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Educational Telecomputing Activities: Problem-Solving Projects

by Judi Harris

Roger Lewin once said:

Too often we give children answers to remember rather than problems to solve.

Problem solving is one of the most beneficial educational opportunities that we can offer students of any age. The Internet can be used to extend cooperative problem solving activity around the world. Educational problem solving projects are, as yet, the least common kind of Internet-based activity that involves precollege students, but they are among the best examples of how asynchronous connectivity can be used to support and enrich precollege curricula.

Problem solving projects are one of three general types of educational telecomputing activities that have been presented in this "Mining the Internet" series: *interpersonal exchanges* ([February 1994](#) and [March 1995](#)), *information collections* ([March 1994](#) and [April 1995](#)), and *problem solving* ([April 1994](#) and [May 1995](#)). Each general class of educational telecomputing activities includes 5, 6 or 7 different *activity structures*, and each structure is presented with at least one example activity that has been classroom-tested and shared by teachers on the Internet.

It is my hope that by providing you with activity structures, rather than a potpourri of lesson plans, you will be empowered to design effective educational telecomputing experiences for your students that are curricularly-based and adapted to suit their particular learning needs and preferences. This

idea (and earlier versions of these activity classes and structures) was first presented in the [May 1993](#) "Mining the Internet" column, then expanded in the [February](#), [March](#), and [April 1994](#) "Mining" columns. The following structures and examples are intended to serve as an update to that earlier work.

There are seven different educational telecomputing activity structures that can be considered to be within the problem solving genre. They are [information searches](#), [electronic process writing](#), [sequential creations](#), [parallel problem solving](#), [virtual gatherings](#), [simulations](#), and [social action projects](#).

Information Searches

In this type of online activity, students are provided with clues, and must use reference sources (either electronic or paper-based) to solve problems. For example, learning disabled students at Desert View High School created [the following activity](#) with the assistance of their teacher, Michael McVey:

Date: Sun, 20 Nov 1994 20:06:31 -0700 (MST)
From: an308@freenet.carleton.ca
Subject: A Challenge to All Students: Where Are We?

Dear Students,

My students are ready to challenge you. We have forty postcards to give away (that's all we can afford right now) to students who are up to our challenge. We will send you a postcard from our city if you can guess where we are AND send us a set of clues about your own home. We want you to challenge us too.

Here are the clues. You can try to figure out the answers in teams and make a game of it or work as a group. Good Luck. ;-)

1. We can see Mexico on a clear day.
2. We rarely get snow.
3. Our city nickname is The Old Pueblo.
4. United States Supreme Court Justice O'Connor comes from our state.
5. Our state's birthday is on Valentine's Day.
6. We live south of the bird that rose from the ashes.

7. Mount Lemmon is in our backyard.
8. Our area code is $(200 * 3) + 2$.
9. We have 300 days of sunshine a year.
10. We are the southernmost ski area in the United States.

Good luck. We have 40 postcards to give away. Remember though, you must send in a list of questions for your own home to challenge us.

Mr. McVey added a note to potentially participating teachers, suggesting that their students use encyclopediae, atlases, and "the full resources of the Library to answer these questions."

Information search activities can also be of longer duration, and embody rather extensive and sophisticated research, analysis, and communication activities for participating students. A good example is the "What's in a Name?" project that is taking place during the 1994 - 95 academic year via KIDLINK interpersonal and informational communications facilities (i.e., the KIDLINK and KIDPROJ discussion lists, the KIDLINK Internet Relay Chat, and the KIDLINK Gopher). The challenge to different groups of participating students in this project is to research particular sets of related names (of people), examine name collections according to particular aspects (such as mythological connections, cultural differences in naming practices, etc.), and then take the results of this collaborative research and analysis and share it electronically through written reports of findings. Din Ghani (din@ghani.demon.co.uk), the organizer of this project from Newcastle upon Tyne, England, has provided a detailed and richly- conceived structure for the year-long project, which organizes students' work into multiple and multi-site "research," "analysis," and "management" "work packages."

[Electronic Process Writing](#)

Students in Trevor Owen's (towen@yorku.ca) English classes in Toronto regularly posted the poems that they wrote to newsgroups sponsored by Simon Fraser University, so that other students in Canada could offer feedback in an electronic version of process writing sessions. Mr. Owen has also been able to enlist the assistance of professional writers, such as the poet Lionel Kearns, to offer constructive criticism...and to sometimes receive some of the same (from the students), in response to pieces in progress. This "Writers in Electronic Residence" project is now supported by York University, and helps students to explore many different types of writing.

