MOBILE SCENARIOS
FOR K-12
About

This technology taxonomy contains over 30 scenarios that show teachers a range of use of mobile devices in the classroom. The scenarios cover all grade levels and subject areas including language arts, mathematics, social studies, science, and the arts. This taxonomy will also be released as app for both Android* and iOS* devices.

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A Plate of Tectonics

Ms. Placer, a middle grades science teacher, and Mr. Orley, a middle grades social studies teacher, are working together to plan a lesson to help students understand the causes and effects of the 2004 tsunami in Indonesia, the 2008 earthquake in China, and the 2010 earthquake in Haiti. The essential/unit question from the perspective of the science teacher is, 'What do earthquakes tell us about what is happening inside the earth and on the surface?' The social studies teacher wants students to consider: ‘How do culture, politics, and geography affect peoples lives?’

The teachers stimulate students interest by showing them video from a film called ‘The Violent Earth,’ containing striking images of the Indonesian Tsunami and other earthquakes, hurricanes, and volcanoes.

Before class begins, Ms. Placer installs the free Android apps ‘3D Earthquakes’ and Google Earth on the classroom tablets. In science class, Ms. Placer brainstorms with students asking them what happens during earthquakes or the locations of earthquakes they have heard about. The students use Google Earth to locate the sites of the earthquakes on their tablets. The voice search feature is very helpful, as more of the students can say ‘Port-au-Prince, Haiti’ than can spell it. She asks them if they see any patterns in the location of these earthquakes. Ms. Placer then asks the students to turn to the 3D Earthquake app. They begin by looking at the most powerful earthquakes in the last century. Then, as they decrease the required strength of the earthquakes in the apps search function, they begin to see lines forming. For example, earthquakes encircle the entire Pacific Ocean! The students are quick to point out the lines but have few ideas about what they mean. After discussing volcanoes, Ms. Placer asks half of the students to use the Google Earth app to locate as many volcanoes as possible and the other half to locate mountain ranges on every continent. Once again the voice search feature is a tremendous help. As they find these features, students mark them on a shared map of the world using Google Earth’s collaborative mapping tools. Each student can annotate the same map from their own tablet marking each volcano with a pin and each mountain range with a line. When they are finished they compare their map of volcanoes and mountain ranges with that of the world’s earthquakes in 3D EarthQuake and notice the similarities in the locations. Ms. Placer uses this discovery as an opportunity to explore the theory of plate tectonics. On the classroom site in Edmodo, she has created an index to animations and videos explaining the history of plate tectonics and the
mechanisms of the three primary boundary types. She has organized the list so that students of varying reading and comprehension skill can easily identify resources at their level. In addition, she creates a quiz for the students to take to on the Edmodo app to become ‘Plate Certified’ meaning that they are ready to continue on with the unit. For those students who don't pass the quiz on the first attempt, she provides a list of links to resources indexed by quiz question number so that they can quickly fill in the gaps.

In social studies class, Mr. Orley wants students to understand the effects that geography has on people's lives. Groups of students choose Haiti, China, or Indonesia and use their laptops to do Internet research on the climate, the culture, and the economies of the regions affected by the earthquakes. As a comparison, one group also researches the effects of the 1989 Loma Prieta earthquake. They document what happened to the region as a result of the earthquake and the efforts to help those affected. Each group prepares a presentation on their region using Prezi, a presentation tool. Their presentations include maps, photos, videos of the devastation, and statistics. The students compare each of the disasters in an effort to understand how they were different and how economic conditions and politics played a role in the effects of the disaster and recovery afterward.

As a summative assessment, students choose an area in China, Haiti, or Indonesia that was affected by an earthquake. Based on their understanding of the climate, culture, geography, economy, and politics of this reason and their knowledge of earthquakes, they will work together to plan a new dwelling for a family who lost their home. They will determine the materials and construction methods that should be used and the best location for the new home. They will develop an illustrated, high quality presentation using Prezi that describes the home and its location and provides sound logic for the choices that they have made.

The teachers have developed a rubric to assesses students on their understanding of plate tectonics, the location and nature of the damage caused by the earthquakes, the geography of the region and the culture of the people living there. In order to get authentic feedback on their work, student presentations will be reviewed by the staff of NGOs working in the areas affected by these earthquakes or individuals who are natives of these countries. Students will be given a copy of the rubric prior to beginning work on the project so that they will understand how they will be assessed.
Resources

- 3D Earthquake
- Google Earth app for Android
- Edmodo Mobile

Tools

- The Violent Earth
- Middle grades resources on plate tectonics
- How earthquakes work
- Culture of Haiti
- Background information Port au Prince, Haiti
- Culture of Indonesia
- Background information Banda Aceh, Indonesia
- Culture of Sichuan Province, China
Are We Addicted?

Mrs. S is a language arts teacher who, for the first time, will be teaching her nations new writing curriculum. A key element of the curriculum is technical literacy; the ability to read and write technical documents. One of the standards, for example, is ‘The student will be able to integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.’ At lunch in the teacher's room, she chats with Mr. T, a social studies teacher. Mr. T tells Mrs. S about an interesting discussion that they had in class about the perception that kids today are addicted to technology. The students in the class were in different camps as to the response. Some felt strongly that kids were, in fact, spending far too much time in front of screens of one sort or another. Others believed that this was overstating the situation and the habits of just a few addicted kids were being projected on a majority that was not so. Mrs. S decides to create a unit titled, ‘Are We Technology Addicted?’

A plan was formulated to structure the unit around original student research. The students formed interest groups around areas of technology they wished to investigate. One group's question was, ‘Do we spend too much time playing games?’

Another group wanted to know, ‘Is texting getting in the way of face to face communication?’

A third group asked, ‘Are violent video games leading to more tolerance for violence?’

One of the concerns that Mrs. S has coming into the project is with the collaborative skills of the students when working with technology. It seems that one or two students sort of took over the group to the exclusion of others. She had read in an article on teaming skills about something called ‘positive interdependence,’ a method for designing tasks so that part of the grade for each student depended upon the others. While her final project would be a Web report designed in GlogsterEDU, each student would also have to do an individual report. The final grade for the project would be a combination of the grade on their individual report, the grade on the overall group Glogster and the mean of the grades each of the team members received on their individual reports.

When each group had refined their research question, they turned to the online
tool FluidSurveys to build their first draft of the survey. After entering the survey on a laptop, teams conducted “talk-alouds.” They invited several students from their target grade levels to take the draft surveys and, as they respond to each question, they speak their thoughts so that the team can identify questions that are difficult to respond to or are misinterpreted by the respondents. The team members take notes on laptops in a Google Doc that will be used later to refine the survey.

After the refinement process, the students email teachers of the target grade levels with a Web address and a QR code (a custom bar code readable by most tablets and smartphones) to guide students to the survey. Using email reminders, they encourage their participants to complete the survey until they have a participation rate greater than 80%. In addition, team members fanned out across the campus during lunch and passing periods to interview students using their smartphones and tablets to gather quotes for the final report.

When finished, the students move the data from FluidSurvey to their laptops and, using a Google Docs spreadsheet, began to graph the data. Some of the findings were quite surprising. The team investigating violent video games, for example, was surprised at how few students actually played those games. The team investigating the use of social media sites discovered that students in their school actually preferred texting and emailing to Facebook posting by a wide margin.

Using their newly-honed technical writing skills, each of the individual team members, working in a word processor on their laptops, prepared a report summarizing these findings. This individual report would be used as part of the students final grade. In addition, the teams combined the findings of their reports into a visual report in GlogsterEDU. This report included graphs, text, audio and video from student interviews, and even screenshots illustrating the technologies included in the study. Team members worked together to review the individual findings and create a summary set of findings in the Glogster product. Mrs. S. is surprised at the creativity of many of the finished ‘Glogs,’ where students had illustrated the findings with illustrations, audio quotes and in some cases animations created with Web tools such as Go!Animate. More importantly, the quality of the student writing was excellent, with all students actively assisting their classmates. It would be tough to go back to her old style of teaching both for Mrs. S and for her students!
Resources

- GlogsterEDU for interactive posters
- Go!Animate for creating animation media
- GoogleDocs Spreadsheet for data collection
- FluidSurveys for survey creation
Art Detectives

Mr. Torres is a secondary social studies teacher in a fairly remote school district. His school has been slow to adopt technologies, and broadband Internet access has only become available in the last two years.

This year, Mr. Torres has both tablet computers and laptop carts available. He is determined to use them to solve a problem that he has had in his World History class, since the adoption of the districts' new curriculum three years ago: the role of art in history and culture. This standard requires that Mr. Torres teach the students what art can tell historians about the beliefs, mores, and social characteristics of a culture, and the value that artifacts can bring to understanding cultures in the absence of written language.

Mr. Torres has always considered himself more of an academic than an artistic type, so this unit has been difficult to teach. But he recently read an interesting article in one of his professional journals about ‘The Art Historian as Detective.’ That has given him an idea. He begins to implement that idea by creating five team sites as ‘virtual rooms’ in Google Groups. For each of these sites, he gathers a set of images depicting artifacts for a lesser-known ancient culture. There are literally hundreds of universities and museums around the globe offering thousands of images from ancient cultures, many of which present the art of those cultures.

At the Metropolitan Museum of Art, for example, he finds multiple examples of the artwork of an ancient South American culture, Valdivia. He supplements these images with artifacts depicted at Universidad de Especialidades Esp'ritu Santo (UEES) in Ecuador. At Fordham University, Mr. Torres finds links to a collection of artifacts from the Kassites, an ancient Mesopotamian culture. He is amazed at the resources available to populate his team sites and is careful to ensure that he either links to the images appropriately or obtains permission for their use.

One of the concerns that Mr. Torres has, as he envisions the project, is solved by the arrival of the tablet computers. Simply looking at a picture on a laptop seemed a poor substitute for actually handling and examining an art object. Using one of the tablets, though, Mr. Torres is amazed at how scrolling, pinching, and zooming result in an experience much more like handling a real artifact. These tools allow students to investigate a small image up close, giving that same sense of discovery that was often achieved with a sharp eye and a magnifying glass by archeologists.
Working in Google Groups, once the virtual rooms are prepared, Mr. Torres assigns a group of students to each room. The students can access these rooms from laptops or from tablets and phones using Google Docs Mobile. In each room is the stated challenge:

‘You are a professional archeologist, part of a crack team often called in by governments to investigate mysterious artifacts discovered in their nation. Your field team has just returned a set of artifacts, mostly works of ancient art, which they cannot identify. Your mission is to learn as much about the culture as possible simply by examining the art and ‘reading’ the characteristics of that culture from the characters and activities depicted in the images. Use the work areas provided in your group space to organize your artifacts and notes by: societal structure, livelihoods, food, sports/entertainment, and myths/beliefs. Your final project will be a Prezi presentation that will report your conjectures as to the characteristics of your society in each of these areas, along with the evidence upon which those conjectures are based.’

