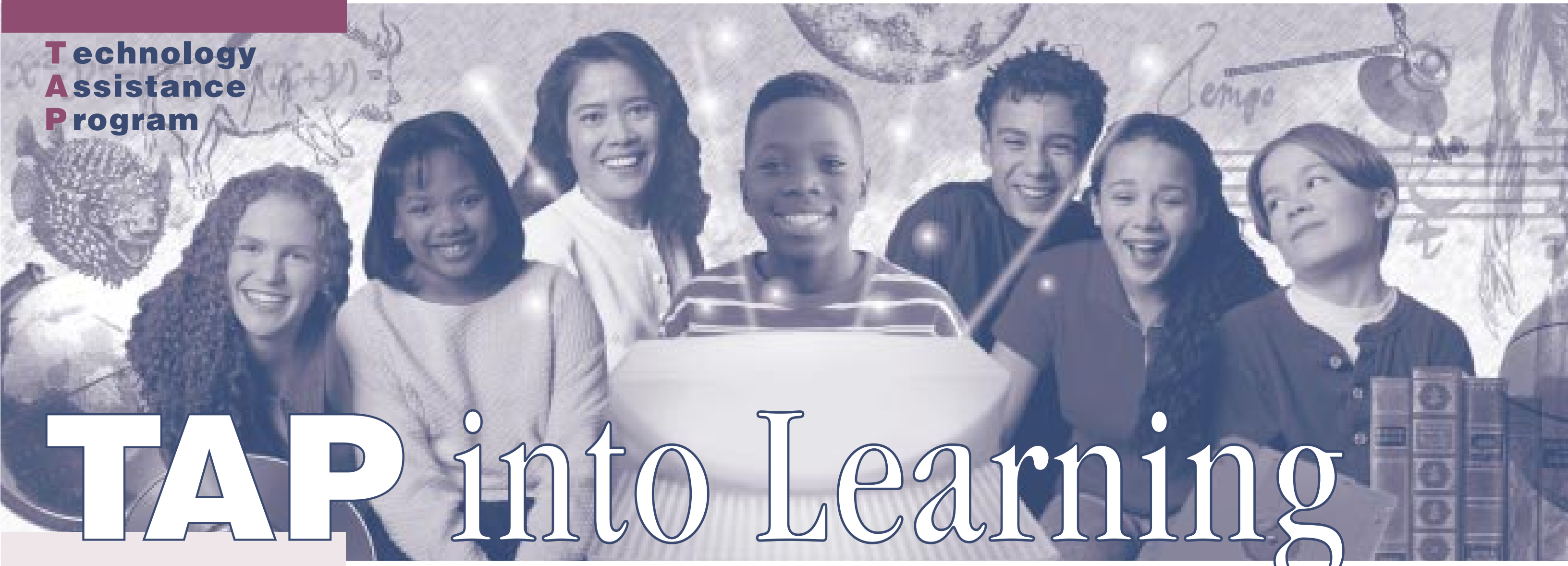
Technology
Assistance
Program



TAP into Learning

Volume 1
Number 2
Spring 1999

On the Road to Student-Centered Learning

In the first issue of *TAP into Learning* we examined constructivism and some ways technology might be employed to support learning environments based on constructivist theory.

In this issue we'll examine one of these principles and some classroom activities based on practices consistent with this principle.

Knowledge is constructed uniquely and individually, in multiple ways.

Constructivist learning theory tells us that we "construct" or build knowledge in our own unique ways by interacting with the world around us and making sense of what we experience. Clearly, each of us is the sum of our own unique personality, beliefs and experiences, which in turn influence our likes and dislikes, strengths and weaknesses, and understanding.

One who has never experienced the ocean may think of water only in terms of a calm bathtub or swimming pool, rather than the briny, tumultuous ocean water.[1]

When we encounter something new that challenges our existing notions, we must change our basic framework for thinking about it. But like people who watch a film together and emerge with different opinions and ideas about the film, we filter new events through our own system of beliefs, preferences and experiences.

But what does this mean for a classroom teacher? How does this principle inform classroom action?

Learning environments should provide a variety of authentic tools, resources, experiences, and contexts to maximize the potential for learning.