Electronically-assisted process writing can also take on other forms. For example, 14- and 15-year-olds from a number of different school sites are now participating in the "[Doomed Train](#)" project, organized and facilitated by Francis Achiu (francis@kalama.doe.hawaii.edu) of Moanalua High School in Honolulu, Hawaii. This project concentrates upon the situation in Bosnia-Hersegovina by asking students to complete the following activities:

We plan to ask our students to write a persuasive essay that addresses the question "Should Bosnia-Herzegovina remain a confederation or be divided into Croat, Muslim and Serb sections?" The English classes will be divided up into six or seven teams consisting of four heterogeneously grouped students. Each team will be asked to select an ethnic group and take a side on this question and present their arguments. Thus, we will have one Croat group arguing for a confederation and another Croat group arguing for separation. The same will go for the other two ethnic groups so that each team will be different. We plan to put this lesson and question on the Internet and call for participation. The classes from around the world can select any of our teams to challenge. Through E-mail the students can exchange papers and offer rebuttals.

Note that this electronic process writing project asks students to concentrate their feedback primarily upon the *content* of each other's writing, while projects such as the "Writer in Electronic Residence" asks writers to concentrate primarily upon the *forms* through which content is communicated. In both cases, rich, geographically unbound, constructively critical exchanges occur.

Sequential Creations

An intriguing kind of artistic problem-solving has emerged on the Internet, in which participants progressively create a common written text, a shared visual image, or a collaboratively-constructed computer program. Yvonne Andres (andresyv@cerf.net) and Mary Jacks, from Oceanside High School in California, for example, helped their students to start a sequential text by encouraging them to write the first few stanzas of a poem about world peace. They then sent their work on to students in a different school, who read the stanzas already written and added their own. This process continued until the poem had circled the world several times, and had grown (understandably) to epic length.

Paul Fretheim (fretheim@guest.nwnet.net) organized students from all over North America in the spring of 1994 to create a "[Native American ChainStack](#)." Students at participating sites created *HyperStudio* stacks on the Native American tribes found in their geographic locations, and then combined these stacks into a common interactive resource. John Ost (jost@mv.mv.com) organized students who were participating in a monthly real-time "[Writers' Corner](#)" via the *KIDLINK* Internet Relay Chat to create a short story online, following this plan:

(1) Let's build a short story as a group online. Don't worry about punctuation or anything other than building a story. So come to the meeting with three nouns, verbs and adjectives that you'd like to see as part of the story.

For example: nouns -->cat, ball, string;
verbs ---> hit, swat, swallow;
adjectives---> big, hard, green.

If I told the story myself, I might write the following:

"I have a big cat named Maryann. Actually, Maryann was a boy cat but I didn't know it so I named him Maryann. One day he saw a green, hard ball lying in corner. He dashed over to the ball and swatted it with his paw. The ball shot across the room and suddenly flew back and hit Maryann right in the nose. "What happened?" He purred to himself. Maryann carefully nuzzled the ball forward with his nose. To his surprise he saw a long gray piece of string attached to the ball. ... "

Well, you get the idea. Now when everyone else comes prepared with words, that story won't just have my nouns and verbs *or my original story idea.* Instead it will be a composite story that grows as each of us adds our choice of words and ideas to each sentence.

Each one of us will take turns being the narrator and building the sentence from the words made available by the group.

(Lord knows how this will work if lots of people come to the meeting. But we'll make it work.)

We can put whatever rules we want on the story telling. But we'll have to decide those rules when we meet. And those rules can always change -- just like they will as you learn to write your own stories and develop your own style of writing.

This activity structure seems to be applied both synchronously and asynchronously, using both text and images, to support intriguing collaborative creative efforts.

Parallel Problem Solving

Using this activity structure, a similar problem is presented to students in several locations, which they solve separately at each site, then share their problem-solving methods electronically. For example, middle school students on the statewide educational telecommunications network in Virginia (VaPEN) participated in an interdisciplinary project called "[Puzzle Now!](#)," organized by Heidi Bernard (hbernard@radford.vak12ed.edu). In this project, students from 25 sites within the state solved a common puzzle each week for 8 weeks, comparing not only solutions, but, more importantly, multiple methods for working the problem.

In another parallel problem solving activity, elementary-level students in different classrooms designed [floating boats](#) made out of a 15 cm. square of aluminum foil to hold as many pennies as possible, then shared designs, problem-solving procedures, and experiences via electronic mail. This simple, but powerful activity was coordinated by Barbara Leonard (bleonard@chpchat.mich.fred.org), a substitute teacher in central Michigan.

