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The Virtual Geography Department: Assessing an Agent of Change in Geography Education

Abstract

The diffusion of the Internet in higher education has prompted new curriculum development projects in geography. One of these projects, the Virtual Geography Department (VGD) at the University of Texas at Austin, sought to promote effective geographic instruction and materials development on the Web. Twenty-nine participants in the VGD project were interviewed for the purpose of learning what effects the VGD had on their teaching- and curriculum development activities. The results of the interviews show that VGD participants gained practical knowledge and skills for teaching and creating instructional materials on the Web in accordance with research-based principles for good educational practice.

Keywords: Internet, curriculum development, instruction, diffusion.

Introduction

The Internet is the educational medium of the future – that much is certain. What remains puzzling to many scholars is the sort of impact the Internet will have on educational purpose, practice, and change. Concern over curriculum is nothing new, as even a cursory review of the literature on curriculum in higher education reveals. In geography, the growing use of the Internet for instruction has once again prompted many faculty members to revisit basic questions about educational practice: What content and skills should students be expected to know? How should a program of study be organized? Who are our learners and what are their needs? What materials should be used in our instruction? How should we be teaching from these materials? How should we assess student achievement? How can we improve college curriculum in light of our experiences?

Stark and Latucca (1997) called for more strategic planning in college curriculum at the disciplinary level as a means to achieve good educational practice with new computer technologies. In this regard, faculty members

become crucial actors in diffusing instructional innovations. Alone or collectively, these individuals are referred to in the innovation diffusion literature as agents of change (Rogers, 1995). Agents of change promote innovations via centralized and decentralized communications with potential adopters, and they also attempt to shape the ways innovations are implemented in a variety of contexts (Brown, 1981). In the area of college curriculum, faculty members act as change agents by conducting curricular experiments and communicating their experiences to colleagues (Sell and Lounsberry, 1997).

Educational change agents have shaped geographic curriculum in the United States at all levels of education. For example, the Geography Education Standards Project (GESP, 1994) and the Commission on College Geography (Hart, 1968) sought to reform geographic curriculum at the school and college level, respectively. More recently, the Virtual Geography Department project (VGD) has attracted international attention to its efforts to build an online clearinghouse of educational resources for college geography. The VGD, under the direction Professor Kenneth E. Foote at the University of Texas at Austin, trained faculty members in the use of the Internet for geographic instruction and curriculum development. Yet, prior to this research, the role of the VGD as a change agent in geography education had not been examined. In what way did the VGD aspire to change educational practice in geography, and was it successful? What effects did the VGD have on its participants? Is the VGD an effective model of curriculum development in higher education? These questions specify the areas of uncertainty addressed in this research.

VGD participants were interviewed for the purpose of assessing the project's influence on their teaching- and curriculum development activities. The paper begins with an explanation of the theoretical role of change agents in the diffusion of innovations. Particular attention is given to the purposes and effects of change agents in higher education. Next, the paper describes the goals, structure, and activities of the VGD project and reports the details of the interviews with VGD participants. The results of the interviews show that the VGD was successful in promoting innovative practice in college geography. Recommendations for managing effective curriculum development projects in geography are offered at the conclusion of this paper.

Agents of change and the diffusion of innovations

A change agent, according to Rogers (1995: p. 335), is "an individual who influences clients' innovation decisions in a direction deemed desirable by a change agency." Change agents are an important part of the pre-adoption stage in innovation diffusion because they provide communication links and select innovations for a certain population of potential adopters. The function of a change agent is to conceive and implement a strategy to promote adoption. Specifically, a change agent is usually responsible for developing a need for change, establishing an information-exchange relationship, diagnosing problems, creating an intent in the client to change, translating an intent into action, stabilizing adoption and preventing discontinuance, and achieving a terminal relationship with the client.

Agents of change serve as information channels to a large group of potential adopters. Initially, communication occurs through a centralized exchange of ideas from a change agent to a population of potential adopters. But, on occasion, change can occur through decentralized, nonhierarchical transfers of creative information. Innovations are subject to reinvention at the local level as users experiment with new ideas, techniques, and products (Rice and Rogers, 1980). When this occurs, individual adopters are behaving much like an agent of change. Knowledge of decentralized diffusion processes remains quite limited relative to what researchers know about centralized diffusion (Rogers, 1995).

In theory, the success of change agents in securing the adoption of innovations is positively related to the degree to which a diffusion program is compatible with clients' needs and to their empathy with clients. Faculty change agents are most influential when they combine disciplinary expertise with an innovative skill that is uncommon in the population at large. Teaching with the Internet, for instance, requires a repertory of skills in computer applications, instructional techniques, and scholarly knowledge, and has, until recently, been practiced by very few educators.

The diffusion of instructional technology seems to be driven by a combination of centralized and decentralized diffusion processes. In higher education, most instructional innovations are designed, developed, and used by faculty members themselves (Hussain, 1990). Change in educational practice can be induced by local experiments in teaching with computer technology. However, agents of change often are responsible for catalyzing such local experiments in teaching.

Faculty change agents have “designed resources and undertaken projects related to the interests of those within their disciplines, and, frequently without financial support, taken the initiative to make those services available to their audiences” (Harrison and Stephen, 1996: p. 8). Change agent activities introduce and transfer skills associated with using instructional technology to individual faculty members. This process of communication is an example of social construction of knowledge. As Dearing et al. (1994: p. 17) explained, innovations are not only adopted, implemented, and confirmed through social relations among people; they are also created, understood, and defined socially.”

