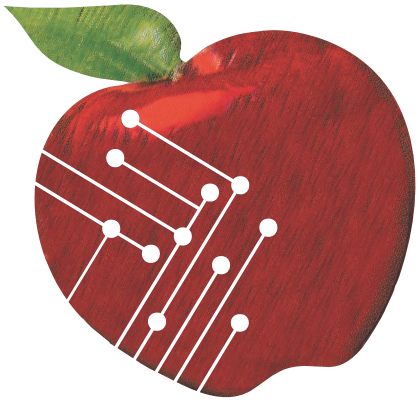

CET

Center for Educational Technologies®

2001 Annual Report

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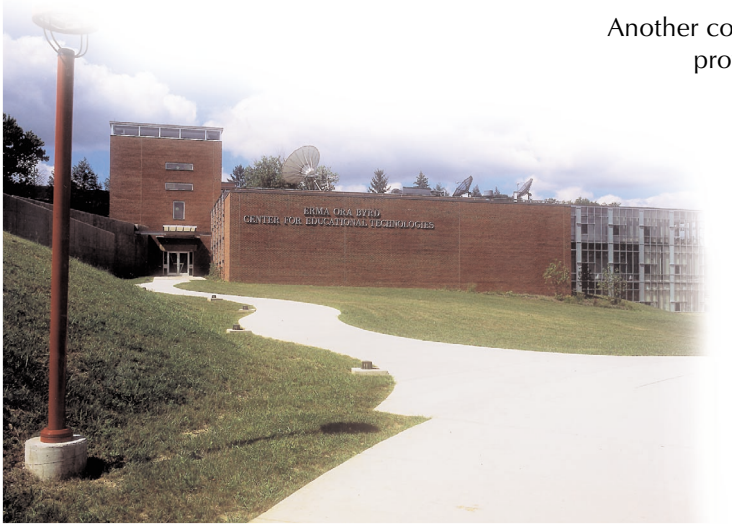
EXECUTIVE SUMMARY

The Erma Ora Byrd Center for Educational Technologies® (CET) is located on the campus of Wheeling Jesuit University in Wheeling, WV. With its mission to enhance lifelong learning and teaching through effective use of technology, the CET provides turnkey solutions to schools, school districts, state departments of education, federal agencies, foundations, businesses, and industry. These solutions help in planning, developing, and implementing advanced educational technologies. The center conducts educational research, develops curriculum supplements, and provides professional development for teachers, administrators, college faculty, and corporate personnel. NASA's Classroom of the Future™ program also is housed at the CET.

CET has published seven curriculum supplement products: Astronomy Village®: Investigating the Universe™, Astronomy Village®: Investigating the Solar System™, BioBLAST®, ExoQuest®, Exploring the Environment® (ETE), Global Perspectives, and The Underground Railroad: Connections to Freedom and Science. These products were developed to support NASA's initiatives in space science, human exploration and development of space, and Earth system science. During 2001 CET had five additional products under development: CVEEC, Foundations of Freedom, International Space Station Challenge™ (ISS), Lewis and Clark Rediscovery Project, and STORM-E.



Another component of the CET is professional development. The CET has provided general leadership training in educational technology through its InSTEP™, BUCKEYE, and CVEEC programs; product-specific training through its product workshops; and content-specific training through its online Earth systems science courses

The learning sciences provide a foundation for the research and evaluation conducted at CET. The main focus of the research team is to understand the conditions under which learning takes place by considering theories of cognition, applications of theory to practice, and technology-rich learning environments. See http://www.cet.edu/research/main.html for a complete list of the research studies conducted by CET researchers.

History

The Erma Ora Byrd Center for Educational Technologies® was dedicated in 1994. Now in its third cooperative agreement with NASA, the Classroom of the Future™ remains the central program within the CET. It serves as NASA's premier research and development center for educational technologies.

During 2001 Wheeling Jesuit University welcomed a new president, Fr. George Lundy. He replaced Fr. Thomas Acker who relocated. Fr. Lundy has since initiated efforts to better integrate the federal and academic programs.

Staff Profile

There were approximately 45 CET staff members in 2001. They were organized into six units: executive management, software and content development, research, publications and support, computer support, and video support. CET projects draw upon the resources of each group to accomplish project goals.

Leadership

Nitin Naik, Ph.D., president

Jeanne Finstein, Ed.D., assistant director

Stanley Jones, Ed.D., assistant director/
Washington office

Nitin Naik

Jeanne Finstein

Stanley Jones

REPORT STRUCTURE

This report covers Oct. 1, 2000, to Sept. 30, 2001. It is divided into four areas: published products, products under development, professional development, and research and evaluation. Each area is then divided into product sections. These describe the product and/or service, 2001 accomplishments (including project milestones and web statistics for the year), and if research is available, the impact of the program.

EDCATS

Starting in 1996 CET began using the EDCATS system to collect evaluation data about its products and services. EDCATS allows CET staff to track the number of participants and their opinions on the quality of CET products and services.