Mr. Torres recommends to the students that they begin their exploration on the classroom tablets. At the outset of the activity, many seem less than interested. But as they begin to make insights into the images, the excitement builds.

‘Zoom in on that black thing behind the guy in a dress,’ shouts one student, ‘I think that thing is a plow! That would mean farming!’

‘They must have had domesticated animals,’ says another. ‘There is a bull standing behind him and it has some kind of rope or chain on its back.’

Soon all of the groups are buzzing with analytical discoveries.

Students turn to the laptops to complete their presentations. The Prezi presentations are beyond what Mr. Torres expected. The students seem so serious about their findings and they use the special effects in Prezi to surprise the class as they had been surprised when they made the finding.

After all the presentations are completed, Mr. Torres provides each group with the name of their culture and invites them to research the accuracy of their reading of the artifacts on the classroom tablets. He has never seen the class so engrossed in what would normally have been considered ‘boring Internet research.’
The grade for each student consists of a personal essay each has been asked to write describing the culture; a group score for the quality of the presentation, using a multimedia presentation rubric that Mr. Torres actually adapted from an MBA program Website; and a score for the accuracy of their characterization of the society based on a rubric with scores for each of the characteristics defined in the group space. Mr. Torres smiles when he overhears one of the students proclaim that he wants to be an archeologist in the future.

Resources

- Online collections of information and artifacts from ancient cultures such as those at Fordham University
- Artifacts from Universidad de Especialidades Esp’ritu Santo (UEES) in Ecuador
- Google Groups

Tools

- Google Docs Mobile (App for reviewing contributions and resources in the group space)
Art with Style

Mr. J wanted to introduce his intermediate grade students to the myriad of artistic styles and genres in a way that would actively engage them and leverage a new set of tools that he found on the Web site of the National Gallery of Art. These tools allow students to create their own works of art in the style of many modern artists and experience the pleasure of communicating their own life experiences in the language of the Masters. Working with the language arts teacher, he co-created a writing activity on ‘My Most Powerful Lesson,’ where students were asked to think back on an experience that they believed had taught them an important life lesson. The language arts teacher selected several stories for the students to read to illustrate the power these lessons can bring to your life. At the same time, in art class, Mr. Jaskoski introduced the students to examples of the work of several artists, most notably the Chicago artist Ivan Albright, whose work communicates a rich message in very powerful images.

In one featured painting, ‘That Which I Should Have Done I Did Not Do,’ for example, a door with a funeral wreath symbolizes the regret that all people experience for missed opportunities in life. Mr Jaskoski intentionally selected artists whose works reflected a variety of styles.

In language arts class, using laptops, the students wrote an original story about a life lesson that they had learned that they felt was accompanied by deep emotions. The emotion might be fear, pain or humor. These stories were peer edited and served as the basis for their art project.

Back in art class, the students were introduced to a variety of online tools for creating stylistic art beginning with the National Gallery tools but including a host of others. They were asked to select an artist whose style they believed was a good match for their message and identified a tool that would help them approximate the style of that artist. The work was done on tablets, whose combination of computer power and tactile control seemed perfect for implementing the tools. Even students who did not think of themselves as being artistic loved to pinch, swipe and tap their way to electronic art that they felt expressed the emotion that was the theme of the essay. The ability to use their finger as a drawing device gave them maximum control and reminded many of the students of the finger painting they enjoyed in their youth!

Once the art had been created, each student returned to their laptop and added
the art to their essay creating a page of a class eBook. Using the free authoring program TreePad on one of the laptops, the students each added their page to an eBook that they were able to publish to their tablets to share with parents and friends.

Each student’s work was self and teacher assessed using a rubric that featured three sections. The first was the district rubric for a personal narrative; the style used for the life experience essay. The second section assessed the student’s effectiveness in learning and using the technology art tool. Finally, the last section looked at the expressive qualities of the finished art. The rubrics were designed as .pdf forms, allowing the students to complete them on their tablets, and then upload them to a teacher folder in the classroom management system.

**Resources**

- Artist retrospective sites, e.g, the Ivan Albright Exhibit at the Art
- Art tools such as The Art Zone from the National Gallery of Art
- A Classroom Management System for organizing instructional and assessment resources such as Edmodo

**Tools**

- Skitch
- Paintjoy Pro
- eBook authoring program: TreePad
- eBook publishing program: Calibre
Blog + Survey=Homework Completed

Ms. Garcia is an algebra teacher. First year algebra is required for all students and she has many students who are struggling to understand and some that do not even try. She knows that many students do not read their assignments or listen during class discussions. Now that the students have smartphones, she has some ideas for how to keep them engaged and help them to reach the learning goals for the class.

Every night students complete a homework assignment of algebra problems. Once they have finished, they use their smartphones to connect to the class blog that Ms. Garcia has set up using Wordpress. The blog contains open-ended questions about the homework assignment. For example, Ms. Garcia might ask them to discuss the common principle behind some of the problems. Using Voice Actions or their home computers to draft their entries, students post answers to these questions using the blog's semi-private comment feature. Students can't see each other's responses, but Ms. Garcia can read all of them.

Using her laptop and an overhead projector, Ms. Garcia reviews the students' answers and is able to assess each students' understanding of the principles behind the homework. Since she began asking students to answer these questions, she finds that more of them do their homework assignments. She grades the students' answers on effort, because she is more interested in knowing how much each student knows, and what it is she needs to teach the next day, than in giving a grade.

Ms. Garcia chooses one of the blog questions and anonymously includes three or four representative answers submitted the previous night by her students. She creates a multiple choice question using the Poll Everywhere tool which can be accessed through any device, and asks the students to indicate which of the answers they believe is the best. The survey software displays the results as a bar graph and students are able to see how many of their classmates choose each answer.

Ms. Garcia then leads a discussion by asking one or more students to explain why they think each of the answers is the best. She encourages students to challenge each others' opinions. Then the class votes again using Poll Everywhere to see how many students have changed their minds. Ms. Garcia can gauge how well her students understand the concepts. When she feels that most of the
students understand, she moves on to another question from the blog.

Throughout the class, students use laptops to post questions using Google Moderator. All the students and Ms. Garcia can see these questions. Ms. Garcia chooses a question and discusses it with the whole class. Students can vote for a particular question of their peers on Google Moderator, to have Ms. Garcia pick that question if they also need an answer, or they can answer peers' questions if they have the answer.

Ms. Garcia has learned that when she counts the student contributions throughout the learning process as part of students' grades, there is a dramatic improvement in attendance and students make genuine attempts to stay engaged throughout the class. They are more likely to participate in class discussions and more students are able to successfully complete the class.

Resources

- Wordpress
- Poll Everywhere
- Google Moderator
Calculating the Area of Rectangles

Ms. Bradbury’s third grade class has been learning multiplication facts and how to use them to solve problems. Today they are learning how to calculate area by working on finding the size of a two-dimensional flat surface. Ms. Bradbury begins with a hands-on activity that is easy for them to visualize and remember. She gives each student diagrams of squares or rectangles and a bag of square crackers. They fill each square or rectangle with the crackers and count the number of crackers they use to come up with a measurement. They label the size of each shape as the number of square crackers.

Next Ms. Bradbury uses her laptop and a projector to show the students how to do a similar activity on the computer. Using Cacoo, a collaborative diagramming tool, she draws a large rectangle on the screen and drags enough squares on top of the rectangle to fill it. There are 2 rows of 3 squares. The students then count the squares and label the area of this as 6 square Cacoos, an invented unit of measurement.

Ms. Bradbury then uses the group function to connect the 3 squares in a row so that they can be moved as a unit. The class discusses that the rows are equal and that 2 rows of 3 squares equals 6. Next, she shows them several ways to write this as a formula: $3 + 3 = 6$ or $3 \times 2 = 6$. She shows them that if they know the number of squares in a row and the number of rows, they can calculate the area without filling in all the squares. Finally, she has the students work in pairs using Cacoo and a laptop. One student draws a rectangle on the screen and the other drags squares into the rectangle. Together, the students count, add, or multiply to calculate the area.

Ms. Bradbury understands that the physical arrangement of the classroom needs to support this type of interaction. Before she begins this activity she helps the students arrange their desks so that each pair of students can easily see and access the laptop.

Ms. Bradbury asks the students who are having difficulty with the concept of area to study a learning object on the Internet. The learning object is found at a site called TV411. It provides a short digital lesson with content, practice problems, and assessments. They use their tablets or smartphones for this activity.

When students understand the concept of area, but need to build fluency with
multiplication facts, Ms. Bradbury gives them time to do skill building exercises using an application such as Math Magician or IXL Math on their tablets. The exercises present students with 10 multiplication problems and give them feedback on their accuracy and the time required to solve the problems. The goal is to complete 10 problems in under a minute. Several times a week Ms. Bradbury writes a goal on the whiteboard for learning multiplication facts to 12. For example, on Monday, she may challenge the students to learn the multiplication facts for 5 and Wednesday for 7. She asks the students to show her the screen of their tablet when they have achieved 100% for that multiplication fact.

Finally, Ms. Bradbury wants to assess how well the students understand the concept of area and their multiplication facts. She uses an online assessment tool Quia Web to create a quiz. The tool allows her to create multiple choice, matching, short answer, and many other types of questions. Using their laptops, the students take the quiz. Ms. Bradbury uses the automatic grading to identify the problems a student missed and the answers they chose.

Resources

- Visualization: Cacoo
- Learning object: TV411
- Skill building: IXL Math
- Online assessment: Quia Web
Calculators and Collaboration

Ms. P, in her fifth year of teaching, struggles to meet the individual needs of her small, rural math class. A large part of her 7th grade math curriculum is reading and interpreting graphs, as well as graphing equations. Her school is too poor to be able to afford graphing calculators, a staple in more affluent schools. In addition, given her small number of students, she has difficulty matching students of similar ability to collaborate as they learn.

Last year, for the first time, students were allowed to bring smartphones to school and connect to the school network. The school also has a number of laptops. So at a summer math education conference, Ms. P meets with a Special Interest Group of rural math teachers and, with three other teachers from similar schools, plans to leverage these technology resources to improve learning for her students. In her classroom, there are only two electrical outlets and she is concerned that it will be difficult to keep all of the devices charged. In order to make sure that electricity is not an issue, Ms. P plans to set a classroom policy that you bring your devices to school charged. In addition, she will assign students each week as ‘electricity monitors.’ It will be the responsibility of these monitors to check the laptops each day and ensure that they, too, are fully charged.

During the remainder of the summer, the four teachers share responsibility for creating a set of online instructional videos and accompanying exercise sheets for their math curriculum. These resources are organized through a shared classroom management system into a ‘mastery-based’ learning system.