In addition to what we may already know when we encounter a new experience, we have particular interests and preferences that come into play when we are learning. Think of the ways you prefer to learn. Do you prefer reading, assembling a project, or talking to others? Many of us might choose more than one response to this question.

continued on page 2

[1] Brooks, J.G., & Brooks, M.G. (1993). The case for constructivist classrooms. Alexandria, VA: Association for Supervision and Curriculum Development.

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 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.

IN THIS ISSUE

Using Databases

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

Tools are items that facilitate the learning process, such as manipulatives, real-life materials, computers, and software. In the mathematics example, students used such tools as candy and pencils for counting, plastic containers and their own hands for measuring, computers and spreadsheet software for graphing, and paper and pencil for recording.

Resources are where we acquire tools or gather information. They can be *people* (teachers, classmates, parents, and guest speakers), *materials* (books, CD-ROMS, laser discs, software, and the World Wide Web) or *places* that house these human and informational resources (the library, field trips, and home). Again, in our mathematics example, group members and the teacher served as resources when students compared estimations and results.

Experiences serve as vehicles for the learning process. Experiences occur with others—in group work, interviews, field trips—or individually—in our thoughts or in other solitary activities such as reading or listening to a speech. The experience presented in the mathematics example was the actual task of estimating and measuring both alone and with a small group.

Contexts are the environment within which experiences occur. In a constructivist learning environment, that context is often real world and learner-centered. The measuring activity began within the classroom and was extended into another context—the home. It could be extended even further by visiting a water treatment plant or researching strategies to conserve water usage.

On the Road to Student-Centered Learning

continued from page 1

But it is often the case that your preferences are different from those of family members, your spouse or your best friend. Thus, the "one size fits all" approach to learning still present in so many classrooms may not address the highly individualized manner in which we all learn. This omission means that we may not be providing students with a vehicle or forum that maximizes their potential to construct new knowledge.

So how can we as educators accommodate our collection of unique individuals, incorporate their prior knowledge, beliefs and experiences, and provide multiple learning opportunities in our classrooms? While we can't address *every* learning preference in *every* activity, we *can* structure curricular units that allow for a variety of approaches. Let's examine the example below, *Learning about Estimation* to see how this teacher provided a variety of tools, resources, experiences, and contexts for learning:

- Students made predictions, organized data, problem-solved and applied their conceptual understanding of measurement and volume to several situations (the classroom objects, the bathtub, their bedroom furniture).

Learning about Estimation

"How many candies are in this jar?" Asks the teacher. As students respond with a variety of guesses, the teacher asks how the student came to his or her prediction. She lists these strategies on chart paper and posts them on the wall. A class discussion ensues about the term "estimation," how the answers provided by the students were examples of the term, and what might comprise a "good" estimate—how close the estimate must be to the exact number. Could it be that in some situations an estimate is just as good as the exact count?

The teacher then divides the class into several small groups and introduces four estimation activities in various locations around the room.

At one station, several circular, plastic chips are arranged in clusters on the table. Students must estimate these clusters as "fewer than", "more than", or "about" a number designated by the teacher. At another station, students estimate the dimensions of classroom objects. To calculate the height of the door, one group places its tallest member against the doorjamb. He knows that he is five feet tall and reaches slightly more than halfway to the top of the door, so the door is about nine feet. One girl, measuring the teacher's desk, recalls reading that a child's hand is about five inches. Her group decides that two "hands" equal a foot and estimates the desk as 4 1/2 feet long.

Using plastic containers such as soda bottles and product containers brought from home, students at another station estimate the amount of water each container will hold. After estimating, students pour water into the container using measuring cups. Each child checks his/her estimation and the group's estimation and records the results on a measurement worksheet.

At the fourth station, students choose strategies to respond to addition problems, for example, "What is the sum of 243 + 479?" One group adds hundreds and tens to produce an approximate sum of 700. Another estimates a sum of less than 750 by rounding 479 up to 500 and 243 up to 250.

For each activity, group members record individual answers and strategies for estimation first, and then the answer and strategy of their group as they work together on the problems.

Once all the students complete the four activities, students graph the height, length and volume of their various estimations using spreadsheet software. A variety of types of graphs are produced to provide a visual comparison of the results.

At the end of the lesson, the whole class discusses its findings and reflects again on the opening question, brainstorming examples of situations when an estimate is as good as the exact amount.