Also, in conjunction with Earth Day observance in the spring of 1994, students in many different grades and schools were challenged by David Warlick (dwarlick@dpi1.dpi.nc.gov) of Raleigh, North Carolina, to become "[Eco-Entrepreneurs](#)" by developing "an imaginative new product that could make a profit, but not impact on the environment." The product designs had to include use of at least 50% recycled materials. Participating students wrote and submitted "sales pitches" for their products on Earth Day, which David compiled into an all-sites catalog. Participating student groups then used the electronic catalog to select and place fictitious orders for the products that they chose. The "sales statistics" were then sent to all groups for review and discussion.

Virtual Gatherings

Virtual gathering activities bring together participants from different geographic locations and time zones in real-time to either participate, virtually "in person," in a computer-mediated meeting, or simultaneously participate, "in spirit," without direct electronic contact, in similar activities at different project sites. Students using the *KIDCLUB* Internet Relay Chat can participate on most Saturdays, for example, in discussions organized by Patti Weeg (pweeg@source.asset.com). On one Saturday in March of 1994, students chatted about what they would do "[if they were in charge of the school](#)." Patti suggested that they think about the answers to questions such as these to help them prepare for the virtual gathering:

1. If I were principal what would I change about our school? Why?
2. What would I keep the same? Why?
3. As a student do you feel that your views are respected?
4. Do you have any part in decision making in any of your classes?

In a poignant virtual gathering involving all 67 school districts in Florida, students and teachers observed "[A Day Without Art](#)" on the 8th annual World AIDS Day. Sandy McCourtney (mccours@firnvx.firn.edu) and Sally Lucke, coordinators for the activities, described the "in spirit" aspect of this virtual gathering as follows:

THE ACTIVITIES: Schools representing all 67 Florida districts will submit visual and discourse statements in the form of a blindfold and an awareness statement. These blindfolds will be draped on the statuary located in the Ringling Museum Courtyard, signifying the message that at times, regarding AIDS, "we are unaware and cannot see." In a symbolic gesture, the blindfolds on the museum statuary will be removed, once the on-site and electronic dialogs have commenced.

THE INVITATION is this:

1. Send an electronic awareness message, a message of support, or, a 'factoid' (facts) related to AIDS and/or,
2. Design a piece of cyberspace-cloth to blindfold one of the statues!

Please limit messages to no more than one screen; if you intend to send a graphic file, please send an email (text) message to the address below to specify the paint and compression program you will be using.

Virtual gathering activities can incorporate use of multimedia. During the weeks of March 7 - 13, 1994, for example, students from many different Internet sites helped to build "[CitySpace](#)" (<http://www.exploratorium.edu>), a model of a virtual city hosted by the San Francisco Exploratorium. Students had previously sent in stories, scanned photographs, hand-drawn pictures, audio samples, 3D models, etc. about the neighborhoods and "imaginary spaces" in which they live. These were then used by teams of students, artists, and developers to create CitySpace, which is continually evolving, and can be explored via online multimedia tools, such as [Cornell University's "CU-SeeMe" freeware](#).

Simulations

Online simulations require the most coordination and maintenance of all activity structures, but the depth of learning possible and task engagement displayed by participants can convince project organizers to spend the additional time and effort necessary to make them work. Notable examples of successful online simulations include Academy One's [NESPUT](#) ("National Educational Simulations Project Using Telecommunications") activities, coordinated in 1994 by Bob Morgan (xx118@nptn.org). These collaborative projects simulate space shuttle launches, historical space missions, space

colony design, ozone layer repair, and stock market investments, to name just a few. These activities depend upon person-to-person communication to create the simulated situation.

Simulations can also be organized around the use of software that creates the virtual worlds that students explore. [The National Educational Supercomputing Program \(NESP\)](#), for example, permits classes of students to use supercomputing facilities at the Lawrence Livermore Laboratory remotely to help them to solve proposed projects in science and mathematics. Sophisticated simulation software, which allows students to explore, for example, climate modeling, ray tracing, molecular configuration, or plant growth modeling is made available to students and teachers at their school sites, along with teacher education materials and curricular integration models. Linda Delzeit (linda@nptn.org) coordinates the National Public Telecomputing Network participation in this project.