In this mastery-based system, teams of students work independently, with teacher monitoring and support, and learn the materials through the online instructional videos and exercises provided by the teachers. As they master knowledge and skills, they access assessments and record that mastery independently. In Ms. P’s implementation, teams are encouraged to collaborate as they learn. Students collaborate through two-way video and messaging using the app, Fring. When the time comes to work together completing the problem sets, the teams work in Google Docs on the laptops while conversing with team members on Fring. In addition, the teachers jointly create a Google Docs-based tracking tool that allows teams of students to check off the skills that they complete, while keeping teachers and themselves up to date on the progress made through the curriculum.
At the end of each unit, the students are independently assessed using the quiz tool in their classroom management system. In keeping with the goal of encouraging skills of collaboration in all students, each student's grade on a quiz is calculated based on a combination of their own score and the score of their entire team. This introduces the element of ‘shared accountability,’ which is strongly supported in research related to cooperative learning.

An additional tool Ms. P takes advantage of is a graphing calculator app. These apps have the functionality of a graphing device, but at a much lower cost. In fact, Algeo, the choice of Ms. P and her team, is free. For those students who do not have smartphones, the similarly free Graphcalc provides the same capabilities at no cost and can be used on classroom laptops.

Ms. P finds that the opportunity to collaborate with other students, combined with the immediate feedback provided by the assessment environment, significantly improves the motivation of virtually every student to succeed in what previously had been her least engaging course.

Resources
- Classroom Management System
- Google Apps for Education

Tools
- Instant messaging app Fring
- Graphing calculator app Algeo
- Graphing calculator program Graphcalc
Cell Anatomy of Animals and Plants

Mr. Tobin is preparing his seventh grade science class for life long learning by engaging them in an independent learning experience. The unit that they are studying is on the structure and function of cells. As part of their independent learning, students will be able to choose how they present their final project.

To begin, he asks the students to use their smartphones and tablets to access iCell, an application that offers 3D views inside animal, plant, and bacteria cells. The students become familiar with organelles by tapping on parts of the cell to select and zoom for more information. This introduces them to basic vocabulary and provides them with strong visual images they can keep in mind as they continue their study.

To help them to get started with their independent learning, students then use their smartphones, tablets, or laptops to access a blog that Mr. Tobin has set up for them. They each respond to the following questions in the blog:

- **What do I already know about this topic?**
- **What am I interested in learning about this topic?**
- **What is the goal for this lesson or unit?**
- **How would I explain to someone else what I am learning?**

Mr. Tobin knows that this activity with the blog, will reduce possible classroom management issues that might arise if students have difficulty getting started on independent work.

Next, using Moodle, Mr. Tobin provides the students with a number of online resources and asks them to use their laptops to research the cell anatomy of animals and plants and create an online presentation comparing them. The presentation must include pictures, models, or drawings of cells and describe the function of their parts. He tells the students that they can create any kind of presentation as long as it can be published online so that it can be shared with the rest of the class over the Internet.

Mr. Tobin provides the students with rubrics that will be used for evaluating their presentations. He also tells them that they will be taking an online assessment on the cell parts at the end of the unit and they should prepare for
Students use their laptops to access the websites that Mr. Tobin has specified. Some of these websites contain photographs, drawings, and animations; others contain text describing the function of cells. Some contain multiple-choice questions that help them build skill in remembering the names of the cell parts and how to spell them. These skill-building sites help students prepare for both their presentations and their end of unit test.

Students in the class develop a variety of very creative presentations. Some create videos and podcasts of themselves explaining the parts of the cell. Others use graphic programs to draw and then label the parts of the cell. They create wikis, web pages, PowerPoint presentations, interactive posters, and even music videos.

In addition to learning about cells, the students learn a great deal about working independently and how to communicate effectively using technology. When the projects are completed, students post them on the Internet and send the web addresses to Mr. Tobin and their classmates via email. Each student (and Mr. Tobin) then use the rubric to evaluate their own projects and those of each of their classmates.

Mr. Tobin has created an account for his class, in an online assessment site, which has tests on many science and math topics. Teachers can also create their own tests and the site keeps records and scores for all the students. Students can even take tests using their smartphones, since the tests can be displayed in a small format suitable for the screen of a phone.

To evaluate his students' learning, Mr. Tobin uses scores from the rubric evaluation of the students' presentations, as well as their scores on the online assessment.
Resources

- Skill building
- CELLS alive!
- Online assessments
- Online assessments
- Interactive posters: Glogster
- Moodle

Tools

- iCell
Classification Meets Visualization

Mr. X is a middle school life science teacher. One of the core topics that he teaches is animal and plant classification. He is excited this year by the confluence of three events.

First, his school has opened up the school network for use by students with smartphones. In his eighth grade life science class, for example, over two-thirds of the students have phones with which they can take pictures, record sound, and connect to the Internet.

The second event is the arrival of a set of ten tablets running the Android operating system in his classroom. In addition to being great tools for doing research, using educational apps and reading ePublications, these devices can be used by students without smartphones for the same media access purposes.

The third event is a refresh of the laptop carts available to his class. Mr. X feels fortunate to have these technology resources available. He is determined to find ways to use them that will improve learning and engage his students.

Mr. X has devised a semester-long project to support his life science curriculum and leverage the student interest, which he has noted, in local plants and animals in his rural community. During the course of the semester, the students will collect images of plants and animals that they encounter in their community. Using the online ‘mind-mapping’ software Mindomo, they will use these images to create an increasingly sophisticated map of the classification of these species.

Mr. X contacts a former biology professor at the local university. She agrees to put together a small reactor panel, consisting of herself and several graduate students. They will view a presentation of the work of each group of students, and provide feedback and both formative and summative evaluation data regarding the accuracy, creativity, and comprehensiveness of each team product. They will do this at several points during the semester. Mr. X believes that the students having their work viewed and commented upon by experts will raise the stakes for the students, and cause them to take special care in constructing their products.

Mr. X begins the project by forming teams and asking the students to collect images of the flora and fauna in their community. The class takes several walking field trips to local parks and reserves with phones and tablets in hand to support
this collection. As a friendly competition to locate less common species develops between the teams, Mr. X is surprised at the number of students who go into the field each weekend to collect additional images.

One of the rules of the project is that all plant images must be original. Images of animals, however, due to the difficulty of obtaining these images in the field, may be obtained using open source images as a supplement. One class session is spent discussing intellectual property law, and Mr. X invites a local attorney to join this conversation and answer student questions via Skype, a video communication tool. As the images are collected, they are stored by the teams in the online photo library environment, Snapfish, which allows for the creation of free group photo libraries that can be used collaboratively. The students find that some of the plant features can only be illustrated when the plant if magnified. Fortunately, the classroom tablet computers have a microscope attachment; just the thing for close-ups of leaf surfaces and serrations!

As the semester progresses and the students begin to learn about the Linnaean system of animal and plant classification, each team of students begins to build maps of the flora and fauna of the region using the laptops. As they add a picture to their schematic in Mindomo, they also label that picture with a list of key characteristics that they know are the basis for its classification. For example, when adding a local snake, the list includes cold-blooded, scaly, legless, etc.

The first session with the reactor panel is a huge success. The professor and her fellow panel members treat the students as fellow scientists and the impact on student motivation can be seen in the following weeks.

In the end, many of the teams find extremely creative ways to display and label their maps and the final presentations are accurate, comprehensive, and often humorous. The grade assigned to each student is a combination of their personal contributions to the library and project; the accuracy of the content of their project; with the final third of their grade is provided to the group by the reactor panel.
Resources

- Snapfish for storing and organizing images by group
- Mindomo for creating mindmaps
- Encyclopedia of Life: An open source resource for both learning about plants and animals and for obtaining free use images
- Skype for two way video communications

Tools

- Photography app native to Android phones
- Snapfish app to upload and manage photos away from the computer
Data Collection and Graphing

Ms. Meyers, a primary grades teacher, is designing a unit on data collection and graphing for her math class. As part of the standards, students are expected to understand how to formulate questions that can be addressed with data, and to gather, record, organize, and describe data. To address this standard, as well as the 21st Century Skills of visual and information literacy, collaboration, and communication, the teacher plans a unit for her 9-year-old students.

Ms. Meyers addresses these standards through a lesson that combines both hands on and virtual activities. She introduces the lesson by asking her students to pick a colored sticky-note based on the number of brothers and sisters they have, blue for none, yellow for one, pink for two, etc. She then writes the numbers 1 through 10 on the board and the students post their sticky notes in a column above the number of their siblings, which forms a bar chart. The bars of sticky-notes are a little uneven and Ms. Meyers discusses how this might make it inaccurate.

After this basic demonstration of creating a bar graph, Ms. Meyers introduces Cacoo, a tool that will generate bar graphs more easily. She asks the students to tell her their favorite colors and shows them how to make the bar chart about their favorite colors using this tool.

In order to help the students learn how to use the tool, Ms. Meyers groups the students in pairs. Each student has a laptop computer. She has used Moodle to bookmark a website for a bar chart program she previously demonstrated. She then distributes dice to each pair of students. Each time a student rolls the dice, the other student records the total number using the bar chart tool the teacher has shown them. They then use the bar chart program to create a representation of that data.

The students compare their results with those of others in the class and learn vocabulary for describing the distribution of the results. Ms. Meyers realizes that the students may need some structure for this activity to ensure each student can participate equally. Before they begin this activity, she and the class create the following rule for how the students in each pair will share the tasks of rolling the dice and recording the numbers in the bar chart tool. Rule: One student will roll the dice 5 times while the other person records the total number. Then they will switch roles.
Students then complete additional activities to generate and represent data. For example, she has the students access a virtual spinner she has bookmarked in Moodle that serves as a random number generator. When the student clicks on a button next to the spinner the arrow spins and points to a number between one and six. Again, the students use the bar chart tool to represent their data and compare their results with the rest of the class.

Ms. Meyers thinks that she would also like to engage her students in collecting data to answer real-world questions. For homework, she asks the students to collect data to answer a question about their neighborhood, such as the number of buildings on the block where they live, the number of cars parked on that block, or another question about quantities of things in their neighborhood of their choosing. They use their smartphones or tablets to email the question they investigated, and the answer, to the address designated by the teacher. The next day, Ms. Meyers collects that data and shares it with the class. The students continue to use their laptops to construct bar charts to represent that data.

Once they create these graphs, each pair copies their graph to a page of a PowerPoint template created by the teacher. Each page of the template has a box for a question and another for the graph representing responses to this question. When all the graphs have been entered into the template, the whole class practices interpreting graphs by reading the students' questions and using the graph to find the answers.