Table 1: 1996-2001 Breakdown of Participants

	1996	1997	1998	1999	2000	2001
Products distributed	31,481	36,770	25,805	13,305	5,813	2,955
Students						
Grades K-4	180	202	661	180	244	723
Grades 5-8	7,217	14,111	9,780	15,662	16,046	16,700
Grades 9-12	2,960	3,496	4,480	1905	4,560	2142
Teachers						
Grades K-4	269	288	243	153	319	52
Grades 5-8	8,669	8,922	4,884	1,373	1,582	413
Grades 9-12	8,776	8,522	1,799	386	914	167
Web statistics						
Hits	151,214	2,253,163	3,337,028	5,088,368	13,861,795	19,509,969
Unique users			227,605	369,303	1,132,919	1,671,145

Table 1 includes summary statistics for all CET curriculum products. Because NASA has started to make most of its products available online, the drop in the number of products distributed is not surprising. Web statistics follow national trends; that is, more information is available over the Internet, and the number of individuals with access to the Internet is increasing. The steady decline in the number of teacher participants can be attributed to the recent movement toward more in-depth training of teachers in smaller groups and the use of more virtual opportunities. The steady increase in the number of students served from 1996-2000 is explained by the support the CET provides to the Challenger Learning Center®, which continues to expand, and also to the research and testing involved with product development. Meanwhile, the slight drop in students served in 2001 is evidence that once the software is put on the market, most teachers do not have their students complete the EDCATS surveys, unlike in research and testing phases.

Population Served

Table 2 shows some demographic information about the teachers who participated in CET professional development workshops in 2001, according to the EDCATS system.

Table 2: Summary of EDCATS Teacher Workshop Responses

Of the 286 teachers who reported their gender:

84% female
16% male

Of the 285 teachers who reported their ethnicity:

2% African-American
97% Caucasian
1% other

Of the 280 teachers who reported their teaching experience:

4% first year
13% 2-5 years
13% 6-10 years
13% 11-15 years
57% 16+ years

Of the 277 teachers who reported their highest degree attained:

38% bachelor's
62% master's

Of the 277 teachers who reported their school affiliation:

88% public
12% private

Of the teachers who reported their grades taught:

42% K-4
36% 5-8
21% 9-12

Total number of students taught = 17,955

The statistics cited in Table 2 represent mostly InSTEP™ workshop participants (that is, 257 West Virginia teachers). The data is therefore, consistent with West Virginia's 3 percent minority demographic. It is interesting to note that most of the participating teachers are late in their career cycles and have earned their master's degrees, yet they still are seeking ways to improve their teaching. Most of the participating teachers teach at the K-8 level.

PUBLISHED PRODUCTS

CET™ has published seven curriculum supplement products: Astronomy Village®: Investigating the Universe™, Astronomy Village®: Investigating the Solar System™, BioBLAST®, ExoQuest®, Exploring the Environment®, Global Perspectives, and The Underground Railroad: Connections to Freedom and Science. These products were developed to support NASA's initiatives in space science, human exploration and development of space, and Earth system science. The hallmark of CET software is the use of cutting-edge NASA science questions, the use of real NASA data, and the innovative combination of instructional strategies and technology tools. The programs engage students in hands-on experimentation, cooperative learning, collaboration with experts, and important scientific inquiry activities (for example, collecting and analyzing data, weighing evidence, and presenting findings). Students participate as real scientists doing real science. As they work cooperatively to conduct investigations, we believe that they will develop positive attitudes toward science and the important problem-solving skills required for scientific inquiry. This section briefly describes each program and highlights new developments in 2001.

Astronomy Village®: Investigating the Universe™

In March 1996 COTF™ published Astronomy Village®: Investigating the Universe™. It's a CD-ROM multimedia program for the Macintosh computer. It provides 9th- and 10th-grade science classrooms with 10 complete investigations of important questions in stellar astronomy. Since 1996 more than 12,000 free copies of Astronomy Village have been distributed to educational communities across the country. This product won *Technology & Learning* magazine's award for best microcomputer software of the year in 1996.

Astronomy Village simulates living and working at a mountaintop observatory (the village). That's the primary way students investigate contemporary problems in astronomy. Numerous curricular resources allow students to experience the same computer-based tools that NASA scientists use to acquire, explore, and analyze information. Students have access to an image-processing program, a document reader, an image browser, the World Wide Web, simulation programs, digitized video clips, Hubble Space Telescope images, interviews with astronomers, computer animations, and graphics.

This innovative software has received tremendous acclaim from professional science educators. In accord with national science standards, the academic activities promote learning of both astronomical concepts (stars and stellar evolution) and processes related to scientific inquiry.

What's New in 2001?

The development team is upgrading the product to include a conversion from Hypercard to HTML (to support cross-platform access) as well as content revisions. The expected release date is spring 2002.

In 2001 there were 9,317 unique users and 32,956 hits to the web site.

Astronomy Village®: Investigating the Solar System™

Astronomy Village®: Investigating the Solar System™ was funded by the National Science Foundation (Grant # ESI-96178) with additional support from NASA COTF. It is an exciting multimedia program intended to supplement existing science curricula. Although designed for middle school students, components of the software can be adapted for use at other grade levels. Two core research areas, encompassing seven focused investigations, form the basis for student explorations. Each investigation encourages students to participate in scientific inquiry individually or as members

of a cooperative learning group. Additional software components include an image browser, a variety of simulators, and a solar system explorer. All of them can serve as stand-alone applications to support science curricula in primary, middle, or high school classrooms.

The program consists of sets of tools and multimedia material housed in a virtual community that is an "astronomy village." Individuals or teams of student researchers pursue one of Astronomy Village's two core research areas. Each research area can be completed in one week. Students then spend a second week exploring one of the seven focused investigations designed to explore the core research material at greater depth. Throughout the activities students engage in scientific inquiry and follow the steps used in actual scientific research.

Astronomy Village® can also be used as a teacher resource and classroom astronomy reference. It contains numerous articles on astronomy as well as many Earth- and space-based telescope images. Teachers and students alike can access these articles and images by using the online retrieval system in the Astronomy Village library. The solar system explorer, an optional component of the program, lets students and teachers explore the wonders of the solar system. The solar system explorer contains hundreds of planetary images and a wealth of information about solar system astronomy. Computer simulations and a variety of other activities afford students the opportunity to explore and construct their own knowledge.

