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## Thinking About Educational Technology

Joseph Weizenbaum, former M.I.T. Computer Science professor, once gave a speech entitled “Are Computers Good For Children?” He claimed that his speech would be short: The answer is no, he said. His main objections were:

- literacy vs. computer literacy: Basic reading and math skills must have preference over computer literacy and programming.
- too much money is being thrown at problems when computers are under used, teachers inadequately trained, and so many other needs exist.
- too much truth coming from a CRT: children already spend too much time sitting in front of that other CRT, the television set.
- not real motivation for learning.

But Weizenbaum missed the point. The future of computers in schools is not to see them as separate entities to teach computer literacy but to use the computer as a powerful tool for enriching, expanding, and ultimately, rethinking our primary and secondary school curriculum.

We need to recognize that educational software and websites are simply another learning medium. We must accept their imperfections and work on using their strengths. We do accept imperfections in our textbooks, but we use them for what they offer. And so it must be with educational technology. Beware great expectations; but also realize the tremendous potential.

In thinking about educational uses of technology, inevitably we become involved in global school issues by focusing more attention on the curriculum and learning process. In fact, an important humanware theme involves altering job descriptions to create time for evaluating software and websites. It is crucial that several people at each school become active as educational technology experts.

- Drill and Practice software and websites are not ideal, but they serve a useful purpose. They should not be compared to an ideal teacher - ever patient, ever rational - that cannot exist. Instead, they should be used for their patient objectivity and record-keeping options, and evaluated for their graphics, animation, and intelligent use of the material.
- Educational technology functions as marvelous project tools, in the way that Howard Gardner suggests is so important in *Frames of Mind: The Theory of Multiple Intelligences* and for those who focus on differentiated learning styles.
- We need to use the strengths of technology to address the weaknesses of the curriculum. Two striking examples are improving problem solving and writing skills.
- There is tremendous value in using technology to address the problem of heterogeneous classes and differentiated learning. The flexibility of technology both allows for and encourages the creation of projects suited to the needs of a variety of skills and a variety of learning styles.
- Some aspects of our curriculum do need dehumanizing. Removing the human relationship in these areas can be useful for the learning process.
- In contrast to programming, educational software and websites demystify the computer, opening it up to everyone. Diverse use of the computer helps to overcome the trap of the computer as male territory.
- The time crunch is a challenge to be met, not a problem to be solved.
- It is not necessarily a question of the right software or the best website, but a question of what individual teachers find intriguing and exciting.
- There is no “right” way to use educational technology, but rather a variety of approaches. See the section on Classroom Management which formalizes these various styles.
- It is particularly important that females see the computer as more than a math/science tool. Girls too frequently “drop out” of higher level computer courses and even at an early age, girls perceive the computer as boys’ territory. By creating their own websites and multimedia projects, girls feel empowered by computers.
- Evaluating educational technology should be seen as a process that can help promote faculty collegiality and communication. We need time to see if the technology serves its purpose. We need to be careful of both the explicit and implicit values found in software packages and websites, e.g. racism, sexism, violence. We need to evaluate with children and take advantage of the extensive YouTube and other tutorials available. We should make errors in using it to see how the site handles mistakes. We should investigate if the online digital storytelling project can be saved to edit at a different time. Ideally, we should gather a group of friends or colleagues to try out the technology or let a group of students try it

out. Many aspects of educational tech come as positive surprises for a school. With a fairly well-defined goal of seeking educational Web 2.0 and social media sites, many teachers and schools have found these significant fringe benefits:

- Use of technology can be a revitalizer and lifesaver for teachers, helping in some ways to reprofessionalize the profession
- Web 2.0 can excite and energize the classroom, e.g. simulations, projects, creative endeavors, opportunities for real-world problem solving and global solutions
- Because Web 2.0, YouTube, and other media-intensive and interactive sites can add conceptual richness to so many topics, we may come to realize that we need to slow down the pace to cover subjects in greater detail.

## Drill and Practice Software/Websites

### Frequent complaints

- most commonly maligned as an electronic workbook
- asks only close-ended questions, left vs. right brain teaching
- cannot compare to an ideal teacher, an ideal text and an ideal role for the computer
- no supertechno answer to children's difficulties in learning and no zippy future tech use of the computer
- doesn't change education in any fundamental way; the computer is a scarce resource and should not be wasted on D & P which teachers can do better. Teachers should be encouraged to do things that may be riskier, more exciting and potentially more beneficial; lulls teachers into thinking that they are using computers to their full potential
- Too much focus on "fact-based" education
- Too cute, too many games, unnecessary animations, and not enough content

### Reasons for Drill and Practice

- Patient and consistent, non-involved, self paced, can respond individually, errors can be analyzed and corrected, records can be maintained, future ones will be able to detect conceptual problems that are leading to mechanical errors (i.e., multiplying  $9 \times 3 = 12$ )
- relatively easy to implement because it involves a change of mechanics but not a change in point of view, easily worked into the existing curriculum to support and perhaps accelerate the pace
- frees up teachers' time to allow them to be more creative and to focus on higher order thinking skills
- works well to reinforce a concept or to use as a self-assessment tool
- can be used effectively in the one computer class for group skills and practice sessions
- very useful for the differentiated classroom

### Research and General Observations about Drill and Practice Activities

- impact of computers is highest with young children and decreases steadily as grade level increases
- using a computer to supplement regular teacher-led classroom instruction is usually more effective than use to provide instruction
- in mathematics, younger and lower ability students learn better from drill and tutorial programs while other students appear to profit more from simulation-type Computer Assisted Instruction (CAI.) (A recent study, however, suggests the opposite: drill and

practice software can increase the gap between strong and weak students because good students can use the software to shore up their skills quickly and then move on to more demanding problems.)