Schwartz (1994) described five stages of expertise in faculty member relationships with innovations: 1) general interest, 2) personal use, 3) survival skills for classroom application, 4) active integration and adaptation, and 5) evaluation and reflection. Because many faculty members do not go beyond step 2 without help, encouragement, and persuasion, faculty change agents are important for promoting the use of instructional technology in higher education (Dearing et al., 1994). Faculty change agents introduce innovative teaching techniques to faculty members, who, after adoption, tailor the technique to meet their individual needs. After the change agent terminates a formal relationship with the adopter, local experimentation may or may not continue. Hussain (1990) concluded that the viability of local experiments is often dependent upon support from one’s office, colleagues, and department chair.

Solem (1999) found that two of the main obstacles to adoption of the Internet for geographic instruction are its perceived complexity and incompatibility with certain teaching objectives and philosophies. Accordingly, he recommended additional training for faculty members in the use of technology for teaching and curriculum development. As of now, there is only

one curriculum development project in U.S. college geography whose dual purpose is the professional development of faculty members and the dissemination of Internet-based instructional materials. That project is the Virtual Geography Department (VGD) project at the University of Texas at Austin.

Overview of the Virtual Geography Department

The VGD had a formal existence of three years, commencing with its first workshop in June 1996. During this time, 144 geography faculty members representing 117 colleges and universities met for one- to two-week long workshops held at the UT-Austin campus. Thirty-one participants were workshop repeaters. The workshops were designed to train participants in the use of the Internet for geographic instruction and curriculum development through collaboration, teamwork, and strategic planning (Table 1). Participants were not compensated for their work, but all expenses related to travel, lodging, and meals were covered by the project.

Table 1. Goals of the Virtual Geography Department Project (Foote, 1998).

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|---|
| <ol style="list-style-type: none">1. Create a "distributed" clearinghouse for high-quality curriculum materials.2. Develop aids that make it easy to find and use these materials.3. Adopt a flexible, modular approach so that geographers can readily contribute and share materials.4. Promote experiments in curriculum development that take advantage of new opportunities for interaction and collaboration.5. Share the time and expense of developing materials independently.6. Establish a permanent means for the process of curriculum sharing to continue. |
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The annual VGD workshops were organized to develop, evaluate, refine, and implement Internet-based instructional materials over a subsequent three-year period. In June 1996, participants convened in Austin for a two-week workshop focusing on the production of instructional modules to be published

on the Web. The products produced during the 1996 workshops were presented in various sessions at the annual meetings of the National Council for Geographic Education (NCGE) in Santa Barbara, California and the Association of American Geographers (AAG) in Ft. Worth, Texas. Materials produced in 1996 were subject to evaluation in 1997, and were to be finalized for publication on the VGD homepage by 1998.

This cycle of production, presentation, and assessment was repeated in 1997 and 1998, with some changes in the duration and structure of the summer workshops. Beginning in 1997, the workshops were split into two separate one-week meetings. In the first week of sessions, participants focused exclusively on materials development in physical geography, cartography, GIS, virtual field trips, and nature-society relations. Week 2 was devoted to materials development in introductory human geography, cultural and historical geography, regional and area studies, urban and economic geography, and the history and philosophy of geography. Also, in 1998, a pre-workshop HTML "bootcamp" was added for participants who were just getting started with Web authoring.

The workshops assembled teams of faculty members in "working groups" to concentrate on developing Web-based curriculum materials within ten subject areas. Working groups were further divided into focus groups tailored to a geographic subfield. A lead geographer was selected to coordinate and review module contributions to the focus groups. In addition, working group leaders oversaw the development of related course and educational resource lists on the Web.

The workshop sessions on Web publishing were held in the Environmental Information Systems (EIS) Laboratory in the Geography Department. Several tutorials on multimedia software (e.g., Photoshop, CorelDraw) and Web languages (e.g., CGI-Perl, Java, JavaScript) also took place there. The EIS lab was equipped with 15 Intel-based Windows NT microcomputers connected to a 200MHz server, 1 Windows 95 system, 1 Windows 3.1/DOS system, 1 mobile NT system, and 6 Macintosh

workstations. The lab was also equipped with paper and slide scanners and two computer projection systems. All of the computers had direct, high-speed Ethernet connections to the Internet.

The Windows and Mac workstations were loaded with Microsoft Office (Word, Excel, and PowerPoint), Photoshop, Netscape, and other useful software programs. In addition, the PCs had the CorelDraw 6.0 Suite (Draw, Photopaint, Capture, and 3D) and Freehand, and Adobe Premiere and Pagemill were installed on the Macs. Participants were free to bring along their own software for personal use at the workshop.

During the workshop, participants were provided with their own Web publishing area on the University of Texas's main Web server for the purpose of developing and testing new materials. Participants were able to use FTP, Telnet, and Fetch to access Web servers at their home institution. In addition, participants were given a choice of using Netscape Composer or their own software programs for HTML authoring.

Footnote wanted all VGD submissions to conform to a modular format that would facilitate the use and contribution of instructional materials by outsiders. The format specifications did not set requirements on content, objectives, learning activities, or assessment devices – these matters were left up to the author. Module authors were asked to provide an abstract, a table of contents, a list of acronyms and abbreviations, supporting materials (e.g., links to related Web sites, a bibliography, an online glossary, and review questions), notes on active pedagogy, an evaluation form, and general information about the VGD.

