VISIT Annual Report Year 2

Activities and Findings

1. Describe the major research and educational activities.

The Virtual Immersion in Science Inquiry for Teachers (VISIT) project conducted six types of activities between March, 2001 and August, 2002 (the period of this report). These included organizational development, development of investigations and learning materials, recruiting, Collaboratory development and operations, formative evaluation, and dissemination/institutionalization (described in Section 4. Outreach).

1.1 Organizational Development Activities

During the second year (actually 18 months) of the project, we developed a new organizational arrangement, the Teacher Leader team. We recruited 25 high school teachers and other educators to serve in one or more of the following roles: online facilitator; recruiter; lesson developer; technical consultant; workshop presenter. In addition, these Teacher Leaders serve on a Management Advisory Board which meets via teleconference every other week. Major activities in developing the Teacher Leader program included recruiting candidates and selecting leaders, defining contracts with each individual, evaluating their performance, and developing and conducting a leadership development program.

The PI also conducted meetings with representatives of VISIT’s partner organizations as discussed under Recruiting Activities.

1.2 Developing Learning Materials and Investigations

VISIT PI’s, staff, and Teacher Leaders acquired, reviewed, assembled, revised and/or developed the following types of learning materials to use in the professional development program:

- Five Investigations (environmental science spatial analysis; water chemistry; ecological classification; HAZMAT simulation; and toxic chemicals); a Teachers’ Guide to georeferenced databases on the WWW; readings and web sites supporting GIS in schools; online and desktop geospatial analysis and visualization tools; demonstrations of how to use tools and datasets; tutorials and hands-on exercises for learning use of tools and databases; sample lessons that apply aspects of GIS in different curriculum areas; investigation process model; investigation scenarios; online course syllabi and courses in WebCT; teacher lesson plans; rubrics for evaluating lessons. Course materials that were developed in Year 1 were evaluated and revised in Year 2, and the course was restructured based on year 1 experience.
1.3 Collaboratory Development and Operation
We revised the design and contents of the Collaboratory, conducted Collaboratory operations with teacher participants and teacher leaders throughout the 18-month period, conducted ongoing assessment of the effectiveness of the Collaboratory, and made ongoing revisions.

1.4 Recruiting Activities
Two types of activities were conducted for the purpose of recruiting teachers: a) partnerships with other institutions and b) national recruiting through VISIT Teacher Leaders and Advisory Board members.

1.4.1 Partnerships and Workshops.
One strategy for recruiting and retaining teachers in the VISIT program was to build partnerships with schools and other educational institutions. Meetings, workshops, and technical assistance sessions were conducted to build the partnerships and recruit teachers under this strategy. Details of the activities and agreements with the following institutions are provided in the appendix to this report.

- Detroit Public Schools
- New Detroit Science Center
- Colorado State Geographic Alliance
- Colorado School of Mines
- Michigan Department of Education
- Lansing Community College
- Oakland County Public Schools
- Ann Arbor Public Schools
- Michigan Earth Science Teachers Association
- Michigan Geographic Alliance
- Hillsdale/Lenawee/Monroe Intermediate School Districts
- Maine Math/Science Alliance (MMSA)

1.4.2 National Recruiting by VISIT Leaders and Advisors
Members of the VISIT Teacher Leaders team and members of the VISIT National Advisory Board assisted in recruiting teachers locally and nationally via presentations at meetings of science and social science teachers, and sending email notices through their own professional networks.

1.5 Formative evaluation activities.
Five main types of formative evaluation activities were conducted, and the results of these drove the revision and refinement of VISIT strategies and materials and operation of the Collaboratory:

- Teachers leaders and the Co-PIs analyzed the discourse with teacher participants in the Collaboratory and proposed revisions based on those analyses. Teacher leaders met bi-weekly to discuss these findings and their implications.
• Rockman et al external evaluator interviewed a sample of teachers in the fall of 2001 and summarized results, which were then used to propose revisions to the program.
• Progress of teachers in the program was summarized periodically.
• An analysis of the effectiveness of the recruiting strategies was conducted with assistance of Rockman et al.
• An external expert in online facilitation analyzed samples of the Collaboratory discourse and provided recommendations for training of the teacher leaders in moderation techniques.

