People. All about Mars includes Mars: Extreme Planet; Pop Culture Mars; and Mars in the Night Sky. Users may Participate under Mars for Everyone; Mars for Educators; Mars for Students; and Mars for Kids.

**Bees** – 19 Beautiful magnified screens with images of bees are accompanied by informative text.
BLISS – Biogenerative Life Support System is a NASA app simulation to explore how plants can be used for life support for space, which is applicable to adult or high school education. It includes information on photosynthesis, the carbon cycle, artificial ecosystems, and the scientists involved in the project. Players conduct research on crops which may flourish in space growth chambers. There are 4 levels to complete, all quite complex.

Bobo & Light – an interactive book with captions or audio teaches about light through the character Bobo. Bobo’s antenna glows when something new is introduced. Pull on the chain at the top of the screen to find out more on a topic; then tap on the arrow for in-depth analysis of the topic. Some of the pull down screens have videos on a topic. Launch Bobo into space and see the Universe from his ship from Saturn, Jupiter and all the way to the Sun.

Boeing Milestones – brings to life Boeing’s innovations from 1916 to the modern day.

Bridges – players are afforded a budget to build a bridge over a specific location. The materials are moved from the side of the screen to construct the bridge, and when finished the bridge may be tested with cars and trucks and is evaluated.

Butterflies – 14 butterfly photos are accompanied by educational text.

Butterfly HD – The life cycle of a butterfly is taught stage by stage, including extensive information and vocabulary on body parts and development. Information on moths is included in the “Did you know?” section. Beginning with the egg, players read the information on that stage, plus additional information at the bottom of the screen. Press “Home” and continue to the next stage.

Cubify Draw – a simple drawing program for files which are converted to .stl to be printed on a 3D printer.

Deer – Beautiful photos are accompanied by text as users slide from screen to screen.

Dinosaurs 360 - Includes photos with dinosaur names, a tour of three periods, in which you tap on the visual for its name and sound. Jigsaw puzzles of dinosaurs and a quiz to identify dinosaurs by appearance only are included.

Earth as Art – satellite images of Earth are presented; tap the i to read about the location of the image.

Earth Day Carol – is a retelling of Charles Dickens’ classic A Christmas Carol. Plastic Bottle Scrooge is visited by the ghosts Plastic Past, Plastic Present, and Plastic Future. Touch the screen to read additional information about landfills and recycling.

Earth Viewer – excellent science app in which players see a map of the world in every geological age from Cenozoic to Cambrian. Presented by the Howard Hughes Medical Institute, information includes the length of a day, the atmospheric composition, temperature, and other in depth information. Place the slider on the correct eon and era, read basic information, access charts, view temperature, cities, geological and biological events, and use teacher resources (which follow NGSS) at the bottom of the screen.
**EasyLearn Simple Machines** (Simple Machine) – is an excellent tool in which students learn, practice, then take a quiz on simple machines. The Learn Menu lists each machine topic from which players proceed to learn and practice. The Practice Menu has the categories Naming, Questions, Matching, Trivia, Sorting, Puzzles, and Assorted. After the quiz, players can look at the correct answers.

**Eco-Explorer** (New) – players travel to places all over the globe for eco coins, which they earn learning about the ecology and climate factors surrounding the area. Travel to Japan and learn about the Liter of Light a sustainable light project, plant trees to help with CO₂ absorption.

**Estes for iPad** - There are four main parts of this rocketeer app: a list of rockets and engines, altitude predictor, virtual Altitrak, and a Facebook feed. The products are categorized into rockets and aircraft, then presented by skill level. At the bottom of the app, the second item is the altitude Predictor: Touch the rocket name listed alphabetically, and the recommended engines is listed at the right. Place the rocket in the blue bar, and then press “Calculate” to view the projected altitude of the chose rocket, usually given in feet. To employ the Virtual Altitrak, pace off 50 - 500 feet from the launch pad at a right angle to the wind. Launch the Altitrak using the third button at the bottom of the screen, then hold your iPad vertically straight out in front of you. When the rocket is at its apogee click the “Get Altitude” button. Hold the iPad until the altitude appears below the crosshairs. Reset the Altitrak.