In addition to the sessions and tutorials on Web authoring and multimedia software, the VGD workshops included many sessions on educational practice, learning theory, and curriculum development in geography. These sessions were conducted at each of the summer workshops by geographers with expertise in geographic education. In 1996, Dr. Ruth Shirey (Indiana University of Pennsylvania) and Dr. Gail Ludwig (University of Missouri) respectively led talks on "Developing Effective Pedagogical Strategies" and "Cultivating Active-Learning Processes." Shirey and Ludwig teamed with Dr. Sarah Bednarz (Texas A&M University) on a panel discussion on the aims of geography education in the information technology age. Participants were given

the opportunity to discuss a variety of papers on instructional technology, pedagogy, and computer-assisted learning that were included in a packet of materials sent to them prior to the commencement of the summer workshops.

For the 1996 workshop, two geography professors were invited to discuss their experiences with curriculum development projects in K-12 and undergraduate geography education. Dr. A. David Hill (University of Colorado at Boulder) talked about the purpose, development, and implementation of the *Geographic Inquiry into Global Issues* (GIGI) project (Hill, 1994). Dr. Susan Hanson (Clark University) gave an overview of the *Hands-On! Developing Active Learning Modules on the Human Dimensions of Global Change* initiative (Hanson, 1994). Their presentations convinced Foote and VGD participants to adopt a modular format for VGD materials. In 1997 and 1998, Hill and Bednarz took over the sessions on pedagogy, active learning, and assessment.

Foote envisioned the VGD as a 90-credit online materials clearinghouse that would be the equivalent of an undergraduate major in geography (30 geography courses). His intention was not to create a fully accredited geography program, but was, rather, to produce and distribute a comprehensive suite of geography instructional materials on the Web. By mid-1998, the VGD had produced course homepages for 200 geography courses, which represented about one-third of all the geography courses on-line worldwide. Each semester, dozens of new homepages for geography courses were appearing on the VGD Web site (Foote, 1998). Since the first workshop in 1996, the VGD has produced several instructional modules in a variety of geographic subfields and has made these modules available on the Web pages of various VGD working groups.

In late 1999 or early 2000, the VGD will be officially transferred to the AAG. Foote has organized a new World Wide Web specialty group to provide continued support for the project (AAG, 1999). But what, precisely, did the VGD achieve with its workshops?

Methodology

VGD participants were interviewed for the purpose of assessing the project's influence on their teaching practice and curriculum development

activities (cf. Seidman, 1991; Gall et al., 1996). A letter was sent to participants in the 1996, 1997, and 1998 workshops requesting their cooperation in an interview. Participants were asked to return a postage-paid postcard with indications of their decision to participate, the times they would be available, and their permission to tape-record the session. In a separate enclosure, candidates were assured of confidentiality in accordance with University of Colorado at Boulder Human Research Committee requirements.

Of the 35 postcards returned, 29 individuals agreed to be interviewed. These individuals were contacted via e-mail to arrange a time and date for the interview. One week prior to the interview, participants were mailed a copy of the interview agenda. The interviews took place on the telephone in November and December 1998 and each interview lasted approximately 20 minutes. After the interviews were completed, raw transcripts were made of the tapes. This process produced over 200 pages of unedited text.

After the transcripts were reviewed, the author refined the text to reduce the number of imperfections in grammar and syntax that naturally arise in unrehearsed verbal communication. Space limitations prevent the full, unabridged results of the interviews from appearing here. Instead, the paper presents a summary of the key findings of the interviews along with representative comments from the proceedings.

An important issue with qualitative data has to do with the validity of the information, that is, how true are the meanings elicited by the interview? Ferrarotti (1981), in taking an extreme position on the issue, argued that only the deepest levels of subjectivity in research will produce useful and meaningful information. As an alternative to validity assessments, Lincoln and Guba (1985) suggested that researchers evaluate data in terms of "transparency," that is, how clearly the researcher presents his or her methods of elucidation. Klein (1993: p. 306), citing McDowell (1992), argued "the ultimate test of validity is whether the interpretation convinces the reader that the investigator has captured the true reality of the informants' experiences."

Rowan (1981) described the interpretation of interview data as a dialectical process in which the reader continually reflects and responds to the words of the participant. This process gives the reader a chance to verify the

information presented in the text by making personal connections with the statements. Of course, the researcher's persona is always present in some form in the analysis of qualitative data. As the principal investigator for this study, it was the author's responsibility to reduce the text of the interview transcripts into a manageable form, present it in a manner that facilitates interpretation, and structure the text in meaningful ways that illustrate critical themes and ideas.

In the analysis that follows, responses to the interview questions are organized under two broad headings: "The Impact of the VGD on Educational Practice" and "Fostering Communications on Teaching and Learning with the Internet." Participant statements are prefaced with the author's interpretive comments. In the text, the author is referred to as "P.I." (Principal Investigator). Participants are identified with full-name pseudonyms.

The Impact of the VGD on Educational Practice

First, participants were asked whether the VGD influenced their teaching practice. According to the results, the VGD was instrumental in boosting personal confidence with a new instructional medium. Others who were uncertain of what they were doing before the VGD left the workshop feeling affirmed in their experiments with the Internet. Furthermore, participants claimed to benefit from working in a collegial environment of geographers who were all interested in the creation of educational resources on the Web.

P.I.: *Do you feel the VGD influenced how you currently teach your courses?*

JILL: Yeah, I think so. It's given me more confidence and has encouraged me to get out and get these resources that are out there. I met good examples of role models, people who were really knowledgeable about what was going on. And, overall, they made me more aware of what some of this stuff [on the Web] is.