- in a two year CAI math and reading test, children did not differ from non-CAI children in attitudes towards school or towards math. However, children in the CAI experience did develop a stronger sense of academic self-confidence and a greater sense of personal responsibility for success than did the non-CAI children. This finding was especially strong for educationally disadvantaged children.
- Girls do far better on drill and practice that stresses cooperation rather than competition, does not contain negative reinforcement, timed drills, violence, and the game involved is not arcade-oriented.

## The Next Step: Simulations

In contrast to drill and practice software, simulations inevitably raise issues of higher vs lower order thinking skills. According to B.S. Bloom's *Taxonomy of Educational Objectives*, higher order thinking skills include knowledge (define, repeat, record, relate), comprehension (translate, restate, discuss, describe, explain), application (interpret, employ, demonstrate, dramatize, illustrate), analysis (distinguish, appraise, calculate, experiment, solve, categorize), synthesis (compose, plan, design, formulate, create), and evaluation (judge, appraise, evaluate, revise, estimate, measure).

Many people want to focus on what can the computer do well that schools need to be doing. Where do the strengths of the computer meet the weaknesses of the curriculum: that's the place to look for effective and exciting use of educational software. Two most frequently mentioned problems are writing and problem solving. Simulation activities are natural for the latter because they can involve spatial relations, higher level thinking skills of analysis, synthesis and evaluation, asking critical questions, classifying ideas and facts, and the social skills of working cooperatively. Simulations fit in wonderfully with Howard Gardner's *Frames of Mind* approach to education that builds on the theory of multiple intelligences and different children learning in different ways.

Simulations support and enrich the entire curriculum. The computer must be part of the curriculum, which usually means that something is happening away from the computer which relates to what is happening on the computer. The activity must be an integral part of a larger unit and its presence must make a difference; computers should not be stand-alone products. It is of utmost importance that children view technology in a larger scope, with a wider context and a big picture. An appropriate analogy is learning how to use the English language: it is not something we do in and for a language arts class alone; it has definite links across the curriculum as a discovery tool and as a means of communication. Children need to see that technology, too, has ties with art and music as well as math and science.

Computer simulations frequently involve the creation of microworlds to set up experiences that challenge students to enter into another system of thought that allows them to manipulate data.

Computer simulations have the potential to ignite a spark by turning facts and figures of so many classes into living environments in which the students participate and demonstrate how skills gained can be used. Students control the environment; simulations have tremendous potential for energizing the whole learning process and to be the central focus of a laptop program. Many teachers have had great success with the website Second Life.

Social Studies has a tradition of using simulations to bring historical and contemporary topics to life. With the computer, simulations have the advantage of graphics, animation, number crunching and actively involving students in collecting and interpreting data. They also provide access to another country or another century.

Science Simulations provide experiences in scientific reasoning or using the computer as a lab assistant. Additionally, students can observe changes that could not be done under normal circumstances. Many websites contain flash animations of physical properties and chemistry experiments. Explorations of the solar system can be heightened by many websites and by KML tours created for Google Earth.

## Problem Solving Websites

This type of technology addresses areas that traditionally are difficult to teach but can be reached with the power of the computer: spatial relations, critical thinking, estimation, recognizing patterns, discovering attributes and rules, scanning for clues, predicting results.

Examples:

K-1: National Library of Virtual Manipulatives ([nlvm.usu.edu/en/nav/vlibrary.html](http://nlvm.usu.edu/en/nav/vlibrary.html))

2-4: [crickweb.co.uk/](http://crickweb.co.uk/), National Library of Virtual Manipulatives ([nlvm.usu.edu/en/nav/vlibrary.html](http://nlvm.usu.edu/en/nav/vlibrary.html))

5-6: [thinkingblocks.com](http://thinkingblocks.com), National Library of Virtual Manipulatives ([nlvm.usu.edu/en/nav/vlibrary.html](http://nlvm.usu.edu/en/nav/vlibrary.html))

Many websites, with their use of Flash and Shockwave animations, provide terrific resources for spatial relations activities. One tip: when searching for these sites, check [http://delicious/summercore](http://delicious.summercore) for many resources, or when searching in google add the word “activity” or “animation” or “interactive” to the particular topic you are searching. For example, if you want an activity about tangrams, enter tangrams animation into the search box. (You do not need the quotation marks.) This tip, by the way, is a useful one for all web searching of curriculum resources.

# Cooperative Learning

The computer's capacity to be open-ended makes it an ideal problem solving tool to use in cooperative groups whose focus is not only on what students learn but also on how they learn. Cooperative computer learning encourages pursuing the goal (how many would have given up if left on their own?), building our knowledge on the knowledge of others, thinking of new ideas by listening to others' ideas, and giving support when about to give up.

Cooperative computer learning reinforces key life skills: the ability to think critically and the ability to work with other people. Create unique roles and activities for each group; then ask each group to report to the others or form jigsaw groupings to share knowledge.

Examples: Webquests aid group cooperation and problem solving. Or use Google Earth: each team is assigned a state or a country to study, with each student investigating a different subject area of the locale, such as products, demographics, climate or economics. Then the three-person teams split up and form "expert groups" consisting of members of the other teams who have been assigned the same subject area, then return to original teams and teach what they discovered. They have to come up with a single team product (create an advertising campaign to convince people to move to their venue) or debate about the quality of life with other teams or create bartering units to show how different states could combine resources or focus on one issue — demographics, cultural background — to discuss political or social ramifications. Students can use Google Apps to create group presentations and spreadsheets to analyze data.

# The Creative Computer

Graphics, animation, movie editing, and music software provide an alternative route to the computer to those children who see the machine as a math/science tool or who are more "right" brained in their approach to school work. Students can explore digital storytelling for all subject areas.