*As an alternative or additional activity to the real world sticky note activity, the students could use the flowchart function in Cacoo to create and label a sticky note bar graph.
Resources

- Interactive math lessons incorporating computers
- Free educational computer games for primary grades
- Sticky notes, dice, projection monitor

Tools

- Problem solving and data analysis: Virtual Manipulatives: Bar chart and spinner
- Visualization: Cacoo
- Daily and professional practice: Moodle, Powerpoint (both as teacher presentation tools)
Eye on the Sky

Mr. Z is a middle school science teacher who is out to solve a problem. Each year, his eighth grade physical science class takes an outdoor education trip to a camp that is located a half-day bus ride from the city. He schedules the trip so part of it occurs at night, and uses this as an opportunity to add some hands-on observation experiences to his unit on astronomy.

But despite the fact that the night sky is clear and the weather consistently perfect at the time the trip is scheduled, he has trouble engaging the students. They have a tendency to gaze rather mindlessly at the sky, and have great trouble actually seeing the planets and constellations that he points out.

Mr. Z has not been able to envision a project that they might do as a result of the experience, beyond a quiz on the constellations, which a large number of students fail. He would love to have his students share his love of, and curiosity regarding, astronomy.

This year, for the first time, students have been asked to bring smartphones or other Android devices on the trip and, for those students who don't have devices, the school set of tablets has been transported to the camp as a supplement. Mr. Z's astronomy unit is about to receive a 21st century facelift.

Prior to the outdoor education session, on the classroom Website, Mr. Z posts a list of astronomical ‘objects:’ stars, planets, galaxies, or constellations that he knows will be in the night sky during the trip. He asks the students to select three to five of these objects that they find at least mildly interesting. That interest might be due to the physical nature of the object, the size of a galaxy perhaps, or to the history or mythology that surrounds the object. In order to facilitate their exploration of the objects, Mr. Z provides links to a host of online resources from ComPADRE, the National Science Foundation, and others.

The assignment for each student is to create a ‘sales pitch’ with an accompanying electronic poster for the object that they find the most interesting. He tells the students that they can make their final choice of the subject for their poster while on the outdoor education trip, after they have met their object ‘in person!’ In addition, Mr. Z provides students with a link to the Android app, SkyMap, which he also installs on the schools tablet computers.
On the evening of the outdoor education experience, Mr. Z provides the students with a quick tutorial on the SkyMap app and then charges them with meeting their celestial objects. Using the app, students search for the constellations, planets and/or galaxies that they have selected. After entering the name of the object, the students are guided, as they scan the phone or table across the night sky, until the app centers them on the target.

For each of these objects they are asked to take a screen grab of the app as it displays the object, usually by simply pressing the power and menu button simultaneously. In addition, students are invited to try taking pictures of the object with their devices, although they are cautioned that, depending upon the quality of the camera, this may meet with mixed results. Soon the students are scanning and grabbing their way across the night sky with, as Mr. Z notes, much greater enthusiasm than they have demonstrated in the past.

Back in the classroom the students download their screen-grabs and photos to classroom laptops and, working in the online poster creation environment Glogster, create their sales pitches for the supremacy of their object in the night sky. Mr. Z is pleased when the students embellish their posters using other resources, including additional images and videos from NASA and the other resources that he supplied on the classroom Website.

Then the students record their sales pitches as sound files and add them to their Glogster posters. In the end, Mr. Z and several of the tech savvy students create a survey in the Web survey environment SurveyMonkey and invite the 7th grade students to view the posters and vote for their favorite object. Mr. Z is pleased to overhear 7th graders in the lunchroom discussing excitedly the celestial objects that they will choose when their turn comes the following year.
Resources

- Astronomy resources from ComPADRE
- Astronomy resources from the National Science Foundation
- Educational version of the multimedia ‘poster’ tool Glogster
- Online survey tool SurveyMonkey

Tools

- SkyMap
From Field Trip To Field Guides

Mr. Q really enjoys field trips but he feels the students don’t take them seriously and that they come away from these trips without learning anything of substance. His middle school science curriculum is primarily based on life sciences and ecosystems, so field trips should be a key element to student motivation and learning. This has not been his experience.

Mr. Q’s school is located within a few blocks of one of the best-preserved natural habitats in the region. There are several naturalists on staff who are knowledgeable and anxious to be of service to schools. Mr. Q had noticed on the last field trip that the students did not seem particularly interested in the informational signs that mark species and features in the park. One of the naturalists remarked, ‘I wish we had a more in-depth, kid-friendly field guide to use for these classes. One that kids could take with them or access virtually and return to when they get back to class.’

Mr Q thinks this is something his students might be able to interested in being involved in. Using what he has learned about authentic learning and the comment that the naturalist made, Mr. Q decides that the creation of an online field guide describing the park’s ecosystems, written by kids for kids, would be the culminating product for his class, and that technology would be the key to making this happen. The field guide could be printed, but would be primarily designed for visitors with a smart phone or other portable device.

Mr. Q begins by organizing his class into two committees: Abiotics and Biotics. Each member of the biotic and abiotic committees is then assigned to subcommittees for data gathering purposes: biotic subcommittees on flora, fauna, and interactions complement abiotic topics of climate, soil, and water.

Mr. Q provides the students with several examples of well-designed field guides, collected from websites for parks from around the world, and together they identify the key characteristics of the best of these guides. From those characteristics, and from the content standards in the science curriculum, Mr. Q works with the students to create a rubric for assessing the work done by the committees.

Each team will use a wiki to gather and organize the content for the field guide. The field guide content development is done through three field trips during the
course of the year. The trips are scheduled in the fall, winter, and spring to capture the status of the selected ecosystems throughout the year. Using the tablets or their own smartphones, students use the cameras on these devices to collect images. Whenever possible, HDR (High Dynamic Range), built into most tablets and smartphones, is used to sharpen images. For field notes, VoiceText is used to allow voice notes to be turned instantly into text for later transfer to a word processor, or the students are annotating notes right on their tablets. All these images and notes will be uploaded to the wiki where the students are ready to access them using their laptops in order to create the field guide pages.

Mr. Q monitors the progress of each subcommittee. He requires each member of those committees, working individually, to create a summary report to both solidify their learning, and to serve as an assessment of their readiness for the project.

Mr. Q is amazed at the difference in the field trips. The students are focused and purposeful throughout the day. The students treat the naturalist and Mr. Q as valuable co-collaborators. After each trip, several class periods are spent on the laptops, editing text and media, and drafting articles in subcommittees.

After the third and final field trip, students are given two weeks to finalize the field guide in two formats; Web and print. Some entries are done within subcommittees and some require cross-committee collaboration. Working on desktops and laptops in Google Sites, for the web guide construction, and in a word processor for the print version, the final field guide is produced published on the Web.
Resources

- Golden Gate Park
- Field Guide to Marine Invertebrates
- Franklin Institute
- KidsGeo
- PBS' Earth on Edge

Tools

- VoiceText for Android
From Readers to Reviewers

Ms. Greene is a primary grades teacher who wants to address one of the Language Arts standards for her grade level: Students will read and respond to literary text and share their responses with peers. She structures activities around one essential question: How can peer interpretations of literary text inform our reading choices?

While reading her Sunday paper, Ms. Greene realizes that the book review section is where she gets information about books in which she might be interested. She decides to create an online student review journal. This service will allow her students to post reviews of books that they have written that can be viewed, not just by Ms. Green, but by the world! Ms. Green has noticed in other projects she has done that simply knowing that their work will be seen by others outside the classroom seems to significantly improve the effort the students invest in their work and the quality of the resulting project.

Ms. Green creates the ‘Green Guide to Great Reads,’ an online review site for children's literature reviewed by children. Ms. Greene decides to build the site using the web-based version of WordPress. The Green Guide to Great Reads will be a site where any child can come in and either look up a book to see if a review is available, or browse through ratings and reviews to find a book that others seem to like. In the beginning, the review authors will be Ms. Greene's students, but the site will allow other students to complete a form and post a review. Her students will serve as the editors for the reviews of other students.

Ms. Green introduces the project to her students and is surprised at their excitement. Each student is given editor's rights to the content areas of the blog that she has created. She realizes that she needs to explicitly teach her students how to use this blog and incorporates time to do this in her lesson plan as an important classroom management strategy.

To begin the unit, each student selects a book that is a particular favorite to ensure that the journal will start off on a positive note. When the students finish reading the books, they use their laptops and a formatted book review guide, developed online as a Web form by Ms. Greene to compose their reviews.

Each student partners with another student in the class to peer edit their book reviews and send the revised versions to Ms. Greene for her feedback. They
post their completed book reviews on the online journal. Students use ‘tagging’ in the online journal to make it possible for other students to search for topics of interests. When the journal has over thirty book reviews posted, the students begin the next stage of the unit.

Each of the reviews has a comment area where other students reading the journal can add their own comments about the books. Ms. Greene reviews all the comments before they are released to the students, deleting any that are inappropriate. In the beginning there are few comments but as days pass, the journal is ‘discovered’ by students from a number of locations. In addition, Ms. Greene sends out an invitation on several of the teacher-oriented social media sites that she visits and soon the journal is buzzing.

One of the most popular features of the journal is a voice annotation tool called Chirbit. Chirbit allows comments to be given as voice comments that after being reviewed by Ms. Greene, are automatically forwarded to students on their own android tablets, phones, or on their parents phones. By simply recording a response to a voice comment and emailing it from the phone, an operation simple enough even for her primary students, the student author of the review can respond quickly and efficiently. Soon the journal is buzzing with activity. Also within days, students from around the country are submitting reviews for publication in the journal. Ms. Greene organizes her students into editorial teams to review and select the best of the reviews for inclusion in the site.

By the end of the semester, students from around the country are using the journal to find books to read. Mondays are an important day in the classroom as Mrs. Greene displays the activity charts showing the increasing use of the site and a world map with dots representing use in countries literally across the globe. The students in Ms. Greene's class demonstrate through their own research that peer interpretations of text can inform peer choices.

Resources

- Web-building site WordPress
- Voice annotation tool Chirbit
From Tourist to Tour Guides

Mrs. W is a primary teacher in an urban school located near the heart of the city. Her school is within walking distance of several museums, including the local historical society. For several years she has done a project with her students in which teams of students select an exhibit at the historical society that they find interesting, and then they do additional research on the topic of that exhibit.

Last year, one group of students became interested in the early settlement of the city and used materials provided by the historical society to research this. Another group became interested in furniture production, one of the early industries that supported the development of the city, and even invited an elderly craftsman who had worked in the industry as a classroom speaker. The product of each project was a written report presented to the class. This time Mrs. W decides that she will use the technologies, which have recently been made available to her classroom, to ‘spice up’ the unit.

Mrs. W reads about an app called Layar, which is an ‘augmented reality’ tool. Augmented reality tools add computer-generated media to real world objects or views. An example given in the augmented reality article that Mrs. W read is an app that, when a phone or tablet is pointed at a city intersection, recognizes the location and labels the streets and buildings in the scene.

