Y2K: A Teachable Moment
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As the Fall 1999 academic semester progresses, the US media will undoubtedly give more and more attention to the Year 2000 (Y2K) bug. Everyone in our society exposed to the media, through television, newspapers, radio, and the internet, will continue to be bombarded with widely differing viewpoints on the issue. Will the power go out at midnight on January 1, 2000? Could a global recession or even depression be triggered? Is all the hoopla over Y2K greatly exaggerated, intentionally portrayed as "doomsday" by profit conscious opportunists, religious extremists and wackos?

Students, parents, and teachers face these questions today, and will likely seek answers to them even more fervently in the months to come. As educators, the Y2K issue and the opinions which surround it present an excellent opportunity for learning: a "teachable moment." Students can explore a multitude of facts and opinions concerning Y2K, and debate the sometimes fine line between the two under the guidance of their teachers. One of the most important skills of our information age, the ability to determine the credibility and validity of information and its source, must be practiced by students and teachers at every step of this investigation. Since the Y2K problem inherently concerns computers, a veritable plethora of information is available online to inform as well as confuse students on the topic. This article presents ideas for a multimedia student project focusing on Y2K issues, and includes many online sources for Y2K information which can be used as curriculum materials within the classroom. A linked copy of this article is available at www.wtvi.com/teks.

Defining the Project

When planning a multimedia project, it is usually advisable to have students "storyboard" their ideas first. A storyboard serves as a rough draft for the presentation, including the text, graphics, and other media elements which will be included on each slide (or "card," in the case of HyperStudio). The storyboard shows the relative links between the slides,

which is particularly important if the presentation will follow a branching rather than linear format. Most slide shows are linear: screens are viewed in sequential order from start to finish. A branching presentation, on the other hand, usually includes an index slide with buttons (links) to other slides. People viewing the presentation can select the order in which the component slides are viewed.

For this project on Y2K, a branching presentation format works well with nine basic slides. These are:

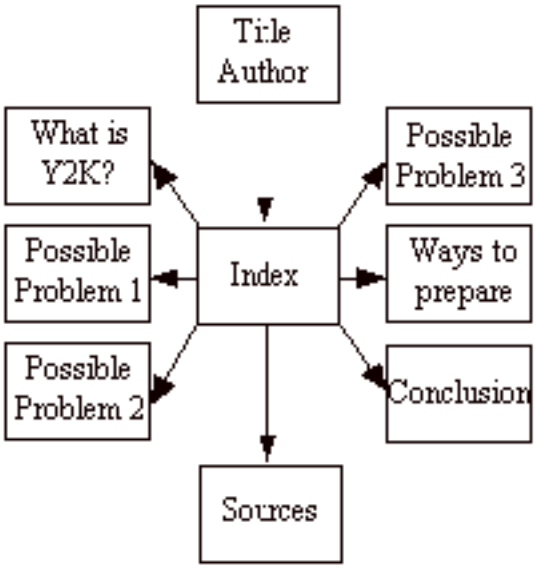


Figure 1

1. Title / Author card
2. Index / Table of Contents
3. What is Y2K? (Definition)
4. Possible Problem 1
5. Possible Problem 2
6. Possible Problem 3
7. Ways to Prepare
8. Conclusion(s)
9. Sources / Bibliography

This suggested model can be expanded or reduced as required (see Figure 1). Teachers might consider presenting this to students as minimum requirements for a "B" project, and then require students to creatively go beyond these guidelines to earn an "A." When designing grading rubrics for computer projects like this, it is important to be thorough and specific, yet allow students room to innovate and exceed already high expectations.

This project is specifically designed to be neither alarmist or naively complacent about Y2K issues. Students should be permitted to read a variety of different opinions about the issue and potential problems which could result to draw their own conclusions. In a "traditional" curriculum focused primarily on demonstrated mastery of textbook content via objective testing, it is possible for students to develop the false impression that the essence of "school" is memorizing and then repeating information someone else has discovered. Like other open-ended topics of investigation, study of the Y2K issue can break students out of this mold and encourage development of critical thinking skills. There are many "experts" on Y2K, but many of them are saying different things! Who is right or more likely to be right, and why? These questions are challenging for adults, and even more for students. It is essential that we help students develop the skills to answer questions like these, as directed in the TEKS for Technology.