Examples include Kid Pix Deluxe, Inspiration, iPhoto, PhotoShop, Movie Maker, Comic Life, Garage Band, iMovie, Final Cut Pro, Microsoft Photo Story, aviary.com, animoto.com, doink.com

Innumerable websites allow for on-line and collaborative photo editing, video editing, comic book creation, drawing, and elaborate slideshows (See Chapter 16 on Web 2.0); in fact, many of these sites are so powerful that they are replacing the standard software packages.

Students can create powerful videos (see [tellingstories.org](http://tellingstories.org) for a spectacular Holocaust project) on a variety of topics, or they can use multimedia sources as an alternative assessment for a class project or lab report. Perhaps student can be assigned to create tutorials on topics covered in class or engage in a digital storytelling project.

# Technology Integration: The 1-2-3 Approach

The following 1,2,3 integration approach is a helpful model to lay the framework for evolutionary and meaningful change.

**STAGE 1:** Teachers start slowly, incorporating educational technology as a means to support the existing curriculum. They do not use technology that involves extensive teacher training or extensive rethinking of the curriculum and the educational goals for the year. The primary use is curriculum supplements, enrichment, and word processing. Moodle and online course management, if used at all, is a depository for web links and documents for handouts.

**STAGE 2:** Teachers extend the use of technology to enrich the curriculum in a variety of ways. Increasingly, collaborative word processing becomes a tool for educational change and improvement of writing skills. Technology use is primarily project-focused, used for alternative assessment and for its ability to aid in differentiated learning. Digital media begins to seep into the curriculum. Faculty actively integrates interactive websites for online activities, uses Interactive Whiteboards as projection screens or touch screens, and assigns some collaborative Web 2.0 projects. It is here that the time crunch can be severe because old topics are now being explored in different ways while new topics are being introduced. Moodle is used as a depository for web links, videos, and documents for handouts; Faculty begin to take advantage of Moodle's and Google's constructivist aspects.

**STAGE 3:** Teachers create a new paradigm of collaborative knowledge-sharing and content creation based on the increased educational possibilities of technology. Teachers take advantage of the collaborative aspects of Moodle and Google Docs, cloud computing, digital media and Web 2.0 content creation. Certain long-standing pedagogies and aspects of the curriculum are no longer valid or have much lower priority. Although this stage heads towards a technology based curriculum, the focus is not "on the technology" but "because of the technology." Modifying the curriculum involves more than changing topics; this Stage 3 process includes reordering topics, eliminating some, and creating new ones. Stage 3 alters our notion of appropriate grade level, facilitating Alfred Whitehead's belief that almost anything can be learned at any age. Some topics might be accelerated, some slowed down and some eliminated. Stage 3 decompartmentalizes academic departments by integrating larger themes and connections. In short, digital media is used for its potential to revise the way we think, the way we learn, and the way we teach. Recognizing that our students are increasingly proficient, teachers use technology to address 21st century learning skills with media literacy, social networking, and the host of web 2.0 sites now available. The focus is on preparing students for a world we can only imagine, instilling in the students the ability to collaborate, share knowledge, and harness the collective intelligence offered by Web 2.0 and beyond. "If we teach today's students as we did yesterday's, we are robbing them of tomorrow."--John Dewey

# Common Mistakes in Evaluating Educational Technology

Because the medium of educational software is so new to us, we are prone to many traps in evaluating software.

- **Mistake #1: we spend insufficient time evaluating websites, not reading/viewing the tutorials or exploring features.** We should learn from our experiences with textbooks that the process of evaluation is time-consuming, and that first impressions can be misleading. We all want the quick fix and the snap judgment. Many YouTube, TeacherTube, and Vimeo tutorials exist for popular websites and apps; view some first before the final evaluation. To pass judgment quickly is like a student who evaluates *Jane Eyre* after browsing the first few pages. Many websites and apps improve upon closer inspection.
- **Mistake #2: we can be too righteous in our evaluations.** We forget the diversity of interests and appeals of various teachers and students. We forget to take a holistic approach. Because apps and websites can have that magical feel, people like to find a few faults and thereby write off technology: perhaps the menu choices are not clear, or the site is too gimmicky at first glance, or the choices are not always customizable. Yes, these are correct observations, but no different than what you might make in evaluating another teacher's class or evaluating a textbook. We rarely write off a colleague for a few faults, and we all use textbooks with some imperfections. Unfortunately, we hold technology up to a higher standard.
- **Mistake #3: we too often evaluate without students.** It is easy to pass judgment as adults and be dead wrong. Watching students communicate, interact and problem-solve can convince a teacher that the specific application or website has much more merit than originally conceived. Evaluating technology by watching students explore it leads to a richer appreciation of the learning process. What can seem to be an incomprehensible maze to teachers might be much less confusing to young learners used to clicking around menus and screens.
- **Mistake #4: we cannot see useful strategies for incorporating the particular site or app into our curriculum.** Even now, we still have few models of effective technology integration in the teaching process. Most teachers still have never taken part in the use of educational technology as a learning tool. Analyzing online data and constructing collaborative Google Apps projects, placemarking Google Maps or incorporating YouTube videos are not the common experience set of most adults. We learn to teach partly by good and bad models we have had when we were students. Lacking these models, most of us need to be in experimental mode in trying to use technology. For a teacher who has taught for 20 years, using technology is risk-taking of the highest degree, resembling the first year of teaching. Not that many teachers are comfortable increasing their level of anxiety by breaking new ground; it is much safer to continue on with the traditional, proven approach that has worked for the past 19 years.
- **Mistake #5: we are fearful that educational technology distracts from our educational goals.** Instead, we need to embrace the big picture of the much-quoted 21st century skills. Technology can enhance the skills we value and have traditionally taught --writing effectively, problem solving, critical thinking--while providing an easier method of teaching the skills that we valued but could not teach so easily--collaborative learning, leaving a legacy, publishing, global empathy.