The Layar program allows users to upload a pdf file of a document and then add media, video, images, sound files, etc., to specific locations in the document. For example, on a pdf of a map of the historical society, which shows the location of the furniture exhibit, a button can be added. When a phone or tablet running the Layar app is pointed at any print version of the document, a video created by the students plays on the phone or tablet, providing background information regarding the furniture industry in the town. If the Layar app is pointed at the page of the map that describes the early history of the town, a student video pops up on the device that provides student generated information and images about that history.

This project allows Mrs. W to work on several areas of the curriculum at once. It requires students to do research, read informational texts, write informative texts, and do expressive oral reading. She can’t wait to get started!

On the day of the tour, Mrs. W provides each student with a print copy of the map of the historical society museum. As they tour the museum, the students
circle those exhibits that they are interested in researching further. Using their phones and tablets, students take pictures for exhibit elements that might be included in their product.

Upon returning to school, Mrs. W forms teams based on the exhibits that interest the students. Each team creates a simple media project that any visitor to the historical society can access with the Layar app, simply by pointing their phone at the print map of exhibits and clicking a button. With ideas provided by Mrs. W, each team decides on what their project will entail.

One team, interested in a display on historical buildings in the town, decides to do a ‘then and now’ exhibit, which will show a building when built and then contrast that with the building as it currently exists. On another team interested in the early furniture industry, one member of the team has a grandfather who used to work as a craftsman in the furniture plant. The team decides to interview him as their media project. A third group, interested in learning more about the early settlers of the town, decides to do use the student animation tool DoInk to create a cartoon introducing the most interesting of these settlers.

The students work on the classroom laptops to do research, write their scripts, and assemble their projects. When they are finished, they upload their projects to YouTube and then create links in the online Layar Creator site. At the end of the project, Mrs. W and her students return to the historical society and, with phones or tablets, use the Layar app to experience the ‘augmented reality’ tour, as other visitors will be able to in the coming years.

Resources

- Layar Creator for creating and augmented reality layer for the historical society map
- DoInk for creating animations

Tools

- Layar to experience the augmented reality
Fun with Fund Raising

Mr. T is a middle school math teacher who dreads his unit on probability and statistics. The students don’t seem interested and, though he has tried to use both humor and relevance to make his worksheets more interesting, it still seems to be one of his least engaging units. In the teachers room that afternoon, Mr. T was discussing the upcoming school carnival with the principal and a couple of other teachers. Last year, several of the games that were created by the parents turned out to be far too easy to win and, as a result, the carnival made little money. As they spoke it dawned on Mr. T, this is a probability issue! He decided that he would get his kids involved.

Mr. T. asked the principal to speak to his classroom the following week, describing the profitability problem and asking the students for their help with this year's carnival. When the principal left, Mr. T broached the problem to his students, ‘How can we accurately predict the amount of profit that carnival games will make?’

Rather than directly teaching students a strategy, Mr. T. assigned them to groups and asked each group to identify a strategy. He allowed students to access the Web on their tablets and smartphones as they explored and discussed, but asked each group to summarize their strategy in a Google Doc. One member used a laptop to enter the team's strategy into the Google Doc while the others viewed the Doc through any available device. He used a single document that had a section marked for each team. This allowed teams not only to review their team's work, but to learn from the progress of the other teams as well. After each team had devised a strategy, a quick classroom discussion identified that best of those strategies and they created a formula to guide their process:

\[
\text{Profit} = ((\text{Number of Students Playing} \times \text{The Cost of the Game}) \times (\text{Number of Students Playing} \times \text{The probability of winning}) \times \text{The Cost of the Prize})) - \text{The Cost of the Game}.
\]

Several of the groups had even gone further and replaced the (Number of Students Playing X The Probability of Winning) with a more complex formula that recognized that different subgroups, grade levels for example, might have different probabilities of winning. Mr. T was almost as amazed at the sophistication of their solutions as he was at the level of engagement among even the most reticent learners!
Each of the teams either adopted a game from the previous year or created a proposal for a new game. Searching on their tablets and smartphones, students quickly located a host of Websites that featured ideas for carnival games that could be adopted or adapted. Together, the class decided that the final product would include:

- **A computer-based model of the game that included a cost estimate for construction**
- **A working model of the game for testing purposes.**
- **Survey data from a random sample of students in the school describing the likelihood that they would play that game.**
- **A proposal that included a all of the data defined in the formula above; predicted numbers of players, specific probabilities of winning the game including subgroup data if relevant, and costs for prizes. The proposal would provide an estimate of the total profit for the game if it were selected for the carnival.**

While students were invited to model their games in any technology-based format, most found the tablets to be the best tool given the freedom from a mouse or other input device. They locate tools such as Sketcher 3D Lite or Kids Sketchup Lite to do the job.

Each team contributes an image of their game with a brief description. Using a laptop, these are assembled by a cross-team group into a survey in SurveyMonkey and, tablets in hand to display the choices in the SurveyMonkey list, students fan out in the halls before and after school and at passing times to gather preference data regarding the games. They stop passing students, ask them to look briefly at each of the games on the tablet, and then mark their top three selections for games that they would like to play. It reminds Mr. T of the preference surveys that were conducted in supermarkets in his youth, but without the paper!

On testing day, students randomly select a test population from each grade and set up stations in the hall and, using tablets running either Google docs or Datadroid Forms lite to capture live data on both probabilities of winning and additional student reaction data.
All of the data and images are sent to team laptops where the final proposal is assembled both as a print document and as a presentation. On presentation day, each team presents their game proposal to the school carnival planning committee made up of PTA leaders, the school principal and the district math coordinator. Mr. T is impressed with both the quality of the proposals, particularly the mathematics, as well as the earnestness of the presenting students. He is pleased when all of the games are accepted by the committee!

Resources

- Google Docs
- SurveyMonkey

Tools

- Sketcher 3D Lite (App)
- Kids Sketchup Lite (App)
- DataDroid Forms
Global Communities

Ms. S is a middle school social studies teacher in Argentina whose class studies the characteristics of communities. In the past she has used the textbook, but has found that the students are not terribly engaged. She also finds that the information in the text is dated, somewhat shallow, and focuses only on communities in her nation. She is hoping to give her students a more global perspective.

Using the Web resource GlobalSchoolNet, Ms. S establishes a relationship with teachers with like teaching assignments, at a Spanish immersion school in the United States, and at a school in Spain. Students in each of the classrooms speak Spanish, so this language will be the common language for the project. Each of the schools has access to multiple technologies: laptops are available at each site, as well as a variety of smart phones and tablets.

Using the messaging tool Fring, the three teachers refine the design of the project together. They ask students to work together in multi-site teams to create an online presentation comparing three key characteristics of communities: social, demographic, and economic. Students will create two versions of the online presentation, using the tool Prezi. The first version will be a standard Prezi presentation for presenting in real time. The second will be a voice-over version for display on the Web.

To start the unit, the teachers set up a three-way Skype between the three classrooms to introduce the project. The decision is made to conduct all three-way communications at 12 PM GMT. This would equate to 8 AM in the States, 9 AM in Argentina and 2 PM in Spain. Students are introduced to each other and assigned to teams of six, two students at each school. Much of the communication for the project takes place asynchronously, through email. All writing the students do is hosted in a shared document in Google Docs.

Students begin by listing the elements of community on which to focus in the three categories of social, demographic, and economic characteristics. They quickly discover interesting contrasts between the communities in jobs, architecture, diversity in ethnicity, and more. The availability of smart phones and tablets allows the students to explore their communities: after school or on the weekends, they travel around their community and collect sounds, images, and interview snippets to include in the final presentations. One of the teams discovers a team facilitation
site, named Teambox, which integrates with Dropbox to allow for shared calendars, file storage, and more. Soon most of the other teams adopt the tool as well. They download these sounds, images and interviews to their laptops as they create their final presentations.

The final presentations to each other are made at 12 PM GMT via Skype, with team members alternating during the presentation. The voice-over version is created in six sections, allowing each team member to contribute. The final sound file for that version is stitched together on classroom laptops using the free audio tool Audacity. The presentation is posted on a custom Website created in Google Sites, and the URL is distributed to other schools via GlobalSchoolNet.

**Resources**

- [GlobalSchoolNet](#)

**Tools**

- [Fring](#)
- [Skype](#)
- [Prezi](#)
- [Google Docs](#)
- [Teambox](#)
- [Dropbox](#)
- [Google Sites](#)
Immigration and Imagination

Mr. N is a recent graduate, who teaches language arts and global awareness in a suburban school district. Ms. O, a university friend, has also accepted a similar teaching position, but in a school primarily serving the children of recent African immigrants. Both share a concern about recent tensions between the native and immigrant cultures in their country. They decide to involve their students in a project that should develop both their students’ fiction writing skills and their understanding of the issues related to immigration.

With a combination of laptops and tablets available in each of their classrooms, and new collaborative writing technologies appearing regularly, the students will be able to work together across classrooms in ways not possible just a few years ago. The students will be paired, one from each classroom. The pairs can also collaborate with students from other cultures, providing a powerful tool for building bridges between those cultures. For this project, Mr. N and Ms. O choose the collaboration tool Diigo, which can be used for free by the students.

The assignment students are given is:

‘There are many issues today related to immigration in our nation, which evoke widely differing opinions. For example, some people believe that immigrants should adopt the local culture, while others believe that immigrants enrich the culture with new practices, beliefs, and foods. You and your partner will be charged with selecting a problem or issue related to immigration, particularly immigration from African nations. You will research the issue on the Internet and use collaborative writing tools to create a work of fiction that illustrates that issue. The storyline will familiarize the reader with multiple points of view on the issue and propose a solution to the problem. The solution can be based on an idea that you find as you research, or it can be one that you create yourselves. A list of starting points for your research can be found on the classroom Web site.’

The student pairs, one native-born and one recent immigrant, each bring their own perspective to the story that they develop. At each of the classrooms, the teachers focus on supporting instruction in three key areas: non-fiction writing, elements of culture and cultural literacy, and immigration history. In addition, a key skill of global awareness is focused upon as the students interact: perspective consciousness. This skill, identified as a central component of global awareness, simply means that you have the ability to recognize and respect
the perspectives of others, even if you don't agree with those perspectives. To support this instruction, the teachers have students read excerpts from the book, *Conversations with Immigrant Teenagers*, by Marina Budhos, and discuss the perspectives of these teenagers.

Students are provided with free, protected email accounts from providers such as Google or Gaggle. In addition, each pair sets up an account in the collaboration site Diigo and downloads the Android app for phones and tablets, allowing them to share their research with notes and comments on the fly, as well as to co-edit during the writing process.

After writing and peer-editing their works of fiction, the two classes create a Web-based journal of student writing. They use the Website builder Weebly for Education and they open it to other interested students.