For homework, students extend the classroom experience into another context—their home—as they estimate the gallons of water in their bathtubs and the approximate dimensions of their bedrooms and furniture.

"Learning About Estimation" was adapted from Belinda Avey and Jane Tierney, Brentwood Elementary School, Austin, TX; Southwest Consortium for the Improvement of Math and Science Teaching. (1997). *Classroom Compass.* Austin, TX: Southwest Educational Development Laboratory.

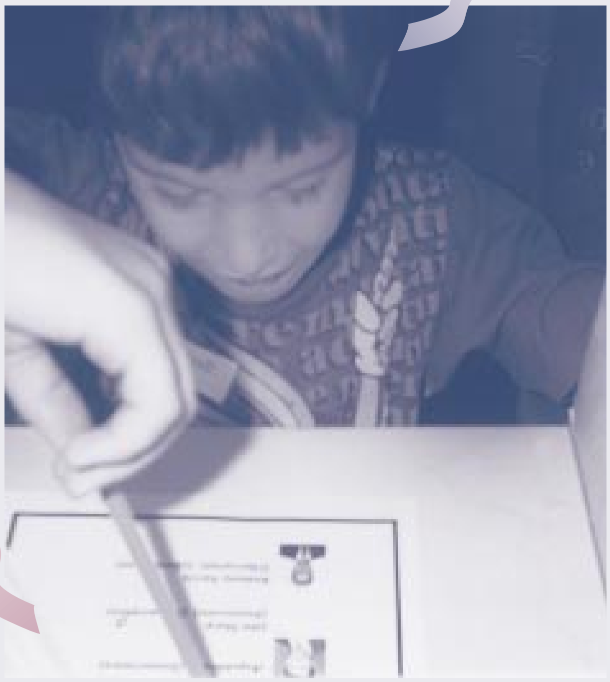
- Students manipulated objects, measured themselves against classroom objects, poured and measured water, observed the size of each container and held the different containers in their hands to get a "feel" for a certain volume weights.
- Students verbalized, listened to, questioned, discussed and debated their hypotheses and findings with one another.
- Students recorded their estimations and results in charts, created a visual representation of their data, reflected in writing upon experiences, and recorded the results of additional research.

While this mathematics activity focused on the concept of estimation, the teacher guided students toward this concept from a variety of fronts: measuring, writing, experimenting, observing, comparing, listening, questioning, discussing, and reflecting. By allowing students to use multiple methods to arrive at answers to the problems at hand, the teacher encouraged numerical flexibility, mastery of a certain level of mathematical computation, and reflection about spatial and mathematical concepts.

By posing problems that allow for multiple paths to a final answer, that employ diverse tools, contexts and experiences, and that demand reflection and self-generated meaning, teachers can facilitate students constructing their own understandings and beliefs. The wealth of learning opportunities (by no means exhaustive; you may be thinking of your own approaches to such an activity as you read this) present in the mathematics example provided more opportunities for student learning than would have been the case if the teacher had attempted only one of these approaches.

I Voted!

I voted!



"Who'd ya vote for?" asked the second grade student, his *I Voted!* sticker proudly displayed on his jacket.

"That's private information," his classmate replied.

"I voted for George W. Bush!" cried a first grader, eaves-dropping on the conversation.

These Texas students had just voted in their first gubernatorial election. After registering to vote, learning about the election through the local media, and doing election-related activities in class, these students had exercised their civic responsibility and made their choices for the state's governor and lieutenant governor. But how did these underage voters manage to do this?

The project began with Steve Swain, a fourth-grade teacher at Bernice Hart Elementary School in Austin, Texas. His students had been following the election by talking to their parents, reading the newspaper headlines and short articles, and watching television news and commercials. In class students shared their understandings of the two party system, candidates' positions on issues, and thoughts about negative campaign advertisements. When Swain asked them if they wanted to coordinate a school wide election, they responded with a resounding "Yes!" But how does a fourth-grade class organize an election that is authentic and compelling for children aged four through twelve? The class began by brainstorming tasks necessary for a "real" election—ballots, voter registration, the creation of polling stations, and the logistics of managing an election—and began addressing the creation of each.

continued on page 4

"I Voted" was adapted from Steve Swain, a fourth grade teacher at Hart Elementary School in Austin, Texas. He may be reached by e-mail at sswain@staff.austin.isd.tenet.edu

I Voted!

continued from page 5

Ballot Creation

Students created an election ballot listing the two major political offices: Governor and Lieutenant Governor. The students customized the ballot by downloading images of the candidates from the Internet. Realizing that many students were primarily Spanish speaking[2], the students decided to provide ballot information in both English and Spanish.