All of the objectives of this Y2K Multimedia Project fulfill mandates in each strand of the the Technology TEKS:

- á Students will define and support a personal opinion about the Y2K issue and its potential problems. (¤126.3.b.7.B&C: **Problem Solving**. "Use appropriate software to express ideas and solve problems including the use of word processing, graphics, databases, spreadsheets, simulations, and multimedia; and use a variety of data types including text, graphics, digital audio, and video.")
- á Students will develop a multimedia presentation to communicate their opinions about Y2K to a group of their peers and teacher. (¤126.3.b. 11.B: **Communication**. "Use presentation software to communicate with specific audiences.")
- á Students will resolve information conflicts and validate information sources relating to Y2K issues. (¤126.3.b.6.A: **Information acquisition**.

"Apply critical analysis to resolve information conflicts and validate information.")

á Students will properly document references in a bibliography. (¤126.3.b.3.B: **Foundations**. "Model respect of intellectual property by not illegally copying software or another individual's electronic work.")

Teaching the Lesson

Once the Y2K issue has been introduced and the basic outline (storyboard) of the project has been explained to students, turn students loose to research using a selected list of Y2K websites. Depending on their grade level and computer literacy levels, students may work better on the project in pairs rather than individually. For convenient reference, all of the Y2K websites mentioned in the remainder of this article are listed (by category) on www.wtvi.com/teks/y2k/links.html. Teachers with live internet access in the classroom or computer lab can bookmark this site in advance for students. Another option is to put a link to the page on a local "intranet" webpage saved on each workstation or on the school server. In this way, students will be able to quickly link to these pre-screened Y2K sites and get on task.

Teachers without live internet access or limited access at school have several options. Webpage content can be downloaded from the internet on another computer using software like WebWhacker (www.bluesquirrel.com/products/whacker/whacker.html) or Web Buddy (www.dataviz.com/Products/WebBuddy/WB_Home.html), and subsequently transferred to a school server or individual workstations using a zip drive or network connections. Another alternative is to print selected pages from referenced websites for student use. If one or only a few computers are available in the classroom with web access, students can rotate in groups through the computer "center."

When students begin the research process, instruct them to write down information on their storyboard which they might include in their presentation. The storyboard can be drawn on a large, blank piece of paper. It is especially important to remind them to document sources on their bibliography slide. To avoid having to tediously copy long URLs onto

their storyboard paper, students may prefer to copy and paste internet addresses into a word processing document for later transfer into the presentation. In addition to the site address, students should record the site title, site author, and the date the page was viewed by the student(s). More guidelines for preparing bibliographies of electronic media sources is available on "Bibliographic Citations for the Digital Age" (www.hcc.hawaii.edu/hspls/bibcite.html).

After students have prepared the textual portion of their project on a storyboard, require them to obtain your approval before proceeding to the next phase: creating the multimedia presentation. This provides an important opportunity for students to receive feedback on their work, and helps ensure that each has been thorough in preparing the "meat" (the textual content) of the presentation. If the storyboarding / rough draft process is skipped, students will inevitably jump right into the multimedia software and start inserting fancy sounds, animations, and other eye catching features. As is true in webpage authoring, students should be taught that "Content is King" when designing multimedia presentations. Have students develop worthwhile content first, and then allow them to add exciting multimedia elements afterward. This usually increases the already high motivation of students to produce quality presentations, and makes the facilitative role of the teacher even easier.

The remainder of this article will provide background information for this lesson on Y2K, and preview the content of some of the Y2K links provided for student use onwww.wtvi.com/teks/y2k/links.html.

What is the Y2K Issue?