**Resources**

- [Educating About Immigration from the Constitutional Rights Foundation](#)
- The book, *Conversations with Immigrant Teenagers, by Marina Budhos*
- [Europe and Immigration from the BBC](#)
- [A good article on immigration in Europe from the Organization for Economic Cooperation and Development](#)
- [Publications on Migration and Children from the Global Migration Group](#)

**Tools**

- [Classroom Management Site](#)
- Diigo
- Safe email collaboration
Individualizing Algebra Instruction with Video Explanations

The students in Ms. Meredith’s algebra class are very diverse. She has very high achieving students who grasp new concepts quickly and others who are struggling to understand. In addition, she has new students who have just come to the school who do not speak the same language as her other students. She wants to be able to provide individual attention to all of them, but she has found it very difficult.

Ms. Meredith finds videos on the Internet that provide explanations for many algebra concepts and procedures. Each video is short and shows a teacher working a problem on a whiteboard while he/she explains it. Some topics have videos with captions translating the audio into second languages and others have different versions of the video created by teachers or students who speak different languages. She also finds a library of learning objects, which are short text lessons, and which include opportunities for practice and feedback.

Ms. Meredith is introducing a new topic to the class this week. She explains the concept and then asks students to work in pairs at their desks to solve a problem. After they finish, Ms. Meredith has students use their smartphones or tablets to respond to a survey she created with Poll Everywhere. The survey shows the math problem that students have just worked, and several different answers. She asks students to use their smartphones or tablets to select the answer they believe is correct.

Ms. Meredith then works the problem at the front of the room and shows them the correct answer. She knows from the survey that many students are still confused, so she gives them the web address of videos and learning objects that explain the topic. Pairs of students watch the videos or use the learning objects to try to solve similar problems. The videos and learning objects help most students work independently while Ms. Meredith helps other students individually.

In order to keep students engaged in practicing this topic, Ms. Meredith asks each student to create a video explanation. Using Pixorial and their smartphones, students record themselves solving and explaining a problem. They share these videos by uploading them to a private site Ms. Meredith has set up for them. Using Poll Everywhere, the students vote for the videos that provide the best instruction.

Now, using their laptops and a video editing application, the students edit the
selected videos and upload them to their class ‘Algebra Academy’ site, which Ms. Meredith has set-up for them.

As Ms. Meredith introduces new units, the students continue to select the best videos created by their peers, edit them, and add them to the ‘Algebra Academy’ site. During the school year, the students use this site to recall how to solve problems and prepare for quizzes and tests.

Ms. Meredith knows that time management can be an issue when students use technology. She therefore uses two techniques to keep students on task and productive. First, when she plans to integrate students' use of technology in a lesson, she posts a sign on the whiteboard indicating that they will be using smartphones, tablets, and/or laptops. If there is no sign posted, the students know they should put away these devices. Secondly, she projects a countdown timer so students know how much time they have to finish their tasks, save their work, and store their devices.

**Resources**

- Communication and collaboration (Audience Response Tool): Poll Everywhere
- Video capture: Pixorial and smartphones
- Video editing: Laptops with video editing tool

**Tools**

- Video explanations
- Learning objects
**It is a Fact**

Ms. Y is a primary teacher who is extremely concerned about her students' mathematical futures. She recently read an article in a journal that describes recent research, which suggests that students who don't have a firm grasp of their math facts score poorly on assessments of mathematical reasoning. According to math education experts, the inability to quickly operate on numbers 'in their heads' prevents students from gaining insights into complex mathematical processes.

In the past, Ms. Y has used traditional tools to teach students math facts: worksheets, flash cards, and the like. She decides that it is time to leverage the tools of the 21st century. In addition, Ms. Y is focusing on the 21st Century Skill of self-regulated learning and plans to build practices, to support this skill, into a new project. She focuses on three practices to support self-regulated learning: student goal-setting, student access to formative assessment data, and student choice.

Ms. Y’s school recently provided her with a classroom set of tablets. In addition, Ms. Y knows that many of her students have Android devices in their homes, either their own or their parents. When she goes online and searches for Android apps for teaching math facts, she is amazed at the number of apps available.

Ms. Y establishes four criteria for selecting the apps that she will make available to her students. The app needs to:

- Have a free version;
- Allow the students to work at their own pace, selecting the exact range of the facts to be practiced;
- Include a record-keeping system to allow students to track their progress with formative data; and
- Allow for challenges beyond math facts for her more advanced students.

Ms. Y quickly locates several apps that meet her criteria. The app that she selects as the classroom standard is ‘Math Workout.’ She also posts links to additional apps on the classroom Website, to provide the element of choice that she knows is essential to engage students.
To launch the process, Ms. Y has each student take an independent assessment. Based on the data from that assessment, each student is asked to set weekly goals for improvement and to make a simple plan for reaching that goal. At the end of each week, the students will share their goals and progress with Ms. Y so that she can intervene where progress is not being made.

Mrs. Y installs the Math Workout app on each of the classroom tablets and provides each math group in the classroom with access to those tablets. In addition, she encourages students to use personally or parentally owned devices to use the apps at home. Each student maintains private records of their progress.

In the early spring Ms. Y realizes that, for the first time in her two decades of teaching, every student is able to demonstrate mastery of their math facts. She notices as well that this mastery is reflected in higher achievement in all areas of the math curriculum. An additional yet unexpected benefit also comes in the spring. For the past two years, the local high-stakes assessment is taken on the school laptops. Mrs. Y notes that her students seem much more comfortable while taking the assessments. She vows to continue to refine the process in the future.

Tools

- Math Workout
Measuring Motion

Ms. V is a high school physics teacher with the good fortune to live in a community with a popular amusement park nearby. For several years she has taken a class field trip to the park and had the students do a variety of experiments that illustrate principles of force and motion. Unfortunately, the experience has been a bit frustrating. To measure acceleration, Ms. V has had the students build a multidirectional accelerometer out of a plastic tube using springs and a fishing weight. While the devices do demonstrate differences in force, they simply lack the precision to provide accurate data so that students can calculate forces such as vertical or centripetal acceleration and reach that, ‘Aha!’ moment where they realize that the math behind physics really works!

This year, Ms. V is hoping things will be different. Most of her students have smartphones and Ms. V has found a free app for those phones that a colleague recommended called Physics Gizmo. She decides that she will present the class with a problem that should actually be fun to investigate. She calls the problem, ‘The Biggest Thrill.’

To complete the problem, the students work in small groups and fan out across the park to select three specific ‘thrilling’ moments on rides in the park. These moments might come from a single ride, three different rides or any combination of attractions. Students identify these ‘thrills’ and then collect data to calculate and describe the nature of each in physics terms. Does the thrill come from a spinning, centripetal force, or perhaps simply from sudden acceleration? Are there visual factors that contribute to the thrill such as a sudden view of a large hill prior to plummeting down that hill? In addition to the data collected with Physics Gizmo, students collect photographs and video using their smartphones.

Upon their return to the classroom, each team turns to the free graphing program GeoGebra to analyze and describe their three events and then select the ‘thrill’ that they believe, and the data support, is the most thrilling. In order to allow for the assessment of this project, teams of students are required to create two products. The first is a brief scientific ‘paper’ that will display their data and report their findings for each of the three ‘thrills.’ This will be created on the classroom laptops using GeoGebra and a word processor. Each student will serve as the primary author for one of the three ‘thrills’ that the team has selected. Second, the team works together to create a visual version of the report for the class. This version includes the content of each of the papers supplemented with
the photographs and videos taken at the park. Both versions of the report are added to both their group and individual ePortfolios. These are stored in the open source portfolio management system, Mahara where they can be accessed and viewed by all in the school community.

Resources

• Resources for educators to plan physics activities at amusement parks from Six Flags Great America, Chicago
• Open source ePortfolio management system, Mahara

Tools

• Physics Gizmo for Android
• Free data analysis and display software, GeoGebra
Media Messages for Kids

As part of the critical thinking standards, in the social studies curriculum in Ms. Malek's primary grade classroom, students are studying the effect media messages have on people. Students are learning about the ways in which commercial messages influence people's buying decisions. Students learn several of the 'tricks and techniques' that marketers use to appeal to young children, such as making toys seem far more fun than they might realistically be; using movie stars or cartoon characters; or making products look bigger than they really are.

As a culminating activity, the students devise an experiment for seeing how commercials affect people. They decide to create different commercials for a fictitious game called Solar Escape. Students share responsibility for creating the materials for the game: cardboard spaceships, a colorful board, etc. Students then divide into teams and each team is comprised of a writer, videographer, and editor. Each team works to create a commercial.

One team creates a very factual commercial for the game, simply describing Solar Escape as a game that takes about 20 minutes to play and is appropriate for children ages 6 through 9. The other teams each create a commercial using one of the marketing techniques they studied. All the commercials are videotaped very simply using the video camera built into their laptops and the Windows Movie Maker software. They upload the commercials to a website Ms. Malek has set-up for them using Weebly.

Ms. Malek's students then create a survey using FluidSurveys to use in determining how their commercials affect people. As customary when Ms. Malek introduces her students to a new digital tool or application, she ensures her students have an opportunity to download this new application and to become familiar with how to use it, prior to their development of their survey questions. (Her students had previous experience creating videos.)

The subjects of their experiment—the people whose survey responses they will collect—are drawn from the other three classrooms at their grade level. Thirty student volunteers are identified and view each of the commercials by accessing the website. After each commercial is shown, the volunteers use smartphones or tablets to respond to three simple questions in the survey about Solar Escape, including, 'After watching this commercial, how likely would you be to ask your parents to buy this game?' Ms. Malek's students track the results in real time as
volunteers complete the survey. They can view the results in aggregate and look closely at individual responses. As soon as they begin collecting responses, they use FluidSurveys to automatically start to generate charts, graphs and stats. Ms. Malek finds that her students are so interested in the results of the survey, that they continue tracking the results after school.

In class, Ms. Malek’s students share the summary charts, graphs and stats from their survey by displaying them on their tablets or smartphones. Based on this data, Ms. Malek leads a discussion that explores which commercials are the most likely to lead to purchases. Students then use their laptops to individually write up the results of the experiment, describing the method they used to conduct the study incorporating the data in the form of charts or graphs, along with a few sentences describing what they learned. They post them on the website to compare what each other learned. Ms. Malek uses these reports to evaluate how well students learned content for this learning activity.

In addition students complete an evaluation of their peers for each student’s collaboration and contribution to the team.

Finally, Ms. Malek uses a simple media project rubric, based on an original found online at Rubistar and refined for her needs, to evaluate the quality of each teams’ commercial.