Student Registration

Voters need to be registered, so Swain obtained outdated voter registration cards and students separated them into packs for each classroom. Each K-5 class completed and returned their voter registration cards to be entered into a voter registration database.

Voter Registration Database

For the most part, urban voting precincts store voter information in electronic databases. The digital nature of such storage allows easy access to and administration of voter information. To simulate real world voting procedures as closely as possible, Swain and his class built a Hart Elementary School voter database to store pertinent information on Hart's 450 voters. The database contained the student's name, teacher's name, and the student's grade and hall. For greater efficiency, a pull-down menu was created to handle information that tended to be repetitive, such as grade and hall. The final field was signature, a space for the student voter to sign on Election Day. Finally, students added an image of the Texas flag.

[2] Forty percent of Hart Elementary students are Spanish-speaking.

Voter Information

Following database creation, the fourth grade students entered information about Hart's 450 registered student voters. After a student's data was entered into the database, his/her voter registration card was validated with a stamp. Students returned the voter registration cards to classroom teachers so voters could present them on Election Day.

Voting Booths

As with a real election, polling stations needed to be established. Students decided upon two central locations in the school, made ballot boxes, produced signs, printed database records, created a class schedule for voting, and photocopied ballots for each station. Following a class discussion on the importance of voter privacy, students placed blinders and separators in the voting area. The day before the election, some fourth grade students stayed after school to set up the tables, blinders, and materials in the voting areas.

Election Day

The school held its election prior to the national voting date of November 4th, 1998. 371 students voted. Students from Swain's class monitored each hall to assist with the voting. Student voters brought their voter registration cards and signed them in the presence of the student election official. Upon voting, students were given a student-created *I Voted!* sticker.

After the polling stations closed at the end of the school day, the students manipulated the software to calculate the number and percentage of votes. Students also discussed why they voted as they did.

Swain and his class were pleased with their election. By providing students with an authentic, meaningful experience and some of the tools of a real election, Swain had hoped that students would gain a better appreciation of the importance and nuances of the election process. His hopes appeared to be realized. Said one student, "We've already (voted), so we'll know what do (when we're adults)!"

Candidate for Governor	Party	Number of Votes	Percentage
Bush	Republican	307	83%
Mauro	Democrat	64	17%
Total Votes		**371**	**100%**

Candidate for Lt. Governor[a]	Party	Number of Votes	Percentage
Perry	Republican	232	76%
Sharp	Democrat	72	24%
Total Votes		**304**	**100%**

a. Not all students voted for lieutenant governor

Let's examine the ways in which the voting unit was a constructivist activity supported by technology.

The activity simulated an authentic experience within a relevant context. One of the outcomes of Texas state standards in social studies is that students will understand the importance of participation in the democratic process and be able to identify leaders in state government, including the governor.

Swain could have certainly adhered to these standards by having students memorize a list of government officials, participate in a discussion on the importance of voting, or read about gubernatorial elections. Instead, he provided students with the experience of participating in their own gubernatorial election and nested this experience within the larger context of the actual state election. As their adult counterparts do, students engaged in the debate and discussion that comes with exercising one's right to vote. However, the logistics of setting up a mock election provided them with a richer appreciation of the election process. Said one student, "(This) taught us how to vote."

The activity made use of a multitude of resources and authentic tools. Like their adult counterparts, student voters accessed a number of resources in order to gather information and make educated choices. Some were technological (TV, radio and the Internet); others not (parents, classmates and teachers). Many children shared the insights gleaned from the media with their classmates and teachers.

Students designed authentic *tools* for the mock election—ballots, election signs, blinders and separators for voting privacy. Though student-created, all of these tools are employed in a "real" election. The use of such tools added to the authenticity of the activity.

As county clerk's offices do across the nation, students created, managed and organized an electronic database of voter registration information. The creation of the database and the categorization and organization of information required for database design was a valuable learning opportunity. The digital nature of the database allowed for easier storage and retrieval of student information and enhanced the efficiency of the election process. Thus the database served as a "real tool for a real purpose"[3].