"I'll do a mea culpa, too. I'm one of the culprits who created this problem. I used to write those programs back in the '60s and '70s and was so proud of the fact that I was able to squeeze a few elements of space out of my program by not having to put 1-9 before the year. And back then it was very important. We used to spend a lot of time running through various mathematical exercises before we started to write our programs so that they could be very clearly delimited with respect to space and the use of capacity...It never entered our minds that those programs would have lasted more than a few years."
Federal Reserve Chairman Alan Greenspan, February 24, 1998

The Year 2000 bug was created by computer programmers who did not think their software would be used after the year 2000. As a result of this assumption, they only used two digits instead of four to record the year in the programs they wrote. In our present day of multi-gigabyte hard drives and 64 megabytes of random access memory (RAM) becoming standard on personal computers, it is difficult for many students to imagine the value of saving both time and money in merely eliminating two digits from recorded dates. Yet in the early days of computer programming, when punch cards and mainframes were the norm, it was imperative for programmers to save every byte of memory space possible.

The Federal Government's "Chief Information Officers (CIO) Council Committee on Y2K" has a page specifically for kids on its website. It includes an explanation of the problem, a frequently asked questions section, and a forum for asking additional questions (www.itpolicy.gsa.gov/mks/yr2000/kidsy2k.htm). The FCCÕs website also includes succinct but thorough background information about Y2K (http://www.fcc.gov/year2000/bkgndtxt.html). The Canadian Broadcasting CompanyÕs "Millennium News and Y2K for Kids" site (www.cbc4kids.ca/general/time/millennium/y2kqanda.html) includes a helpful list of questions and answers like "What is the Millennium Computer Problem?", "Who cares if some computers don't know the date next year?", and "Do I need to do anything about Y2K?" Each of these pages can provide students with enough information to adequately define and explain "the Y2K bug" for slide number three.

"The Y2K problem is the electronic equivalent of the El Niño and there will be nasty surprises around the globe." -- John Hamre, Dep. Secretary of Defense

For comparison sake, students can visit Ken HolderÕs "The Year 2000 Disaster: The End of Civilization (As We Know It)?" website (www.webleyweb.com/y2k/y2kintro.html) and John Harvey's "Y2K? DonÕt Panic!" website (www.io.com/~johnbob/y2k/index.html). Both of these sites, created by individuals unaffiliated with government or news organizations, present views which are polar opposites on Y2K. Both sites define the Y2K issue well, but naturally invite discussion with students on the importance of analyzing the **source** of information on a webpage. Interestingly, many students will unquestionably believe anything they read on the internet, but might doubt something they read in a newspaper or news magazine. Teachers can take advantage of this opportunity to explain why information published by a national government or news agency will often be considered more reliable than information published by a lone, uncredentialed individual. The larger number of people involved in researching and proofreading published information on organizational sites, as well as the fact that the reputation of the group is at risk if false or misleading information is published, partially accounts for the higher credibility adults and students should give these sites over many individually published ones. Additional guidlines for assessing validity are available in the article "Validating Information and Resolving Information Conflicts" online at www.wtvi.com/teks/98_99_articles/validate.html.

Potential Y2K Problems

Since computers are pervasive in society at the close of the twentieth century, potential problems with the Y2K bug abound. According to Information Week, the bill for fixing just Y2K software problems will reach $600 billion (www.techweb.com/se/directlink.cgi?IWK19980525S0037). The following is a partial list of some areas which could be negatively affected by Y2K problems. Students can select three or

more of these "potential problems" and explain them on slides four, five, and six of their presentation.

Before exploring these topics, however, it is interesting to note that amidst the variety of dismal Y2K predictions, there is at least one positive, undisputed aspect of the issue. Users of Macintosh computers, unlike virtually all of their Windows computer counterparts, do not have to worry about the Y2K bug. Since Macintosh computers were introduced in 1984, each has had the ability to smoothly make the transition into the year 2000 (www.apple.com/about/year2000/). While some software applications on Macs may need updating prior to January 1st, no hardware or "BIOS" upgrades are required for any Apple computer. As Douglas Adams of Apple noted, "We may not have got everything right, but at least we knew the century was going to end." As students consider the following list of potential Y2K problems, they will undoubtedly wonder why more computer and software manufacturers couldnÕt have made the same observation and responded appropriately before a scramble to prepare at the close of the decade became necessary.