2. Describe the major findings resulting from these activities

Major findings or outcomes from project activities include the following: 1) teacher leader program, 2) Collaboratory development and operations, 3) investigations and learning materials, 4) recruiting methods and outcomes, and 5) findings from formative evaluation.

2.1 Findings -- Teacher Leader Program

The design of the Teacher Leader program of VISIT is one of the most important outcomes of the VISIT program in terms of its implications for design of professional development collaboratories. The recruitment, composition, competencies, roles, activities, training, compensation, and professional development outcomes of this program will be one focus of year 3 summative evaluation, so as to inform other similar projects such as those being developed by state education agencies, partnerships of universities and school districts, industry-led initiatives, and the like.

Composition of the Leader Team. Table I lists teacher leaders and staff members who participated in year 2 and their main subject areas. (Not all of those listed were active at any one time.)

<table>
<thead>
<tr>
<th>Leader/facilitator</th>
<th>Location</th>
<th>Main Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karl Balke</td>
<td>Detroit P.S.</td>
<td>Physics, math, earth science</td>
</tr>
<tr>
<td>John Bayerl</td>
<td>Dearborn MI</td>
<td>Biology, Land surveys, cross-curricular GIS in schools</td>
</tr>
<tr>
<td>*Deborah Boisvert (Boston coordinator)</td>
<td>Boston/Acton MA</td>
<td>Technology in Schools; Tech Prep</td>
</tr>
<tr>
<td>Alfred Doyle</td>
<td>St. Bernard’s, New York City</td>
<td>Academic technology, internet training, online learning</td>
</tr>
<tr>
<td>*Anne Eschtruth (EMU staff)</td>
<td>Ypsilanti/Michigan</td>
<td>Ecology, VISIT operations</td>
</tr>
<tr>
<td>Scott Gaffri</td>
<td>Denver CO</td>
<td>Geology, environmental sciences</td>
</tr>
<tr>
<td>Melanie Goldman</td>
<td>Boston area</td>
<td>Online facilitation, mentoring</td>
</tr>
<tr>
<td>Bill Hamilton</td>
<td>Boston area</td>
<td>GIS, GIS applications, ArcView, IDRISI</td>
</tr>
<tr>
<td>Fred Hohn</td>
<td>Acton MA</td>
<td>Environmental science, IDRISI</td>
</tr>
<tr>
<td>*Beverly Hunter (Co-PI)</td>
<td>Virginia</td>
<td>Online collaboration, GIS applications, pedagogy</td>
</tr>
<tr>
<td>Nasreen Jalili</td>
<td>Detroit P.S.</td>
<td>Chemistry, biology, environmental science; water quality</td>
</tr>
</tbody>
</table>

Jan 12, 2001
Teacher Leader Roles. Teacher Leaders played several roles and received a variety of professional development opportunities in addition to those received by other teachers in the program. Their primary responsibility is to facilitate learning in the online Collaboratory. They also recruited teachers to join VISIT; developed and evaluated learning materials; made presentations at workshops and conferences; and served on the Management Advisory Board. Some Teacher Leaders provided technical assistance to other teachers in their own school building or school district.

Teacher Leader Compensation and Outcomes. In addition to the intrinsic rewards of collegiality, professional recognition, and developing their own technical skills, Teacher Leaders receive a combination of graduate credits, consulting fees, opportunities to present at workshops and conferences, and travel expenses, depending upon their roles and performance.

Teacher Leader Characteristics and Qualifications. The Teacher Leaders are either currently K-12 classroom teachers or are in other K-12 educational leadership positions such as an educator in the Maine Math/Science Alliance. This is a change from the original design of VISIT’s “Core Team” concept, which was designed to include university faculty and working scientists as well as K12 educators. Intentionally, the Teacher Leaders are a diverse group, reflecting the range of subject areas and types of expertise of interest to participating teachers. They teach in a variety of settings – inner city, suburbs, rural areas, private schools and public. Some are in their first five years of
teaching, while others are veterans of 25 years or more. About a third of them were women. The leaders represent a range of teaching methods as well, covering the spectrum represented in our teacher participant groups. The teacher leaders most actively engaged as online facilitators tended to have experience in using GIS in the real world and/or in the classroom, and were specifically interested in working in cyberspace and in learning to improve their skills in online collaboration. An external evaluation of the Teacher Leader program was initiated and designed, and data collection will take place in year 3.