MIKE: I use the Internet a great deal in every course I teach now. And participating in the VGD kind of launched me into that and it legitimated the attention that I give to it. I can think of some general ways that it kind of gave support for me to continue along this direction. In terms of how it may have assisted me technically or whatever I didn't necessarily get a great deal out of it. But I think just knowing that there was a group of geographers around doing this was important.

The VGD assisted many participants by setting good examples of how to design and present instructional material on the Web. Some novice Web authors learned, for the first time, how to create a course homepage on the Web. Other newcomers to the Web benefited from seeing how geographers organized the content and structure of their personal course homepages.

THEO: It really gave me a structure that I could use. I had started using the Web and learned it on my own over a summer. I sort of struggled with formats for the home page and how to put the lectures and the syllabus on it. Going to the workshop really helped me see what other people were doing and to get a better sense of what really worked and what was confusing, and so on. I got a lot of feedback there.

ZACK: Admittedly, before I worked in the VGD I didn't know how the Net could be used to enhance the class situation. So I would put my syllabus online and I knew that was a haphazard way of saying, well, I use the Internet for classroom instruction. Going to the VGD program really made me realize there was a lot more to it than just doing your syllabus.

Several participants came into the VGD project familiar with the technical aspects of the Internet but had limited experience in using the Web as a teaching tool. Most participants had course homepages available that typically featured a syllabus, e-mail addresses for course staff, and links to related Web sites. In contrast, very few participants were using the Web as a learning resource. Participants were quick to specify how the VGD influenced their approach to teaching geography in new ways.

PAUL: The VGD led me to experiment with techniques for trying to help students learn concepts in geography through the Web. I spent a week working with students for the first time on this in my lowest-division class. And then, last Spring, I worked on a seminar-level exploration of the question of how the Web can be incorporated into teaching.

LENNY: I use the Internet to teach computer mapping with GIS. I asked the students to download the data that I prepared for them instead of giving them a disk.

A major theme that emerged in the responses was the importance of the VGD sessions on pedagogy, active learning, and assessment. Many participants ruminated on the ideas presented in these sessions and thought carefully about the larger educational issues posed by the Internet. The effects of the sessions on educational practice are evident in the words participants used to describe their current approaches to teaching.

TERRY: One of the things that I really appreciate about the Virtual Department was the time that we spent talking about pedagogy and things like active learning. And that made me think a lot more about good practices in undergraduate education. And so I tried to incorporate some of those things in the way I teach and structure the material that I have on the Internet. So, I tried to incorporate review questions in there that would encourage students to think about what they are reading. Some of the things that we've talked about in pedagogy made me think a lot more carefully about objectives. And, also, about the advantages of using the Internet as opposed to other kinds of technology and what is an appropriate use. So, those are the kinds of things that I think have had an impact on how I teach my classes and how I approach what I do in class.

MICHELE: I found it really interesting to talk about questions like, What are we trying to teach by using these Web-based resources? What are we trying to teach and is this the best instructional method for making sure that our teaching goals are being matched by use of technology? And that was something that I felt the Virtual Geography project addressed. So, that gave me a lot of food for thought. I think it has really reined in my enthusiasm and has made me think really hard on what I am trying to accomplish when I am designing a class Web site or making assignments using the Internet. You know, why do I feel that the Internet is an appropriate medium for specific activities, specific learning objectives.

Only a few participants said the VGD had no effect on their teaching. Some felt the uneven technical skills of the participants "dumbed down" the proceedings. A couple of participants felt they were invited to attend as role models of Web and computer-assisted instruction. These individuals left the workshops feeling dissatisfied with not having directly profited from the time they had invested in the VGD.

VICTOR: I was one of the people with established skills. They had a real mix of people there. I don't think they had people from high school but they certainly had people from community colleges, from very small liberal arts colleges, they had ones like my undergraduate institution, and they had people from Ph.D. institutions. And I would say there was no more than a

third of us there who really had already developed Web pages and had a sense of what we were doing with it. Most of them were just curious about it. A lot of them didn't even know about file management, frankly, they didn't even know where the files were being saved and it was quite tedious. A lot of time was spent getting people up to computer skills let alone Web teaching skills.

Next, participants were asked whether the VGD affected the quality of their performance in the classroom. Overall, participants believed the project improved their effectiveness in the use of instructional technology. For some, self-improvement came in the knowledge of how the Web could be used to teach geography in new ways.

P.I.: Do you feel the VGD had any effects on the quality of your teaching?

PAUL: I think anybody who is following trends in higher education is overwhelmed with the technological revolution that's going on in many different respects. How you can project information to a flat screen using certain types of overheads that are linked with computers, to the actual development of exercises where students have to command and master in some way the protocol of the Web in order to collect information. I worry about that, I worry about whether I am keeping up with my students, much less leading them to deeper understanding. The exposure of the workshop has opened me up to a bigger world of information but at the same time it has helped order that information. I learned the importance of having to use the Web in a meaningful way that reinforces what my objectives are in the classroom.

Many participants noticed an improvement in both the content and presentation of their courses. They started to use the Web to supplement lecture material with links to various on-line information sources. Participants cited many advantages to teaching with on-line hypermedia, which includes access to up-to-date news and data, sound documents, and digital graphics.

NANCY: Sure, because I think putting these materials out there in advance as well as having it on a Web site all the time the students perceive that as doing more for them. It's much easier to revise things at the last minute, because it's a physical geography course with all kinds of environmental things coming up in the media. It's possible to make timely adjustments much easier, so I think the course is more trustful with students and more timed with current events.