# Summary of Classroom Management Styles

Since most of our teaching styles have been deeply influenced by the role models we've observed during 12-16 years of sitting in classrooms as students, it is no wonder we are at a total loss when it comes to teaching with computers. We have had no such role models! No wonder it is common for teachers to think that teaching with computers means taking 18 students to a computer lab to work on 18 computers.

**Style #1 One Computer/Corner:** The majority of children are working on various tasks and projects at their desks, while 1-3 children work on the computer in a corner of the room. In effect, the computer becomes one of several activity centers in the room. Drill and practice activities work well in this style since there are usually very few computer usage skills involved. Perhaps the one machine becomes a dedicated word processor or digital storytelling option. Certain types of simulations or micro-worlds might work well this way with proper preparation and setup. Other software and websites also work if they can be used without teacher supervision. In order to make this style work, the application has to be for the most part self-explanatory. Teacher organization can help in this regard, with the important keys and features marked clearly on a poster next to the computer. Additionally, the teacher needs to have enough "other" classroom activities going on so that everyone gets his/her turn at the computer while others are doing similar productive work at various locations.

**Style #2 One Computer/Teams:** The children are split into groups. The computer poses a problem. Each group tries to solve the problem and plans out the solution on paper within the group. One group at a time takes its turn at the computer while the other groups are planning and/or watching. Problem solving sites work well this way since the computer displays the problem to be solved. Simulations allow teams to address real-world problems or create multimedia projects. Logolab, Google Sketchup, or Scratch can be made to work this way, if the teacher presents a challenge that involves careful group planning.

**Style #3 One Computer/Central:** This is the best style when using software/websites that are fairly sophisticated in terms of content, abstraction and intellectual skill. Use of a projector is an important asset, if not necessary here. Making use of manipulatives and an interactive whiteboard can be quite exciting and intellectually provocative for all students. A Voicethread activity can work well in this format; post pictures and have students add comments and doodles. A SMART Board Notebook or Eno Board Easiteach activity can be used effectively this way. Of course, viewing YouTube or other videos or a web site takes advantage of a central computer projected onto a main screen.

**Style #4 Computer Lab/Hands-On, one-on-one:** Here the students go into the lab with one child at each machine. It is best to reserve this style for the types of computer usage that are most appropriate: word processing, typing practice, graphics packages, PhotoShop, and most software tools. This is not to say that these activities can't be done in a different style. They can but sometimes work better as individual projects.

**Style #5 Computer Lab/Several-on-one:** Here the students go into the computer room with two, three or four children at each machine. Perhaps one student works the keyboard and the other

student takes notes or helps to make decisions. If we have three children at a machine, one can be the operator, one can be the note-taker and one can be the supervisor in charge of the first two. Almost all problem solving websites, apps such as Google Sketchup or Scratch, and Google Earth/Maps tour creation can be effective in this style. This approach also works well with peer editing of a digital storytelling assignment or a Google presentation; one child is writer, the other is critic.

**Style #6 Computer at home:** The vast majority of students now own a computer and have internet access, so a school can take advantage of this availability for projects and homework. Teachers can rely on web access to assign homework on blogs, wikis, gathering photos for a project, conducting web research, or working on a collaborative writing site like Google Doc. Moodle or other course management systems provide the opportunity for 24/7 learning. Students can participate in Forums and Chat Rooms in Moodle to extend an interesting class discussion or provide follow-up to a difficult physics problem. Students can download Google Earth to their home computers to work on creating KMZ Google tours for a literature or history assignment, or the Sketchup to create 3-D models. They can create timelines for a history class or the steps of a physics experiment on multimedia timeline websites, like [circavie.com](http://circavie.com), [Tiki-Toki](http://Tiki-Toki.com) or [capzles.com](http://capzles.com). They can create web pages using [weebly.com](http://weebly.com) or multimedia posters using [Glogster](http://Glogster.com).

**Style #7 Required Laptops or iPads:** Here we have reached the point of development where all students own a laptop or iPad. Many schools are beginning to require this purchase either targeting one class or the entire school. All students carrying laptops allows for group writing activities, whole class Web activities, and online explorations. Some schools purchase the laptops, renting them to students for a fee; another option is a collection of fifteen to twenty laptops on a rolling cart. The explosion of iPads, netbooks, and other low-cost tablets could give many schools the impetus to move forward with a one-to-one program.

## Beyond Word Processing

Computers can be effective tools to inspire children to write more frequently, edit their work more aggressively, and create more interesting compositions. One way to effect this computer use is to establish a writing lab or writing corner and require students to spend time on the computer as part of the Language Arts and English curriculum. Another way is to build entire creative writing units around a specific software package.

### Preschool through Kindergarten

- **Scholastic.com:** offers animated versions and activities of many popular books for young readers. A host of other websites offer similar opportunities for online reading. Teachers can monitor students' progress.
- **Kerpoof.com:** story starters or write their own stories and rebuses with a word finder and the ability to switch pictures with words; recording feature allows students to then strengthen the reading/writing link
- **KidPix Deluxe:** although primarily a drawing tool, KidPix or Tux Paint allows young learners to stamp in letters or write the text to accompany their illustrations.