What's New in 2001?

Astronomy Village: Investigating the Solar System was officially released in January 2001. Since the release 836 complimentary and purchased copies have been distributed.

In 2001 there were 9,526 unique users and 53,657 hits to the web site.

What Was the Impact in 2001?

The research team conducted a study to track teachers using Astronomy Village over two school years. Prior research indicated that teachers were successful with the students when the teachers enjoyed extensive support from the project developers. What would happen when the project support was no longer available? Would students be as successful? Would the teachers continue to implement the program in ways consistent with the developers' intentions? Of the seven teachers who conducted the Search for Life core research project during the summative evaluation (1999-2000 school year), we identified three teachers who also conducted the Search for Life core research project during the 2000-2001 school year (post-summative evaluation). An analysis of the learning outcomes indicates that students in the second implementation year achieved greater learning outcomes than students in the first implementation year. Researchers will continue to monitor the progress of these teachers during a third implementation year.

McGee, Dimitrov, et. al. (2002) concluded, "This research on the implementation of a specific program is in its nascent stage. The critical assumption underlying this research is that long-term reform involves much more than the design of curriculum materials. Not enough is known about how innovations evolve over the course of time in the face of strong market forces. The track record for innovations in science education reform has been one of early success, followed by gradual obsolescence as the original designers eventually fade away from the project. A long-term perspective will provide developers and reformers with a better understanding of how to achieve long-term success for new innovations."

BioBLAST®

BioBLAST® (Better Learning through Adventure, Simulation, and Telecommunications) is a multimedia curriculum supplement for high school biology classes. Based on NASA's advanced life support research, the program offers students both traditional and computer-based research tools to study the interdependent components of

a bioregenerative life-support system (BLiSS) for long-term space habitation.

BioBLAST® uses a multimedia learning environment and resources from the Controlled Ecological Life Support System (CELSS) project and other NASA sources. The program features a virtual reality interface, laboratory investigations, computer simulations, computer-based resources, and a link to interviews with NASA scientists and engineers.

Students work cooperatively as research scientists to investigate the interdependence of plant and human life. Starting with instruction about photosynthesis, plant cultures, and recycling, students participate in authentic NASA CELSS research, with the goal of balancing life-supporting dynamics. This multimedia approach is innovative, and numerous testimonials indicate that students find it exciting. Supporting the instruction are extensive multimedia and telecommunication resources, including the ability to query NASA scientists online (Ask a NASA Expert).

What's New in 2001?

A total of 152 complimentary and purchased copies of BioBLAST were distributed in 2001. COTF continued support of the product with professional development workshops.

A chapter in *E-Learning: Technology and the Development of Teaching and Learning* was written and accepted in 2001 (Ruberg & Baro, in press).

In 2001 there were 34,599 unique users and 142,861 hits to the web site.

ExoQuest®

Whether or not extraterrestrial life exists is a question of immense popular interest and a scientific issue of profound importance. ExoQuest® uses this question as a framework for integrating current research in astrobiology into the grades 7-9 curriculum. Within the context of astrobiology, students explore astronomy, evolution, paleontology, biology, Earth science, physics, chemistry, geology, and remote sensing.

ExoQuest creates links between students, NASA scientists, and other research organizations, thus integrating NASA's experience and expertise into middle and high school curricula. Students travel on virtual journeys to destinations in the solar system and beyond. Their trips are based on past, present, and future NASA missions. At each destination students conduct investigations that include hands-on and simulated experiments. Each investigation poses problems that focus on different areas of research, providing an interdisciplinary approach to science and scientific inquiry. Students ask the same kinds of questions and conduct the same kinds of research as scientists from NASA and other organizations around the world.

What's New in 2001?

A beta version was released and tested in March 2001.

Since the official release in September 2001, 350 complimentary and purchased copies of ExoQuest have been distributed.

In 2001 there were 5,888 unique users and 27,081 hits to the web site.

What Was the Impact in 2001?

Kirby and McGee (2001b) reported the results of the beta test of ExoQuest conducted in March 2001. Fifteen teachers (with 1,008 total students) participated in the beta test.

Table 3: ExoQuest Student Demographics

Of the 707 students who reported their gender:	
	56% female
	44% male
Of the 851 students who reported their grade:	
	66% 6-8
	34% 9-12

The results indicate that the ExoQuest® program provides a rich context for exploring exobiology. Both teachers and students responded favorably to the program. However, there was no significant gain in student understanding of the core requirements for life and how to search for life. Students were not able to transfer their knowledge from the learning environment to a new context. Future revisions should provide greater support for students to transfer their learning.

Exploring the Environment®

With funding from NASA's Learning Technology Program (NASA CAN NCC5-107), the Exploring the Environment® project created a series of 17 problem-based, Earth science modules for high school and middle school students.

ETE provides real-time and near real-time data visualization tools to help students understand and record fast-changing natural phenomena and human influences on Earth. Students decide how to best respond to real-world problems related to weather, population growth, biodiversity, land-use patterns, volcanoes, water pollution, and global warming. The designers anticipate that as students work through the modules, they will acquire not only content knowledge, but also important research skills.

ETE has made some major contributions to science education. First, ETE is Internet-based and free of charge, which makes it usable around the world and accessible to schools that might not have the financial resources to invest in software. By using this broad and low-level technology, the curriculum is usable on older-model computers and across both Windows and Macintosh platforms. Second, the ETE curriculum addresses current and authentic worldwide environmental issues. Examples include hurricane tracking, the global impact of volcanic eruptions, endangered species, the Amazon rainforest, deforestation, ozone depletion, and atmospheric carbon buildup. Third, the designers anticipate that ETE learning activities encourage students to work cooperatively. It is believed that through such self-directed research, students develop important scientific inquiry skills and improved attitudes toward science. Fourth, ETE provides students with unique access to powerful and authentic science tools, techniques, and data, such as imaging software and remote-sensing data from NASA. Students are trained online to use imaging software so they can view extensive biological, chemical, geological, and physical changes on Earth. Finally, ETE actively supports teacher implementation through training workshops and other activities.

What Was the Impact in 2001?

While there is no active funding line for ETE, the CET continues to refine this product. Teacher input and rigorous testing suggested the addition of a K-4 section. In addition, the Earth Science Explorer (originally intended for middle school audiences) was updated for the upper elementary level. Finally, the site features new graphics and text, making it more consistent than before.

In 2001 there were 1,373,772 unique users and 14,474,748 hits to the web site. A total of 1,081 teachers have registered for ETE passwords during the year.

Global Perspectives

The Global Perspectives web site was released in 1999. The site's objectives include producing an interdisciplinary web site supportive of middle and high school students in geography, social studies, and history; providing tools and resources for data gathering and analysis on topics of worldwide concern; involving teachers in the design, development, and assessment of learning materials; and developing sample lesson plans with supporting problem-based learning modules.

The team developed four modules focusing on the Balkans, Kashmir, Central America, and the Middle East. Subject matter experts from Wheeling Jesuit University and West Virginia University contributed to the effort. Each module included historical background and information about the social, political, economic, and geographic issues in the region. Geographic information contained satellite imagery, transportation networks, and topographic data.

The Global Perspectives site has been extremely well received. Teachers report that they appreciate finding "everything we need" in one place. The site continues to set the standard for engaging K-12 humanities resources for teachers across the country.

What's New in 2001?

In 2001 there were 13,901 unique users and 174,107 hits to the web site.

The Underground Railroad: Connections to Freedom and Science

In July 1998 President Clinton signed a bill into law that would recognize and preserve the Underground Railroad, the South-North escape routes used by freedom-seeking slaves during the 19th century. Specifically, the law authorized the National Park Service to physically link the railroad's "safe houses," to produce educational materials about the railroad, and to otherwise commemorate this important part of our nation's history. This fascinating video is the result of a collaboration between the COTF, National Park Service, and NASA educational resources.

Slaves traveling the Underground Railroad, usually on foot, depended on celestial navigation to find their way northward. They continually looked to the Big Dipper and the North Star for direction. This video increases student awareness of the Underground Railroad and the role celestial navigation played in the railroad's success. The video also highlights the importance of modern global information system technology in reconstructing historical topographies and finding the exact route of the railroad. The video combines amazing historical facts, such as the use of handmade quilts for communication, with mathematics, remote-sensing technology, Earth system science, and astronomy. The educational experience is dynamic, moving, and broadly cross-curricular.

What's New in 2001?

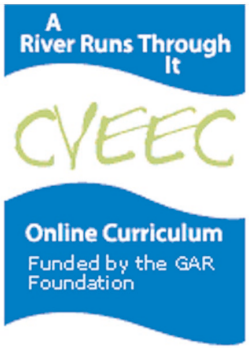
The video is distributed through NASA's Educator Resource Center network free of charge. Teachers can purchase copies through NASA CORE (Central Operation of Resources for Educators), which has distributed 48 copies.

PRODUCTS UNDER DEVELOPMENT

Although CET continues to support and refine its existing products, new products are also being worked on. Through the following projects—CVEEC, Foundations of Freedom™, International Space Station Challenge™, Lewis and Clark Rediscovery Project, and STORM-E—the CET is expanding its efforts to other domains to reach a wider audience. This section provides brief descriptions of current developmental efforts.

CVEEC

The CVEEC project is a partnership among the Cuyahoga Valley Environmental Education Center (CVEEC), Summit Education Initiative, and the CET. It is privately funded by the GAR Foundation. The purpose of the partnership is two-fold: to develop nine online curriculum supplements (three during each of three years starting in 2001) that bring together Summit County (OH) students, their parents, and the community; and to provide professional development for Summit County teachers (see the Professional Development section for a description).



The content of the three 2001 online curriculum supplements is complete. The How Big? How Far? module introduces students to remote sensing and map skills. They must use ArcView and/or Scion Image to digitally measure the distance between their school and the CVEEC. The Panther Relocation module introduces students to the concept of endangered species. Students must determine whether or not it is feasible to transplant some of the endangered Florida panthers from the Everglades to Cuyahoga Valley National Park. The Predicting the Weather module introduces students to remote- sensing products and other tools meteorologists use to predict weather. Stundents must determine the weather for the next 24, 48, and 72 hours to prepare for a trip to the CVEEC.

What's New in 2001?

The first three of nine online curriculum supplements were created in 2001. Ideas for the next three (2002) modules were gleaned from the professional development workshops, and prototypes for these modules were created.

In 2001 there were 741 unique users and 3,941 hits to the web site.

What Was the Impact in 2001?

Preliminary reports indicate that an effort to refine Earth science materials at the CVEEC and to engage in professional development with Summit County teachers has been well received. See the Professional Development section for a discussion of the report.

Foundations of Freedom™

The primary objective of the Foundations of Freedom™ project is for high school students to learn about the historical and philosophical foundations of the U.S. Constitution. They'll study significant historical issues relevant to the Constitution. A number of "challenges" will be posed within the context of constitutional themes. These challenges address separation of powers, representative government, and liberties and civil rights. Each challenge will pose a question that focuses on a historical event that illustrates one of the themes.

Legal scholars and constitutional historians will introduce challenges with documentary-style video segments and video commentary. All necessary research materials will be contained within an electronic archive. The archive will include historical documents, landmark court cases, and significant speeches, debates, essays, and letters. All materials in the archive will be fully cross-referenced and searchable. Support tools will include an online notebook and glossary.

Specific learning objectives will be consistent with the National Standards for History published by the National Center for History in the Schools. Specifically, the main

focus of the curriculum will be on historical analysis and interpretation. To complete each challenge, students will be required to compare and contrast differing sets of ideas, values, personalities, and institutions. They will also be expected to marshal evidence of antecedent circumstances and contemporary factors contributing to problems and alternative courses of action.

The final release for the Foundations of Freedom™ project is planned for fall 2003.

What's New in 2001?

The development team hosted a workshop of constitutional advisers to determine the content framework for the software and identify the first two modules to be included in the alpha version.

International Space Station Challenge™

The International Space Station Challenge™ project contributes to the overall NASA effort to attract students from all backgrounds to pursue further studies and possible careers in science and engineering. ISS Challenge draws upon International Space Station design, construction, human exploration, and research as a vehicle to capture student curiosity. By gleaning science, technology, and human factors challenges from the space station, ISS Challenge brings NASA research and development and technology innovations into its curriculum modules.

ISS Challenge has the unique opportunity of linking curriculum modules to a live, progressively changing, multi-year NASA mission that is easily visible by the naked eye in the night sky. Unlike missions to remote planets or even to the Moon, the space station provides opportunities to tie this project to ongoing news events. The ISS Challenge has tried to highlight the unique timeliness of the ISS with weekly updates on its front page, feature stories in the ISS Tech Check newsletter, frequent updates to the Reading Room, and live links to space station resources in all curriculum activities. Curriculum modules center on unique design, construction, human exploration of space, and scientific research uncertainties and challenges that have emerged with the development of the space station. Each module attempts to capture student interest by presenting a real problem that students must practice their science, math, technology, geography, and communication skills to solve.

What's New in 2001?

Four physics-based activities—recognizing steady motion, recognizing accelerated motion, centripetal force, and centripetal force apparatus—were added to the Docking Challenge.

Two Macromedia Flash interactive simulators were added to enhance and support ISS curriculum. They are a) Orbital Tutorial Simulator, which allows students to explore the relationship between the altitude of an orbiting object and its orbital period, and b) Shuttle/ISS Simulator, which allows students to dynamically rendezvous the space shuttle and ISS by adjusting the altitude of the shuttle.

Three ISS Tech Check newsletters were published on the web (http://www.cotf.edu/iss/main.asp). An e-mail announcement about the newsletter publication with links to each article was sent to NASA and teacher and corporate contacts and also forwarded to SpaceLink for e-mail distribution. The newsletter features original articles related to ISS, educational technologies opportunities for teachers, and an interactive quiz.

Lewis and Clark Rediscovery Project: Lifelong Learning Online

In recognition of the 200th anniversary of Lewis and Clark's voyage with the Corps of Discovery, the University of Idaho (the lead institution for the project) has teamed with the CET and the University of Montana-Missoula to continue building a learning environment that offers an introspective look at our country. Maps, images, GIS data, and NASA visualizations are housed in a database that interacts with the University of Idaho's learning environment interface. The interface offers flexibility for use with similar projects involving different content. Using multimedia from historians, American Indians, scientists, and citizens connected to the Lewis and Clark saga, the project piques students' curiosity, and provides an in-depth look at the growth of the United States, from the Louisiana Purchase through the 200 years of change that followed.

Of particular note is the combination of interdisciplinary sources that provide informed and provocative viewing for educators and the public (still under development). The learning environment provides background material and standards-based strategies useful to in-service and pre-service teachers and their students. The project offers educators an online environment where NASA products can be incorporated into the Corps of Discovery theme.

The main thrusts of the program have been the development of content and design and use of interactive learning environments focused on the 200 years of change since the Lewis and Clark expedition, and NASA's role in discovery into the future. The program uses a learner-centered environment that will be usable by a variety of learners and teachers. It emphasizes K-12 standards, allows interaction among learners at different stages, and will become a model for online education for K-12 and college courses. The learning environment includes mathematics and science as well as aspects of geographic, historical, and cultural change. The themes of the environment include various changes over the past 200 years in the context of the Lewis and Clark expedition and where we, as a nation, are headed.

What's New in 2001?

Five modules were developed in 2001: Philadelphia, Pierre, Knife River Villages, Great Falls, and Umatilla River.

In addition to the content work consisting of text and video, the GIS specialists at the CET have been working on early American maps.

STORM-E

The Center for Educational Technologies is designing simulations for K-12 audiences. The simulations immerse and engage students in standards-based content materials. The student-centered simulations require students to work into four teams and apply their knowledge. For example, STORM-E, a weather simulation, divides students into air pressure, humidity, temperature, and wind teams. Students study their particular area so they can serve as experts during a live event. This event is a videoconference connecting the students to the CET. The students provide weather predictions with reasons based on data. During the event CET staff presents students with data, which could indicate new weather patterns. In worst-case scenarios the students might predict severe weather or recommend that a space shuttle launch be postponed.

What's New in 2001?

In 2001 the CET prototyped STORM-E, a new meteorology simulation.

PROFESSIONAL DEVELOPMENT

CET professional development activities provide general leadership training in educational technology. They aim to integrate content, pedagogy, and technology as they help teachers implement new activities and reflect on their experiences. These activities also help to establish a community to which teachers can contribute and from which they can benefit. This section provides brief descriptions of CET's professional development efforts.

BioBLAST®

The CET continued to support the BioBLAST® program through collaborative workshops on implementation of BioBLAST. For a description of the BioBLAST program see the Published Products section.

What's New in 2001?

Collaborations were forged with the following NASA and educational institutions for using BioBLAST as part of professional development activities:

- U.S. Department of Agriculture
- NASA Kennedy Space Center, Space Biology Research Group
- Florida Ag in the Classroom Program Inc.
- Sarasota County Farm Bureau
- Utah State University, Utah Ag in the Classroom Program
- New Mexico Ag in the Classroom
- Department of Ag Education and Communication, University of Florida
- Department of Entomology and Plant Pathology, Auburn University
- College of Ag Environmental and Natural Sciences, Tuskegee University

BUCKEYE

The BUCKEYE (Bolstering the Uses of Computer Knowledge to Enhance Youth Education) program addresses substandard Ohio proficiency test scores through teacher professional development, technology infusion, and engaging curriculum. The BUCKEYE program consortium consists of Barnesville, Bellaire, Belmont-Harrison Joint Vocational School, Bridgeport, Martins Ferry, Shadyside, St. Clairsville, and Union Local school districts and the CET.

During each year of the program, which began in 2000, two graduate courses were offered. Each strand consisted of teachers from grades K-4, 5-8, and 9-12. The fall course covered math methods; the spring course covered science methods. The program demonstrated that teacher professional development can take place over a longer, sustained period of time, and that technology such as asynchronous discussion spaces and videoconferencing equipment can contribute significantly to teacher professional development. Informal analysis of teachers' term papers, journal reflections, and discussion entries suggested that positive changes in teaching and learning occur as a result of emphasis on teachers as reflective practitioners. The program was made possible through the use of distance learning technology.

What's New in 2001?

During 2001 the program offered training in math methods to the consortium's middle school teachers.

CVEEC

As mentioned previously, the CVEEC project is a partnership among the Cuyahoga Valley Environmental Education Center, Summit Education Initiative, and the CET. It is privately funded by the GAR Foundation. The purpose of the partnership is two-fold: to develop online curriculum supplements and to provide professional development for Summit County teachers.

A goal of the professional development workshops is to introduce teachers to problem-based learning, Earth system science, and the integration of technology into their classrooms. The target audience of this initiative is an expanding group of Summit County teachers who have an interest in sharing and improving their instructional

practices using various technology tools to support them. A specific focus of their professional development activities is on teaching environmental science topics in multiple academic subjects.

A core part of each professional development workshop is focused on problem-based learning. Teachers support student learning by creating active, collaborative learning experiences. These efforts develop critical thinking, self-designed research techniques, and students' learning in teams to solve authentic environmental problems.

What's New in 2001?

Three workshops were conducted at the CVEEC in 2001 with a total of 27 teachers attending.

What Was the Impact in 2001?

Table 4: CVEEC Teacher Demographics

Of the 24 teachers who reported their gender:

83% female
17% male

Of the 24 teachers who reported their ethnicity:

4% African-American
92% Caucasian
4% other

Of the 24 teachers who reported their teaching experience:

8% first year
17% 2-5 years
29% 6-10 years
13% 11-15 years
33% 16+ years

Of the 24 teachers who reported their highest degree attained:

4% associate's
25% bachelor's
71% master's

Of the 24 teachers who reported their school affiliation:

92% public
8% private

Of the teachers who reported their grades taught:

60% K-4
40% 5-8
0% 9-12

Total number of students taught = 1,693

Table 5: Teacher Feedback on Workshop - CVEEC

Statement	Average Rating
The program was a valuable experience.	4.8
I expect to apply what I learned in this program.	4.7
The workshop was well organized.	4.6
I was satisfied with the overall quality of the presentations.	4.7
The program staff was excellent.	4.9
The program was excellent.	4.8
I would highly recommend this program to someone who asks me about applying.	4.9
What I have learned in this program is important to the educational process.	4.8
This workshop adequately prepared me to implement this program immediately.	4.6

Ratings are based on 5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree.

Table 4 shows the demographic information for the CVEEC participants. As you can see from Table 5, the teachers were very satisfied with the workshop they attended (Kirby and McGee, 2001a).

ESSEA

The Earth System Science Education Alliance (ESSEA), a NASA Earth Science Enterprise program, provides teacher professional development in Earth system science. It demonstrates the effectiveness of the World Wide Web in delivering high-quality courseware, and it responds to the need for more teachers. This is accomplished through a systematic, five-year program in which institutions of higher learning integrate the ESSEA online courses into their curricula.

These online graduate courses, developed over a three-year period, address the needs of K-4, 5-8, and 9-12 teachers in the areas of content, technology, educational resources, and new teaching methods. The courses immerse teachers in a knowledge-building community in which they conduct research, learn new content, expose their thinking to critical analysis, and develop new activities.

The ESSEA program disseminated these cutting-edge graduate courses to 20 colleges and universities engaged in in-service teacher professional development. Participating institutions learn how to incorporate the courses into their curricula. The ESSEA team at the CET and the Institute for Global Environmental Strategies (IGES) support participant institutions' execution of the ESSEA courses.

What's New in 2001?

Eight colleges were supported in their implementation of the online courses. The summer 2001 ESSEA workshop was held in Woods Hole, MA, and was presented by CET personnel along with the IGES staff and the assistance of Dr. Hilarie Davis of the Technology for Learning Consortium. The eight universities that implemented the online course during the school year were in attendance. Time was spent reviewing the past year and evaluating the status of each school's implementation.

The use of a new embedded database was evaluated (in collaboration with Dr. Bill

Slattery at Wright State University). This database will assist in future evaluations as all submissions made by participants across the country will be stored on the server at the CET. Along with the testing of the new database, CET has continued to refine the courses and update them in preparation for a workshop scheduled for summer 2002.

A second Earth System Science Education Alliance workshop was held at the CET. Six new universities attended. Two weeks later the newest versions of the K-4, 5-8, and 9-12 courses were distributed.

In 2001 there were 7,186 unique users and 154,103 hits to the web site.

InSTEP™

InSTEP™ (Integrating Strategies and Technology in Education Practice) workshops are designed to enhance teachers' understanding of constructivist learning principles and their ability to integrate technology into the classroom. InSTEP is funded by the Department of Education and focuses on West Virginia teachers. Participants receive five days of intensive training in problem-based learning, inquiry, and the effective integration of technology into the teaching and learning process. Workshop sessions address pedagogy, methodology, and application by providing the participants with authentic interdisciplinary tasks and problems.

What's New in 2001?

During summer 2001 seven five-day workshops were held at the CET. In addition, two five-day workshops were held simultaneously in Beckley, WV. A total of 257 K-16, math, science, and technology teachers from throughout West Virginia participated.

What Was the Impact in 2001?

Table 6: InSTEP Teacher Demographics

Of the 227 teachers who reported their gender:

84% female
16% male

Of the 226 teachers who reported their ethnicity:

1% African-American
97% Caucasian
1% other

Of the 222 teachers who reported their teaching experience:

5% first year
13% 2-5 years
11% 6-10 years
15% 11-15 years
57% 16+ years

Of the 222 teachers who reported their highest degree attained:

40% bachelor's
59% master's
1% doctorate

Of the 219 teachers who reported their school affiliation:

85% public
15% private

Of the teachers who reported their grades taught:

41% K-4
31% 5-8
26% 9-12

Total number of students taught = 14,819

Table 7: Teacher Feedback on Workshop - InSTEP

Statement	Average Rating
The program was a valuable experience.	4.5
I expect to apply what I learned in this program.	4.5
The workshop was well organized.	4.2
I was satisfied with the overall quality of the presentations.	4.3
The program staff was excellent.	4.6
The program was excellent.	4.5
I would highly recommend this program to someone who asks me about applying.	4.4
What I have learned in this program is important to the educational process.	4.5
This workshop adequately prepared me to implement this program immediately.	4.0

Ratings are based on 5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree.

Table 6 shows the demographic information for the InSTEP participants. The data reflects the actual 3 percent minority population of West Virginia. As you can see from Table 7, the teachers were satisfied with the workshop that they attended.

ITESM–Problem-Based Learning Institute

The CET has a team experienced and knowledgeable in educational reform, teacher professional development, and alternative instructional teaching methodologies. Beginning in the summer of 2000, the CET has conducted two-weeklong summer workshops, followed by on-site training and support for the Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), which is a university system comprised of 30 campuses around Mexico.

The workshops acquaint professors with the theory behind problem-based learning, model it to the professors, coach them during practice, and provide feedback. Professors work in groups of three to five in designing and refining PBL scenarios. They also practice implementation of PBL by working with groups of college students brought in to support the workshop. Professors end the two-week workshop by presenting their credentials to a certification panel. The credentials consist of written documentation supported by an interview.

The CET believes that the PBL Institute has proven to be a significant contributor to the systemic reform in the ITESM campuses. Faculty members and administrators have reported anecdotally that they are pleased with the PBL Institute and its impact on the manner in which students are educated in Mexico.

What's New in 2001?

CET personnel designed, developed, and presented a two-week problem-based learning workshop for 72 engineering and science faculty from ITESM.

TIGRS

Teaching to Improve Geometry Readiness and Success (TIGRS) is a program designed to enhance the content knowledge and teaching strategies of regional math teachers. This yearlong professional development program targets teachers from the five-county northern panhandle region of West Virginia. Participants are trained in geometry and pre-geometry content as well as standardized test analysis and new teaching strategies.

What's New in 2001?

Three sessions were conducted during the year. Thirty teachers (grades 4-6) participated in the sessions.

What Was the Impact in 2001?

Table 8: TIGRS Teacher Demographics

Of the 27 teachers who reported their gender:

85% female
15% male

Of the 27 teachers who reported their ethnicity:

4% African-American
96% Caucasian

Of the 26 teachers who reported their teaching experience:

4% 2-5 years
15% 6-10 years
4% 11-15 years
77% 16+ years

Of the 26 teachers who reported their highest degree attained:

27% bachelor's
73% master's

Of the 26 teachers who reported their school affiliation:

100% public

Of the teachers who reported their grades taught:

31% K-4
66% 5-8
3% 9-12

Total number of students taught = 778

Table 8 shows the demographic information for the TIGRS participants. As Table 9 indicates, the teachers were very satisfied with the workshop that they attended.

Table 9: Teacher Feedback on Workshop - TIGRS

Statement	Average Rating
The program was a valuable experience.	4.8
I expect to apply what I learned in this program.	4.8
The workshop was well organized.	4.9
I was satisfied with the overall quality of the presentations.	4.8
The program staff was excellent.	5.0
The program was excellent.	5.0
I would highly recommend this program to someone who asks me about applying.	4.9
What I have learned in this program is important to the educational process.	4.8
This workshop adequately prepared me to implement this program immediately.	4.8

Ratings are based on 5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree.

RESEARCH AND EVALUATION

The learning sciences provide a foundation for the research and evaluation conducted at the CET. The main focus of the research team is to understand the conditions under which learning takes place by considering theories of cognition, applications of theory to practice, and technology-rich learning environments. See http://www.cet.edu/research/main.html for a complete list of the research studies conducted by CET researchers. This section highlights the main research efforts for the past year.

JesuitNET Evaluation

JesuitNET is a collaboration of 25 U.S. Jesuit colleges and universities. The main goals of JesuitNET are (a) to develop, share, and deliver a broad range of online academic programs and services for a national and eventual international audience, and (b) to produce courses that embody the Jesuit attributes of higher education (academic rigor, personalized instruction, faculty advisement and support, service to others, and ethical concerns).

The CET is conducting an ongoing formative evaluation of A Model for Competency-Based Distance Assessment. This is a JesuitNET project funded by the Department of Education's Learning Anytime Anywhere Partnership (LAAP). The underlying goal of this project is to build a new model for distance education that will help institutions break free of classroom-based models of course credit and instead define credits in terms of student competencies. A first step in achieving this goal is to develop a technological infrastructure to support faculty members in developing competency-based online courses, that is, the LAAP online faculty development course. The CET is focusing its evaluation on this development course and the resulting distance education courses produced by the participating faculty members.

What's New in 2001?

The purpose of the LAAP online faculty development course is to assist faculty in developing competency-based online courses. Staff from Georgetown University's Center for New Designs in Learning and Scholarship (CNDLS) designed the LAAP course.

JesuitNET's first two online courses to go "live" were designed by Loyola University Chicago faculty and were scheduled for the fall 2001 semester. It should be noted that these faculty did not participate in the LAAP course because it did not exist at the time their courses were being developed. They did, however, participate in an intensive two-day workshop run by the CNDLS staff.

Virtual Design Center

An important goal of the CET research team is to guide the development of future products through consideration of theories of cognition, applications of theory to practice, and technology-rich learning environments. The CET research team has developed the TETEP (Testing Educational Theory through Educational Practice) framework to communicate the conditions in which effective learning takes place. The TETEP framework links the phases of scientific inquiry as described by the Third International Mathematics and Science Study framework with theoretical constructs that inform the design of instruction to support scientific inquiry.

The virtual design center (VDC) is a web-based resource will provide detailed instructional design guidelines based upon the TETEP framework. The VDC is intended to be used by the NASA community that is involved in or interested in designing online learning experiences. To achieve this goal, the VDC will provide a large, searchable collection of existing best practices linking research and education. The CET's existing collection of research articles will be supplemented with links to existing, searchable databases. The selected topics will be of particular importance to the nation's educational agenda and will be presented with in-depth content to assist in the design of meaningful, effective electronic resources. The VDC will also serve as a showcase for NASA products as examples of best practices and effective designs. It is also intended

that the VDC will be used in the future as a professional development tool.

What's New in 2001?

The four phases of scientific inquiry around which the design recommendations are organized are identifying questions to investigate, designing investigations, conducting investigations, and formulating and communicating conclusions. In 2001 entries were developed for the conducting investigations phase. These entries address self-regulated learning, team research, the fostering of multiple abilities, and the offering of choices to students. The four completed entries are currently being reviewed and revised.

The CET conducted interviews with the educational technology staff at Ames, Marshall, and Johnson space centers to determine what support they would need for improving their instructional design process.

NEW CET RESEARCH REPORTS IN 2001

Hong, N. S., McGee, S., & Howard, B. C. (2001, April). Essential components for solving various problems in multimedia learning environments. Presented at the annual meeting of the American Educational Research Association, Seattle.

Howard, B. C., McGee, S., Hong, N. S., & Shia, R. (2001). The triarchic theory of intelligence and computer-based inquiry learning. *Educational Technology Research & Development (ETR&D), 49*(4), 51-71.

Howard, B. C., McGee, S., Shia, R., & Hong, N. S. (2001, April). The influence of metacognitive self-regulation, aptitude, and achievement on problem solving. Presented at the annual meeting of the American Educational Research Association, Seattle.

Howard, B. C., McGee, S., Shia, R., & Hong, N. S. (2001, April). The influence of metacognitive self-regulation, aptitude, and achievement on problem solving. Presented at the annual meeting of the American Educational Research Association, Seattle.

Kirby, J. & McGee, S. (2001a). Results of the CVEEC year-end report. In-house report. Center for Educational Technologies, Wheeling, WV.

Kirby, J. & McGee, S. (2001b). Results of the ExoQuest beta test. In-house report. Center for Educational Technologies, Wheeling, WV.

McGee, S., Corriss, D., & Shia, R. (2001, April). Using simulations to improve cognitive reasoning. Presented at the annual meeting of the American Educational Research Association, Seattle.

McGee, S., Howard, B. C., Dimitrov, D. M., Hong, N. S., & Shia, R. (2001, April). Addressing the complexities of evaluating interdisciplinary multimedia learning environments. Presented at the annual meeting of the American Educational Research Association, Seattle.

Ruberg, L. F., & Baro, J. A. (2003). Designing graphical, interactive simulation to model scientific problem solving. In: S. Naidu (Ed.), *Learning and teaching with technology: Principles and practices.* Sterling, VA: Kogan Page.

Schwartz, N. H., & McGee, S. M. (2001). Theoretical context and issues of instructional design: Learning and problem solving in web environments. In M. E. Robertson & R. Gerber (Eds.), *Children's ways of knowing: Learning through partnerships* (pp. 128-143). Camberwell, Victoria, Australia. Australian Council for Educational Research.

All CET research reports are distributed through the research papers web site. In 2001 there were 21,266 unique users and 118,435 hits to the web site.

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McGee, S., Dimitrov, D. M., Kirby, J., & Croft, S. K. (2002, April). Using design experiments to investigate long-term program success. Paper presented at the annual meeting of the American Educational Research Association, New Orleans.