Once again, several participants praised the workshop sessions on educational practice.

JOE: I just love hearing Dave Hill talk about how you have to make sure you've got a purpose and that this is not just a high-tech exercise. A lot of the things that he said did have an effect on how I designed my Web exercises so that it is not just a matter of look-up but they have to do a little bit of critical thinking.

OLIVER: Yeah, I think largely through contact with other folks that are working on geographic education. I get a lot of help from the people in the department here, but the workshop elements were really intensive, very focused on trying to design things that worked. At the department here there is much more emphasis on getting things done from day to day. The workshop was a lot more helpful in focusing on goals and how to evaluate them.

Several participants found it difficult to answer this question. Their uncertainty stemmed from not having reliable assessments on their performance with the Internet. Without hard data to back-up their beliefs, these participants were hesitant to say definitively whether or not the VGD affected the quality of their teaching.

DAVE: That's kind of hard for me to judge. I realize the students seemed to express their satisfaction. I am not sure they did better. And one of the big shortcomings that I see is not having a way to evaluate that. I have used kind of informational Web pages, services, assignments, notices, and things like that. And the students liked that; in fact, they requested more of those types of things in the class evaluations. But, I really don't know how to say it affected my teaching quality.

MIKE: One question we were talking about and really never quite resolved was assessing the effectiveness of Web-based instruction. That is, you can imagine nerdy professors just throwing the Internet at every possible problem. I just think it's going to make things better. There's a healthy recognition that evaluating effectiveness is really important and there's a need to talk further. We discussed that briefly and I bet they have gone a lot further. I just kind of haven't been on the track. All those glorious Web-based materials may not necessarily be improving the quality of student education.

Following the questions on teaching practice, participants were asked to comment on their curriculum development activities with the VGD. The majority of participants had contributed materials by the time of the interview, while others were in the process of doing so. Instructional materials encompassing many geographic specialties are currently available through the VGD clearinghouse.

I asked participants to provide a description of their modules and to comment on what kinds of Internet-based materials they planned for the future. Their responses describe the diverse ways in which the Internet is being used to teach geography in higher education. Overall, participants found the process of curriculum development to be quite challenging, and implementing the materials in the classroom did not always go smoothly. But it is clear that VGD participants are at least attempting to use the Internet in a manner that encourages constructivist, student-centered learning in geography. The following are descriptions of some of the materials produced by the VGD:

P.I.: Have you contributed instructional materials to the VGD, or are you planning to do so?

BERNIE: Yeah, I have an online virtual field trip that I contributed to the Virtual Fieldtrips working group.

P.I.: Could you describe that material for the Virtual Fieldtrip?

BERNIE: Sure. It's a fieldtrip to a local metro park here in the area that I use to have them practice their map reading skills. And also we talk about the geomorphology and geology of the area, so that there are specific examples with maps and photos and questions.

FRANK: So far I have done a maps projection module, which is part of the Cartography working group. And that is complete including form-based exercises. And I am working on a color theory module. Some of it is available. I gave the head of the Cartography working group the URL so that at least some of it can be put up and I am still working on that one.

P.I.: Could you describe some of the details of those materials?

FRANK: They are following the format for instructional modules that was given by Ken. There is a section of the module overview, there is a table of contents, there is an introductory section with a lot of details, terminology, links to examples, some of the examples I created, some I used from other people. There are exercises that are form-based so that students can fill out their answers on the computer and e-mail the results.

P.I.: What sort of exercise does that involve, is that a map interpretation, a scale interpretation, what exactly are they learning?

FRANK: I have a number of different questions on that projection. Some of them are fill-in's or multiple-choice and they are asked to link to projections and do some analysis. And some are asked to make some decisions, "What projections would you select for what purposes?"

P.I.: *And what are your plans for the color theory module?*

FRANK: That will have four lessons, covering four main topics that I usually lecture on, and each lesson will have an exercise. I am trying to make some of them interactive, using multimedia software. I have worked on a couple of things where they can select different colors and compare them with different background colors, things like that.

PATTI: I have a plate tectonics module in which I provide content material allowing them to get the background they would need to complete the exercise. They then access online data from Tokyo, it's called the Plate Tectonics Calculator. It allows you to see how fast a particular plate is moving and in what direction, and based on that students project where they will be, say, a million years from now. I go time scales like a million, 20 million, maybe 40 million, or a hundred million. And I get to see if they understand direction and whether they understand the whole theory behind plate tectonics, that we're basically wandering nomads.

JEN: One is a weather exercise where students download real-time weather data and weather maps and then evaluate the early predictions themselves and what they expect the weather to be in the next couple of days. The other exercise is basically using real time data you download from the US Geological Survey. You can get data within the last day or so on stream flows. We ask students to try to figure out what will be the future stream flow based on the precipitation and the runoff over the past week or two.

EVAN: Well, I do retail-site analysis, and so I got two major components to go out and contribute to the Virtual Geography Department. One that is relatively old and one that is relatively new. So, if you are interested I can describe the projects.

P.I.: *Yeah, please!*

EVAN: O.K., so, there's a shopping center near Cincinnati. It cost \$250 million to build. I offer this exercise that the students go through doing a very simple spatial analysis, finding out that there just are insufficient people and dollars to support it. I've used that one in class for several years.