#### **Grade 1 through 4:**

- **Introduction to Keyboarding:** most teachers agree that beginning drill in keyboarding makes the most sense at the ages of 8 or 9. Without keyboard training, students type about 5 words per minute, but they can hand write 10 words per minute. The ideal typing speed for young students to strive for is about 20 words per minute.
- **Word Processor as Text Editor:** recent survey indicated that 87% of children preferred revising with a word processor. The word processor is ideal for process writing and group compositions. The word processor can be used for a variety of writing skills exercises: sentence combining, adding or deleting descriptive language, templates for poetry or creating analogies, changing point of view, computer aided essays, rewriting literary passages to focus on style and tone, creating a class newspaper or literary magazine.
- **Word Processor for Language Arts Activities:** Easy-to-use word processors allow children to write and illustrate their own stories or create their own newspapers. A variety of digital storytelling sites, like littlebirdtales.com, allow for multimedia stories. Kerpoof.com allows children to create a storybook complete with illustrations and background,s and students can collaborate on writing activities with Google Docs--perfect for the laptop classroom.
- **Graphical Mapping:** Kidspiration offers young students the mapping activities of Inspiration, plus idea grouping options and read-aloud features. Students can use Kidspiration for story starting, understanding literature, and beginning to understand outlining. Webspiration.com allows for online, collaborative mind maps.

#### **Grades 5 through 8:**

- **Keyboarding and Word Processor:** Most of students' work should be done using the computer; students have most difficulty editing on the screen, so perhaps first drafts should be edited off-line. Students at this level can use Google Docs and the comments feature for editing and peer editing.
- **Language Arts and Critical Thinking:** Annotating text with an interactive whiteboard or the reviewing features of Word, Google Docs, and Pages helps students to think analytically about the structure of language; to become more effective language users, students need to be more aware of how our language works. With the analysis opportunities afforded by an IWB, students gain practice in improving their own style. Teachers can use word processing activities to illustrate style, paragraph unity, word choice, and the creation of tone; for instance, teachers can type in paragraphs from literature that the class is studying or perhaps from books that the class has not read. The class can be divided into groups: one group is the forger and the other is the detective. The forgers enter a sentence into the paragraph, trying to match its style, tone, length, vocabulary and use of literary language. The detectives then try to detect the forgery. Both small group and large group discussions can then ensue on authorship, style, literary choices, etc.
- **Grammar, Vocabulary, Spelling Skills:** Studies have shown that spelling improves with use of individualized word lists, a natural use of spelling checkers. Many websites provide a variety of exercises for using unusual or required vocabulary words. A simple website, like Wacky Web Tales, can be turned into a grammar activity lesson; its madlibs type feature allows practice in understanding parts of speech and vocabulary development. Useful grammar websites exist, and they can function as individual drill and practice or as team competitions.
- **Graphical Organizers and Slideshows:** Inspiration can be a powerful tool for analyzing themes, comparing and contrasting characters, tracing archetypal patterns and understanding plot

developments. Additionally, Inspiration's graphic mapping interface allows visual learners another approach to outlining for essay writing. Webspiration allows for online, collaborative mind maps. PowerPoint, Keynote, and Google Presentations can help students to outline key points and prepare oral presentations.

- **Moodle Workshop , Wikis, and Google Apps:** The Workshop activity in Moodle is particularly useful for teaching the process of drafts and revision; students can enter their drafts for both teacher and peer editing. Google Apps allows for the creation of group writing and revising activities. Ditto Wikis. Teachers can enforce the rule of "Edit, then Add;" students cannot add new information until they revise the work of another student.

- **Digital Storytelling:** Many programs and websites, including KidPix Deluxe, MovieMaker, iMovie, glogster.com, animoto.com, and voicethread.com, allow students to create sophisticated multimedia presentations, combining digital videos, animations, text, graphics, sound, and photos.

- **Peer Editing and Group Writing:** Google Apps allow for round robin writing sessions or group evaluation of student writing. Students can use the chat feature while peer editing and view the revision history to make the appropriate changes.

- **Spurring Creativity:** frequently students this age get into a writing rut with each story sounding suspiciously like another one; programs and websites that combine graphics and word processing appeal to those who are visual learners but can also help avoid the typical sixth grade plot lines that teachers see so often. Programs like Kidpix and websites like comiqs.com and kerpoof.com allow students to select canned clip art to create a scene; while the act of creating the scene might not be considered particularly creative, the act of choosing the images and creating the scene can spur the blocked writer and improve word choice, theme development and plot. One study supported this thesis, indicating that children who used these creative writing packages actually wrote longer, more complex and more interesting stories than those who created a story using a traditional word processing program.

### **Grades 9 through 12:**

- **Word Processor as Text Editor:** Focus in these grades is on writing style, organization and support of ideas, sentence structure and effective communication of ideas; Google Docs can be used to teach and reinforce these skills. An IWB is key to teaching the art of essay writing; teachers can quickly write and then rearrange ideas to arrive at thesis statements, supporting details and sequencing ideas. The ease of the IWB allows for the focus to be on the skills necessary to develop a cogent essay, not on the mechanics of handwriting a bunch of examples. A SMART Board Notebook or EasiTeach lesson plan allows the teacher to print, email, or upload to Moodle.

- **Graphical Organizers and Slideshows:** Inspiration can be a powerful tool for analyzing themes, comparing and contrasting characters, tracing archetypal patterns and understanding plot developments. Additionally, Inspiration's graphic mapping interface allows visual learners another approach to outlining for essay writing. PowerPoint and Keynote force students to outline key points and prepare oral presentations. Many mind map websites are now available.

- **Digital Storytelling:** Students can create a hyperlinked presentation analyzing a poem, a scene from a play or a short piece of nonfiction, including links to poetic terms, glosses of lines, historical background and oral interpretation. Students can use iMovie and a digital camera to create videos of Shakespeare productions or readings of their favorite poem; visit

favoritepoem.org to view videos of students and adults reading their favorite poem and discussing its impact on their lives. Web 2.0 sites are terrific for digital storytelling: check out voicethread.com, glogster, animoto, bubbleshare.com, and any one of the many comic strip creators. Students can create a multimedia timeline on dipity.com or capzles.com to create a digital memoir or use Google Earth or Google Maps to create a geobiography or pinpoint the wanderings of the hero of a novel.