[Social Action Projects](#)

It should be no surprise to global citizens living at the end of the 20th century that the Internet can serve as a context for "humanitarian, multicultural, action-oriented telecommunications projects" (Ed Gragert, I*EARN) which involve the future leaders of our planet: our children.

Mike Burleigh (ubjvm6q@ccs.bbk.ac.uk), for example, organized students via the KIDLINK Internet Relay Chats to participate with his students at the Cedars School in London on a 24-hour telecommunications vigil that helped to raise money for [children in Lebanon](#). He described the activity to potential participants, in part, as follows:

Dear KIDLINK friends,

We are one of the KIDCLUBs on KIDPROJ trying to find things which we can do to prove the KIDLINK fourth question that we are.....

.....'thinking globally and acting locally'
.....to make the world a better place.

We have decided to have a sponsored IRC link to raise money which we will send to the support UNICEF projects in the Lebanon.

There are will be six of us and we will be staging a 24 hour telecommunications vigil at the Cedars School London UK.

We will be meeting after school on Friday 11th February and will hope to receive messages of support from KIDLINK people around the world.

This will be reported in the local press. Some of us will be sleeping (the tough ones will stay awake).

Nina Hansen, from the Timothy Edwards Middle School in South Windsor, Connecticut (ahansen@uhavax.hartford.edu), organized students from all over the world to "[Save the Beaches](#)" by planning and participating in "beach sweeps." She described the organization of the project, in part, as follows:

The Save the Beaches project is getting underway full force. In order to meet the May 30th deadline, schools are in the process of putting together a schedule and planning their beach sweeps. Each school is coordinating the project according to what works best for them. On Lake Erie, teachers were concerned over what types of litter students might encounter. To help alleviate any health hazards, experts from the State Health Department were called in to give students tips on what to do should they encounter any potentially dangerous litter. Here in Connecticut all students will be supplied with rubber gloves and will be required to wear them during the clean-up. Precautions such as these will ensure both an educational and safe experience.

The most exciting aspect of the project is the wide range of locations that will be participating. At this writing there at least 12 of the United States represented, two provinces in Canada, and the countries of Brazil, Costa Rica, Denmark, Portugal, Australia, and Japan have assured us they will be sending data.

Finally, students from classrooms in California, Tennessee, Virginia, and London, after reading Vice President Gore's *Earth in the Balance: Ecology and the Human Spirit*, cooperated to "investigate the problems created by water run-off and to design a public awareness program that [could] be implemented in their own communities, and then shared and replicated globally" as part of [the SAFER](#) (Student Ambassadors for Environmental Reform) Water Project. This work incorporated several Internet-based video teleconference meetings of the four research teams and their invited subject matter expert guests, then televised project results nationally during National Science and Technology week in 1994. The project was coordinated by Yvonne Andres (andresyv@cerf.net) and Al Rogers of the Global SchoolNet, with support from the National Science Foundation and many commercial networks and corporations.

The potential for multi-disciplinary, forward-thinking, truly collaborative learning via projects such as these is awesome. It is also interesting to note that many of the more sophisticated, interdisciplinary, authentic online problem-solving projects focus their participants' attention upon the problem to solve, rather than upon the "answers to remember" or the telecommunications technologies used to share information among coworkers. This clear emphasis upon the *process* of curricularly-integrated learning, rather than the *technologies* that can facilitate that learning or the answers to which that process leads, is perhaps one of the characteristics that makes Internet-based problem-solving projects so potentially powerful.

An Educational Telecomputing Archive

Would you like to learn more about any or all of these innovative educational telecomputing projects? If so, there is an Internet file archive subdirectory made just for you. Use the **ftp** command from your Internet account, or the **ftpmail** gateway service via electronic mail (both presented in ISTE's [Way of the Ferret: Finding Educational Resources on the Internet \[Harris, 1994\]](#)) to anonymously access [the Texas Center for Educational Technology's server](#) at this address: **tcet.unt.edu**

Once connected, look in the subdirectories contained inside: **pub/telecomputing-info/ed-infusions**

...to find additional details on the activities mentioned above, plus descriptions of telecomputing projects from these and other "activity genres."

If you would like to share your examples of successful telecomputing activities with visitors to the **tcet.unt.edu** archive, e-mail your activity descriptions to me at jbharris@tenet.edu.

Reference

Harris, J. (1994). [Way of the ferret: Finding educational resources on the Internet](#). Eugene, OR: International Society for Technology in Education.

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[Other "Mining the Internet" columns](#) are available on the [Learning Resource Server](#) at the College of Education, University of Illinois, Urbana-Champaign.