A second one is finding a site for a store. What kind of store do you want to put in there? What kind of sales are you likely to get from that site? This semester, each one of them picked a type of store to build in Oxford, a small college town near Cincinnati, that has a declining retail base. I am going to put their projects on the Web. Ken Foote's the one that gave me the idea of doing that, you know. I am going to ask some people I know that do retail site analysis to review the student projects. And Ken said, once students know this they tend work a lot better and a lot harder on them. I think the Web is becoming a vehicle for getting students to work harder.

Because they are going to put this material out and the world is going to be able to see it.

Fostering Communications on Teaching and Learning with the Internet

The next two questions were designed to assess how effective the VGD was in building communication networks in support of Internet-based teaching. First, participants were asked whether they had encouraged their peers to use the Internet for teaching geography. Many participants did so with enthusiasm and found their departmental colleagues to be quite receptive to using the Internet. In fact, a few individuals succeeded in recruiting new VGD participants.

P.I.: *Have you encouraged your colleagues to use the Internet in their teaching?*

JERRY: Yeah, I sure have!

P.I.: *What happened because of that encouragement?*

JERRY: Well, let me ask you this. You know how obnoxious people who give up smoking are? You know how zealous they become?

P.I.: *O.K.!*

JERRY: Yeah! It's sort of like that! I could consider myself the last dinosaur, that is, there aren't too many people who as recently as four years ago didn't touch computers at all. But I was one of them. I finally became electronically happening and found the advantages of it for what I was doing and became really zealous about the thing. So, yeah, I encourage everybody constantly, I mean I can get downright obnoxious about bugging people about putting their stuff online. And I do that only because it's been so good for me to have done it, that I can't imagine it wouldn't help everyone. So, yeah, I push it and promote it constantly.

FRANK: Yes. And those who were already using it some have talked to me about what I am doing and we share a lot of information. One of my professors asked me to give a Web-page design lecture to his class, to his advanced class. And they since set up a Web site where they are doing some GIS analysis. So, that's exciting.

LOIS: Oh, yes. Matter of fact I sent two of my colleagues down to Texas. Plus, we have departmental conversations on teaching now.

Other participants encountered some resistance from their colleagues to the idea of teaching with the Internet. A few participants were unsure whether their encouragement made a real difference in terms of convincing a colleague to adopt the Internet.

BERNIE: To a certain extent, although the ones who seemed to be interested were the ones already doing it. The number that are not teaching on the Web have absolutely no interest in it. I generally have them aware that if they wanted to they could ask me about it. I am pushing it as an agenda that we should be all using it.

ALEX: The Geography Department here has finally realized that they need to do something. We've had a number of aborted things going on inside the department. I think we are finally beginning to get somewhere. A few other people here have done their complete course set. Some people are further along than I am. The department is in the process of considering these things, but have I been a leader in that? Well, only to the extent that you can't force anybody to change their teaching style. You can show them what you are doing and you can encourage them a bit to take risks but that's about all I've been doing.

VICTOR: I always do that. There are a couple of people in my department that share similar academic interests and I show them how I do it and how basically they can take a lot of the stuff I have done and just modify it very simply to meet their own requirements. And as you can imagine the results have been . . . fill in the blank . . . nothing! It's because, you see, what a workshop like that does is it pulls together maybe 20 or 30 people in the whole country that has this interest. But they don't have colleagues who share that interest, and I find it very difficult to get faculty to do anything other than what they already do. So, the people that are into computers use them, the people who are interested in the Web use it. But it is very difficult to bring new people online and I don't think a packaged bunch of Web assignments will actually pull those kind of people in. I have no evidence to suggest that will happen. The more passive it is, the less committed they are even to the process.

I followed up this question by asking participants if they had initiated any collaborations on Internet-based teaching since the workshops ended. Overall, participants reported little new collaboration on curriculum development and Internet-based teaching. A few participants have launched materials projects with colleagues at their home institutions, both in and out of geography. Two participants used the Internet to collaborate on a course on environmental change that was taught simultaneously at two different institutions.

P.I.: Following the workshop you attended, have you collaborated with VGD participants and/or other faculty members on Internet-based teaching?

ZACK: Yes, I have, and a couple didn't need a whole lot of encouragement. In fact we were talking just this morning about collaborating and putting together a module for use among three different classes that we teach. I'd say

half of the faculty have maintained Web pages for their courses now. I am in the process of collaborating with people in other departments on campus and we are in the process of putting together something that is going to be called the Virtual Campus. A fellow from Sociology and myself had a small grant last year to hire a computer science student to develop software. And right now, we have established an ad hoc committee from a variety of departments and colleges on campus. We've developed strategic plans for Web-enhanced courses that are on the verge of being endorsed by our faculty senate and the VP for Continuing Education. That's really progressed quite a bit and it's been interesting to work with faculty in other departments.

MIKE: Yeah, I did a project with Bob Ford once called Global Dialogues and we did a collaborative seminar in which students of his and students of mine examined environmental change affecting an area close to the university. That proved kind of interesting.

P.I.: *Any more details you'd like . . .*

MIKE: On collaboration?

P.I.: *Yeah!*

MIKE: We actually have a paper on it that is coming out in the Journal of Geography. I think it's an interesting process and there are a lot of issues, the devils in the details on this kind of thing. And not just the technical details, those are the easiest, it's more of the pedagogical details of getting students to work in collaboration with students at a different University. Some of the problems that I experienced were not technical at all, they were simply concerned with how students do research and the quality of the work they produce. So, the way it was structured, it was just set on a typical academic quarter, and students started by getting to know each other. We did some lectures and we gave them a series of timelines and they just went about doing it. And frankly some groups did a lot better than others. Some groups didn't do too well. The groups really appreciated the interaction with the other University. And that seemed to offer a nice checkpoint for them to compare their results and also to see how geographically specific environmental change is. The reason I am interested in all this collaborative work on education is for students to see how things are different in other places. And I think those were positives. But the process itself really needs to be ironed out.