- **Blogs and Wikis:** These have unlimited potential for Upper School students. Blogs and Wikis encourage thoughtful writing and commenting, collaboration of ideas, and peer editing. Google Apps allow for collaborative activities, the creation of newsletters, and the archiving of student work. One of the great joys of these websites is the flexibility of access and use: whole class activities with each student on a laptop, one computer projected on a monitor, or a homework assignment. Blogs, in fact, are God's gift to the English teacher.

## Writing & Learning Activities

### Grades 3-6: A Literature and Social Studies Project

- Class will read Molly's Pilgrim, by Barbara Cohen, a short novel that focuses on a young girl's shame about her mother's "foreign" ways and the teasing she receives at the hands of her schoolmates. Only when she brings in a doll, fashioned by her mother, that shows her peers there are many kinds of pilgrims, does she feel pride in her immigrant mother's experiences. There is a film of this story and children may read books with similar themes, including Watch The Stars Come Out and Journey to America. The latter is more appropriate for older children.
- Using a word processor, children can write and email a letter to parents, grandparents or great-grandparents that both explains the book and asks them to tell about their native land, their own experiences when immigrating, or folktales from their childhood.
- Explore a festival holiday: some groups can explore Thanksgiving, others Sukkot, others festival holidays from other lands. Students can use Google Sites to create a cookbook, write explanations of each holiday for a class newspaper or research report, or use Glogster or Voicethread to create a class presentation on the holiday.
- Use Timeliner, capzle.com, dipity.com, Tiki-toki.com or circavie.com to create family histories on immigration.
- Create a Wiki or Google Site about each of the countries responsible for the immigration patterns at your school.
- Use the Ellis Island website which provides first person accounts, videos, and data.
- Use digital cameras to create podcasts or documentaries about grandparents' or great grandparents' experiences.
- Visit ellislandrecords.org to research immigration data; students can enter their great grandparent's names to try to find an ancestor's date of birth, date of arrival, ship manifest, etc.

### **Literature and History in the Upper School**

- Students can use the Web for research and to create their own presentations and slide shows for a multimedia class discussion of the historical background of the selected literature.
- Students can use Google presentations, Keynote, iMovie, Voicethread, a Google Earth tour, Photo Story, or Creaza.com to create a multimedia essay that defines the cultural and social context of an author's life; students can include video clips from YouTube and other video sites, digitized music, scanned photographs and art, as well as biographical and historical information. Try animoto.com for a rock video version.
- Students can use Timeliner, capzles.com, dipity.com, Tiki-Toki.com or circavie.com to create multimedia cultural or biographical timelines of the author's life or a plot and theme development timeline.
- Students can follow current events on Twitter and use these personal narratives to reconstruct and analyze the event.
- Students can create fake Facebook pages using Google Docs templates for a literary or historical character or create a Ning (now, sadly, not free) to enter a social world populated by historical or literary characters from one time period or from one novel. Or use a Moodle Forum or Chat to respond to an event in the role of a particular historical or literary figure.
- Students can create Google Search Stories (youtube.com/searchstories) to highlight key points in a fictional or historical character's life.

### **Word Processing as Educational Software for the writing curriculum**

#### **Expanding an essay to work on developing paragraphs and supporting and analyzing ideas**

1. Students first write a 1- 2 page essay using google apps
2. They share the text and then the teacher (or the class) selects one for class revision
3. Then each student expands that essay into a four page paper
4. First, they infer the outline from the paper and then create the outline
5. Then they edit the outline to expand or deepen the essay topic and each subtopic
6. Then they revise and expand the thesis to fit the new paper length

#### **Color coding parts of a paragraph**

1. Send all students a model paragraph via e-mail
2. Ask students to use the highlighting feature to highlight the significant parts of the paragraph, including topic and concluding sentences, transition words, introduction to quotations, etc.

#### **Using Web essays to avoid plagiarism and to demonstrate model essays**

1. Find an online essay relevant to topic; copy and paste into a Word document
2. Display on screen and/or print out for homework assignment
3. Discuss structure or opening paragraph and thesis
4. Students work in groups to revise paragraph
5. E-mail revisions and then project for all to see
6. Students can then write an essay based on the opening paragraph
7. The essay can be a source for quotations and support material, or it can be used to demonstrate the techniques necessary for incorporating secondary sources while avoiding plagiarism.

### **Thesis Fun**

1. Divide class into groups and each group constructs a thesis
2. Email to conference and then view all in one document. Display on an interactive whiteboard.
3. Combine two similarly themed statements to demonstrate the need for developing complex, sophisticated and original essay topics. Or use the drag feature of an interactive whiteboard to group similar themes.

### **Grammar Fun**

1. Create list of commonly used abbreviations for grammar and writing errors
2. Link the abbreviations to Web pages that explain each problem and provide solutions
3. Homework assignment is to explore the most common mistakes on any given essay by reading the information on the websites and then revising the essay.
4. This process is simplified by having students email their essays or using Moodle or Google Apps. Teacher can edit using the accepted list of abbreviations and then turn the key corrections into links to grammar and writing websites.
5. Word users can incorporate the comments and editing feature and hypertext links for this activity, and Google Apps users can incorporate links and the Discussions and Chat features.

### **Literature Chat**

1. Students can be in a lab or spread throughout the school with their laptops.
2. Using the school's email chat abilities, Gchat, Twitter, or Moodle, students can conduct an online chat about a novel; students who rarely speak will see this exercise as a great opportunity to express themselves, and all can work on perfecting their writing and communications skills.
3. Afterwards the teacher can save the chat and email it to all participants. Using Moodle, the teacher can record the chat history to use as the basis for an online assignment.
4. Following is a student's comments about this activity:

Now that we have a double again, I thought of a cool idea: during the first period, we do the spread out chat again, but then we have a discussion and in the second period we come back and look at the discussion printed out or up on the projector and have an in class discussion to supplement it, because I felt a lot of people who usually didn't get the chance or just didn't usually speak very much, or at all, including me, were given the chance to say what they thought. So I think in the chat room discussion a lot more was said than a regular one and a lot more good points were made. But I think the chat room discussion moved too fast at times so it would be good to print it out or everybody have a copy back in class to discuss it over again, almost a review of it.