**Europe** – players answer 10 questions about 20 countries in Europe, and then do a quiz.

**Exoplanet** – information about planets orbiting other stars is provided with pictures, with updates about new planets as they are discovered. Students can explore these bodies or find out more about the Milky Way, which appears as a rotating system. Click on the magnifying glass for a list of all the exoplanets, the button to its right to read about each body you tap on the screen. Within this function players can find the planet in the Milky Way by tapping on the instruction. Each screen can be enlarged with the fingers and rotated.

**Expedition: Insects** (Smithsonian Institution) – This iPad app is an interactive book featuring exotic insects such as giant deadly hornets, gorgeous fluttering butterflies and stealthy crawling stink bugs.

**Farm Animals** – these tangrams are presented in levels of difficulty with 7 geometric pieces to arrange. Pieces are chosen, the shape named, then rotated to fit to the pattern provided. Once the puzzle is completed, student can take a photo and record the work.

**Flowers** – parts of flowers and their processes are presented with beautiful graphics

**Garden Compass** – adult level program to photograph then identify plants. There are four categories, Plant Identifier, Essentials, Problem Identifier, and Design Center. The user creates the program’s information.

**GazziliScience** – This app provides interactive guided “tours” through life science concepts such as biological development. Plants, the Water Cycle, the Seasons, Five Senses, Non-Living Things and Sink or Float are topics covered, complete with vocabulary for preschool children. The first chapter is provided, but additional chapters must be purchased.
GeoDash – this National Geographic app focuses on animal habitats including the African Savannah, Amazon Rainforest in which players develop the skills of animals in the environment.

GeoEye – satellite images of locations in the news are viewed, including maps, information, a magnifying glass and special features for some locations. Each location can be enlarged and toured with two fingers.

Geometry 4 Kids – an excellent app which includes learning and practice in 2D and 3D shapes, Faces, Sides, & Corners, Symmetry, Geometric terms, Angles, Polygons and Triangles, and Transformation & Congruence.

Google

Gravity Lab - interesting game about the motion of objects and the physics of collision. Green blocks act like gravity, red moves up, yellow to the left, and green to the right. Students can return to the same problem as many times as necessary. Later levels include a bounce pad to involve angles.

iBiology for Kids – an extensive amount of information is presented to read about animal and plant life. Major headings (Cells, Microorganism, Plants, Invertebrates, Vertebrates, and Animal system) are provided with subheadings and definitions. The print is a bit small, and there are not many photos, but otherwise this app is educational. It is a bit embarrassing that they misspelled vertebrate.

iBird Lite – this app is accompanied by a “How to use” guide, with a browse or search option. Your own bird photos can be added, and favorites may be selected. The Photo Slide show allows you to view, read about, and listen to the song or call of 48 bird species. Tap each bird name to see photos, view a map of its range, read the characteristics by which they are identified and read other facts about the species.

iChess – 1000 chess puzzles are presented for players to practice.

ISS Live – information on the International Space Station from NASA is provided with an interactive model from which players can view the parts which belong to each country. Visit the Space Station, or see it orbit the Earth.

Just a Ball – students learn physics by experience manipulating a ball into its target. This app would be best accompanied by instruction.

Kid Weather – This interactive meteorological app for young children includes real time weather conditions, forecasts and other educational material concerning weather.

Kids Discover Space – students can read or listen to information about space and solar bodies. There is information on the history of the study of space. A model of our solar system spins around the Sun as players tap on a planet to find its information. Students can return to where they left off via the table of contents.

Kids Discover Machines – This excellent app introduces the six simple machines, providing excellent definitions and applications. Tap a + to read more about a graphic, tap an X to close a pop up window, tap a ▶ to watch a video, tap a » to move forward or spin. This app covers the mechanical and historical aspects of simple machines.
**Kids Solar System** – tap on a planet to read find see its name and a few facts, tap again to read more. After learning about all the planets a quiz is available.

**Life Cycles for Kids** - is an excellent tool that teaches variety of life cycles. Tap on a flower, butterfly, frog, or tree to see its development.

**Love Gears** – educational and fun game for students after they have learned the principals involved in the simple machines. Vocabulary concerning gears should be provided by an outside source.