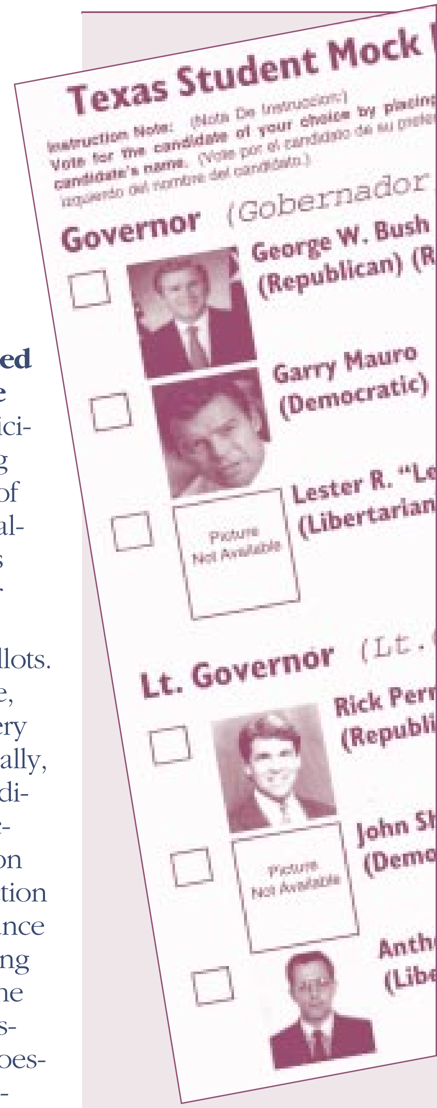
As a result, knowledge was constructed uniquely and individually in multiple ways. While all of Swain's students participated in the mock election by discussing the candidates, organizing some aspect of the election, and voting, each had specialized responsibilities. One group acted as election officials; another created a voter database; some students created voting booths, while others created election ballots.

Most students voted for one candidate, but in classroom discussions revealed very different rationales for doing so. Additionally, while all students learned about the candidates and the many requisites of an election, they emerged with different takes on what was most important about the election experience. For some it was the importance of exercising one's right to vote and acting as responsible voters; for others it was the information-gathering process and discussion of candidates. Said Andrew, who doesn't have a television at home, "(My classmates) helped me a lot …to pick the person who should be the best for the state."

Other students learned from database creation and information management. By preparing a database, these students were actively engaged in deciding what information was important, how it would be classified and for what purposes it could be used.

For some the activity was valuable because of the collaborative nature of coordinating a school wide project. Since they were in a new school, an important outcome for the students was that they learned the names of many of the children in the school, from many classes. This way, they commented, they could "help" each other and "be friends."

Most importantly, students were active, autonomous learners. Aaron compared their election to one organized by adults, "Kids ran it at this school. Kids need a chance to do stuff, take over, be important. Kids are the future."



[3] Means, B. & Olson, K. (1997). Technology and education reform: Washington, D.C.: U.S. Department of Education, p. 121.

What is Database Software?

A **database** is a collection of information organized by fields and records. Though we may not realize it, we use electronic and print databases on a regular basis. When we look up a book in a card catalogue, search for a number in a phone book, or access an Internet search engine, we are using or interacting in some fashion with a database that stores hundreds and thousands of records.

Database software allows users to store, organize and search for information. Once data are correctly entered, the user can search (query) the data for all records that match some pre-determined criterion or combination of criteria. Database construction is a valuable educational exercise requiring classification and organization skills, the ability to think relationally and focus on detail.

The graphic of the database created by Swain's class illustrates some parts of a typical database. First Name (FN), Last Name (LN), Grade, Teacher's Name (TN) Hall, and Signature are all **fields**. A field holds a single item of information. The information from all of these fields is called a **record**. A record is a collection of fields relating to a particular entity. In this example, all of the information about Vicki Dimock—her first and last name, grade, teacher, and hall—constitutes a record.

We can query or search the database for the information contained in each field or record. As an example, we can pull up a list of all students by grade, hall, or teacher. Or we can do a query on one particular student and find out her grade, teacher and hall.