Resources

- **Survey and Polling Tool:** FluidSurveys
- **Creation and Publication Tools:** Windows Movie Maker, Weebly
- **Rubrics for Technology-Based Products:** Rubistar
Mrs. Wells' Writing Wall

Mrs. Wells, a language arts teacher, was readying herself for a new curriculum. Mrs. Wells was excited, but also a bit nervous. This year, she would be responsible for teaching a new area of writing called ‘writing explanatory texts,’ which included the use of graphics and diagrams to explain some technical process or skill. She was excited at the prospect of bringing this to her students. Mrs. Wells believed that this style of writing would engage many of her students who avoided writing, particularly male students, and was a crucial skill for their futures. Beginning this year as well, students were allowed to bring “Personally Owned Devices” (POD’s) to school and connect these devices to the school network. While the class did have laptop carts available, the additional slates and smart phones would be a great addition for tasks such as gathering media, quickly researching simple questions, and bringing more of a “21st Century feel” to her classroom.

Mrs. Wells was concerned with student safety as they connected to the Internet through the school network on personal devices. Prior to allowing students to access the Internet from the classroom, Mrs. Wells ensured that each student and their parents had signed the school Acceptable Use Policy (AUP). This policy described both the acceptable and unacceptable uses of the technologies in schools; asked for guarantees from the students that they would follow these policies; asked parents to acknowledge that they understood and supported the policies; and described sanctions that might result from violations.

The new writing requirement for Mrs. Wells' classroom happened to coincide with the school’s implementation of a new Web-based environment. This included the school Website, along with parent communication tools, and classroom Websites including blogs, wikis, shared discussion spaces, and more. The principal had been trying to identify some learning resources for teachers, parents, and students to support the new environment. At several meetings, the principal discussed the need for a series of instructional videos and ‘how-to’ guides that might support new users in learning how to use the school site. Mrs. Wells decided to have her student create these resources.

Working with the school principal, the PTA president and, via Skype, a support representative from the company that created the school’s new Web environment, Mrs. Wells’ class created a comprehensive list of the various functionalities that would benefit from an instruction guide. Working in pairs, students selected one of...
these processes to document, creating a Web and PDF-based tutorial to be included in a library on the Website.

AUP in place, Mrs. Wells suggested that students who had slates or phones download two apps to support the project, which they would need to use along with cameras and other built-in apps. The first of the two new apps was Google's Voice Actions, which in addition to allowing students to control apps such as Web search tools and telephone functions, also allowed students to take notes by voice as they completed the process that they were documenting. The second app was a screen capture app. On the laptop side, Mrs. Wells showed interested students how to use the built-in screen capture capability. This would allow students to create the screenshots of the new school Website that would be used to illustrate their instructional document.

Working with their smart phones or on the classroom laptops, students began gathering the photos, screenshots, and text they would need to create instructional tutorials and documents. Mrs. Wells provided guidance, reminding students to think about the audience for whom the instructions were being written, and the level and language that might be most appropriate. One of the student's mother, a technical writer for a local technology company, joined the class for a couple of days to talk about organizing a technical writing project. She provided the students with a storyboard-style template that helped to organize their development process.

Soon the room was humming with students taking verbal notes and snapping screenshots to illustrate their tutorials. Most students used laptops for the writing, working in Google Docs, where the writing could be easily viewed from any device. As teams finished, laptops were accessed from the carts to pull the final projects together in Weebly, the Web-design software. The students used a Weebly template designed jointly by the art teacher and a small team of tech-savvy and art-savvy students. The site had the look of a wall with sticky-notes labeled with tasks users might need help with as a menu for the help documents.

When presentation day arrived, each pair of students presented their tutorial. Using a rubric app, other students in the class rated the work of each pair, as did Mrs. Wells and the technical writing mom.
Resources

- Weebly (or any similar Website design tool.)
- Google Docs

Tools

- Voice Actions (Google)
Natural or Manmade

Ms. Guerra has never really enjoyed teaching science. She has always viewed herself more as a reading and writing specialist and actually avoided science as an undergraduate. Her school has recently added mobile devices, tablet computers, to her classroom and she is anxious to use the devices in a truly positive way. She believes that the media gathering capabilities of the devices; video, sound and images; makes them a good fit for engaging science activities. Plus, their portability makes them truly mobile devices even for her young students.

The next science topic in Ms. Guerra's curriculum is called ‘Natural or Manmade’ and is based on the science standard that states that student should be able to tell the difference between objects and substances that are natural versus those that are created by man. This seems to be a fairly simple topic, but when Ms. Guerra had an exploratory conversation with some of her students in the lunchroom the other day, she was surprised at the misconceptions common in seven year old children. Rather than ‘teach’ the children to recognize the difference between natural and manmade, she decides to let them teach others.

Ms. Guerra opens the unit with a lively discussion about the difference between natural and manmade objects and substances. She puts the children into groups and then uses her laptop and projector to show pictures of objects or substances that are natural or manmade. The students discuss each item and then, using a tablet computer connected to the free version of PollEverywhere, enter their response to the question, ‘Natural or manmade.’ Ms. Guerra begins with easy examples such as images of animals or rocks and progresses to trickier examples such as a farmer's fence that is made out of split rails that still have the appearance of natural wood. She asks each team to develop a criteria for deciding into which category an object would fall and, after a few false starts, on group excitedly raises their hands.

‘We just ask ourselves, would this thing be here is there were no people around!’

The next day, Ms. Guerra introduces the project. Using the tablet computers, each group of students will collect images of objects that are natural or manmade. Working in the free quiz-building software, ProProfs Quiz, teams will create an online quiz for other students to take. Each quiz will included twenty items and, as Ms. Guerra modeled for the students, the items should become increasingly
The students will take turns taking the tablet home to gather images, but are invited to use digital cameras or parent cellphones as well for the image collection process. To make things simple, Ms. Guerra sets up an account in the free image storage site, SnapFish and demonstrates how to add images to the site using the Android app directly from the tablet or a cellphone.

Soon the student have acquired quite a library and spirited discussions take place as to which images to use and how to determine the relative difficulty of correctly identifying each image. One of the students suggests that they ‘try out’ their images, in effect creating a pilot to rate the relative difficulty. This impresses Ms. Guerra and she allows several of the groups to create a ‘practice quiz’ with their images, administer the quiz to students in another second grade class, and then rate the images by the number of people who got each correct.

Finally the quizzes are ready and each of the teams sends the URL for taking the quiz to another primary classroom. When the quizzes have been taken, the students use a free graphing site, Create a Graph, to create a large bar graph that displays the results of their quiz it is immediately apparent which students piloted their quiz as the bars showing the number correct decreased from the left to the right side of the graph. Ms. Guerra realizes that, in addition to the science that she usually found so difficult to teach, she has also imparted some very sophisticated mathematics and technology skills to her students! This style of teaching will definitely become part of her repertoire in the future!

Resources

- Online quiz-builder ProProfs
- Online photo library Snapfish
- Online graphing tool Create A Graph

Tools

- Camera App native to Android
- SnapFish app for adding images to the group photo library
Photographs That Changed the World

Mr. Lopez is a secondary school world history teacher. He believes that it is important to use primary source materials in his teaching and frequently shows his students maps, photographs, documents, and other objects that were created when the events he is teaching about took place. To help the students understand the importance of these documents and how to use them, he frequently starts the year with a unit on ‘Photographs That Changed the World.’

Mr. Lopez starts the unit by asking the students to recall the photographs or videos of current events that had a big impact on them. Many recall videos of the World Trade Towers falling in New York City or the tsunami in Indonesia. They discuss what makes these pictures meaningful to them. He then uses Internet resources to show them historic photographs of wars, famines, or events around the world since the beginning of photography. Although many of them are striking, the students do not have the knowledge to appreciate the events they portray or their point of view.

In order to understand the importance of background knowledge in interpreting photographs or writing, Mr. Lopez then has the students use their laptops to conduct research on some famous photographs. Each group of three to four students selects a photograph and uses Internet resources to identify the photograph and determine where it was taken.

They also discuss these questions:

What is the significance of the photograph?

What is the significance of the place where the photograph was taken?

Discuss how this photograph could have influenced an event in history or public opinion?

What does the research say about this photograph? Cite that research.

Does the photograph’s influence continue or was it only powerful during the time that it was taken?

The students use their research and laptops to complete an interactive poster in Glogster or a PowerPoint presentation to share their photographs and the events
and perspectives they represent. After each group presents, students in the audience use their smartphones and Poll Everywhere to provide feedback about the presentation and then they discuss that feedback as a whole group.

Mr. Lopez then asks each group to use their laptops and to act as reporters and create a blog about a current world event. They describe the event and select photographs or video to illustrate the event, being sure to cite their sources for information and media. For each photograph or video, the students answer the following questions:

Why did you select this photograph?

Does it only represent one point of view?

What is happening outside of the photograph's frame that might alter its significance?

Members of each group use the blog to comment on other groups' reporting, focusing on how well the blog communicates details of the event and whether or not it appears to be biased in favor of one perspective on the event.

Finally, to keep students aware of the powerful role photos and images play in communicating current events, Mr. Lopez asks his students to each use their smartphones to tweet two examples of photos or images the media has used that week in articles about world or local events. At the end of the week he shares and discusses those images with the class as a culminating activity for this unit.

Mr. Lopez knows that students need to learn how to collaborate in order to work together productively in small groups. Therefore, before he begins this lesson, he models and teaches the students collaborative skills, such as giving constructive feedback, using active listening, and summarizing and rephrasing for clarification. The class creates a collaboration rubric, which they use each time they participate in small group work, to assess how well they collaborate. During this 'Photographs That Changed the World' lesson, they use this rubric twice, each time they complete a project as part of a small group.
Resources

- Document Creation and Publication: Glogster
- PowerPoint Audience response tools: Poll Everywhere

Tools

- Primary source: Photographs That Changed the World
Politics and Student Pollsters

Mr. R has been teaching political science for over 20 years and is ready for a change. It has been difficult to communicate his interest in politics and community involvement to his students over the years, and he is hoping that he can leverage the multiple technologies available to his students to change this: laptops, tablets, and this year, due to a policy change at the school, even the students' own cell phones. Mr. R's biggest concern is that students use the technology only for approved purposes in the classroom. He has read several articles with tips for communicating expectations to students for technology use and has decided to use some of these strategies.

Mr. R decides to take advantage of a political issue brewing in the small community served by his school. The local government is considering a controversial new tax and the community quickly divides into factions for and against. Even in his political science class, mentioning the tax proposal triggers a lively debate, which is positively viewed by Mr. R as a sign of interest he rarely sees.