**Maps & Apps** – 4-H Global Information Systems (GIS) game

**Match Animals** – tap on a graphic and an animal and its sound are presented; tap on another graphic to find its match.

**Mars Globe** – players view the surface of Mars in Globe or Telescope (from Earth) mode, rotate the planet, zoom in or out and view location labels. There is a brief introduction to Mars and its exploration. Tap on a labeled location and basic information is presented. Features on the surface are easily visible by zooming in Globe mode.

**Mechanics** – under six headings (Kinematics, Dynamics, Energy, Momentum, Rotation, and Gravity) the properties and actions of matter are discussed. Each screen definition is accompanied by a visual, sometimes a motion or simulation to illustrate the point. Under Dynamics, Newton’s Laws and force are explored. For most students it is advisable to learn the topics progressively. This app covers an extensive amount of physics, so it is probably best used with other lessons.

**Monster Physics** – Players should start with the “Learn” section is dedicated to teaching you important physics concepts such as gravity, friction and speed and velocity. Fifty missions are divided into five categories; starting with the tutorial missions and ending with the advanced missions. A simple invention may be modified by rotating, scaling, flipping, overlapping; a simulation then shows the machine in action, next vary the thrust, speed, etc.

**Moon Globe** – players can view the surface of the Moon in Globe or Telescope mode, rotate or flip the image. Players can tap on labeled locations for more information, view them in Terrain, Spacecraft or distance modes, and there are Time and Illumination buttons; click the now button to return to your current time.

**Moon Tours** - is a version of the NASA’s Lunar Mapping and Modeling Portal (LMMP). LMMP is the repository for over 600+ geospatial lunar data products and imagery focusing primarily on the 50 "sites of interest" that were selected as possible landing sites for future lunar missions. At the bottom of the screen the choice of Base Maps, Layers, and Tour are presented. Users can find the latitude and longitude of locations, calculate the distance between sites, and Search for the names of features such as craters.

**Moths** – this app presents information and visuals from the travelling exhibition “Winged Tapestries: Moths at Large” from the Canadian Museum of Nature. In Gallery mode players can read about any moth presented, or retrieve information about moths in general.

**NASA Be A Martian** - lets you experience Mars as if you were there! Take part in discovery as it happens and join a community of worldwide explorers.
**NASA Space Technology AR** – demonstrates new NASA technology, but uses a “printed marker”, instructions are not clear to a beginner.

**NASA Spinoff** - profiles the best examples of technology that have been transferred from NASA research and missions into commercial products. From life-saving satellite systems to hospital robots that care for patients and more, NASA technologies benefit society. This app is appropriate for HS Seniors and above.

**NASA Viz** – a visualization explorer than usually employs the internet to read the stories. Without the internet, viewers can see a few space photos of planets and interstellar events, chose favorites, and view credits.

**Newton’s Cradle** – the Newton’s cradle has three types of material for the balls, and may be manipulated to observe the behavior of the balls. Begin by moving one ball a small amount to show students the equal and opposite reaction.

**Newton’s Laws** – apply force to watch each of Newton’s Laws in action; normal force, gravity, air resistance are explored and manipulated to observe the results.

**Networking** – a NASA app gives players the option to be a scientist, engineer, technologist, or mathematician for a space flight communications program. Players accept satellites and try to manage their resources to build up a Near Earth, Space, and Deep Space Network for research.

**Noteworks** - a musical game, designed to teach note recognition and improve sight reading skills.

**Ocean Science** – The 7 principles of Ocean Science are presented: 1) One Ocean, 2) Supreme Power, 3) Out of the water, 4) Origin, 5) Another World, 6) The Great Provider, and 7) Final Frontier. For example, principle one is *The Earth has one big ocean with many features*, which is demonstrated with documents and visuals.

**Operation Math** - teaches basic addition, subtraction, multiplication and division through interactive game play. Complete each mission by solving the equations that lock the doors along your escape route.

**Parallel Bulbs** – students construct a parallel circuit with two bulbs with components or symbols of components. Learning objectives and assessment tools are included.

