Integrating Digital Resources in Science Class

1. *Skype in the Classroom (http://education.skype.com/)*

Skype in the classroom is a free community to help teachers everywhere use Skype to help their students learn. It's a place for teachers to connect with each other, find partner classes and share inspiration. This is a global initiative that was created in response to the growing number of teachers using Skype in their classrooms.

Meet new people, discover new cultures and connect with classes from around the world, all without leaving the classroom.

Collaborate on projects

Projects are a way for teachers to find partner classes, partner teachers or guest speakers for a specific learning activity. You can create your own project or find one where your help is needed.

Connect with other teachers

Use the directory to find like-minded teachers all over the world. You can search by keyword or explore the directory by ages taught, a teacher's location, or subjects of interest.

Discover new teaching inspiration

The resource section of Skype in the classroom is stacked with videos, links and tips. Add resources of your own or favourite the ones you like best to create a huge, shareable library of teaching ideas.

2. *Lab Simulations / Animations*

There are many advantages to using online simulations. They can provide access to equipment not available in most classrooms, and can mimic the behavior of objects or situations which may be too dangerous, too large, or too small to be studied in the lab. In addition, students are often highly motivated by computer simulations, increasing the desire to learn and the capability for retention. A comprehensive list of animations / websites to support Alberta Science Grades 1-12 can be found at:
http://janediner.blogspot.com/p/technology-integration.html

Division 1 Science Websites:
https://docs.google.com/document/d/1VVdvWCdxURRuc5T3mRmOdV_weQTVZvolGhNNcgFbUFU/edit?hl=en_US

Division 2 Science Websites:
https://docs.google.com/document/d/19zzI1juXSOPQW_2K333UHcno8lvqBodEB3jZkAqZhZM/edit?hl=en_US
Division 3 Science Websites:
https://docs.google.com/document/d/1Y8UkYRLMNuk8Y7GRQvJ0oS1Ym804TjIo43iqItW-_YW8/edit?hl=en_US
Division 4 Science Websites:
https://docs.google.com/document/d/1_nk9lMjobUbmTM48XEERpNCwJT5yQF_r8VQxT4AvdWU/edit?hl=en_US

3. *Science Apps*

So your school has purchased a class set of iPads and you want to be able to use them in a meaningful way. And, finally, the school administration has lifted the ban on personal devices and cell phones are allowed in the classroom under the supervision of teachers. What do you do?

Panic? No.

First, begin considering how smart phones and iPads/tablets can complement what you do in the classroom. Students are engaged by the technology and, if well managed, the devices will become an incredible learning tool. You need to demystify the cell phone. If you are planning to use cell phones in class, ask the students to place their cell phones on the corner of their desks in full view. This is where the phone stays unless it is being used for educational purposes.

Second, consider your teaching style and what is it that you want to achieve. Does your teaching style primarily make use of lecture or do you focus on collaborative activities or are you somewhere in the middle? Your teaching style will determine what types of apps you will choose to use. The three types of apps are generally "productivity apps", "interactive apps", and "reference apps."

Productivity apps allow students to create. Interactive apps require students to work with the app to receive feedback. Reference apps provide information but don't require the students to interact or input anything.

If your style is more lecture focused, then you will probably use reference apps periodically where as if you use collaborative activities you may find the productive and interactive apps more appealing. It really depends on your style.

Third, limit yourself to two to three apps per course. Don't underestimate the learning curve of the app; always allow the students to play with the app for homework before working with it in class. Ensure the app is used for meaningful learning not just playing with technology.

Fourth, after you try the app out as a learning activity, be sure to assess its use. Ask the students if the app provided a beneficial learning experience.

So, pick an app, test drive it and determine if it can provide a meaningful learning experience. Here are some mostly free subject specific apps from iTunes:

General apps:

App Store: http://itunes.apple.com/ca/genre/ios-education/id6017?mt=8
Education apps review: http://www.iear.org/
Science apps at a glance: http://scienceappcentral.com/
Mobile Science:
http://homepage.mac.com/swain/Macinchem/iPhone/mobile_apps.html
Application of apps: http://www.apptivities.org/?p=199

Biology:

3D Cell: Learn about the cell and all its structures using our new 3D Cell iPhone application tool. Enjoy the ability to rotate the cell 360 degrees and zoom in on any cell structure. Visit the cell structure screen and learn more about how each structure functions. In this application you can also watch videos from our live cell video library as well. (Reference)

iCell: Compares animal, plant and bacteria cell. (Reference)

Genetic Code: Genetic Code is a handy reference tool for students and researches. The application visualizes standard genetic code as well as provides information about 20 amino acids and their abbreviations. (Reference)

Instant Heart Rate: Determines heart rate (Interactive)

Mitosis: Cell division (Interactive and Reference)

Virtual Cell Animations: The Virtual Cell Animations app includes an animation, still images, narrative, and content quiz. Version 1.0 contains the Photosynthesis and Electron Transport modules.