2.2 Findings Regarding Design and Operation of the Online Collaboratory

The VISIT Collaboratory is the interaction of people, software tools, learning materials, technical information, and a structured set of activities that take place in cyberspace. Between January 2001 and June 2002, 202 persons participated in the Collaboratory. These included teachers, the PI’s, staff members, and teacher leaders. The Collaboratory supports high school and middle school teachers and teacher leaders as they develop scientific and geographic investigations and lessons that take advantage of tools for spatial visualization and analysis as well as geo-referenced data. The Collaboratory structure includes a fifteen-week course for which teachers who complete the requirements receive three graduate credits in science education. Teachers are encouraged to continue their participation and obtain additional support in the Collaboratory after they complete the course. Teachers have also been encouraged to bring some of their students into the Collaboratory but none have done so.

The Collaboratory structure has become more refined. In year 1, the second Collaboratory was structured into three separate online “courses” in webedt, each run by a different instructor. Each course included a syllabus, assignments, set of lessons and asynchronous Forums for class discussion, technical help, and other related topics. Many participants found this structure to be too complicated. We redesigned the 15-week 3-credit course as one syllabus, with all materials accessible through one webedt “course”. To improve the quality of learning in the Collaboratory, we also instituted a number of refinements to the roles of teacher leaders and their methods of facilitation.

We monitored the Collaboratory for evidence of “effective collaboration” through the following indicators:

- The work products developed by the participants – projects, investigations, classroom lessons, guides to data sources, technical procedures, FAQ’s and other forms of knowledge built through the collaboration process.
- Nature and quality of interactions among the participants
- Numbers and roles of participants
- Extent of participation as evidenced by number of messages posted and by completion of course requirements.

More details regarding these indicators are provided in the Appendix to this report.
2.3 Findings Regarding Learning Materials and Investigations

VISIT assembled a repertoire of learning materials. These range in topic and forms, such as:

- how to navigate the Collaboratory itself
- how to interact effectively in online class discussions,
- how to use and evaluate resource materials,
- links to research articles, case studies, and web sites illustrating applications of GIS in schools and communities
- exercises in basic skills of using GIS software,
- hands-on tutorial lessons applying GIS to various curriculum topics,
- datasets accompanying tutorial lessons,
- procedures for accomplishing technical tasks such as converting file formats or reprojecting shapefiles
- guide to online sources of georeferenced data
- procedures for locating and downloading data from particular online sites,
- templates and assignments for developing a lesson or investigation,
- advice on pedagogical, curricular, classroom management and assessment matters
- rubrics for evaluating GIS-based lessons, and many other kinds of materials.

Some of these materials are currently available to anyone from the main VISIT web site. Others are only accessible by members of the Collaboratory through webct.

The repertoire of materials has undergone several rounds of revision and expansion. Initially, many teacher participants were not able to overcome the technical challenges involved in using the materials within the amount of time they felt they could afford to invest in this effort. Nevertheless, the expanding scope and improving quality of materials is one indicator of successful collaboration. We employed several techniques for assisting teachers in overcoming technical hurdles. These included providing some of the lessons on CDROM, providing guidance on basic tasks such as downloading datasets from the web, providing rapid turnaround in a Technical Help forum. Teachers desiring more advanced training in GIS are being provided access to the ESRI Virtual Campus through special arrangement.