The class decides, with guidance from Mr. R, that they will build an informational Website that includes coverage of both sides of the debate. The site will include: details of the proposal with a link to the divisional council Website; interviews and summaries supporting the pros and cons of the tax; and periodic poll data generated by the students themselves. At the outset of the project, Mr. R does two things to communicate the expectations for appropriate use of the technology. The first is to communicate to the students the acceptable use policies already in place in the school. He has posted these policies in the front of the room and reviewed them with the students. The second is to prepare a ‘to do list’ with the students for each stage of the project and then list the technologies that will be used for each of those stages. If they are at the final editing stage, for example, the technologies in use should be laptops only. Mr. R decides that to do this project justice, he will involve the language arts and math teachers as well.

The other teachers are excited by the project. The language arts teacher sees this as an opportunity to apply two styles of writing that are central to her curriculum: persuasive writing, for the position papers that the students will generate, and technical writing in support of the polling data. The math teacher is pleased at the opportunity for students to conduct polls, a process that involves math from population sampling strategies to significant data analyses.
As part of his unit on probability and statistics, the math teacher has worked with the students on the concept of creating a representative sample. Through the Internet, students access the publicly available voter rolls and use what they have learned in math to construct a polling sample. The polling is done online, using SurveyMonkey, a free Web survey tool. Students follow up with non-respondents through phone surveys. The students identify leaders and supporters on either side of the issue and conduct interviews with using their smartphones and tablets to take photographs of the participants where permission is granted. Working in the free area of Wikispaces, teams of students write content in support of or against the initiative. Finally, the teams turn to their laptops to edit the content, add the photographs and prepare their work for One team of technically inclined students prepares the informational Website in Weebly, a free Web-building tool.

Prior to the election, students conduct the survey in two different time frames to gauge any changes in opinion. Even the students who support the tax have to admit that they are delighted when the defeat of the measure is almost exactly predicted by their final poll. Mr. R is delighted at the new interest that the project engenders in his students.

Resources

- Online voter databases

Tools

- Wikispaces
- Weebly
- SurveyMonkey
Recycling Campaign

Ms. Gee is a secondary science teacher who is collaborating with a math teacher on a lesson on the impact of humans on their environment. They plan an inquiry based lesson that will addressing the following science standards: including formulating questions based on observations, and proposing and comparing viable methods of responding to an identified need or problem. They will also address math standards.

The essential question for this unit is, ‘How does human consumption of resources impact the environment?’

Ms. Gee kicks off the unit with a whole class discussion of what students throw away every day and what happens to it afterwards. The students quickly identify the things that they throw away frequently—paper, food, plastic water bottles, and soft drink cans. They also know that the trash is picked up and hauled to the landfill. At this point, they are not clear about what happens next. Some suggest that the trash decomposes, but others think that the landfill gets full and a new one is established. Ms. Gee devises two methods for students to address these hypotheses.

She first proposes that students do a hands-on experiment with pieces of banana peel placed in plastic bags. Some bags are left in the light; others are kept in the dark. Water is added to some but not others. Some are closed tightly and others are left open. A pair of students is assigned to each bag and they observe the banana peels every day and take pictures of them with their smartphones or tablets. Using their laptops, the students create a report on their findings in their science wiki that is illustrated by the series of pictures taken with the smartphones or tablets. As a class, they compare the reports of the various bags. The students come to the conclusion that the banana peels do decompose and that water, air, and light have an effect on the process.

Ms. Gee also asks the students to choose several of the items that they commonly throw away and search the Internet to find information on how fast these items decompose. She asks them to find several sources for their information and to use their laptops to document each source explaining why they believe that it is a credible source. The students create a graph using Excel and include it in the wiki showing rates of decomposition for each item. They quickly come to the conclusion that both of their hypotheses are correct, trash
does decompose, but many items decompose so slowly that landfills do fill up. They decide that this is a problem that they would like to address by conducting a campaign to make their families and schoolmates aware of this problem and to encourage them to recycle.

In math class, the students plan to collect data to show the difference in how much people throw away before and after their campaign. They create a mobile survey, using an online tool called QuestionPro, which asks questions about what people throw away, how much they throw away, and if they recycle. They also ask demographic questions, so that they will be able to identify the ages of the people responding and their job or station in life (parent, teacher, secretary, student, sibling, etc.) They then send an email with a link to the survey asking everyone in their school and in their homes to respond. The mobile survey can be easily accessed and viewed on a smartphone, which makes it easier to reach a larger number of people.

After gathering the survey results, the students begin a campaign to make everyone aware of how much trash is thrown away at school and at home. Their campaign has many facets and the class divides into work groups: some use their laptops to create a blog to document the process of the project; others create a website. Another group sends tweets with their smartphones to remind everyone to recycle. At the end of the campaign, they email the mobile survey to the individuals who responded to the first survey and ask them to take the survey again. They compare the data from before and after the campaign to see if they have had an impact. They also analyze the data by group to see who was more likely to change—adults or youth, those at home or at school, teachers or students, etc. They use the school website as well as email to announce their findings to everyone.

Daily, the students use a rubric to grade themselves and each of their teammates on the quality of their work and the amount of their contribution to the group product. Ms. Gee uses these checklists as well as the group products to assess the students' learning and teamwork.

Ms. Gee knows that extended use of laptops, tablets, and smartphones can distract from learning if used inappropriately. Therefore, before beginning this lesson, she and the math teacher explicitly communicate expectations for using these devices. They ensure the students understand limits for ‘surfing the Web’ and using specific software (such as media players or instant messaging), as well
as the goals for the day (what needs to be completed or what progress needs to be demonstrated).

Resources

- Interactives
- Visualization: Graphing software
- Data collection: QuestionPro mobile survey
- Creation and publication: Wetpaint Central
- Lifetype blogging tools
- Google Docs
- Problem Solving and Data analysis tool: Excel

Tools

- Technology Construction: Smartphone or tablet cameras
Success with Simulations

Ms. U is a secondary world history teacher who is about to begin a unit on World War II. She has decided to take a totally new approach to the unit and base the instruction on a World War II simulation program that has recently been offered for free to schools, Making History: The Calm and the Storm. This simulation is a ‘turn-based’ game in which pairs or small groups of students play the role of one of eight nations. In each turn, they need to make industrial, military and diplomatic decisions and history is modifiable based on those decisions. This award-winning software is already in use in hundreds of schools around the globe and Mrs. U is hoping that it will provide students with deeper insights into international issues and relationships than the textbook she has used in the past.

Ms. U introduces the simulation to the class and allows the students to choose the nations that they would most like to guide through the game. She finds that she needs to do a bit of ‘arm-twisting’ to find students to play the roles of the eventual losers of the war, but reminds students that the outcome in a simulation depends on the decisions made and might not be the same as the historical outcome.

In addition to reading the background materials that are included with the game, Ms. U requires the students to communicate outside of school as they make the decisions for the next day's game turns. Ms. U's class has been using the Web-based classroom management site Edmodo for several years now. Each ‘country’ establishes a team in Edmodo where they can communicate, share documents and maintain a group calendar. Edmodo has an app as well, allowing students to communicate on their smartphones outside of school. For the few students who don't have phones, Ms. U checks out tablets from the classroom collection for the duration of the unit.

The unit begins and each country is assigned a laptop on which to enter their game turn during the class period. Ms. U is a bit nervous in the first couple of days. Some of the teams arrive seeming unprepared and, by reviewing the communications in Edmodo from the evening before, Ms. U finds little evidence that they are communicating. Then Poland makes its move. During the evening of the second day, Poland quietly contacted the United Kingdom and forged a new alliance. In research that the members of the Polish team had done in the first two days, they discovered that the UK was sympathetic to their cause and even allowed for an exile government after the German occupation. They pressed this
relationship to create a stronger alliance prior to the threatened German attack. This raises the stakes on Germany as they move forward with plans to occupy Poland and, suddenly, interest and levels of participation in the game explode. Ms U was surprised both by the amount of communication in Edmodo each evening and by the level of sophistication of the analysis being expressed. One of the students had even invited a local history buff to join their conversation when they believed they needed more information than the game materials provided! Several students asked to check out tablets because the amount of time spent communicating on the smartphones was straining their eyes. With access to all of the messages, Ms U notices that all but a few students are actively contributing. She conferences with these students to build their confidence and remove any roadblocks to participation.

A week into the unit, one of the students suggests that Ms. U might want to subscribe to the Twitter feed #SimGermany. She finds that the German team has begun tweeting the news from their teams point of view. Other nation-teams are following suit. ‘#SimGermany: ‘Winter has come to this stinking nation! All may be lost on this front!’’ is the first Tweet that she reads.

On the final exam for the World War II unit, submitted electronically on the classroom Edmodo site, the quality of the essays that students write demonstrate a level of insight and depth of understanding that Ms. U has not seen before. It seems to her to be more at the level of graduate students than secondary. Prodded by students previously disinterested in history, she begins to search for additional simulations for the other periods in her curriculum.

Resources

- Edmodo
- Making History: The Calm and the Storm support materials

Tools

- Making History: The Calm and the Storm from Muzzy Lane Software
The Diary of Anne Frank

Ms. Niles is a fifth grade teacher who is teaching a language arts unit on autobiographies using primary sources. She plans to organize the unit around the book, Anne Frank: The Diary of a Young Girl. The unit will address the essential question, ‘How does literature present truth?’

Ms. Niles introduces the genre of autobiographies. She also discusses how diaries might be different from some other kinds of autobiographies. She tells them that they will be reading a diary written by a young girl during World War II. In order to help them understand the book, she divides her students into groups and asks them to do a webquest using smartphones or tablets that will give them an overview of World War II and the Holocaust. On the webquest page, created using Weebly, she provides links to sources that are at the appropriate age for her students. She focuses on sources, especially photographs and maps that were created during the war. With their smartphones or tablets, each group of students collects photos and images from the webquest and uploads them into an online Snapfish group room.

Then each group uses their online shared collection of photos and images and their laptops to create a timeline of the events of the war using the tool xTimeline.

Ms. Niles begins exploration of Anne Frank’s diary by reading out loud the first entries written in June 1942. The class discusses these entries and the setting of the book. They enter this information into the class wiki. Each day the students read another section of the book, discuss it in literature circles and make entries in the wiki. The different literature circle groups take turns making the first entry in the wiki and the other groups edit it to make additions or corrections.

To ensure her students use their time productively, Ms. Niles begins each class session by sharing an agenda or ‘to-do’ list with the students. This strategy helps her to ensure her students have a clear understanding of what she expects them to accomplish during the session.

As the students read and discuss the diary, they use their laptops to add events to their timeline on World War II to include events described by Anne Frank. They compare Anne Frank’s perspective of World War II to the events occurring during the war.
The unit concludes with each group using primary sources and their laptops to create a presentation about Anne Frank, World War II, or the Holocaust in one of the following formats: A slideshow, a concept map, a timeline, or an eBook.

**Resources**

- [Anne Frank](#)
- [Creation and publication: Weebly](#)
- [Visualization: xTimeline](#)
- [Photo sharing](#)