Most of the participants, however, did not collaborate on Internet-based teaching or curriculum development after the workshops ended. A number of participants did not care to explain their decision when asked to comment further. Those who did elucidate complained about not having enough time to begin collaborations on new materials. Others simply preferred to work alone.

PETER: Collaboration has not continued as strongly as I would have liked once away from the workshops. We have kept in touch periodically in preparing to make presentations at AAG meetings or when posting new

products to be listed on the VGD pages, etc. I've also enjoyed seeing what was produced by subsequent workshops to those I attended. But most everyone is swamped when they return to their real lives on their respective campuses and keeping up the same level of intensity is difficult. I also think that many of our colleagues that we interact with "at home" still don't value this type of work so interest can wane. I hope this trend ends, but it is a reality. I was also away much of the last year and was not able to participate in last year's AAG meetings.

JERRY: One of the reasons I haven't collaborated with anybody or anything is pretty much because I have always done things alone. During the Virtual Geography Department, I was working with others on some Latin American sort of things. I saw what they were doing and sort of backed away from it. I thought, "You know, I don't want to do that." It wasn't that I didn't like what they were doing, but it just didn't fit into what I was doing. So, I preferred to make my own stuff. So, I'm just not a very interactive kind of person in that regard.

Finally, participants were asked to offer general comments on their overall experience with the VGD. Participants were overwhelmingly favorable in their appraisal of the project. For many participants, the VGD revealed to them an entire new world of instruction.

P.I.: *What else did you learn as a result of your experience with the VGD?*

JILL: I learned about the power of this stuff. I'd heard about it before but I learned it there. And you can quote me on that one. I think a lot of us have heard about it before but we never got fully involved with it. And that awareness of what was there, I've certainly watched more intensively what other people have done with their Web and Internet-based geography education. I go to the sessions at the conferences where these things are emphasized.

JOE: I learned that I could do this stuff. I was really intimidated when I went to Austin. In the first few days I didn't know what I was doing. I knew how to look things up on the Web but I had no idea how to put things on the Web. But by the end of the week I was doing it slowly but surely, and I guess that was for me the most important thing. I learned not to be intimidated by the technology. And now it's been relatively smooth sailing since I have taken that. I feel efficient in that regard.

LENNY: Actually, it's an eye-opening experience. I just see myself doing many things naturally nowadays after that workshop that otherwise I probably wouldn't do. Also, we had the advantage of the pedagogical discussion on teaching in general. I feel a benefit from that as well. I feel so positive about the project and I think it's a good thing to be involved and to know what is going on.

Many participants praised the structure of the workshops. They particularly enjoyed having the opportunity to work in collegial teams, which they found to be very inspirational and empowering.

THEO: Well, I thought it was a great idea to do this simply because you could interact with geographers from different disciplines and see what they were doing. And actually look at course content and structure on a very detailed level. You know, not just talk about it, wow we've got to do this, but we peer-reviewed different modules. You know, came up with a module and sort of simulated being a student and how they would do it if they were faced with this kind of activity or this kind of module. And I think that it was helpful to see how my colleagues work and I learned a lot from it.

ALEX: I think I got a broader sense of what other geographers were doing. I think I was brought there as an example of how someone does it. And I guess you know, Ken's a busy guy and the VGD thing was a huge undertaking. He's a catalyst for change throughout an amazing spectrum of geography. I think there was a whole lot of very good things that were done by Ken Foote's VGD. I think he motivated a lot of people who were there and gave them a bunch of tools that they wouldn't have got otherwise.

PATTI: I kind of learned that the Web can really be a community. It can really link scholars throughout the world. I don't see a lot of the people of the virtual group, but I've made a lot of good friendships and maintained contacts. So, it really created a community, a community that I didn't feel before.

The working groups spawned new opportunities to work together on materials development and assessment, presentations at professional meetings, and collaborations on teaching courses.

MATT: I suppose the first thing is just an awareness of what is going on, and the second thing is dealing with people that are actually doing something. There's a lot to be said for that because you get people talking to one another that have common interests, and then things start to get done. Some of the people, in fact, are presenting papers at meetings about their instructional materials.

ZACK: Probably the most that I got out of it was to be with enthusiastic people in geography who really care about their teaching, and see that it was possible to collaborate with people with their different academic interests and specialties. In a small department like our own we all have to specialize in something to cover the whole spread of geography and it's kind of hard to find somebody to talk to with your own interests. It was certainly possible in the Virtual Department. It was really great to be able to work with those people.

SUE: One of the things I was very much reminded of during these workshops in Austin was how invigorating it is to immerse yourself with other professionals on a very specific project. The first year we spent two weeks specifically on developing Web materials. And then the second time we did the same thing, but for only a week. We were on that one issue, and that was very invigorating and motivating for me to really go back and apply that.

Many participants came to appreciate broader issues related to effective instruction, student assessment, and the purpose of geography education.

PETER: I became much more cognizant of and interested in the whole issue of geographic education and was introduced to the work of the NCGE. That was very positive. I have also become much more open to developments in the discipline in general by learning through the Web what others are doing in related areas, for example, physical geography, GIS/cartography, historical geography, regional studies, etc. I must thank in particular the great enthusiasm transferred to me by the work of Ken Foote and his colleagues at the University of Texas, Austin. Their contribution was pivotal and I think an important turning point for the whole discipline.