### **Tone Analysis**

1. Type or copy from the Web a passage or passages from the current novel being studied.
2. Break up class into four groups, half are detectives and half are forgers.
3. The forgers insert a sentence that replicates the tone, style, diction, etc. of the author.
4. Detectives have to find the forgery.
5. Project the passages for all to see to begin discussion of authorial tone.

### **The Find Feature**

1. The Find text feature is an invaluable tool for both literary analysis and text editing.
2. For text editing, have students type the word "is" into the Find Text feature (be sure that the whole word feature is checked so students are not burdened with every appearance of the letters is); students will be shocked to see their over-usage of this word.

3. Repeat assignment with other common mistakes such as over-usage of the word “there” to begin sentences or over-usage of a particular phrase.
4. The Find feature can also be used for literary analysis. Download the text of a play and use the find feature to trace an author’s use of a keyword and to see how the word changes throughout the text. If the original text is on the Web, you can use the Find Feature in your Web browser button bar to the same effect. Many concordances exist on-line that also provide this feature.

### **Color coding errors**

1. Students copy and paste their essays into message area of email or uses Google Apps or Moodle.
2. Teacher can forward the text to him/herself or copy the text into a new message.
3. Inform students of color choices (red = sentence error, blue = punctuation)
4. Then the teacher changes the colors of those errors only; this activity probably works best if teacher announces beforehand that he/she will be focusing on only a few specific trouble areas.
5. Upon receipt of corrected version, students have to correct errors and remail both the highlighted and corrected versions back to the teacher.
6. Teacher can create a collection of these highlighted errors and display them for all to see. Students can then work in pairs to correct them, correct them for a test, try to identify the errors, keep a portfolio of their mistakes, etc.

### **Or go to [online-literature.com](http://online-literature.com) to find searchable online texts**

1. Students work in pairs at the above site.
2. Let’s say students were studying Oedipus in class. They would then enter "Oedipus" in the Book search space
3. Next type in the word "light" in the first "search word" space and look at a few examples of the surrounding text. Then search for "dark" and then for "true" and/or "truth"
5. See what they come up with in terms of links between the words. Students can then create a thesis based on Sophocles’ use of these words.

## **Why Use Software to Teach Math**

In 1983, I heard Seymour Papert, creator of Logo and author of *Mindstorms*, give a talk about the potential of computers in education; at one point he said “the computer is the only way to make subjects like math and grammar come alive.” I was shocked. I was upset. As a math teacher who took a lot of pride in trying to make math come alive for my students, I took his comment personally, since in the years 73-80, I had never used a computer as part of my math classroom and yet thought that I was doing something special mathematically for my students. I took offense at Papert's statement and lost some respect for the person whose book, *Mindstorms*, had been the catalyst for my starting The Teaching Company the previous year. I even changed the slogan of our company from “a consulting firm for computer education” to “a consulting firm for (and sometimes against) computer education.”

In 1984, I returned to teaching math part-time. I had heard Tom Snyder speak frequently about using one computer in a classroom and how the best way to use software for the first time was as a “rainy-day” activity: one computer, one big screen with students divided into teams. It did not seem like my style, but one day when subbing for a sick colleague, I decided to try The Factory,

a problem-solving package produced by Sunburst. I was astounded by the results. These seemingly sophisticated high school students, split into teams, playing a game for arbitrary points were “completely into it.” They were building models of cubes out of paper, rotating them, exploring changes in orientation, verbalizing mathematics and collaborating in ways that were different from my traditional lecture/dialogue class presentation.

I was hooked. Over the years from 1984-1990, as a part-time math teacher, I incorporated various software projects into my geometry, algebra and calculus courses. The school was using primarily Apple II computers; I had the flexibility of using one big screen in my room, several computer stations or the entire computer lab. Each year, I felt I was getting better at the pedagogical and management strategies, but only by encountering mistakes and feeling like a first year teacher again. The first year I incorporated Logo, I made Tuesday our Logo day and tried to do the standard curriculum the other days. What a mistake! Immersion is the key, I finally realized; and so in subsequent years, we concentrated on Logo in January and did not attempt the schizophrenic model of grabbing one day a week for computer time.

Another mistake I made involved my naiveté that computers could be implemented without making any dent in the curriculum. As the years progressed, I realized that the Logo and Geometric Supposer projects were competing for time with the intellectual and mathematical values of proof-solving geometry which I have always cherished. Ultimately, I decided with some anguish that the emphasis on proofs needed to be diminished. By limiting “solving proofs” to one unit of the course in the first semester, I freed enough time in the second semester to accomplish the Logo and Geometric Supposer projects.

### **Top Ten Reasons to Use Software in the Math Curriculum**

- Reason #10 Using software is a way to incorporate the writing-as-part-of-math theme for across-the-curriculum writing assignments.
- Reason #9 Using software can be very useful for both slow learners who need more drill and practice on certain areas and bright, capable learners who need enrichment and extra challenges.
- Reason #8 Using software can broaden the appeal of mathematics, making a course more multidimensional and helping to bridge sometimes disturbing male/female attitudinal differences.
- Reason #7 Using software allows students to leave their legacy behind, producing explanation sheets, posters and write-ups that younger students will then encounter and value some day.
- Reason #6 Using software can help address the need to modify our pedagogy to address the learning needs of different individuals. As Papert says in *Mindstorms*, “the computer is the Proteus of machines. Its essence is its universality, its power to simulate. Because it can take on a thousand forms and can serve a thousand functions, it can appeal to a thousand tastes.”