One of the more common databases with which we interact is the phone book. The phone book is organized by a number of fields: name, street address, city, zip code and of course, phone number. All of the information contained about one person, phone number, or address (Joe Smith, 15 Maple Street, Anywhere, 10001, 555-1212) constitutes a record. Because of its non-digital nature, we can only query the phone book by one field: name—a rather rigid structure. When the phone book is a digital database, however (the Internet Yellow Pages, for example), our ability to search becomes more versatile as we can search by multiple fields: name, street address, or phone number, and get the same record.

There are a number of commercially available databases, many of which are extremely powerful applications designed for massive amounts of information storage and retrieval (e.g., Oracle and FoxPro are two commonly found business database applications). The chart on page 8 lists the names of commonly used educational database software. These manufacturers offer trial versions of their database software, through free downloads from the Internet or free demo versions. You can contact the manufacturer through the toll free number or URL provided.

Field

FN	LN	Grade	TN	Hall	Signature
Jackie	Burniske	second	Ritch	Voyager	
Mary	Burns	fourth	Swain	Discovery	
Vicki	Dimock	fourth	Swain	Discovery	
Marilyn	Heath	second	Odom	Discovery	
Jim	Zuhn	second	M.Swain	Endeavour	
Sharon	Adams	second	M.Swain	Endeavour	

Record

But I don't teach civics and the elections are over, how can I use databases in my class?

No matter what subject areas you teach, you can use database software.

Database software and database design are not specific to some subject areas over others. No matter what subject areas you teach, you can use database software, as the following activities illustrate. As you read through these examples, think about the subjects you teach and the body of knowledge students learn. What are some ways database design could augment student skills and learning?

Geography or Science: Fauna Database

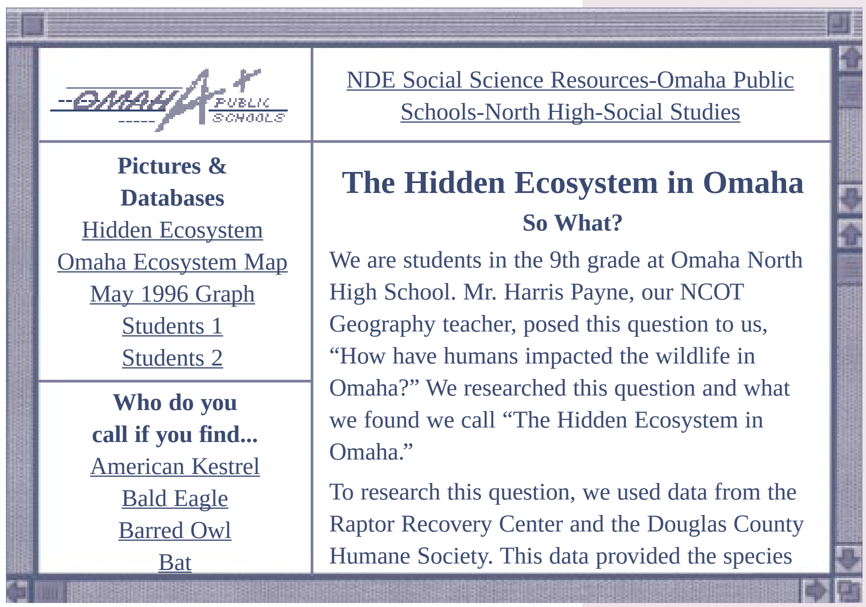
These ninth grade geography students created a database of photos and text-based information on flora and fauna within a five-mile radius of their school. The database included such information as a species map, the phone number and address of relevant private and public agencies such as the city zoo, the Department of Parks and Wildlife and the Humane Society. The class put the database on the Internet, thereby making it a publicly accessible document.[4]

Music: Musical Instrument Database

In this sixth grade class, students constructed a database of the four categories of musical instruments—strings, woodwinds, brass, and percussion. Records contained such information as a photograph or drawing of various instruments falling under this category, a sound file of various instruments, composers or performers who played such instruments, and titles of songs and musical pieces featuring such instruments.[5]

Spanish: Verb Tense Database

Understanding the varying verb tenses and conjugations of a foreign language can be difficult for students learning a new idiom. In order to create a sense of the language's patterns and exceptions, students in this eighth grade Spanish class created a database of verb tenses. Each field corresponded to a particular tense (present, past, future, or conditional) and each record contained the verb endings for that tense. Through the process of inputting and sorting data, students began to notice similarities and differences across various verb tenses. Their discussions about the differences among verbs, particularly between regular and irregular verbs, were greatly enhanced by their work with the database.