The Power Grid

Foremost on the minds of many students of Y2K issues is electricity: will the power go out in the middle of everyoneÕs New YearÕs celebrations this year? Central to understanding the potential for power loss in the United States is the concept of "embedded chips." Unlike computer software which can be reprogrammed as needs change, many computer chips have their instructions "hard wired" into them. These devices are called embedded chips, and they present one of the greatest challenges to Y2K preparation. Since these chips cannot be reprogrammed with software, they must be individually repaired or replaced. Given the fact that millions of embedded chips are present throughout the US power grid, the scope of this task is massive.

..The real answer to the Y2K questions is that no one knows. Either way. Those who claim they do know are either fools or liars. So where does that leave us? For most, the answer is easy. Be reasonable. Be prepared. --David L. Cawthon

An analogy about the embedded chip problem found on some alarmist Y2K sites, uses marbles as an example. The analogy is that an engineer shows you how to fix an embedded chip, represented by a marble. You (the technician) have to pick up the marble, wash it off and dry it with a cloth, and then return it to its original location. This repair process seems extremely straightforward, until the engineer points to the Grand Canyon, explaining that it is filled with marbles (embedded chips) which require this same repair process.

Analogies like this definitely capture our attention, but do not provide statistics or other facts on which an informed opinion can be based. Rick Cowles "Electric Utilties and Y2K" website (www.euy2k.com) is a superb collection of news articles and data specifically pertaining to (as the title suggests) Y2K and prospects for electricity outages. As students browse the resources on this site, make sure they examine the "About the Author" page and consider whether he should Cowles considered "credible." Another excellent and balanced source for information about Y2K and electricity is Daniel P. DolanÕs online paper, "Beyond the Hype: Likely Y2K Impacts on U.S. Electricity Service" (www.year2000.com/y2kcurrent2.html).

Economic Disruptions

In addition to worrying about the power going out, many Americans are concerned that Y2K bugs may prevent them from withdrawing money at the bank or receiving their paychecks. Fortunately, federal regulators have been relatively vigilant in forcing financial institutions to prepare themselves for the new millennium. While the preparedness of federal agencies for Y2K varies widely, the Social Security Administration (which all senior citizens are most concerned about) started its preparations in

1989 and has been deemed "compliant" by inspectors (www.washingtonpost.com/wp-srv/business/longterm/y2k/stories/fed_ss.htm).

An excellent source of information about Y2KÕs potential economic effects is Dr. Ed YardeniÕs Economics Network (www.yardeni.com/y2kbook.html). As the Chief Economist and Global Investment Strategist of Deutsche Bank Securities in New York, Dr. Yardeni offers a wealth of economic data and analysis on his site. The above link to "Year 2000 Recession?" includes the analysis and rationale Dr. Yardeni presented to US Congressional Committees in 1997 and 1998, and comprises a "netbook" with the goal of assessing the likelihood of a global year 2000 recession.

Another website with excellent information about possible economic effects of the Y2K bug is the US SenateÕs "Special Committee on the Year 2000 Technology Problem." (www.senate.gov/~y2k/). Under the "Business Category," the link to the General Business section of "Investigating the Impact of the Year 2000 Problem" will download a small (288K) pdf file to your desktop that details in 17 pages many of the possible economic effects of Y2K. (PDF files can be viewed and printed with free Adobe Acrobat Reader software, which is usually preinstalled on new computers.) On page 9 of the report, for example, researchers conclude that "30% to 50% of all companies worldwide will experience at least one mission-critical failure." The industry by industry analysis of potential Y2K economic effects is thorough and informative.

Health Care Concerns

"The situation we face is without precedent. There has never been an international worldwide IT project with a non-negotiable deadline. Experience tells us that most IT projects fail to complete in time and on budget. In a crisis we can expect there to be variations in duration and intensity. Some countries will be worse affected than others. Within countries there will be noticeable differences by region and local area. At this point we can only make guesses as to which will be affected more then others." Bill Aronson, www.2000aware.com

When Americans think about Y2K problems, most do not immediately think of the elderly and disabled. Although one in five Americans report some level of disability, "little has been done in addressing the emergency needs of the disabled or elderly relative to Y2K" (www.cassandraproject.org/research.html). Many health care appliance devices, like pacemakers, are not Y2K compliant. If the US economy is "disrupted" by Y2K problems, life sustaining medications could be disrupted as well in their delivery to needy patients. "Healthcare's Year 2000 Information Clearinghouse" challenges visitors to "Protect Lives, Protect Healthcare, & Protect Yourself" (www.rx2000.org). The site includes information about liability issues (will patients or families be able to sue companies if they suffer or are killed by non-Y2K compliant health appliances), medication delivery, and other issues. The site seeks to prepare the medical industry for Y2K as well as individuals, and its representatives have presented testimony before Congressional committees on these issues.