BERNIE: I think the major thing that I learned while I was there was active pedagogy. As a student I have been exposed to a lot of lectures, and that was kind of my approach before I went down there. Spending time there, talking with people who were using various active approaches was definitely helpful in keeping with what I think about teaching.

A few participants offered fairly mild criticisms of the VGD project. Their complaints were directed at the lack of training that some participants came into the project with, an area of concern that was redressed with pre-workshop tutorials during the 1998 meeting. One participant apparently came to the VGD looking for advanced technical training and instead found too much discussion about educational issues. In contrast, another participant faulted the VGD for not exploring such issues in greater detail.

JOE: It didn't account very well for the different levels of experience of the participants and I kind of felt like there were a few other things that I needed a lot more work with.

VICTOR: I met a lot of people who are using the Web in interesting ways. But I don't think there was much cross-realization. You know, everybody kind of does it in their own way and you get an idea here and there. And the

discussion about the pedagogical nature of it, and what this all means, lot of that I find tedious and boring. Obviously you need to think about education but I think a lot of the time it's just trivialized into a sort of step one, two, three, four, objectives and goals and things like that. So I don't find it intellectually intriguing, I guess.

KELLY: I think I learned more about the mechanics of how to set up the Web site. One suggestion I made to Ken Foote, we need to really discuss or think about some of the more conceptual or theoretical issues other than the mechanics of how to move course material online. Because my intuition tells me that simply converting our syllabus to HTML and make them available on the Web would not help teaching or learning a great deal. We'll have to think in broader terms of how this new meaning is different from the old way of communication. And right now there are lots of uncertainties in what aspects of Internet-based teaching can complement traditional means of communication. I think that right now we have not clearly thought out these issues.

Conclusion and Discussion

It has been shown in this paper that the VGD inspired change in geography education by training faculty members in the use of the Internet for instruction and curriculum development. The VGD promoted innovative practice via centralized and decentralized processes of communication. Specifically, the results of the interviews show that the VGD successfully transferred innovative skills to its participants, many of who are now encouraging the use of the Internet at their home institutions. Participants were inspired by the sessions that focused on educational practice, which drove home the message that effective teaching, learning, and assessment with computer technology does not happen by accident.

The innovative teaching materials available on the VGD Web site illustrate some of the ways the Internet can be used to support authentic instruction and assessment in geography. Many materials use real data on important geographic issues and place students in problem-solving modes of learning. The designers of these materials obviously reflected on the workshop sessions devoted to using the Internet in a manner that supports issues-based, inquiry teaching.

In organizational terms, the most effective strategy of the VGD project was emphasizing collaboration and teamwork in the development of Internet-based

educational resources. Participants described the pleasure and intellectual stimulation of working in collegial teams of geographers who shared their enthusiasm and goals for instructional technology. Yet, many participants failed to follow through with new collaborations on Web pedagogy after the workshops ended, citing time constraints and work-related obligations. These competing factors limited the quantity of educational resources produced by the VGD.

Additional research is needed to further our understanding of change agents and their relationships to educational purpose and practice in geography. Also, more assessments are needed to evaluate the strengths and weaknesses of various curriculum development strategies in geography. In the meantime, the results of this research suggest ways to enhance the effectiveness of new curriculum development projects. Specifically, future initiatives should:

1. *Demonstrate effective models of geography teaching, learning, and assessment in conjunction with technical presentations.* Many VGD participants described the workshop sessions on educational practice as being very influential and *inspiring*. But rather than discussing Web pedagogy and design separately, the VGD workshops combined the discussions into effective demonstrations of how the Web can be used to support issues-based, inquiry teaching in geography. This structure helped many participants understand the relationships between instructional design and educational theory.

2. *Be intensive and immerse participants in the proceedings.* The 1996 VGD summer workshop lasted two weeks, while the 1997 and 1998 summer workshops consisted of two separate one-week sessions. Although all three workshops expected participants to work full days, many participants used their free evening time to return to the computer lab for additional work. The highly structured routine that participants followed on a daily basis helped focus their collective attention on the task of curriculum development, and participants quickly learned new skills through the many hands-on technical sessions.

3. *Emphasize collaboration and teamwork.* Most participants enjoyed the experience of working collaboratively on instructional materials in various content areas. Teamwork as a form of cooperative learning allows participants to benefit from multiple talents, increases efficiency through the strategic

delegation of tasks, and encourages the creative exchange of ideas. Many new friendships were formed at the summer workshops, which bodes well for future collaboration.

4. *Select participants from diverse backgrounds.* The VGD drew participants from community colleges, liberal arts colleges, comprehensive colleges, and research universities, thereby encompassing the full spectrum of geography in higher education. Participants were disparate in terms of age, professional experience, knowledge of computer technology, and expertise in geography. But all of the participants shared a common interest in seeking to enhance teaching and learning with the Internet. Much of the success of the VGD workshops can be attributed to cooperation and synergy among diverse groups of individuals.

5. *Provide pre-workshop training sessions.* A few participants felt that the presence of Internet novices dumbed-down the sessions. Skill deficiencies can be remedied prior to the actual workshop with one- to two-day long tutorials.

Of course, the promotion of Internet-based teaching per se is not necessarily in the best interests of geographers and their students. The important question is, How can we use the Internet to promote *effective* instruction and curriculum development in geography? As this paper demonstrates, the Virtual Geography Department provides many clues to geographers in working towards this important goal.

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