Five Investigations (environmental science spatial analysis; water chemistry; ecological classification; HAZMAT simulation; and toxic chemicals) were conducted by teams including teachers, consultants and project staff, to serve as models for other teachers to learn from and emulate during their VISIT participation. The products of these investigations include overview documents for teachers that include, for example, connections to state and national standards and scientific background to the problem or phenomena, lessons, and datasets. These materials are available at the main VISIT web site at [http://maps.acad.emich.edu/smplnv/sampleIndex.htm](http://maps.acad.emich.edu/smplnv/sampleIndex.htm). The main challenge encountered in conducting these investigations was in fostering teamwork to draw upon and integrate curricular and pedagogical knowledge, scientific content knowledge, and technical expertise.
2.4 Findings and outcomes from recruiting activities

Approximately 287 teachers registered through the VISIT online application form, for the VISIT Collaboratory and courses during year 2 of the project. Of those registrants, 84 teachers plus 40 teacher leaders and staff participated in the Collaboratory during this time, to at least a minimum level of five postings.

As explained in section 1 of this report, two main strategies were pursued in support of recruitment: face to face workshops and national recruitment via leader networking. How effective were the face-to-face workshops in recruiting and retaining teachers for participation? Of the 480 teachers who attended face to face workshops and recruiting presentations, 60 registered for the program during year 2 (some additional teachers -- about 40 -- registered for the fall 2002 semester and are not taken into account in this year 2 report). Of those 60 who registered from having attended a workshop, fifteen participated online in the Collaboratory and of those, four completed the program. Of the 480 teachers who attended face to face workshops and recruiting presentations, around 140 teachers attended one-day to five-days GIS basic skill training. The workshops should contribute to these teachers’ professional development in technology and its use in science education, though no formal evaluation was conducted.

The majority of teachers who registered (227 out of 287), participated (69 out of 84), and/or completed (10 out of 14) the program were recruited through leader networking in their normal professional channels, at a far lower cost in project resources than through the ftf workshops method. One possible explanation for this is that teachers who sign up for ftf workshops prefer that traditional ftf workshop venue of professional development, whereas teachers who sign up for an online program via an online method are more likely to want to work online. Another explanation is that teachers who signed up via the online method were recruited across the nation and usually have had some previous exposure to or experience in using online and/or GIS technologies.

The external evaluator Rockman et al compared the list of teachers who attended face-to-face workshops to the registrants and participants in the collaboratory. Details of this analysis are provided in the Appendix pdf file to this report.

2.5 Findings and outcomes from formative evaluation

A report from Rockman et al based on telephone interviews with a sample of teachers from the fall 2001 program is included in the Appendix to this report. There were three main findings about weaknesses in the program. First, some participants felt that the collaboration aspects of the program were not focused enough on the content of the program (i.e. too much extraneous discussion). Secondly, there were many technical and pedagogical problems with the GIS lessons. Thirdly, some participants found it difficult to navigate through the various places in the Collaboratory.

Revisions process. These issues were brought to the attention of the staff and teacher leaders, who discussed alternative approaches to remediation in bi-weekly
teleconferences over a period of several months. Extensive changes were made to the program based on this information and decision process. To correct the weaknesses in the collaboration discourse, we provided additional training to the facilitators in how to help participants focus on the content and inquiry, we employed an external expert to analyze the discourse patterns of the facilitators and provide recommendations for improved technique, and we recruited more facilitators with experience in online facilitation. To correct the limitations of the GIS lessons, we revised some of them, added new ones, provided technical support as discussed in earlier sections of this report, and added more options for the teachers, including the use of lessons on CDROM to avoid initial technical difficulties in downloading lessons and data from the web. To correct the navigation problems, we restructured the Collaboratory to streamline navigation and more tightly integrate the different parts of the program, and added clearer links among the parts of the program and materials.

3. **Describe the opportunities for training and development provided by your project.**

The central purpose of the VISIT project is to provide opportunities for training and professional development of teachers. The development opportunities for the 20 teacher leaders were described above. 126 teachers logged in to the Collaboratory between January 2001 and June 2002. About 30 percent of those 126 teachers participated at a level of 15 postings or more (equivalent to five weeks at 3 postings per week). In year 2, fourteen teachers and teacher leaders earned graduate credits from EMU for completing the course. A total of 72 credits have been awarded by EMU thus far, out of 300 available in the program. Moreover, around 140 teachers participated in one-day to five-days face-to-face and hands-on GIS workshops and summer institutes. About 300 teachers attended one-hour – four-hours VISIT project recruiting presentation and GIS demos. Moreover, 290 teachers have registered for the Fall 2002 VISIT online course, which started on October 13, 2002.