- Reason #5 Using software facilitates projects that are multi-dimensional, and allows for the Howard Gardner emphasis on teamwork, cooperation, problem-solving, and inter- and intra-personal learning experiences.
- Reason #4 Using software can help focus on theory and concept by saving time and allowing for easy manipulations and investigations with graphs, equations, spatial relations, probability, statistics and many other topics.
- Reason #3 Using software is essential to subjects like fractals and modeling that come out of the marriage of mathematics and computers as part of the intellectual world of the 21st century.
- Reason #2 Using software can be a facilitator of professional collegueship for math teachers in talking about experiences, pedagogy and curriculum as well as collegueship with other departments who need to “lean on math teachers” for help with formulas.
- Reason #1 Using software is exciting for teachers, since it presents a new pedagogical challenge and becomes a facilitator for re-examining curriculum areas and classroom styles.

### **Sample Projects that would span 1 to 4 weeks and result in a lab report**

- (1) Drawing a “dream” picture on paper of something that is meaningful to you; then using Logo skills, recreate that picture on paper and write a paragraph about it.
- (2) Designing a known or original tessellation using Logo and write a paragraph that will become part of an informative poster.
- (3) Using the Geometer’s Sketchpad to investigate questions at the start of the semester such as “what can you say when you draw the 3 medians of a triangle?” or “find the point(s) within an equilateral triangle that achieve s the minimum sum of the distances to the 3 sides (surfer) or the 3 vertices (spotter) of the original triangle.
- (4) Playing Green Globbs in team format with one big screen and then requiring students to win a Green Globbs game with the 5 different conic sections; using a graphing program, students had to produce a graph to illustrate their game.
- (5) Using a graphing program to compare the family of polynomial functions  $y = x^n$  with the exponential family  $y = 2^x$ . Students had to then demonstrate the remarkable statement that any member of the  $2^x$  family will eventually beat any member of the  $x^n$  family.
- (6) Using a 3D graphics program, construct a 3-D models with x, y and z coordinates.
- (7) Using the Geometer’s Sketchpad, try to come up with a new and interesting mathematical relationship and verify it/disprove using the trial and error repetition
- (8) Writing paragraph reactions or explanations throughout the year to various questions and topics that are then word-processed and incorporated into an individual or collective publication at the end of the year.
- (9) Creating Web pages of famous mathematicians or steps in solving geometry proofs.
- (10) Developing a spreadsheet unit as part of a standard grade 7,8 or 9 math class so that the formula manipulation within a spreadsheet is related to the basic manipulation of algebraic variables

- (11) Developing a problem-solving course or unit in a mathematics class based on using spreadsheets to facilitate problem solving
- (12) Producing a series of in-house “geometry videos” to facilitate different learning styles and to use throughout a geometry course

## Rating Software: GP, PG, R, or X(NC-17)

Because students seem to catch on to software so quickly, most teachers fault themselves for having trouble with software. More generally, most people fault themselves for having trouble with their DVD, cable box, digital camera, or cellphone. We are in an age of technology overload and it will accelerate over the next 20 years. Learning to read the help screens, learning to problem solve, to take risks and to troubleshoot all new gadgets, web sites and apps are definitely 21st century skills. Most important, learning to get help from someone else is crucial. Many apps and even Web 2.0 sites are not easy-on easy-off. The old rating system of GP, PG, R or X can provide teachers with an understanding of technology and less guilt about using or not using it in their curriculum.

- **Go Get Started:** This type of app or web site requires no manual, no video tutorials or on-line help, no resource person and no preparation. Any basic help you need will be on-screen or with guided tutorials. Examples: Voki.com, Blabberize, Twitter.
  
- **Personal Guidance suggested:** This software will benefit tremendously if someone who has used the software gives you a head start. That person can show you the idiosyncrasies, the stumbling blocks and a few tricks. Of course, you can read the manual and figure out things for yourself. In fact, it is recommended that you browse the manual before you even put in the disk. Examples: Google Apps, iTunes, SMART Board or EasiTeach software, Weebly, Delicious and Diigo, and many Web 2.0 sites
  
- **Read the manual/online help screens or view online video tutorials:** This type of software can be mastered by many people, but the best approach is to explore the existing tutorials. Yes, we know that some of these apps can be learned at beginner levels without tutorial help, but to learn the software in-depth more is needed. Also please understand that some people—frequently those under age 20—can become proficient with this kind of software without help from YouTube videos; the variable is not just the software but the learner. Examples: MS Office, Geometer’s Sketchpad, iMovie, PhotoShop, Google Reader, and Facebook.
  
- **X-tremely difficult software:** Most normal people will need a course and/or ongoing support in order to use this software effectively. This software is analogous to learning Latin, violin or Algebra. Examples: FileMaker Pro, Moodle, or Final Cut Pro. **(Or NC-17 because unless you are less than 17 years of age, you will never be able to figure this out.)**

# Evaluating Educational Technology

## **Ease of Use**

- Clarity of design

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- Clarity of classroom use instructions \_\_\_\_\_

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- Depth of explanations \_\_\_\_\_

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- Clarity of User Interface \_\_\_\_\_

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## **Classroom Use**

- Strength of content presented \_\_\_\_\_

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- Depth of material presented \_\_\_\_\_

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- Quality of multimedia \_\_\_\_\_

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- Enrichment or drill \_\_\_\_\_

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## **Presentation and Integration**

- One computer, lab, one-on-one laptop \_\_\_\_\_

- Group and/or single user \_\_\_\_\_

- Overall Evaluation \_\_\_\_\_

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