**Plants HD** – excellent learning tool for the development of plants from seed to fruit. Players tap on the picture of one part of the plant cycle, read about it, and view photos. At the bottom of the screen additional information is supplied. There is a “Read to Me” option, and the screen moves on its own as the text is read. Tap the “Play” Feature to arrange the steps of plant development, and the “Pop Quiz” within each topic to test your knowledge.

**Play Science** – players chose Plants, Animals, Our Earth, Weather & Sky, Matter, or Motion & Energy, and answer questions and read information about the topic. Once a topic has begun, when the subject is tapped the next time it returns to where the player left off; this may present a problem for multiple players.
Robots – an interactive look at current robots made by several different organizations from IEEE. Tap on a robot, read its specifications, swipe or tap to see the robot operate, and rate the design and appearance.

Rockets 101 – players build a rocket at one of three levels. Once the rocket is built, players launch and watch a simulation of the spacecraft’s flight and separation.

Rocks HD – an excellent Sprout Learning tool about Earth’s rocks, minerals, soil, and fossils. Beautiful pictures are presented with information as players swipe the screen. Tap each part of the rock cycle, and types of rocks produced to gain information. Tap the right arrow for options to take pictures, get detailed information with a “Read to Me option, watch a video if you have internet, or take a quiz.

Satellite Insight – has a game based on NASA’s GOES-R satellite series, which is designed to provide constant data and imagery on Earth's weather. This app asks players to collect data on clouds, solar energy, radiation, magnetic fields, lightning, and charged particles with six advanced instruments for the Geostationary Operational Environmental Satellite. Players tap on the screen for color matches to obtain info for the satellite before the grid fills.

Science 360 – From the National Science Foundation, this app is for use with the internet and has many topics of choice to read about and videos to watch on these topics.

Scratch Jr. - an introductory programming language (coding) that enables young children to create their own interactive stories and games. Children snap together graphical programming blocks to make characters move, jump, dance, and sing.

Seed Cycle – simple seed and pollination app, where players proved water, sunlight, and pollination through a bee to watch the complete cycle of a flower. There is a “Read to Me” option.

SerialBulbs (Building Serial circuits) – students are instructed to build and manipulate series circuits and answer questions about the circuits as well as construct circuit diagrams. This tool comes complete with objects and assessment tools. It is very limited in scope- only includes a circuit with two bulbs.

Simple Circuits – this is an Exploriments app in which players chose series or parallel circuits to build with parts available; there is an auto complete function to add wires. Players select the direction of current. The circuit is shown so construction is relatively simple, but players learn about the flow of electricity in either type of circuit.

Simple Physics – players experiment with design physics as they build simple structures, a tree house, a train bridge, truck crane, and Ferris wheel. Players must stay within a budget for materials, and when the structure is completed a test is given for strength. Students redesign if there are problems.

Snakes – 13 photos are accompanied by informational text on snakes.

South America – players answer questions about 20 South American countries and take a quiz. The area the question concerns is highlighted in red.
**Space Exploration** – an excellent and comprehensive look at all aspects of space exploration. Tap on a subject to see photos and watch videos about that topic. Appropriate for Grade 5-adult.

**Spacecraft 3D** – players select a robotic explorer spacecraft; requires a printed AR Target.

**Spacecraft TechAR** - investigates Augmented Reality through a Laser Communication Relay from NASA. A printed marker must be obtained, then tap on the buttons to see data.

**Sphero Edu** – a programming app for the robotic Sphero ball. Superior to the app that comes with the ball for educational purposes.

**States** – information and quiz on 20 states and their capitol is provided with the option to secure the other states.

**Temperature HD** – Type in a temperature in Fahrenheit, Celsius or Kelvin, and it is converted to the other standard units.

**Tone Generator** – Generate tones of different frequencies on this app.

**Touch Physics** – players draw shapes with a finger to move an object to a desired location at increasingly difficult levels from Primary to Desktop to Rainbow steps and Unstable ground; players learn about angles, mass and movement of objects.

**WeDo 2.0** – The second generation WeDo kits have building instructions and programming available for iPads.

**Weight and Mass** – users can compare weight and mass on Earth, the Moon, and other planets, examine the effect of altitude on weight and mass, and explore the effect of depth below the Earth’s surface on weight.