National Security Risks

The 1983 movie "War Games" pitted an out-of-control computer simulation game against teenagers seeking to prevent the computer-directed launch of US nuclear missiles, and the resulting (accidental) onset of World War III. The fear of some "Y2K survivalists" (who have stocked up on food and weapons and moved to the hills) as well as US defense experts is that Y2K computer failures could lead to an accidental missile launch

scenario similar to that of the "War Games" movie. If computer system screens in Russia and/or the United States dedicated to the early warning of intercontinental, nuclear missile launches suddenly go black on January 1, 2000, an extremely precarious situation could result. Generals from either country could misinterpret the complete failure of launch detection systems as enemy sabotage, and order a nuclear missile launch in retaliation. To prevent this scenario, the US has attempted to coordinate exchanges between Russian and US military forces. Unfortunately, Russians have rebuffed these initiatives, possibly because of their relectance to reveal the poor condition of their nuclear command-and-control systems. The near accidental launch of Russian nuclear missles by President Boris Yeltsin on January 25, 1995, precipitated by a communications failure within the Russian bureaucracy, remains a sobering indication of the fragile condition of early warning systems.

The US military still has over 358 million lines of computer code in languages more archaic than COBOL (a non-Y2K compliant programming language) running computer systems all over the world. Many of the "smart weapons" (Tomahawk cruise missiles, for example) in the US military arsenal prior to the sustained 1999 air campaign on Serbia were not Y2K compliant, and many remain in stockpiles. Because of cutbacks in personnel, training funds, and equipment upgrades, the US military capability is already significantly degraded from Gulf War levels (www.govexec.com/dailyfed/0998/093098a2.htm). The addition of Y2K computer failures to this mix of lowered capability is ominous. The fact that other military forces around the world are even further behind than the US in preparing for Y2K is also troubling. The July 1999 article in Air Force Magazine "Midnight Crossing: Nobody knows what will happen when Y2K sweeps east across Chinese and Russian nuclear facilities" (www.afa.org/magazine/0799midnight.html) details some of the risks and uncertainties faced by the worldÕs three largest militaries.

The US Department of DefenseÕs "Defenselink" provides information about the militaryÕs readiness for the year 2000 (www.defenselink.mil/issues/y2k.html). It includes a link to "related news articles" which performs a current internet search of Defenselink for the keyword "y2k." Another site which contains exhaustive links to information about military Y2K readiness is Gary NorthÕs website (www.garynorth.com/y2k/results_.cfm/Military). It is important to note that NorthÕs Y2K

website is considered by some critics to be "on the fringe" or "extremist" because of the doomsday-like conclusions he has reached based on Y2K research. Whether teachers or students choose to agree with NorthÕs opinions, the links to news articles on his site are extensive and useful. As discussed previously, a visit to a website like www.garynorth.com necessitates a discussion with students about questioning source credibility and determining the validity of presented content. Gary North was one of the first people in the United States to draw national attention to the Y2K issue, and is considered by many to be an invaluable source of up-to-date information about the various aspects of Y2K. Most of the referenced articles included on NorthÕs site (which are from other sources) can be analyzed and assessed on their own merit, without regard to NorthÕs opinions.

Interdependencies

When asked about their companyÕs readiness for Y2K, many business leaders will quickly offer assurances about their compliant status. Further questioning will often lead to less certain assurances, however, when the status of supplier companies or other "external factors" are considered. Like it or not, our economy at the close of 1999 is truly global. Purchasing decisions by East Asians dramatically affect the cotton-dependent economy of West Texas. Dependencies like these were much weaker in the past, but seem to be gaining more strength in our global, networked economy.