Frog Dissection: NOT FREE, $3.99 for iPad (interactive)

Lab Timer: LabTimer is a count-up and alarming count-down multi-timer. (interactive)

Skeptical Science: Ever heard someone claim Global Warming isn't happening? Did their explanation seem wrong but you didn't know why? Be careful with this one as you need to consider both sides of the discussion. (reference)

Earth Observer: ($0.99) Explore your planet as never before with the mobility of Earth Observer. Use your fingertips to travel through terrestrial landscapes and across the ocean floor. Visit frozen icecaps, study geological maps, scout mountains to climb and trips on coastal waters and exploit a rich atlas of other earth and environmental

imagery. (reference)

3D Brain: Use your touch screen to rotate and zoom around 29 interactive structures. Discover how each brain region functions, what happens when it is injured, and how it is involved in mental illness. Each detailed structure comes with information on functions, disorders, brain damage, case studies, and links to modern research. (interactive, reference)

Project Noah: Project Noah is the best way to share your wildlife encounters and help document our planet's biodiversity (interactive, reference, productivity)

My Food - Nutrition Facts: MyFood provides complete nutrition data for hundreds of foods and also includes common servings sizes for each food. (reference)

Chemistry:

The Chemical Touch Lite: periodic table (reference)

Organic Chemistry Nomenclature: The Organic Chemistry Nomenclature Quizillator has been designed to help you master organic chemistry by practicing the identification, naming and recognition of organic molecules and their functional groups according to the IUPAC guidelines. (reference and interactive)

Lewis Dots: Lewis Dots allows the generation and manipulation of chemical structures depicted as their Lewis dot diagrams. Start by adding individual atoms to the canvas and adding them together, matching their lone electrons to others' lone electrons. Dragging and dropping electrons to match them, bonds will be automatically created. (interactive)

Video Science: A growing library of over 80 hands-on Science lessons that are great for home and the classroom. These short videos demonstrate inexpensive and easy to recreate experiments that are designed to inspire and excite kids of all ages. (reference)

Elements Test: The Elements Test helps you to learn each chemical element's name and symbol as in the Periodic Table of Elements. (interactive)

OChem: O-Chem was made for you so you can spend your time studying organic chemistry instead of making flashcards. Makes learning functional groups easy. Plain, simple, and FREE! (interactive)

Chem Lab: NOT FREE! $0.99. Chem Lab offers high school students a chance to build simple chemical compounds in an approachable game-like environment. (interactive)

Chemistry Formula Practice Lite: Chemistry Formulas Practice stimulates students' mastery of the fundamental skill of naming compounds and writing formulas. The practice categories include ionic and molecular compounds, acids, bases, polyatomic ions, hydrocarbons, and organic functional groups. Students may choose their pace as they work from formula to name or name to formula. (interactive)

Titration Simulator: ($0.99): Beginning chemistry students can use this app to get a feel for conducting an acid-base titration and solving for unknown concentration. (interactive)

iCelcius: Not an app but a sensor that attaches to the iPhone or iPad. (interactive)

Physics:

Physics Pro: Tired of struggling with Physics? Let "Physics Pro" ease your pain. This application covers six topics. (interactive, reference)

iPhysics ($0.99) Find and prioritize formulas in groups. (reference)

Physics Formulas for High School ($0.99) Physics Formulas for High School puts at your fingertips all the constants and formulas you need to know to ace High School Physics, SAT Physics subject test and AP Physics B and C. (reference)

iProfessor!-Physics ($1.99) A quick reference guide for physics students that include physics concepts with definitions of common terms, formulas and illustrations. (reference)

Physics I ($0.99) This app consists of about 20 simple physics calculators covering many concepts from high school physics. (interactive)

Phy-phys. formulas and calculator ($1.99) Phy is the perfect companion for physics students. The more than 120 formulas cover the topics mechanics, relativity, fluid mechanics, thermodynamics and electrodynamics. Phy also consists of a scientific calculator. (reference)

Physics Quiz ($1.99) This application will help you revise for your final Physics exams. It is based on the A-levels curriculum, but can also be helpful for those studying for other equivalent exams. (reference, interactive)

Newton's Laws ($0.99) Study and understand Newton's Laws of Motion right on your favorite mobile device. (interactive)

Physics Formulas ($0.99) This application can provide every possible formula for anyone who studies Physics. It can be used to build your own formulas reference in Physics. (interactive)

Physics Bites!-Lenses ($0.99) The purpose of Physics Bites! is to give the user a chance to better understand certain concepts in physics by playing with tiny simulations (or "Bites"). Each Bite allows the user to change several parameters but is designed to be simple enough to not overwhelm the user with controls...

Laws of Physics ($0.99) Learning physics has never been so much fun. "Laws of Physics" app satisfies all the needs of physics. Gone are the days when you have to browse through big fat physics books to search for Newton's formula or Snell's law. (interactive)

Wind Tunnel ($1.99) Turn your iPad/iPhone into a wind tunnel simulator!(interactive)

WolframAlpha ($1.99): Wolfram|Alpha has rapidly become the world's definitive source for instant expert knowledge and computation. (Interactive)

Vernier Video Physics ($2.99) *2012 CODiE Awards Finalist - Best Educational Use of a Mobile Device* Video Physics brings physics video analysis to iPhone, iPod touch and iPad. Take a video of an object in motion, mark its position frame by frame, and set up the scale using a known distance. Video Physics then draws trajectory, position, and velocity graphs for the object. Share video, graphs and data to facebook, your Photo Library and to your computer running Vernier's Logger Pro software. (interactive)

Tinkerbox: TinkerBox is a fun, free-to-play physics puzzle game. While it is full of interesting science facts and teaches basic engineering concepts, TinkerBox is more than just educational! (interactive)

Particle Zoo: Would you like to get to know the particles that make up our universe a little better? Then carry this convenient list of subatomic particles in your pocket! (reference)

4. *QR Codes in the Classroom*

QR codes, short for Quick Response, are a type of two-dimensional bar code, readable by dedicated QR bar code readers and camera phones. For example:

QR codes could be used in Science: https://docs.google.com/a/share.epsb.ca/document/d/1DZFUKX2oUbz1GZMMDwMSGWJsRvlw5-_kQVDU1EIkb0A/edit

- on worksheets to: lead to interactive websites with more practice, display a website with examples or explanations, or even to provide an answer key.
- during a field study so that students can access dichotomous keys or photographs of organisms.
- during a scavenger hunt
- to provide a video of a chemical reaction that may not be appropriate or safe
- in the school newspaper to link to related videos and other media.
- in physical locations around a school to provide visitors with further information:
- near the front door to display contact information and hours of operation.
    - outside classroom and office doors to display business cards or a department website.
- on a calendar bulletin board that links to videos of science labs for students who have been absent.
- on cards in library books to: play book review podcasts by students; access book discussions; view the author's website; display Amazon book reviews.
- on posters in the hallways that display maps with directions to an event, further details, a survey or poll.
- on objects in a Foreign Language classroom to play an audio file that prononces its name in the language of study.
- on the bones of a skeleton model to display the name and details about specific bones
- Vcard: For starters, you might consider updating your business cards to include a QR code, which would upload your contact information directly into another person's contact list. Hand your cards out to parents at back to school night and show them how to add you to their address book if they have a mobile device.
- Interactive Back to School Night: Post QR codes throughout the classroom, with titles about various student work. QR codes could access student videos, projects, blogs, and many other ideas only teachers can envision. Hand out devices (iPod Touches, for instance) to parents who don't have a mobile device and show them how to read the QR code and access the materials.
- Resource links on class handouts: Include QR codes that link to online resources, your contact information, articles, YouTube channel/playlists, your email, phone, SMS,

Facebook link, Twitter, and any other resources students will need to access. Remember to include the URLs and text-based information as well, for those students who might not have a mobile device.

- Mobile Assignment Reminders: As your students leave the classroom, post a QR code on the door, with the title "Assignments for this Week." Students could quickly scan the QR code and have that information instantly visible on their mobile devices. They won't lose this as easily as a piece of paper.
- Self-Assessment: Create flashcards with the QR codes on the back, which would provide the answers. You could get very creative with this and incorporate links to websites that would provide additional information about the questions.
- Guided Tours: Students could create a guided tour of their school, a historical site, museum, or public building–researching the site, creating mobile webpages, videos, audio files, or any other type of appropriate media to provide more information–creating and posting the QR codes to the various locations.
- Mobile Class Newsletters: Include a QR code along with the printed URL that would direct parents to a mobile version of your class newsletter. Make sure you include directions on what the QR code is and how it can be read by a mobile phone.
- School News: Have students create weekly videos on school activities, publishing them to their school Intranet or other private location, then post QR codes that link to these updates with the notice "What's Happening in School This Week!"
- Code Quest: Create a cooperative learning "Code Quest" by posting QR codes at various locations. Each QR code will ask a question that will require the retrieval of an object. Once the object is found, another QR code will send students to another location, to locate yet another object. This Code Quest involves teamwork, cooperation, thinking, and moving around!
- Instant Surveys or Quizzes: Create a survey or quiz using a Google Docs Form and create a QR code link to that form. Students, parents, whoever, can easily access and complete the survey or quiz on the mobile device.

These sites create QR codes:

Kaywa QR code generator: http://qrcode.kaywa.com/
QR stuff: http://www.qrstuff.com/
Zxing QR generator: http://zxing.appspot.com/generator/
Goqr me: http://goqr.me/
QR code creator through Google Extension

You also need a QR reader for your smart phone. This site offers a suggestion of readers to download: http://www.mobile-barcodes.com/qr-code-software/

QR Codes Example in Science Class:
https://docs.google.com/a/share.epsb.ca/document/d/1MOFNrOx60AmKJLAAEUyFbGXmf8F-tzmWplPOBduGExU/edit

5. *Classroom Blogs*

This can be a powerful form of communication. You can blog with your class, between classes or with your colleagues as a form of collaboration. Create your own blog:

- Blogger: http://www.blogger.com/
- Wordpress: http://wordpress.org/
- Edublogger: http://edublogs.org/

Creating a classroom blog:
http://outreach.mcb.harvard.edu/teachers/Summer07/KeithHartan/Classroom_blog.pdf
The Edublogger – steps to making a classroom blog:
http://theedublogger.com/2010/01/05/week-1-create-a-class-blog/
Science Blog: http://scienceblog.com/
Discovering Biology in a Digital World: http://scienceblogs.com/digitalbio/
Extreme Biology: http://missbakersbiologyclass.com/blog/
Dr. T Chemistry Blog: http://drtchemistry.wordpress.com/
Teaching Chemistry: http://blog.msbethea.com/?p=52
Dot Physics: http://www.wired.com/wiredscience/dotphysics

6. *Wolfram Computational Website*

What is Wolfram Alpha? It is a supercomputing brain. It provides calculates and

provides comprehensive answers to most any science or math question. Unlike other search sources, you and your students can ask questions in plain language or various forms of abbreviated notation.

Contrary to popular belief, Wolfram Alpha is not a search engine. Unlike popular search engines, which simply retrieve documents based on keyword searches, Wolfram computes answers based on known models of human knowledge. It provides answers which are complete with data and algorithms, representing real-world knowledge.

Goofram: Search Google and Wolfram Alpha at the same time!

7. *Flipping the Classroom / Screencasts*

Traditional high school classrooms are places where teachers may lecture for 75-85% of each class. Teachers introduce 'the basics', give examples, and have students take notes while they speak. If students are lucky enough to have a teacher who uses some kind of media, they may get to view one or two videos, simulations, or diagrams during the lesson. By the time 'the basics' have been taught, there is little time for students to delve deeper into challenging questions. And despite a few minutes of multimedia, the classroom is still an overwhelmingly teacher-centered place of learning.

Jonathan Bergmann and Aaron Sams are award-winning teachers in Colorado who use the term, Mastery Learning to describe how they have 'flipped' their classrooms inside out. Instead of lecturing in class, they have created hundreds of vodcast videos which their students view for homework. When the students are at school, they do hands-on, interactive, problem solving, and active learning. For a brief intro to this concept, check out Jonathan and Aaron's short video titled, The Flipped Classroom, by Learning4Mastery.

Screenr: http://www.screenr.com/

Screencast-o-matic: http://www.screencast-o-matic.com/

Camtasia: http://www.techsmith.com/camtasia.html

8. *Website Literacy*

Teach students how to evaluate websites and become critically literate. The Media Awareness Network provides resources to support this:

http://www.media-awareness.ca/english/index.cfm

9. *RSS Feeds* 

Instant subscriptions that come to you every day! RSS (Rich Site Summary) is a format for delivering regularly changing web content. Many news-related sites, blogs and other online publishers syndicate their content as an RSS Feed to whoever wants it. You need a RSS Feed Reader to read the RSS feeds. Recommended feeds are:

- http://www.freetech4teachers.com/
- http://www.newscientist.com/
- http://blogs.discovermagazine.com/notrocketscience
- http://www.sciencedaily.com/news/
- http://www.badscience.net/