<http://www.ops.org/north/curriculum/socstudies/ecosystem/ecoframes.html>

[4] Developed by Harrison Payne, geography teacher, North High School, Omaha, NE.

[5] Adapted from an activity by Jeanie Hermanson, music teacher, Hart Elementary School, Austin, TX.

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, Jackie Burniske, and Vicki Dimock.

Mary Burns, Editor.

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

The SEDL Technology Assistance Program obtained permission to reproduce pictures of websites that appear in this newsletter.

Design, Jane Thurmond, Austin, TX

Database Resources

Ideas for Using Databases in Your Classroom

Perhaps we think of database software as appropriate for more analytic subjects such as science and math. These resources illustrate how database design can be used to facilitate understanding in all subject areas.

1. Caughlin, J. (1997). Claris Workshop for Students. Gresham, OR: Visions Technology in Education, Inc.
2. Holmes, B. (April 1998). *The Database: America's Presidents.* In Learning and Leading With Technology, 6-11. The International Society for in Education (ISTE).
3. Norton, P. and Harvey, D. (September 1995) *Information = Knowledge: Using Databases to Explore the Tragedy at the Donner Pass.* In Learning and Leading With Technology, 23-25. The International Society for Technology in Education (ISTE).

Getting Started with Database Software

If you'd like to use database software, but don't know how, the following web sites are good instructional resources for learning how to design and create electronic databases. You can follow along on-line, print out the directions, or in some cases, download the file to your computer. The information in parentheses lets you know the platform for which the tutorial is designed.

1. FileMaker Pro (Macintosh)

A step-by-step tutorial for getting started with FileMaker Pro for the Mac. Directions are supplemented by screenshots of what your database should look like.

- *Source:* St. Olaf's College (Minnesota)
- *URL:* http://www.stolaf.edu/ stolaf/services/acc/documentation/filemaker/

2. FileMaker Pros: K-12 Exchange (PC/Macintosh)

A list of activities using FileMaker Pro databases in the K–12 classroom. Simply click on a lesson you like and it will be downloaded automatically to your computer. You can then open the file in FileMaker Pro. Each activity also contains a link to the author's email, so you can contact them for more information.

- *Source:* Database Pros and FileMaker, Inc.
- *URL:* http://www.best.com/~jmo/k12.html

3. Lotus Approach (PC)

Not a tutorial for Lotus Approach, but rather a troubleshooting area. Send your questions to this site or look through the archives of past questions. You can also check out Screenshot: <http://www.screenshot.com/KeyScreen(s)4/lotusappr.htm> for a pictorial overview of Lotus Approach

- *Source:* Lotus Approach Help and Discussion Group
- *URL:* http://www.helptalk.com/forums/approach/

4. Microsoft Access (PC)

This site contains 14 tutorials for Microsoft Access, beginning with an Introduction to MS Access and increasing in sophistication. Tutorials are in Adobe Acrobat PDF format and can be downloaded individually or as a set. To view the files, you'll need the Acrobat Reader, a free application that can be downloaded from http://www.adobe.com.

- *Source:* Graduate School of Library and Information Sciences at the University of Texas at Austin.
- *URL:* http://mis.commerce.ubc.ca/~brydon/MSAccess/tutorials.html

5. Microsoft Works (Macintosh)

Scroll down to *On-site Technology Inservices* and click on *Databases* to automatically download a tutorial on using Microsoft Works. To view the files, you'll need Adobe Acrobat Reader, a free application that can be downloaded from http://www.adobe.com.

- *Source:* Minnesota Independent School District 196
- *URL:* http://www.isd196.k12.mn.us/departments/technology/sd/sd.html

Some Commonly Used Educational Database Software

Database Application	PC	Mac	Phone Number	URL
Apple Works (*formerly ClarisWorks*)*	x	x	800-800-APPL	http://www.apple.com/appleworks
FileMaker Pro*	x	x	800-725-2747	http://www.FileMaker.com
Lotus Approach 97**	x		800-343-5414	http://www.lotus.com
Microsoft Access***	x	x	425-635-7050	http://www.microsoft.com
Microsoft Works***	x	x	PC: 425-635-7130 Mac: 425-635-7160	http://www.microsoft.com