4. **Describe outreach activities your project has undertaken.**

The project leaders conducted several activities in pursuit of institutionalization and dissemination of the VISIT model and materials.

**Michigan Virtual University - MVU**

The PI and Randy Raymond a VISIT leader met several times with Michigan Virtual University administration to discuss a potential state-wide ESRI K-12 GIS license and possible illustrations of GIS in classroom instruction, technical career development, and school management through the VISIT project. Dr. Xie and EMU College of Continuing Education jointly developed a proposal to Michigan Virtual University, called, The Geographic Information Systems (GIS) in the Classroom Module. This proposal was
awarded in June 2002. The Geographic Information Systems (GIS) in the Classroom Module combines an overview of the general principles of GIS with an introduction to using GIS to teach science concepts in the classroom. Through the use of demonstration lessons this module will introduce teachers to the basic technical skills needed to understand spatial data and analysis. This course will include information about the VISIT (Virtual Immersion in Science Inquiry for Teachers) program. This module will coincide with the Engineering/Manufacturing, Industrial Technology, Natural Resources and Agriscience elements of the Michigan Career Development Program.

University of Massachusetts & Boston Metropolitan Area Partnership
The Boston Metropolitan School to Career Partnership was an original partner in the VISIT project design. Deborah Boisvert, VISIT coordinator for the Boston Metropolitan Area Partnership, in the spring and summer of 2002 developed a plan in collaboration with the Dean of Education at University of Massachusetts, Boston, to incorporate the VISIT Collaboratory into a science education graduate program at UMass Boston that would combine the online Collaboratory with field studies. This plan would institutionalize the VISIT program on a regional level and provide teachers in the Boston area with graduate credit from UMass Boston. This proposal was not implemented because the PI determined that it was quite late to get all details clarified and to get resources to support. Thus, he suggested that this partnership be supported through other funding sources.

Colorado School of Mines
The graduate credits for teachers in Colorado who take the VISIT Collaboratory online course are offered through Colorado School of Mines. CSM sends out the VISIT Online Course as a class listed in CSM Continuing Education (CE) Class Schedule. CSM-CE places a small fee charge to cover processing cost ($75 for 2 credits and $150 for 4 credits). CSM Teachers who are participating in VISIT are asking their school districts to pay CSM the processing fee.

ESRI International Education User Group Conference
The PI, Co-PI, and members of the VISIT project presented major sessions at the ESRI International Education User Conferences in the summers of both 2001 and 2002. The paper for the 2002 conference is available at http://www.piedmontresearch.org/visit/esri2002.html

Publications and Products
The VISIT Web Sites are http://www.emich.edu/visit and http://www.piedmontresearch.org/visit/index.html

Jan 12, 2001 9
Hunter, Beverly “VISIT Guide to Online Sources of Geo-referenced Data” available at http://www.piedmontresearch.org/visit/gis_data.html

Hunter, Beverly and Xie, Yichun (2001) "Data Tools for Real-World Learning” Leading and Learning with Technology, International Society for Technology in Education


GIS introduction and Integration of GIS in the Classroom by Ron Robinson, Ann Arbor Public Schools

"Best practices" presentation by John P. Bayerl from Fordson High School


VISIT Presentations from the ESRI Education Conference 2001

VISIT Newsletters

Contributions to Resources for Research and Education

The VISIT project is built on geo-spatial technology and data analysis. The project innovatively uses geo-spatial technology as instructional tools to assist science learning and teaching in schools, and provides illustrations of conducting science inquiry through data analysis.

The VISIT project is of interdisciplinary nature. The VISIT instructional materials and participants cover a wide range of subject areas, including, math, environmental science, biology, chemistry, earth science, information technology, social science, geography, and history.

The VISIT project is constructing instructional materials and an infrastructure in cyberspace to support teachers’ professional development. The courses and other are expected to be used as a long term resource by other professional development organizations after the project grant period has ended.

Special Requirements:

Unobligated Funds:

Funds estimated to remain unobligated will not exceed 20% at the end of the period for which NSF is currently providing support.
Continued Funding: