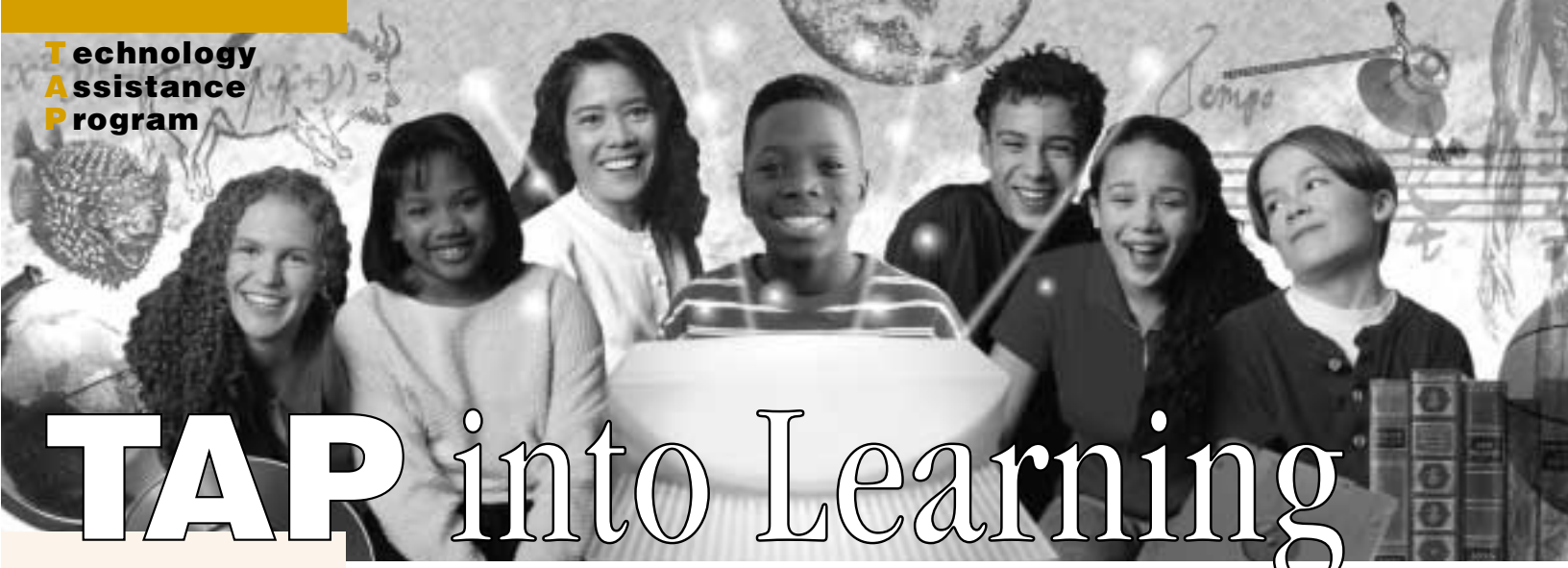
Technology
Assistance
Program



TAP into Learning

Volume 2, Issue 3
Volume 3, Issue 1
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IN THIS ISSUE

Using Hypermedia

To learn more about SEDL's Technology Assistance Program, visit our Web site at http://www.sedl.org/tap.

Knowledge under Construction

Learning is a process of accommodation, assimilation, or rejection to construct new conceptual structures, meaningful representations, or new mental models.

Learning is not an isolated or static process, nor does it occur in a vacuum. We enter learning situations—indeed, all situations—with some form of prior knowledge. As we interact with the world around us, and the infinite variety of images, ideas, information, and other stimuli that comprise our world, we are constantly constructing, revising, and reconstructing our knowledge and beliefs to create a new framework of understanding. Knowledge then is constantly under construction—a dynamic, evolutionary, developmental process. Think for a moment about your knowledge of the world and the beliefs you held as a child, as a teen, and ten years ago. How and why have your beliefs changed? Why did you hold the views you did at those particular points in time?

Learning is also determined by our level of biological and psychological development. As the writings of the Swiss

continued on page 2

Hegel and the Dialectic

Georg Wilhem Friedrich Hegel (1770-1831) was a German idealist philosopher whose key philosophical tenet was his proposal that all of history, and indeed all human thought and experience, could be understood through the concept of the *dialectic.* The dialectic is a tripartite construction, consisting of the idea of a *thesis, antithesis,* and *synthesis.* Our knowledge and concepts are constructed through opposition to something else. We form concepts of a person, object or idea through our interaction with and experience of it.

continued on page 2

A Framework for Constructivism

- Learners bring unique prior knowledge and beliefs to a learning situation.
- Knowledge is constructed uniquely and individually, in multiple ways, through a variety of authentic tools, resources, experiences and contexts.
- Learning is both an active and a reflective process.
- **Learning is developmental. We make sense of our world by assimilating, accommodating, or rejecting new information.**
- Social interaction introduces multiple perspectives on learning.
- Learning is internally controlled and mediated by the learner.

These six principles were distilled by the staff of SEDL's Technology Assistance Program from a variety of sources on constructivism, brain research, and education research as well as staff members' experiences as teachers, learners, and observers in classrooms.

Hegel and the Dialectic *continued from page 1*

For example, let's examine the way a young child forms an understanding of a dog: She can touch it, play with it, smell, see, and hear it. Her concept of "dog" is formed by these experience with this particular canine. For her, "dog" may be small, brown, long haired, with floppy ears, and a long tail. This paradigm of knowledge about "dog" is the young child's ***thesis.***

However, she will soon encounter another image of a dog—different from the paradigm she has constructed. This new dog will have different characteristics: perhaps it is large, black in color, with short hair, ears, and tail. Though perhaps not conscious of her construction of knowledge, the young girl must make a decision: does she accept this new creature as "dog" or reject this creature as "not" dog? Hegel refers to this confrontation of conflicting information as the ***antithesis.*** By assimilating/accepting this information, the young girl's concept of "dog" becomes more complex: the dog can have many colors, be of varying heights and different breeds. Thus, by experiencing this contrasting notion of dog (the antithesis) and assimilating or accommodating it into her original understanding or thesis of a canine, the young learner forms a *synthesis*—a fuller realization of "dog."

This is a rather simplified example of a profound process in human intellectual development. This dialectic—the constant interplay of thesis, antithesis and synthesis—is an apt metaphor for learning: as we develop higher forms of knowledge, we constantly confront more complex and abstract pieces of information and must decide how to reconcile often divergent pieces of information. Learning is therefore often a process of conflict resolution.

Hegel had an immense influence on American pedagogy. The *American Hegelians,* as they were called, indelibly impacted the American educational system: William Torrey Harris, whose views on education helped to shape the public school system; Susan Blow, the leader of the 19th century kindergarten movement; and John Dewey, America's leading education philosopher, and considered by many to be one of the founding fathers of constructivist learning theory.[3]

Knowledge under Construction *continued from page 1*

psychologist Jean Piaget (1896-1980) assert, children think and reason differently at different periods in their lives. The cognitive development of a child passes through a series of stages: from the *sensorimotor stage,* during which the child gains motor control, through the *pre-operational stage,* when the child acquires verbal skills. During the *concrete operational stage* the child begins to deal with abstract concepts such as numbers and relationships. Finally, in the *formal operational stage,* the final stage of cognitive development, the child begins to reason logically and systematically.[1]

Learning is oftentimes fraught with tension and conflict. If new information matches our existing understanding, we can easily assimilate it. However, if new information does not match our existing knowledge framework—or threatens our existing corpus of knowledge—we must either accommodate the new information, by forming new understandings or re-evaluating our prior beliefs and reconstructing our prior theories, or reject that new information.[2] This continuous struggle between pieces of varying and oftentimes conflicting information—this *dialectic* of learning—occurs constantly, sometimes consciously; more often than not, unconsciously, and contributes to our overall construction of knowledge. Learning then is rarely a final product. More often it is a constant evolutionary, and sometimes revolutionary, process.

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1 Plucker, J. *History of Influences in the Development of Intelligence Theory and Testing.* http://www.indiana.edu/~intell/piaget.html. December 1998. Accessed August 2000. Piaget's four stages of mental growth form the foundation in American education of our understanding of intellectual development. Piaget himself is considered one of the fathers of constructivist learning theory.

2 Piaget, J. (1952). *The Origins of Intelligence in Children,* 6. New York: International Universities Press, Inc.

3 Hamilton, S. Hegel's *Influence on American Education.* http://www.geocities.com/Athens/5079/hegedu.html. January, 1997. Accessed August 2000.

Implications for Teaching and Learning

Theory aside, as teachers, we know that learning is a developmental process. We see the ways in which children, as they mature, can handle more difficult cognitive tasks and develop the ability for more abstract and sophisticated thinking and expression. The idea of learning as a developmental process is also formalized in the American educational system through *Bloom's Taxonomy*.[4] Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts, at the lowest level, through increasingly more complex and abstract mental levels, such as comprehension, application, analysis, synthesis, and finally, evaluation, the highest order. This classification system has influenced the way we structure curriculum, impart information, and design assessment tools.

The traditional transmission model (e.g., lecture/short answer format), arguably efficient in terms of transmitting large quantities of information within a compressed time frame, focuses too intently on the *product* of knowledge (i.e., a certain amount of information as evidenced by how many pages of text were covered, notebook pages filled, or grades received). As we have discussed thus far, learning is equally a *process* that must be examined and understood. Thus, the transmission model does not allow for the time that learners need to engage with objects, people, and concepts, and at the same time examine their relationships with such resources. Nor does it allow for the necessary reflection and dialoguing that allows teachers and learners to track the development and unfolding of procedural knowledge and to construct meaningful representations of information.

In contrast, learner-centered environments appear to offer the best potential for the development of new conceptual structures, higher order reasoning skills, and understanding complex and often conflicting information. In fact, Piaget strongly advocated learner-centered environments that allow for discovery of new ideas and materials: the teacher should allow students the opportunities to assimilate and accommodate new mental models. Children, Piaget noted, need to be active: exploring, manipulating, questioning, and discovering answers for themselves. As much as possible then, instruction should be individualized, and the teacher should act as a facilitator, motivating and guiding students, and providing for curriculum that allows for discovery.[5]

Activities should be developmentally appropriate yet challenging enough to allow for a certain level of frustration on the part of the learner. Without this *disequilibrium* (Piaget's term) or antithesis, the oppositional challenge to the learner's framework of understanding, the student's belief system is not challenged and the potential for greater intellectual growth is stifled. Or to use Bloom's taxonomy once again, the learner should scale the levels of intellectual development.

Consequently, where and when possible, we should encourage students not simply to think within their existing intellectual paradigm, but "outside the box," to develop critical thinking skills, to challenge, invent, and create. History is replete with evidence that the great intellectual discoveries and ideological shifts of the ages were accomplished by individuals—Copernicus, Galileo, Newton, Einstein, to name but a few—who confronted the boundaries of the existing paradigms of knowledge and began to explore and embrace new (and often scorned) concepts, create new bodies of knowledge, and transform our beliefs about particular disciplines.[6]

4 WestEd. *Bloom's Taxonomy*. http://www.dlrn.org/library/dl/guide4.html. July, 1998. Accessed August, 2000. Bloom's Taxonomy, developed in 1956, by Benjamin Bloom and a group of educational psychologists, is a classification of levels of intellectual behavior important in learning. This system of classification includes three overlapping domains: the cognitive, psychomotor, and affective.

5 Ginn, W. *Jean Piaget: Intellectual Development*. http://129.7.160.115/inst5931/PIAGET1.html. July, 1995. Accessed August, 2000.

6 See Kuhn, T.S. (1962). *The Structure of the Scientific Revolution*. Chicago: The University of Chicago Press.

How Can Technology Help in the Developmental Process?

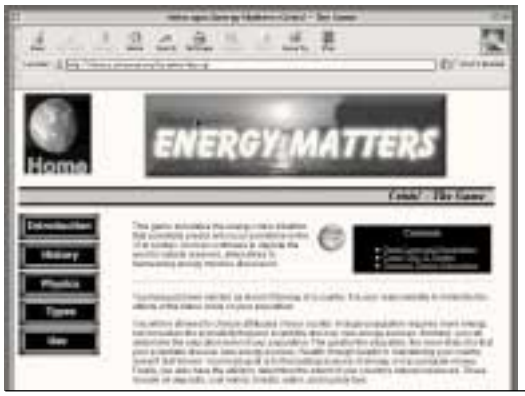
Since learning occurs by interaction with something—a resource, material, or person—particularly one that is challenging, certain types of technology appear to help with a child's intellectual development. When used appropriately, technology can become a "mind tool, function(ing) as an intellectual partner with the learner to engage and facilitate critical thinking and higher-order thinking."[7] Further, it can enable students to manipulate information in a manner that accelerates both understanding and the progression of higher order thinking skills. Finally, because of the plethora of information available on the Internet, students can learn to question, evaluate, and validate the veracity of the types of information they gather.[8]

While Type I software often reinforces recall and recognition (lower developmentally on Bloom's Taxonomy), Type II software that allows for active discovery, such as multimedia, hypermedia, and simulation software, appear to offer opportunities for higher levels of intellectual development since they allow students to become designers of knowledge rather than consumers of information.

With multimedia applications such as *PowerPoint, AppleWorks SlideShow,* or *HyperStudio,* students can communicate their understanding of the world around them, both concretely, through text, and more abstractly and creatively through the use of sound, video, and graphic representations. With simulation software, or more interactive types of software, students can enter a virtual setting in which they are confronted with new organizations of reality and intellectual challenges, which they must overcome to advance or continue in the game. In simulation applications that have an adversarial element (various chess programs, for example), or a problem-based component (See, for example, *The Energy Crisis Game* at <http://library.thinkquest.org/20331/game>), learners must understand and anticipate the thinking of their virtual opponent, make split second decisions, strategize, simultaneously negotiate various options, and determine the effect of a change in variables.[9]

Hypermedia software, such as web editors and thought processing software, is highly interactive and structures learning as an active exploratory exercise in which students discover or share knowledge. Like multimedia software, hypermedia allows learners to create and communicate understandings in a structure that is both creative and logical to the student. More flexible perhaps than multimedia software, hypermedia allows learners to determine relationships between pieces of information, in the form of hyperlinks. We discuss some examples of hypermedia on page 10.

With many Type II software applications in general, when students are allowed to work together, they teach and coach one another, argue about ideas and understandings, and are challenged by increasingly complex tasks. Technology also allows learners to work individually and autonomously at a pace that is developmentally appropriate for the individual.



7 Jonassen, D. (1996). *Computers in the Classroom: Mindtools for Critical Thinking,* 3. Englewood Cliffs: Prentice Hall

8 Adams, S., & Burns, M. (1999). *Connecting Student Learning and Technology,* 27. Austin: Southwest Educational Development Laboratory.

9 Ibid.

Type I and Type II Applications

Not all instructional software is equal in its educational outcomes, not even when it shares the same content area focus. Just as a saw and a plane shape wood differently, each type of software tool shapes learning in different ways. As educators, it's important that we reflect on and think critically about the design of software applications and how they support learning. The following classroom example provides an illustration of the different types of learning that occur with different types of software.

Mr. LaGrange's 6th grade geography class began the year as it always does: with a unit on the United States—identifying the states and memorizing the state capitals. Following a week of textbook and map activities focusing on the 50 states and their capitals, students utilized the freeware application, *USA Puzzle* (available at http://www.torpedosoftware.com) in which the user can assemble a puzzle of the United States and match the capital with its appropriate state. The software has varying levels of difficulty from 1 to 20 and provides the user with an automatic feedback mechanism and score.

Working in pairs, students spent several hours using *USA Puzzle*. Because the software is designed as a self-paced, stand-alone application, Mr. LaGrange observed but gave little assistance to his students. Their time using *USA Puzzle* paid off: when orally tested almost all students could recognize each of the 50 states and identify the various state capitals. The educational outcome—student recognition of state shapes and identification of state capitals—had been achieved.

Later in the school year, the class moved on to longitude and latitude, a common but complex concept that involves mathematical and spatial skills. Mr. LaGrange's goals for this unit were more ambitious than for the states' unit: He wanted students to understand the concepts of latitude and longitude and be able to utilize them as a navigational device. Again, Mr. LaGrange employed a software application, *On Top of the World Light* (available for $15.00 from http://www.tiac.net/users/hlynka/ontorder.htm) to help his students in this task.

Characteristics of Type I Applications	Characteristics of Type II Applications
Generally stimulate relatively passive intellectual involvement on the part of the user.	Generally stimulate relatively active intellectual involvement on the part of the user.
Are usually aimed at acquisition of facts by rote memory.	Are usually aimed at accomplishing more creative tasks.
The software developer predetermines almost everything that happens on the screen.	The user, rather than the software developer, is in charge of almost everything that happens.
The type of interaction between user and machine is predetermined by the developers of the software; the user's contribution must conform to a very limited range of acceptable responses.	The user has a great deal of control of the interaction between the user and machine, and there is an extensive repertoire of acceptable user input.
Everything the software is capable of doing can usually be observed in a very short period of time, frequently in ten minutes or less.	It generally takes many hours of use before the user has seen everything that a specific program is capable of doing.

C. Maddux, D. Johnson, and J. Willis (1997.) *Educational Computing: Learning with Tomorrow's Technologies,* 2d ed. Boston: Allen & Bacon.

While *USA Puzzle* was a self-contained application that led students through the activity, *On Top of the World* offered no such guidance or feedback and thus required more active participation by the teacher. Mr. LaGrange employed the scenario of sailors on a sea voyage circumnavigating the globe. He guided the students' exploration from one location to another with a series of increasingly complex problems centered on the concept of latitude and longitude ("You are leaving the west coast of Africa headed for New Orleans. How will you get there?", "You must now journey from Australia to the North Pole. Which line of longitude will you follow?", "You're at the North Pole. Travel forward one hour in time."). In such ill-structured problems, the student responded to the problem in differentiated

continued on page 6

Type I and Type II Applications *continued from page 5*

and individual ways, based on his or her experience and reasoning processes. Furthermore, students had to learn to figure out the problem-solving process as well as find the solution. Mr. LaGrange gauged students' success by observing their ability to navigate from one point to another and by assessing their ability to comprehend the concepts of latitude and longitude, utilize analyze and synthesize information, and evaluate the fastest routes to circumnavigate the globe.

Developmentally, by their very design, each type of software application resulted in very different types of learning. While the drill-and-practice software (*USA Puzzle*) helped students recognize and identify information, the more open-ended application (*On Top of the World Light*) relied on the students' prior knowledge to enable them to scale the ladder of intellectual development and understand abstract concepts, analyze and synthesize new information and evaluate the effectiveness of their decisions.

USA Puzzle is an example of a "closed," "full," or Type I software application, while *On Top of the World Light* is an "open," "empty," or Type II application. One is not better than the other, nor are both equally effective in achieving the same sorts of learning. Like all tools, Type I and II applications by their very design achieve different instructional outcomes. As with all tools their strength rests in appropriate use.

Children's Ways of Learning and the Evolution of the Personal Computer

Most adults appear to agree that children take to computers quite easily, indeed almost instinctively. Why is it that five year olds can effortlessly (and embarrassingly for their parents and teachers) master technology while novice adults often struggle with moving a mouse?

In the 1970s, engineers at the Xerox Palo Alto Research Center (PARC) labored on the optimal interface design for personal computers. The computer, in its early form, was difficult to understand and manipulate. Its interface was command-driven; essentially the user typed lines of code that prompted the computer to perform particular functions. Engineers wanted to understand how computers could be made more intuitive and user friendly. Using a group of children as their objects of study, they noted the ways in which the children interacted with and explored computers. Steve Jobs, the 24 year old founder of Apple Computer, visited the PARC campus in 1979. Xerox had just purchased shares in his fledgling company and in exchange had invited Jobs to use some of its research ideas. Jobs observed the engineers' innovations based on children's ways of learning. Using these modifications, Jobs and his partner, Steve Wozniak, created the Apple computer. Its inclusion of a "mouse" and its user-friendly interface based on a graphical user interface and object oriented programming, made Apple the first commercially successful computer. Microsoft later adapted these innovations for its Windows platform.[10]

10 Compiled from a variety of sources, including *Triumph of the Nerds* http://www.pbs.org and Weyhrich, S. http://www.hypermall.com/History/ah08.html. July, 1998. Accessed August 2000.

Classroom Example:

Trial of Julius Caesar's Murderers and Court Case Website

"Have you reached your verdict?" the judge addressed the jury foreman.

"We have your honor. We find the defendants, Brutus and Cassius, not guilty of treason against Rome for the murder of Julius Caesar."

Elated, the defense team broke into high fives, hugs, and cheers. The prosecution sat silently, showing no reaction to the verdict.

Nearly two millennia after his death in 44 B.C., the motives for the murder of the Roman dictator, Julius Caesar, still arouse discussion and debate. Was Caesar a tyrant who planned on subverting the Roman Republic by making himself king, thereby granting himself absolute power? Were Brutus and Cassius, his associates and assassins, patriots who saved Rome from probable tyranny, or were they anarchists who took the law into their own hands, murdering Caesar for less noble reasons?

The death of Julius Caesar had spawned a civil war, but no legal investigation into the motives of his assassins, Brutus and Cassius. Thus, in light of this grand historical omission, these fourteen year olds stepped in where the Roman legal system had left off: putting Caesar's murders on trial. Were Brutus and Cassius guilty of treason, or were they patriots who had saved Rome from despotry?

This 8th grade Latin class at McMillan Junior High School in Omaha, Nebraska had just completed a three-week unit on the life and death of Rome's most famous ruler and general, Julius Caesar. Students read Roman history texts, took notes from teacher lectures, viewed the film, *Julius Caesar,* and parts of the movie, *Cleopatra,* and took a final unit test, on which most did well. Yet, as she attempted to probe their understandings of the complexity of circumstances and motives leading to Caesar's assassination by two Roman praetors, Brutus and Cassius, the teacher was dissatisfied. The students' understanding seemed superficial; their responses formulaic. How could she best get them to think critically about the events they had just studied?

Because of its adversarial nature, a trial is an extremely nuanced and complex process. Attorneys must identify key players and facts, recognize motives and patterns of behavior, comprehend large amounts of information, organize ideas, analyze and synthesize data, apply knowledge, choose among alternatives in problem-solving, and evaluate ideas or actions. Further, they must formulate and put forth their arguments in a cogent and credible fashion and understand opposing belief systems and strategies in order to counter and manipulate them. The teacher decided that a mock trial would be the best vehicle for fostering critical thinking skills.

The trial was modeled on the American legal system, and two lawyers from the community provided in-class consultations about various legal and courtroom procedures and placed themselves on call after school. Students were very excited at having such "real-life" expertise at their disposal and approached the exercise with tremendous gravity. The prosecution team (those representing Rome) and defense team (those representing Brutus and Cassius) voted for their lead lawyers, produced a set of witnesses (e.g., Marc Antony, Cleopatra, Caesar's widow), chose witness roles, and began planning their legal strategies.

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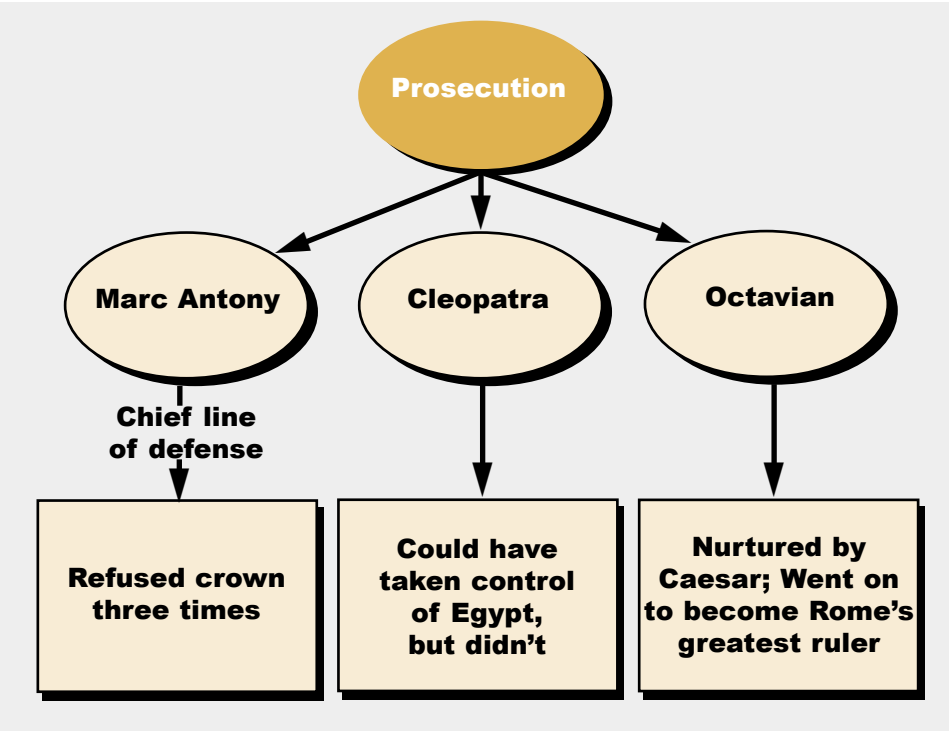

An *Inspiration* Concept Map

All research was conducted via the Internet and through library reference books after school. Class time was used for constructing their legal strategy and preparing for the trial. Because of the complexity of the students' tasks—gathering information, organizing ideas, mapping strategies, and designing questions and possible answers for both their witnesses and opposing witnesses—the teacher was concerned that students have a powerful enough tool that would help them unlock all of their ideas and strategies, brainstorm, and think and organize ideas on multiple levels. Thus, students used the thought processing software *Inspiration*® as an organizational tool for planning their legal strategy. Each day, as they prepared for the trial, students used Inspiration to create timelines of events, color code friendly and hostile witnesses, organize and express their ideas, create questions for both their and the opposing team's witnesses, and map relationships among key players. At the end of the day, they gave a copy of their *Inspiration* chart to the teacher who checked it to make sure each team was organized, prepared, and had logical and comprehensive strategies. She returned each copy the next day with comments and suggestions.

In class, the teacher circulated between the groups, listening to their strategies, and through her questions guided students to a particular strategy or issue that they may have missed. In particular she encouraged students to anticipate the other team's arguments, to think as the opposing team would and in doing so address, defend against, and manipulate their arguments in a way that would best help their case.

During the trial each day after school, the defense and prosecution met separately in two classrooms using *Inspiration* to map out that day's events, create decision trees, organize emergent information and strategies, and plan the next day's testimony and strategies.

Word about the trial spread through the junior high school and other students began to ask to be involved. Students from a 7th grade Social Studies class asked to serve as jurors. One teacher volunteered to give up her one of her plan periods to serve as the judge.

While listening to her Latin colleague discuss the upcoming trial during lunch one day, the 8th grade Language Arts teacher had an idea: Why not volunteer her Language Arts students as court reporters and news analysts? But instead of having her students word process the trial notes and opinions that only they and she saw, they could create a web site which all students could access for a daily trial summary. Since one of the 8th grade Language Arts' outcomes was the ability to write persuasive arguments, students could not only document the trial, but also editorialize on its proceedings and on the justice or injustice of the final verdict. Further, students would gain the valuable skill of learning how to organize and present information—an online newspaper.

The Latin teacher enthusiastically agreed. As the trial progressed over the next three weeks, the Language Arts students constructed their web page using a free web editor. They reported on the trial, organized information, interviewed key players, and inserted digital images. They searched the Internet and created links to other sites on Julius Caesar and to other famous trials (the Scopes, Lindbergh, and Standing Bear trials, for instance). Most important, they evaluated both the proceedings of the trial and its outcome, and debated the merits and

demerits of one another's opinions. In order to do this students applied the thinking processes of analysis, synthesis, and evaluation in Bloom's Taxonomy. Not only had the construction of the web site allowed them to learn content, it had allowed them to delve into the complexities of the court case and hone rhetorical skills. The site served as a valuable resource not only the students involved with the court case, but for parents and other school colleagues.

In this newsletter, we discuss learning as a developmental activity in which learners are continuously faced with new information, which they must accommodate, assimilate, or reject. The teacher certainly could have ended the unit on Julius Caesar without conducting a lengthy and complex court case. Students would have emerged from the unit with a repository of information on the dates, characters and events leading to and immediately following Caesar's assassination. In Bloom's developmental framework, they would have attained the levels of recognition, recall, and possibly comprehension. Most likely this body of knowledge (thesis) would remain static and students' memories of the events and motives resulting in Caesar's death would have faded over time.

Instead, by engaging students in the very active and challenging experience of a court case, both the Latin and Language Arts' students wrestled with contradictory pieces of evidence (thesis/antithesis) and accommodated their belief systems to accept new—and often unwelcome—information. This interplay between often conflicting pieces of knowledge and the process of evaluation, analysis and synthesis of facts in which students engaged, resulted in the construction of new frameworks of knowledge and the development of higher order thinking skills. Thus learning became a dynamic process, as opposed to a static end product. Over time, students may have forgotten much of the content surrounding Caesar's assassination, but they gained procedural knowledge—the ability to analyze data, present arguments, synthesize information—a skill set that transcends one particular content area.

WWW Terms

Browser: An application that allows Internet users to find information on a number of topics hosted by a multitude of Internet "servers." The most popular browsers are Netscape and Internet Explorer.

Downloading: Moving a file, photo, etc. from a server or Internet to your own computer. Conversely, uploading, is the process of moving files and folders from your computer to a server.

FTP: File Transfer Protocol allows users to transfer files over a network from one computer to another. A major channel for distributing software, folders and files on the Internet.

HTML: HyperText Markup Language is a set of "tags" that tells a Web browser, such as Netscape Navigator or Internet Explorer, how to display the document.

HTTP: HyperText Transfer Protocol (HTTP) defines how Internet information is transferred through the World Wide Web over the computer network.

Internet: A network of many computer networks that communicate across dedicated high-speed phone lines.

Link: The underlined text the user clicks on to take him/her to another page or another location on the page. Links are the essential components of hypermedia—the gateways to other sites.

Server: A computer on which large amounts of data and software are stored and from which they can be retrieved. Servers are normally much more powerful than local or desktop computers and "serve" information to your local computer.

URL: Universal (or Uniform) Resource Locator. The address of an Internet site. It usually has the following naming conventions:

http://www.sedl.org

http defines how the information will be transferred. The three symbols [//], [:] and [.] separate different types of information. **sedl** is the name of the organization (and also the server in this case) and **org** indicates the type of institution.

World Wide Web: The "Web" (abbreviated WWW) is a hypermedia system for distributing information on the Internet. Because it is a hypermedia system, it supports the use of text, graphics, sound, video, and hypertext (a series of links that allows you to "go through" one document/site/photo into another). Documents are linked through HTML.

HyperMedia

Hypermedia are applications that allow the user to navigate through a series of linked elements (e.g. text-to-graphics, graphics-to-video). For the user, such structure allows for greater interactivity and greater flexibility in creating the organization of an end product.

What Do I Need to Use Thought Processing Software?

Thought processing software, though not as common in schools as word processing software, is increasingly popular in classrooms across the nation. Unlike word processing software, which tends toward the linear narrative, thought processing software allows students to organize ideas, express concepts, map relationships, build idea webs and outline their thoughts in a graphical, visual, non-linear fashion.

Thought processing software can be used across all subject areas. In literature classes, students can create character webs that show the inter-relationships among characters and create story maps of their favorite works of literature. Social studies students can make timelines of world events, create diagrams of military plans and deconstruct and diagram major national policies. Science students can recreate the periodic table of elements, draw diagrams of molecules, and show the chemical reactions of certain molecules. In all subject areas students can use thought processing software as a brain-storming, planning, systems thinking, and decision making tool, as a visual organizer, and as a concept mapping instrument.

Inspiration

The most common thought processing software found in schools today is *Inspiration.* Intuitive and easy to use, Inspiration allows students to develop ideas, visualize thinking and, in *Inspiration* 6, publish diagrams in HyperText Markup Language (HTML). Check out their web site for great ideas on using *Inspiration* across all subject areas. URL: <http://www.inspiration.com>

Concept Draw

Though not as commonly used as *Inspiration, Concept Draw* is another good thought processing tool that allows students to make idea webs and concept maps. The great quality of its images and its extensive libraries and templates make this a powerful tool. URL: <http://www.conceptdraw.com>

Visio 2000

Microsoft's drag-and-drop concept mapping software, *Visio2000* can be integrated with other Microsoft applications. Though specifically designed for business and industry, *Visio2000* is appropriate for an educational setting. You can order a free 60-day demo from the following URL. <http://www.microsoft.com/office/visio/>

Finally, though most students tend to enjoy the flexibility and visual images of thought processing software, they can employ the same techniques of idea mapping in a low tech fashion: with a set of markers and several big pieces of chart paper.

What Do I Need to Make Web Pages for My Class?

Basically, four things: a web editor, server space, some way of transferring files to the server, and an Internet connection. Let's look at the first three individually. Regarding the first, check with your school or district to ascertain its World Wide Web policies and to see if it allows students space on its server. If not, *Free Yellow* at <http://www.freeyellow.com> offers free web site hosting.

To transfer web pages from your computer to your server, you can generally (in most newer versions of web editing software) directly publish to your server. If not, you'll need some sort of FTP (file transfer protocol) software. *Fetch* <http://www.dartmouth.edu/pages/softdev/fetch.html>

A web page as we see it…

And behind the scenes: the same page in HTML.

is an easy and user friendly Mac FTP client (the transferring files are accompanied by a little animated terrier) that is free to educators. WinFTP is a Windows FTP client that is available free from http://www2.pcworld.com/. Just search for "WinFTP."

For a good step-by-step guide on using *Fetch,* go to <http://www.flash.net/members/tech/machelp/tutorials/software/ftp/fetch/flashnet/index.html>

For a WinFTP tutorial, visit <http://www.flash.net/members/web/winftp.html>

Since web editors are less technical and have greater instructional implications, we'll examine them in greater detail.

What is a Web Editor?

Next time you're surfing the Internet and come upon a page you like, go to the menu and choose **View/Source**. That thicket of bracketed words you see is HyperText Markup Language (HTML), the "language" in which web pages are written. While we create our web pages in English or Spanish or any other human language, the web editor "translates" them into HTML, the language of the Web. So it's a bit complicated: we create pages in English, which the web editor translates into HTML so they can be seen on the World Wide Web in English!

While HTML is not difficult to learn, it's certainly more fun and a lot easier to simply design pages the way we want and in the language we speak. Web editing software allows you to create web pages without having to know HTML. Most web editing software today is WYSIWYG (pronounced "wizzy wig") which stands for "What You See Is What You Get." This means that as you are creating the page, you see will what it will look like on the World Wide Web.

There are a number of commercially available web editors: *Dreamweaver, GoLive!, Front Page, Hot Dog,* to name but a few. Before spending money on them, you may want to experiment with a number of web editors and see what you like. If so, we have a few suggestions.

Free Web Editors

The following web editors are free and can be downloaded via the Internet. If you're just starting out with web editors, we recommend Netscape Composer (it's really a web enhanced word processing application). Once you get comfortable with web editors, try *AOLPress* or *Arachnophilia*. The latter is a favorite of a lot of web aficionados.

1. Arachnophilia (Windows)
URL: <http://www.arachnoid.com/arachnophilia/>

2. AOL Press (Windows)
URL: <http://www.aolpress.com>

3. Netscape Composer (Mac/Windows)
URL: <http://www.netscape.com>

For more free web editors, check out:

Free Editors
<http://members.xoom.com/dafreestuff/freeeditor.htm>

Though not technically a web editor, *PhotoPage* is a free Mac application that allows you to create online photo albums or galleries. Simpler than web editing software, you use a form to create titles, choose images, and annotate your photos—and you'll have a web page in minutes. You can find *PhotoPage* at < http://www.versiontracker.com/> Search for "PhotoPage."

Demos

Additionally, most companies will allow you to demo their software for 30 days, after which it expires. This is a good way to learn more about creating web pages and find out which web editor you like best. Except for *HotDog,* the following programs (this is by no means an exhaustive list) will run on both Mac OS and Windows platforms.

1. Claris Home Page
URL: <http://www.filemaker.com/products/hp_home.html>

2. Go Live!
URL: <http://www.adobe.com/prodindex/golive/demodnld.html>

3. Dreamweaver
URL: <http://www.macromedia.com/software/dreamweave/trial/>

continued on page 12

To contact the Technology Assistance Program, please call us at 1-800-476-6861 or write to us at Technology Assistance Program, SEDL, 211 East Seventh Street, Austin, TX 78701. You may also send us e-mail by writing to Vicki Dimock, Program Manager (vdimock@sedl.org).

TAP into Learning is a collaborative effort by the staff of the Technology Assistance Program. This issue was written by Mary Burns.

Mary Burns, Editor.

To learn more about SEDL's Technology Assistance Program, visit our Web site at http://www.sedl.org/tap.

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Hypermedia *continued from page 11*

Finally, you don't need a web editor to create web pages. Many word processing software programs and electronic presentation programs, such as Microsoft Word and PowerPoint, will allow you to save your documents and slide shows as HTML files. Though the quality is not as good as a regular web editor, they'll get the job done. Additionally you can use a simple text document, such as *NotePad* or *Word Pad* in Windows (Go to File/Programs/Accessories) or *Simple Text* or *Teach Text* on a Mac and create your own web pages using HTML.

HTML is a "markup" language, which you can use to mark up a text file with "tags" that tell a Web browser, such as Netscape Navigator or Internet Explorer, how to display the document. For example, the tags may tell the browser to underline a word, to center a section of text, or to display an image. Each section of your web page is bracketed by a set of tags: <BEGINNING TAG> and </ENDING TAG>[11]

We won't go into all of the tags here. Though web pages may contain innumerable tags, all web pages have at least the following set. As you'll notice the "tag" brackets the text and tells the browser how to display this information.

<HTML> This is the first and last tag of the HTML file. It identifies the file as an HTML document. **</HTML>**

<HEAD> This tag encloses the Title tag and other important header information such as when the file was created and who created it. **</HEAD>**

<TITLE> This is the title of your web page. This title will appear in the title bar of the browser. **</TITLE>**

<BODY> This is where I enter all of the information I want on my web page, including text, photos and video. **</BODY>**

For more information on learning or using HTML:

1. HTML Quick Reference
URL: <http://www.cc.ukans.edu/~acs/docs/other/HTML_quick.shtml>

2. HTML Home Page
URL: <http://www.w3.org/MarkUp/>

3. Netpedia HTML Tutorials
URL: <http://www.netpedia.com/html/tutorials/>

4. Learning HTML
URL: <http://www.devry-phx.edu/webresrc/webmstry/lrntutrl.htm>

Miscellaneous Web Publishing Resources

1. Empowering Student Learning with Web Publishing
A good resource for teachers who want more information on the utility of publishing student work on the web. Covers such topics as critically evaluating sites on the web, publishing safety tips, and assessing their products on the web.
URL: <http://www.siec.k12.in.us/~west/article/publish.htm>

2. Creative Good: First Timers
A great place for Internet novices to learn the basics of the Internet. Loads of help pages and columns that explain some of the basics.
URL: <http://www.creativegood.com/first.html>

3. Creating Web Pages with FrontPage Editor
FrontPage is Microsoft's web editor. However, you don't need FrontPage in order to profit from this useful and easy to follow guide. Not only will you learn to use FrontPage if you have it, but you can also gather general information about web page design, transferring files and publicizing your web site.
URL: <http://www.siec.k12.in.us/~west/online/website/>

11 These are **examples** of what tags look like, not actual HTML tags.