Most US manufacturers now rely on "just in time" delivery of raw materials, which requires that transportation pipelines consistently ship goods without delay. No matter how prepared an individual company or organization may be for Y2K, they have little or no control over how prepared other companies are for the millennium. This is especially true in the developing world, where preparations for Y2K generally lag far behind those in the US (www.washingtonpost.com/wp-srv/business/longterm/y2k/stories/inatl_foreign.htm). Given the interdependent nature of the global economy, disruptions in one sector can have far reaching consequences across the globe.

Many of the links already included in this article can provide students with information about the interdependent links between businesses, organizations, and governments. YahooÕs News Coverage of Y2K (headlines.yahoo.com/Full_Coverage/Tech/Year_2000_Problem) includes a dizzying number of links to current articles relating to the issue. Some of these may address the issue of interdependence. One article which directly discusses the close ties that bind national economies together is the July 6, 1998, article from the Christian Broadcasting Network: "The Year 2000: A Date With Disaster" (www.cbn.org/news/stories/980706.asp). The July 23, 1999, article in the Washington Post: "Global Survey Foresees Many Y2K Glitches" (www.washingtonpost.com/wp-srv/business/longterm/y2k/stories/inatl_072399.htm) also highlights economic interdependencies at risk because of Y2K.

Public Panic

Perhaps more important than teaching students the technology skills outlined in the "Project Description" of this article is the need to educate students and parents about Y2K to avert public panic. As described in the March 22, 1999, Washington Post article: "Y2K Gloom May Bring On the Doom," hysteria over the Y2K issue by consumers could cause the very problems they fear (www.washingtonpost.com/wp-srv/business/longterm/y2k/stories/consumer_panic.htm). As January 1, 2000, draws closer, media hype about the Y2K issue will almost certainly increase to deafening levels. As advertisers know and appreciate, consumers predictably change their behavior based on information they receive through the media. This situation could be a recipe for food shortages and other problems brought on not by computer errors, but by a scared populous acting with the mentality of frightened sheep.

The transition of our economy into the twenty-first century may be much less rocky than pessimists like Gary North predict. Political cartoons showing planes dropping out of the sky at the stroke of midnight encourage unnecessary fears about the US transportation system, as the FAA has been certified "100% Y2K ready" (www.fcw.com/pubs/fcw/1999/0719/web-faay2k-7-21-99.html). As is the case in other situations where ignorance can lead people to make hasty and poorly-thought out

decisions, the solution to Y2K panic is public education. Having students complete this project is a step in the right direction, and the discussion it could foster in your community could have farther reaching consequences.

Preparations

After learning about the Y2K bug and several of the potential problems which could result, students will naturally wonder what they can do to prepare themselves and their families (slide 7 of the student presentation). The May 1999 article in Consumer Reports titled "How To Prepare for Y2K: Steps to take now to protect your home, finances, health, and travel plans" is a reasonable, balanced discussion of the things families need to consider as Y2K approaches (www.consumerreports.org/Special/Samples/Reports/9905y2k0.htm). Another excellent source of Y2K information and preparation suggestions is The Cassandra Project (www.cassandraproject.org). Cassandra is a grass roots, non-profit organization, and its article "Individual Preparedness for Y2K" (www.cassandraproject.org/indprep.html) is among the most comprehensive on the web. Lastly, FEMA (The Federal Emergency Management Agency) has published a Y2K ConsumerÕs Guide (www.fema.gov/y2k/bltn00.htm) that is reassuring about potential risks, but still encourages reasonable preparation by families and individuals in the US. Many Y2K experts suggest preparing for the millennium as you would for any potential disaster. FEMA has excellent documentation online about making these types of preparations (www.fema.gov/pte/prep.htm) as well.

Conclusions

While no one can predict with complete certainty what will happen as the citizens of earth enter the twenty-first century, there is certainly not a shortage of individuals and groups offering their opinions on the subject. Take advantage of the Y2K "teachable moment" for the benefit of students as well as parents in your community. It may be one of the most valuable lessons you have the opportunity to teach.

Wesley Fryer is a Windows95 computer lab teacher and technology facilitator in the Lubbock Independent School District. He invites your questions and comments about this lesson and educational technology issues.

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