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NSF 02-043 CCLI National Dissemination

FINAL REPORT TO NSF
Covering October 2004–March 2009

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Activities

Spatial Perspectives on Analysis for Curriculum Enhancement (SPACE) was funded under the national dissemination track of the National Science Foundation's Course, Curriculum, and Laboratory Improvement (CCLI) program. The objective of SPACE was to initiate systemic change in undergraduate education for the social sciences by focusing on the value of spatial thinking and associated technologies—geographic information systems (GIS) and tools for spatial analysis. The significance of spatial technologies has increased over the past three decades, reflecting developments in theory and innovations in software applications that have permitted the integration of data and scientific perspectives across disciplines as well as a broad recognition that geographical representation of information provides an important means to understanding and resolving societal and scientific problems. Providing undergraduates with exposure to GIS, analytical cartography, remote sensing, and spatial econometric concepts and tools were highlighted in SPACE workshops as a basis for motivating students and enhancing their opportunities for advanced studies and employment. In this program, knowledge in spatial analysis was linked to CCLI objectives for dissemination of curricula and assessment practices.

The core funding from NSF was for three years (October 2003 through September 2006), however an additional year of workshops (summer 2007) and a no-cost extension and supplement (October 2008 through March 2009) allowed for extended support for participants in the workshops. SPACE was organized as a consortium led by the University of California, Santa Barbara (Project PI, Donald Janelle; co-PIs, Richard Appelbaum and Michael Goodchild) through its Center for Spatially Integrated Social Science. Under contract to UCSB, other participants in the consortium included The Ohio State University (PI, Mei-Po Kwan), and the University Consortium for Geographic Information Science (UCGIS PI, Arthur Getis and successive presidents of UCGIS).

The primary activities for achieving SPACE goals were eleven week-long residential workshops to provide undergraduate instructors with basic skills in GIS and spatial analysis, and to introduce them to the latest techniques, software, and learning resources. A website (www.csiss.org/SPACE) was developed to aid workshop organization and to help consolidate resources of value to instructors in a broad range of disciplines. Extensive follow-up activities were designed to leverage these workshops to achieve high rates of participation among traditionally under-represented groups and to bridge the gap between research and teaching in the social sciences. Follow-up activities included (1) awards for curriculum development projects and supplemental training for social science instructors, and (2) support for conference initiatives. These follow-up programs were operative through March 2009.

Summary of Primary Activities

Activities from October 2003 through March 2009 were directed toward (1) planning, organizing, and implementing up to three workshops per year (2004 to 2007); (2) program administration and logistics; (3) developing and maintaining a project website to serve workshop organizers and participants; (4) providing follow-up support to participants in SPACE workshops; (5) national dissemination; and (6) evaluating and assessing program results.

Overlap among these six general types of activities is essential, but for organizational purposes they are segmented under these headings.

1. PLANNING, ORGANIZING, AND IMPLEMENTING WORKSHOPS:

- Workshop coordinators, instructors, and assistants were appointed in October 2003 to plan for summer 2004 workshops at three sites: Ohio State University (OSU), the University of California Santa Barbara (UCSB), and San Diego State University (SDSU, on behalf of the University Consortium for Geographic Information Science, UCGIS).
- In December 2003 the teams for the three workshops met for three days with technical staff and education consultants in Santa Barbara, with a primary goal of structuring the intellectual content and related agenda for each workshop. General guidelines were formulated for the solicitation of applicants, selection of participants, and communication of admission criteria. Preliminary entry and exit surveys were formulated and follow-up activities for workshop participants were designed to help solidify and amplify the mastery of spatial analysis concepts and technologies, pedagogy for the classroom, and assessment of student learning.
- Two important principles were defined for workshop implementation and follow-through: (1) workshops should facilitate participants becoming agents of dissemination of spatial methodologies and spatial thinking in STEM disciplines, and (2) workshop instructors should exemplify and demonstrate the pedagogic practices expected of workshop participants in working with their own students, especially in focusing on project-based learning, classroom communication, hands-on experience, peer interaction, and active assessment of learning.
- The summer 2004 workshops included a 12-day workshop at UCSB and 5-day workshops at OSU and SDSU, with the intention of evaluating different formats for subsequent years in the program.
- Additional annual planning meetings were held in Santa Barbara in December 2004 and December 2005, providing opportunities to assess prior workshop results and to make adjustments in the program for subsequent years. These meetings provided opportunities to share ideas from the different workshop experiences and to acquaint new UCGIS teams from San Francisco State University (SFSU, 2005 workshop) and the University of Oklahoma (OU, 2006 workshop) with the objectives of SPACE. A participant from each workshop was invited to provide client perspective on workshop practices. It was decided at the December 2004 meeting that a 6-day residential workshop format would become the template for all subsequent workshops at OSU, UCSB, and OU. The planning meetings provided excellent opportunities to assess workshop practices as well as to fine-tune application and adjudication procedures, information resources for prospective participants, and the workshop entry and exit surveys.
- For 2007 (a no-cost extension year), UCGIS reallocated its funding to help co-sponsor the workshops at UCSB and OSU. In order to reserve funds needed to administer these workshops, a planning meeting was not held in December 2006. Email and telephone communication proved adequate for coordinating activities.

2. PROGRAM ADMINISTRATION AND LOGISTICS:

- The principal investigator, with cooperation from workshop coordinators (Stuart Sweeney at UCSB, Mei-Po Kwan at OSU, John Weeks at SDSU, Richard LeGates at SFSU, and Tarek Rashed at OU) and the Educational Development Coordinator (Fiona Goodchild), completed annual reports for submission to NSF in fall for 2004, 2005, 2007, and 2008.
- A request for a **supplementary** funding was submitted to NSF in October 2007 to provide 2007 workshop participants with resources to assist their implementation of new curriculum and instructional innovations, acquire enhanced training in the use of geographical technologies, and support conference dissemination efforts. NSF granted the supplement in September 2008, allowing for continuation of curriculum development awards and ACCESS conference programs through March 2009.
- The principal investigator completed the Final Report to NSF in late June 2009.

3. WEBSITE DEVELOPMENT:

- A prototype website was reviewed at the planning meeting in December 2003. At that time, the primary purpose of the site was to serve workshop administration, including online application procedures, data analysis and protection, and information dissemination.
- Based on recommendations made at the planning meeting, the website (www.csiss.org/SPACE) was en-

hanced with resources (syllabi, exercises, data links, assessment instruments, and discipline-relevant resources) for workshop participants as well as for site visitors interested in implementing spatial analysis perspectives to undergraduate education. An on-going effort was made to identify new resources and tools for national dissemination to the broad interdisciplinary set of social scientists interested in spatial thinking and spatial analysis. Workshop participants were invited to contribute resources to the site.

- Site usage increased steadily over the course of the project through 2007 (the last summer for workshops) but has continued at a modest level of use through early 2009, as documented in the “Findings” section.
- The UCSB Center for Spatial Studies will continue to monitor and add resources to the SPACE website. As the Center’s follow-up initiatives at www.teachspatial.org expand, it may be appropriate, in the future, to consolidate resources from the two sites.

4. FOLLOW-UP SUPPORT FOR WORKSHOP PARTICIPANTS:

SPACE sponsored two programs to help solidify participant workshop learning and to extend the reach of SPACE objectives beyond the workshop environment.

- The **Instructional Development Awards** recognized participant accomplishments in introducing new courses and instructional modules at their home institutions. Recipients could use these awards to organize dissemination efforts (short courses and campus forums), or to participate in meetings of discipline associations or in training programs to enhance their own spatial analytic competencies.
 - The award program was announced in November 2004 and, since then, 42 participants have received support in recognition of their accomplishments.
 - A section of the SPACE website describes these accomplishments and provides a resource base used during the workshops to illustrate how prior participants promoted spatial thinking in undergraduate education.
- The **SPACE ACCESS program (Academic Conference Courses to Enhance Social Science)** supported workshop participants in their efforts to organize conference-based sessions, panels, and short workshops for academic and professional societies. ACCESS awards helped participants in these efforts, resulting in the extension of SPACE objectives to the following organizations:
 - Association of Social and Behavioral Scientists (2005)
 - Association of Collegiate Schools of Planning (2005)
 - National Technology and Social Science Conference (2005)
 - UCGIS Winter Meeting (2005) and Summer Assembly (2006)
 - Society for American Archaeology (2006)
 - National HBCU Faculty Development Symposium (2006)
 - Association of American Geographers (2006)
 - American Sociological Association (2007)
 - American Political Science Association (2007)
 - Minorities in Agriculture, Natural Resources, and Related Sciences (2007)
 - American Society for Environmental History (2008)
 - New Orleans Neighborhood Analysis Project’s Community GIS Technology Workshop (2008)
 - Agricultural and Natural Resource Conservation and Management Conference (2008)
 - Harvard University’s AfricaMap Workshop (2009)
 - National Society of Black Engineers (2009)
- Program descriptions, presentations, and related pedagogical resources from these ACCESS activities are posted at <http://www.csiss.org/SPACE/workshops/sessions.php>, and are described in the section on findings.

5. NATIONAL DISSEMINATION:

National dissemination focused on wide distribution of applicant solicitation for workshop participation, making use of the SPACE website, fliers, advertising in newsletters and email listings of social science associations, direct contact with institutions of higher learning that serve minority populations, and presentations by SPACE workshop coordinators and instructors.

- Workshop advertising included the design, production, and distribution of fliers, and the preparation of a brochure describing the SPACE program and its resources, emphasizing the value of introducing spatial analysis in undergraduate teaching.
- The principal investigator, co-principal investigators, and workshop instructors gave presentations about the SPACE program to several organizations, including the Social Science History Association (2005), the Crime Mapping Research Conference (2005), the University Consortium for Geographic Information Science (2005 and 2006), and the Association of American Geographers (2005 and 2006). These supplemented the presentations by workshop participants at conference workshops and sessions that they organized through the SPACE ACCESS program.
- Since the inception of the program, designated **minorities** have represented 20 percent of SPACE workshop participants. Significant efforts were made to encourage applicants from minority-serving institutions. Five of the ACCESS-supported conference workshops were for organizations that serve Historically Black Colleges and Universities (HBCUs) and minority populations.
- The SFSU workshop in 2005 featured the development of a video interview of workshop instructors and participants. The video was shown in several conference presentations and is accessible via the SPACE website.
- **Publications** resulting at least in part from the SPACE experience, include the following:
 - D. G. Janelle, S. R. Hespanha, F. Goodchild, and M. F. Goodchild, Workshops and National Dissemination of Geographic Analysis in the Social Sciences: The CSISS Experience in the U.S.A., *Journal of Geography in Higher Education*, (2009) in press.
 - S. R. Hespanha, F. Goodchild, and D. G. Janelle, Spatial Thinking and Technologies in the Undergraduate Social Science Classroom, *Journal of Geography in Higher Education*, (2009) in press.
 - D. G. Janelle and M. F. Goodchild, Concepts, Principles, Tools, and Challenges in Spatially Integrated Social Science, in T. Nyerges, R. McMaster, and H. Couclelis, eds. *Handbook of GIS and Society Research* (Sage Publications, 2009) in press.
 - D. G. Janelle and M. F. Goodchild, Location across Disciplines: Reflections on the CSISS Experience, in H. J. Scholten, R. van de Velde, and N. van Manen, eds. *Geo-ICT and the Role of Location within Science* (Dordrecht, The Netherlands: Springer, 2009) in press.
 - D. G. Janelle, Expanding the Social Sciences with Mapping and GIS, in D. S. Sinton and J. J. Lund, eds, *Understanding Place: GIS and Mapping across the Curriculum* (Redlands, CA: ESRI Press, 2007) 77–82.
- The principal investigator prepared a poster about the SPACE program for presentation at the **CCLI 2008 PI Conference**, Washington DC, 13–14 August 2008.
- Although not supported by SPACE funding, we were motivated by the experiences of the SPACE program to organize, with the help of Dr. Diana Sinton (prior SPACE participant), a **Symposium on a Curriculum for Spatial Thinking** (University of Redlands, June 3–5, 2008). This involved about a dozen social/environmental science professors from around the country (including participants in prior SPACE workshops). An outcome of this workshop has been the circulation of a white paper on the importance of spatial reasoning and the need for formal instruction in spatial thinking at the undergraduate level. In addition, a new wiki-style website was launched in March 2009, featuring teaching resources about spatial concepts (see <http://teachspatial.org>).

6. PROGRAM EVALUATION AND ASSESSMENT:

A follow-up survey was designed for participants in the 2004 workshop and was used for participants in successive workshops through 2007. These surveys were administered online approximately 10 to 12 months after the workshops to assess how participants have used workshop experiences to enhance teaching for their institutions and organizations and to advance their own understanding of spatial technologies. In addition to

providing a basis for improving successive workshops, the surveys help to identify both the general and specific outcomes associated with SPACE, as documented in the “Findings” section of this report.

Workshops

The last two of eleven workshops were offered during summer 2007, one at UCSB and the other at Ohio State University. Although these and prior workshops were described in detail in previous annual reports to NSF, it is useful to include the agenda for the 2007 workshops as context for information presented in the “Findings” section of this final report.

Spatial Analysis in the Social Science Curriculum: Enhancing Undergraduate Learning

July 15–20, 2007: Santa Barbara, CA

This workshop focuses on spatial methods and perspectives suited for applications in the under-graduate social science curriculum, such as exploratory spatial data analysis and cartographic visualization. Participants will illustrate these methods and design instructional modules and exercises for use in teaching undergraduates. The workshop will also explore strategies for curriculum development and assessment of student learning. Requirements to benefit from this workshop include prior experience with computer file and data management for quantitative analysis and/or basic GIS applications in the social sciences.

Instructors: Stuart Sweeney (coordinator), Fiona Goodchild, Michael Goodchild, Don Janelle, and Waldo Tobler (all of UC Santa Barbara)

Co-sponsor with CSISS and host institution: Department of Geography, University of California, Santa Barbara, and the Institute for Social, Behavioral, and Economic Research.

Overview of Workshop Goals

The UCSB workshop introduces social science instructors to the potential added value provided by spatial perspectives. The workshop engages participants with opportunities to learn spatial theory, methods of spatial analysis, and pedagogic strategies for integrating spatial perspectives into lectures, labs, and demonstrations in undergraduate instruction. The training in spatial analytic tools is not presented as an end in itself, but instead as a means to facilitate undergraduate learning within the context of existing social science theory.

The UCSB workshop focuses on: (1) Implementing core spatial concepts through exploratory spatial data analysis and cartographic visualization; (2) Integrating social science theory and spatial analysis; and (3) Visualizing social science data. These basic themes are intended to transcend disciplinary boundaries. Small-group discussions and teamwork will be used throughout the workshop to facilitate the integration of lectures and lab work with pedagogical development.

Workshop Agenda

Sunday, July 15: Introduction, Motivation, and Project Planning		
9:15	Welcome and Introductions	Don Janelle
10:15	Integrating Spatial Perspectives into Undergraduate Social Science Education	Stuart Sweeney
11:30	Project Planning and Student Assessment	Fiona Goodchild Stacy Rebich-Hespanha Stuart Sweeney
12:15	<i>Lunch with Instructors</i>	
1:30	The Challenge of Spatial Social Science • GIS methods in social science research and education • Thinking spatially in the social sciences • Discussion	Mike Goodchild
3:30	Introducing GIS and Peer Interaction Exercises: Introduction to ArcGIS	Kirk Goldsberry Jeff Howarth
5:30	Workshop Dinner with Instructors (Carrillo Dining Hall)	
6:30	Reception and Poster Session (West Campus Commons)	
Monday, July 16: Spatial Social Science and GIScience		
9:15	Geographic Information Systems/Science: Basic Concepts of GIS • Nature of spatial processes and their representation in GIS	Mike Goodchild
10:45	Learning and Assessing Spatial Thinking	Fiona Goodchild Stacy Rebich-Hespanha
After Lunch	Computer Lab (<i>laptop software checks, data checks, lab logistics</i>)	
1:15	Structured Lab: ArcGIS I: Data Structures / Data Sources / Mapmaking	Kirk Goldsberry Jeff Howarth
4:00	Parallel Electives Open Computer Lab Staffed by:	Kirk Goldsberry, Jeff Howarth
8 pm	Choropleth Maps with ArcGIS Open Discussion — <i>location to be determined</i>	
Tuesday, July 17: Spatial Analytic Methods in Social Science Instruction		
9:15	Spatial Analytic Methods (exploratory / descriptive / inferential) • Point data: SS methods / applications • Area data: SS methods / applications • Interaction data: SS methods / applications	Stuart Sweeney
10:45	Spatial Analytic Methods (exploratory / descriptive / inferential) • Spatial analytic methods in social science research and education • Added-value from spatial analytic methods • Spatial autocorrelation and relation to social science theories • Classroom demos versus student assignments / labs • Discussion	Stuart Sweeney
12:00	<i>Lunch with Instructors</i>	
1:15	Structured Lab: GeoDa: Exploratory Spatial Data Analysis • Reading ESRI Shape files and variable construction • EDA and ESDA utility and interpretation • Inferential pattern analysis / spatial autocorrelation	Stuart Sweeney Kathryn Grace David Folch
4:00	Parallel Electives Open Computer Lab Staffed by: R Language and STARS (space-time analysis of regional systems)	Kirk Goldsberry, Jeff Howarth Stuart Sweeney

5:00	<ul style="list-style-type: none"> • Spatial econometric theory; Spatial error and spatial lag models • Specification tests and model interpretation • GeoDa application: Hedonic real estate model Workshop Debriefing	Kathryn Grace David Folch
<i>Wednesday, July 18: Cartography / Visualization in Social Science Instruction</i>		
9:15 11:00	Cartographic Visualization in Social Science Instruction Structured Lab: ArcGIS II: Topics in Cartographic Communication <ul style="list-style-type: none"> • Classification 	Kirk Goldsberry Kirk Goldsberry Jeff Howarth
Afternoon	Free Time in Santa Barbara (options depending on interest; consult with Stacy Rebich-Hespanha) Open Computer Lab Consultation with Faculty	Limited Staff Support To be arranged
8 pm	Open Discussion —Location to be determined	
<i>Thursday, July 19: Spatial Interaction, Pedagogy, and Project Development</i>		
9:15	Issues in Teaching and Learning Chair: Fiona Goodchild Panel: Stuart Sweeney, and three workshop participants	
11:00	Movement and Flows <ul style="list-style-type: none"> • Flow representation and mapping • Discussion 	Waldo Tobler
12:15	<i>Lunch with Instructors</i>	
1:30	Introducing Spatial Perspectives in Undergraduate Teaching: Institutional Opportunities and Constraints	Discussion with Mike Goodchild
2:30	Parallel Electives Open Computer Lab	Kathryn Grace, David Folch, Kirk Goldsberry, Jeff Howarth
	Flow Mapper Implementation	Waldo Tobler
3:30	Consultations with Instructors	F. Goodchild, M. Goodchild, S. Sweeney, W. Tobler
<i>Friday, July 20: Project Presentations / Closing Session</i>		
9:15	Participant Presentations and Peer Feedback <ul style="list-style-type: none"> • 8-minute presentation, 4-minute discussion(maximum of 10 PowerPoint slides) • Peer review for each participant 	
1:15	Participant Presentations and Peer Feedback <ul style="list-style-type: none"> • 8-minute presentation, 4-minute discussion • Peer review for each participant 	
3:30	Participant Presentations and Peer Feedback <ul style="list-style-type: none"> • 8-minute presentation, 4-minute discussion • Peer review for each participant 	
4:30	Closing Comments	Don Janelle, Stuart Sweeney, Fiona Goodchild
6:00	BBQ Dinner and Workshop Certificates (Location to be arranged)	
<i>Saturday, July 21: Participants Depart Santa Barbara</i>		

GIS and Spatial Modeling for the Undergraduate Social Science Curriculum

June 18–23, 2007, Columbus, OH

This workshop focuses on spatial thinking, spatial analytic methods and their applications suited for undergraduate social science courses. These methods include cartographic visualization, space-time modeling of individual behavior, spatial interaction models, spatial point pattern analysis and spatial optimization methods. The workshop will also cover curriculum development, pedagogy, and student learning assessment. Workshop participants will consider how to integrate these methods into instructional modules, exercises, and learning assessment approaches. Requirements to benefit from this workshop include prior experience with computer file and data management in applications of quantitative analysis and/or GIS in the social sciences.

Instructors: Mei-Po Kwan (coordinator), Ola Ahlqvist, Desheng Liu, Alan Murray, Morton O’Kelly, Kathryn Plank, and Ningchuan Xiao (all of The Ohio State University), and Sara McLafferty (University of Illinois at Urbana-Champaign).

Co-sponsors with CSISS and host institution: Department of Geography, The Ohio State University; the University Consortium for Geographic Information Science.

Workshop Agenda

Monday, June 18		
8:30	Coffee and Bagels	
9:00	Optional Lab Sessions: ArcGIS and GeoDa	
2:00	Welcome (Derby Hall 1080)	D. Janelle, Mei-Po Kwan
3:00	Pedagogy issues: Planning your Students’ Learning	Kathryn Plank
6:00	Reception and Dinner (Buckeye Cafe)	
Tuesday, June 19		
9:00	Lecture Spatial Analysis Using Census Data	Ningchuan Xiao
1:00	Introduction and Space-Time Analysis Census Data	Mei-Po Kwan
4:00	Guest Lecture: Spatial Perspectives on Health and Social Issues	Sara McLafferty
5:00	Extra Lab Sessions	
6:00	Break Dinner on your own	
Wednesday, June 20		
9:00	Introduction to GIS and Cartographic Visualization	Ola Ahlqvist
11:00		
1:00	Lecture Spatial Optimization Modeling	Alan Murray
4:00	Panel Session on Pedagogy Issues (interdisciplinary panel)	Linda Lobao, Philip Brown
5:00	Group Discussion on Pedagogy Issues	
6:00	Break Dinner hosted by Department of Geography, The Ohio State University	
Thursday, June 21		
9:00	Lecture Spatial Interaction Modeling: Space–Price Equilibrium	Morton O’Kelly
1:00	Lecture Exploratory Spatial Data Analysis	Desheng Liu
4:00	Pedagogy issues: Evaluation of Your Students’ Learning	Kathryn Plank
6:00	Dinner on your own	
Friday, June 22		
9:00	Pedagogy Discussion and Group Project	
10:30	Concurrent Lab Sessions on all topics	
	<ul style="list-style-type: none"> • Cartographic Visualization • Space-Time Analysis • Spatial Analysis Using Census Data 	Ahlqvist Kwan Xiao

1:00	<ul style="list-style-type: none"> • Spatial Optimization Modelling • Spatial Interaction Modeling • Exploratory Spatial Data Analysis 	Murray O'Kelly Liu
4:00	Concurrent Lab Sessions continues	
5:00	Group Project: <i>Instructors hold office hours</i> <i>Break Dinner on your own</i>	
Saturday, June 23		
8:30– 12:00	Group Presentations	
12:00– 1:00	<i>Box Lunch</i>	

SPACE Workshops Sponsored by the University Consortium for Geographic Information Science

Spatial Analysis and GIS for Undergraduate Course Enhancement in the Social Sciences

August 2–6, 2004, San Diego, CA

Topics covered: This workshop offers instructors of undergraduate courses in the social sciences an opportunity to gain expertise in the application of GIS and spatial pattern analysis. Primary concentration will be on problems and issues of interest especially to sociologists, criminologists, and demographers. Participants will work collaboratively with workshop leaders and other participants in the design of course materials for use in undergraduate teaching and in learning assessment. Familiarity with GIS and spatial analysis is desirable.

Instructors: Arthur Getis and John R. Weeks (coordinators), Jared Aldstadt, and Piotr Jankowski (all of San Diego State University); Fiona Goodchild and Michael Goodchild (both of UC Santa Barbara).

Co-sponsor with CSISS: The University Consortium for Geographic Information Science.

Host institution: Department of Geography, San Diego State University.

Workshop Agenda

Monday, August 2		
8:30	Staff & Participant Introductions: What brings you to this workshop? The structure of this workshop	Arthur Getis John Weeks Donald Janelle
9:45	<i>Vision and objectives of SPACE</i>	
10:15	Coffee Break	
10:30	<i>The meaning of spatial thinking</i>	Michael Goodchild
11:15	<i>A brief review of Spatial Analysis/Geographic Information Science</i> <i>Environment concepts</i>	Michael Goodchild Arthur Getis
12:15	Lunch	
1:30	<i>Characteristics of an ideal project</i>	Fiona Goodchild
2:30	<i>Spatial analysis software packages</i>	Jared Aldstadt
3:00	Software demo: GEODA	Michael Goodchild
3:30	Exercise in exploratory spatial data analysis using GEODA	Jared Aldstadt
5:30	Reception at Scripps Cottage on campus	
Tuesday, August 3		
8:30	<i>Issues and answers</i> (Michael Goodchild)	
9:30	<i>Spatial analysis application in demography</i>	Weeks
10:15	Coffee break	
10:30	<i>Construction of curricula</i>	Fiona Goodchild

12:00	Lunch	
1:15	Tour of Center for Earth Systems Analysis and Research	Arthur Getis
1:45	<i>Outlining a curriculum module; Resource issues in curriculum development</i>	Fiona Goodchild
3:45	Exercise in spatial analysis using GEODA	Jared Aldstadt
Wednesday, August 4		
9:00	<i>Aspects of spatial analysis for curriculum development</i>	Arthur Getis
10:15	Coffee Break	
10:30	<i>Curriculum development and enhancement</i>	Stacy Rebich-Hespanha
12:00	Lunch	
1:15	Curriculum development issues: breakout groups	Staff
3:30	The development of evaluation instruments; student assessments	Stacy Rebich-Hespanha, Staff
5:00	Bus tour of San Diego (Balboa Park, Gaslamp District; no host dinner at The Fish Market Restaurant)	
Thursday, August 5		
8:30	<i>Participatory problem solving and decision making with GIS; followed by tutorial</i>	Piotr Jankowski
12:30	Lunch	
1:30	Curriculum development	
6:00	Picnic at Getis' house (bring bathing suits)	
Friday, August 6		
8:30	Participants present their curriculum development plans; discussion; some participants conduct sample classes; summing up; exit survey	

Introducing GIS for Undergraduate Social Science Courses

August 1–6, 2005, San Francisco, CA

Schedule

Monday through Friday will be intense structured teaching days with a tight lecture/lab schedule. Workshop days start at 9:00 a.m. and end at 5:00 p.m.

Wednesday afternoon, participants are invited to a historical walking tour of San Francisco. Participants may choose to forego the walking tour and remain at SFSU to work with workshop staff on how to tailor data to specific geographic areas and how to merge their own data with data from other sources.

On Saturday, Richard LeGates and Xiao Hang Liu will describe NSF's evaluation materials available from NSF's On-line Evaluation Resource Library (OEREL) and the SPACE website and lead a discussion of how to assess impacts of introducing spatial analysis into the social science courses.

Participant Data Needs

The workshop schedule includes optional time for you to work with and analyze your own data. Participants wanting to tailor workshop content to their own interests should compile their own data sets (assuming appropriate permissions are in place and that there is no risk of disclosure of individual data). If you do not have suitable data, sample data sets from all lab sessions and sample data from the software are available. Additionally, there is a wealth of data available to applicants via the Internet (at various credible and verifiable sites). You may wish to explore compiled list of data sources from the Institute for Geographic Information Science at SFSU.

Workshop Agenda

Sunday, July 31

Travel day All participants should be in San Francisco Sunday evening

Monday, August 1:		
9:00	Welcome <ul style="list-style-type: none"> • Overview of SPACE and SFSU workshop • Personnel, and logistics 	
9:30	Overview of spatially integrated social science	Donald Janelle
10:15	Break	
10:30	Pedagogy in undergraduate GIS teaching	Stacy Rebich-Hespanha
10:30	Breakout groups <ul style="list-style-type: none"> • Discuss how participants plan to incorporate GIS into their courses 	
11:45	Breakout group reports	Stacy Rebich-Hespanha
12:00	Lunch	
1:30	Spatial data and its modeling in GIS <ul style="list-style-type: none"> Spatial data <ul style="list-style-type: none"> • Overview of vector and raster GIS models • Common file formats • Map Projections 	Xiao Hang Liu
3:00	Break	
3:15	ArcMap Operation basics	Richard LeGates,
3:30	Lab on basic GIS operations	Richard LeGates,
5:00	Break	
5:30	Reception	
Tuesday, August 2		
9:00	Introduction to vector GIS <ul style="list-style-type: none"> • The vector GIS model: points, lines, and polygons • Querying • Classifying features 	Richard LeGates,
10:00	Lab on Vector GIS operations. Querying. Classifying features.	
11:00	Break	
11:15	Computerized cartography. Map symbolgy.	Richard LeGates,
12:00	Lunch	
1:30	Computerized cartography. Map symbolgy.	Richard LeGates,
3:15	Break	
1:30	Working with attribute tables <ul style="list-style-type: none"> • Structure of attribute table • Joining and relating data in Excel or SPSS to ArcMap Attribute tables 	Nickel
4:00	Lab on working with attribute tables	Nickel
Wednesday, August 3		
9:00	Introduction to raster GIS	Xiao Hang Liu
10:30	Break	
10:45	Lab exercise on raster-based spatial analysis	
12:00	Lunch	
1:30	Optional open lab. Participants work on their own, individually, or in groups (with technical support).	
2:30	Walking tour of San Francisco (optional)	
Thursday, August 4		
9:00	Vector-based spatial analysis—Overlay, clip, dissolve, buffer, and related operations etc.	Nickel
10:30	Break	
10:45	Lab exercise on vector based spatial data analysis	
12:00	Lunch followed by keynote speaker	
1:00	Keith Clarke (UCSB): “Spatially enhanced social science”	
2:00	Break	

2:15	Group discussion of how participants might incorporate spatial analysis into their teaching	Clarke
3:00	Break	
3:15	Spatial data acquisition	Xiao Hang Liu
4:15	Lab exercise on geocoding	
Friday, August 5		
9:00	Working with census data	Pamuk
10:00	Break	
10:15	Lab exercise on downloading census data and preparing a data set tailored to your area and interests	
Pamuk		
12:00	Lunch	
1:30	Evaluating spatial learning outcomes	Stacy Rebich-Hespanha
3:15	Break	
3:15	Open lab with technical support	
Saturday, August 6		
9:00	Closing workshop procedures	
9:15	Demo of GIS resources	
10:30	Break	
10:45	Participants discussion on curriculum design	
12:00	Lunch	
1:00	Reports/discussion of curriculum design discussions	
2:00	Workshop closes	

Remote Sensing and GIS Technologies for Undergraduate Curricula in the Social Sciences

July 23–28, 2006, Norman, OK

This workshop will explore the uses of geographic information technologies for undergraduate curricula in the social sciences and offer guidance on the uses of these technologies to enhance spatial understanding for undergraduate social science students. Participants will acquire understanding of the utility of remotely sensed data - how they provide nontraditional, and otherwise unobtainable, measures of social phenomena, and how these measures are used with a wide range of population-related data in GIS for the visualization, analysis, and understanding of social dynamics at micro, macro, and global levels. Lectures, demonstrations, tutorials, and group investigations will foster open discussions to stimulate spatial thinking and problem-solving skills, and to translate these into resources for teaching at the undergraduate level. Applicants should already have basic GIS knowledge since GIS will provide the integrated platform for introducing remote sensing and spatial statistics.

Instructors: Tarek Rashed (coordinator), May Yuan, Jon Pedersen (all of The University of Oklahoma), Victor Mesev (Florida State University), and Rebecca Powell (UC Santa Barbara)

Co-sponsor with CSISS: The University Consortium for Geographic Information Science www.ucgis.org

Host institution: Department of Geography and the Center for Spatial Analysis, The University of Oklahoma

Workshop Agenda

Sunday, July 23: Introduction and Motivation		
8:30	Workshop Registration	Melissa Brown
9:00	Orientation and Ice Breaker	Group
9:30	Welcome and overview of remote sensing multidisciplinary education and research initiatives at OU	Lee Williams, VP of Research OU
10:00	The Objectives of SPACE and Resources from the Center for Spatially Integrated Social Science	Don Janelle
10:30	Break	

10:45	Private Universe, Video	
11:15	Science Teaching and the Learner: The Learning Cycle	Jon Pederson
12:00	Lunch	
1:00	Remote sensing and social sciences: A gallery of applications	Tarek Rashed, Katy Rich, Victor Mesev, May Yuan, Lab Consultants
2:15	Computer lab orientation: Login information, overview of software	Chris Cook
2:30	Break	
2:45	Computer exercise: Linking remotely sensed measures and population data to analyze socioeconomic implications of machine space in Los Angeles, CA	Tarek Rashed, Katy Rich, Victor Mesev, May Yuan, Lab Consultants
4:00	Break	
4:15	Group Discussion: Pedagogy discussion (reflections on the Machine Space exercise)	Jon Pedersen, May Yuan, Tarek Rashed, Victor Mesev
5:30	Catered reception & Poster Session (Goal setting for the workshop)	Group

Monday, July 24: Remote Sensing Classification for Social Science

9:00	Computer exercise: Introduction to image processing software and RS data warehouses	Tarek Rashed, Mang Lung Cheuk, Victor Mesev, Lab Consultants
10:30	Break	
10:45	Introduction to Remote Sensing • Basic RS principles • Types of RS imagery, Data availability Background Reading (password protected): Mesev Introduction, Introduction to ERDAS IMAGINE	Victor Mesev
11:30	Group Reflections	
12:45	Computer exercise: Incorporation of social data in image classification	Victor Mesev, Mang Lung Cheuk, Tarek Rashed, Lab Consultants
2:00	Break	
2:15	RS classification for social science applications • Hard and soft classification • Incorporation of social/economic data in urban image classification	Victor Mesev
3:00	Break	
3:15	Open computer lab and consultation with Faculty	Victor Mesev, Tarek Rashed, May Yuan
4:30	Break	

Tuesday, July 25: Syllabus Design for Social Science Courses Integrating RS and GIS Technologies

9:00	Small Group Discussions I: Pedagogic considerations in incorporating remote sensing and GIS in undergraduate curricula	Jon Pederson, Dustin Howard, May Yuan, Tarek Rashed, Victor Mesev, Becky Powell
10:15	Break	
10:30	Small Group Discussions II: Technical considerations in incorporating remote sensing and GIS in undergraduate curricula • Develop group syllabi, by interest area, including technical challenges based on the exercise and lectures presented July 23–24	May Yuan, Dustin Howard, Jon Pederson, Tarek Rashed, Victor Mesev, Becky Powell
11:45	Synthesis of group discussion & reflections	Jon Pederson, May Yuan
12:15	Lunch	
1:30	Field Trip and dinner in Oklahoma City	

Wednesday, July 26: Regional and Nighttime RS data for social applications

9:00	Computer exercise: Regional land-cover change	Becky Powell, Matt Collier, Tarek Rashed, Lab Consultants
10:30	Break	
10:45	Integrating RS and social science for land-cover change studies • Linking human decisions to landscape outcomes • Scales of analysis	

11:30	Background Reading (password protected): A CIESIN Thematic Guide to Social Science Applications of Remote Sensing	Becky Powell
1:45	Group Reflections	
12:45	Lunch	
2:00	Computer exercise: Nighttime imagery	Becky Powell, Matt Collier, Tarek Rashed, Lab Consultants
2:15	Break	
3:15	Nighttime imagery for social sciences	Becky Powell
3:30	<ul style="list-style-type: none"> • Estimating population • Modeling the spatial distribution of economic activities • Measuring human impact on the environment 	
3:45	Background Reading (password protected): Nighttime Lights Data OU SPACE Workshop Night-time Imagery as a Tool for Global Mapping of Socioeconomic Parameters and Greenhouse Gas Emissions Mapping City Lights with Nighttime Data from the DMSP Operational Linescan System 1997a Satellite inventory of human settlements using nocturnal radiation emissions: a contribution for the global toolchest Night-time Lights of the world: 1994–1995 Trends in night-time city lights an vegetation indices associated with urbanization within the conterminous USA Urbanization in Sub-Saharan Africa and implication for malaria control Ecological light pollution Biomass burning and related trace gas emissions from tropical dry deciduous forests of India: A study using DMSP-OLS data and ground-based measurements A scale-adjusted measure of "Urban sprawl" using nighttime satellite imagery An Empirical Environmental Sustainability Index Derived Solely from Nighttime Satellite Imagery and Ecosystem Service Valuation Global estimates of market and non-market values derived from nighttime satellite imagery, land cover, and ecosystem service valuation Throwing light on straddling stocks <i>Illex argentinus</i> : assessing fishing intensity with satellite imagery	
3:15	Group Reflections	
3:30	Break	
3:45	Open computer lab and consultation with Faculty	Becky Powell, Tarek Rashed, May Yuan
<i>Thursday, July 27: GIS as integration platform for RS and social data</i>		
9:00	Computer exercise: Socioeconomic and population dynamics in response to large-scale natural hazardous events	May Yuan, James Bothwell, Becky Powell, Tarek Rashed, Lab Consultants
10:30	Break	
10:45	GIS Analysis and Modeling with RS and Social Data	
11:45	<ul style="list-style-type: none"> • Integration of RS and social data in GIS • GIS tools for spatial analysis • GIS procedures for spatial modeling • Incorporating spatial thinking, analysis, and modeling into social science curricula 	May Yuan
12:00	Group Reflections	
1:00	Lunch	
2:15	Research case studies and general discussion	Becky Powell, Tarek Rashed, May Yuan
2:30	Group Reflections	
2:45	Break	
	Open computer lab and consultation with faculty	Becky Powell, Tarek Rashed, May Yuan
<i>Friday, July 28: Project presentation and wrapping up</i>		
9:00	Session I: Participant Presentations and Peer Feedback	Group
10:30	Break	
10:45	Session II: Participant Presentations and Peer Feedback	Group
12:00	Lunch	
1:00	Comments on pedagogic elements in the projects	Jon Pederson

1:30	Comments on technical elements in the projects	May Yuan
2:00	Break	
2:15	Keynote lecture and commentary "What Does Google Earth Mean for the Social Sciences?" Background Reading (password protected): What does Google Earth Mean for the Social Sciences?	Mike Goodchild
3:30	Break	
3:45	Closing and workshop certificates	Tarek Rashed

Follow-up Activities for Workshop Participants

The call for applications for SPACE Awards and ACCESS conference proposals are provided below. Consistent with standards of good science, the adjudication panel (made up of the project's PI, Co-PIs, and workshop instructors) was assigned the task of achieving a balanced distribution of awards across disciplines and across topical research domains.

These programs were formally introduced in November 2004, drawing initially from participants in the 2004 workshops. Workshop participants in subsequent years were added to the invitation list for application announcements, distributed in November of 2005, 2006, 2007, and 2008.

CALL FOR APPLICATIONS FOR SPACE INSTRUCTIONAL DEVELOPMENT AWARDS

SPACE invites applications from faculty at four-year colleges and universities for instructional development awards to fund (up to \$1500 of verified expenses) program activities for spatial thinking in undergraduate social science education. Examples of eligible award uses include:

- Presentation of a conference paper about teaching spatial thinking at the undergraduate level in the social sciences.
- Participation in a workshop or training program on uses of spatial analysis/GIS software (e.g., a GIS vendor workshop, ICPSR workshop, or GeoDa workshop with Luc Anselin).
- Participation in a professional workshop dedicated to instruction and student learning of spatial analysis concepts and technology.

To apply, you must have attended a SPACE workshop. **Please submit:**

- Evidence of achievement in meeting instructional goals to implement spatial approaches in your undergraduate course(s) or programs. Examples might include a new syllabus, curriculum development or assessment resources, a superb example of a student course project, and efforts to enhance the diversity of students who benefit from spatial perspectives. Please specify how your instructional development initiatives have benefited the advancement of spatial perspectives in undergraduate education.
- A statement of how the SPACE workshop inspired and/or supported your achievement.
- Commitment to prepare a short case study or example of your achievement for posting on the SPACE website.
- A description of how you would use the expense allocation of up to \$1500 to enhance your instruction of spatial approaches or to help in the dissemination of spatial methodologies to students and colleagues.

Call for Proposals for ACCESS Academic Conference Courses to Enhance Spatial Science

The ACCESS program is described on the SPACE website as follows:

SPACE sponsors special sessions, short courses, and short workshops on spatial methodologies and curricula development at annual conferences of academic associations. When appropriate, these sessions and short workshops will feature instructors and participants from prior SPACE workshop and symposia programs, and involve educators from the host of disciplines represented at the conference. These may feature demonstrations of how spatial analysis brings added value to instructional programs; others might focus on hands-on instruction in specific spatial methodologies (e.g., spatial visualization of geo-referenced data), or will address issues regarding student needs, expectations, and assessment of learning. These

conference-related events are intended to broaden exposure to the availability of SPACE programs—an opportunity to advertise workshops and to direct instructors to hardcopy and online resources that might assist their classroom offerings and professional development. In addition, the conference setting exposes SPACE personnel to the interests, culture, and needs of scholars from diverse disciplinary backgrounds, enabling more informed and responsive programs for the annual workshop program.

For previously funded ACCESS sessions, see <http://www.csiss.org/SPACE/workshops/sessions.php>

INSTRUCTIONS ON APPLYING FOR SPONSORSHIP OF CONFERENCE PROGRAMS

If you are interested in seeking modest financial support from SPACE, you will need to profile the conference/organization and explain why it provides an appropriate venue for SPACE outreach, and also demonstrate that the workshop plan is consistent with the objectives of SPACE. In a 2-page proposal, please describe the following:

- The Organization (description, objectives, membership)
- The Conference (where, when, purpose/general themes, number of participants, disciplinary mix)
- The Proposed Workshop:
 - Title, duration (half-day/full-day?)
 - Instructors (brief profile)
 - Objectives (see: <http://www.csiss.org/SPACE/about/mission.php>)
 - Agenda
 - Advertising strategy to attract participants
 - Anticipated attendance and disciplinary background of participants
 - Estimated Budget

Organizers who are supported by SPACE agree to the following:

- provide SPACE with a brief report on the outcomes of the workshop: list of attendees and their disciplines, contact information, and details on any workshop-related follow-up activities;
- include a representative from SPACE in the organization and presentation of the workshop;
- post an announcement about the workshop on the SPACE site, borrowing heavily from the proposal;
- post appropriate workshop PowerPoint presentations (pdf format) and workshop-related instructional resources; and
- provide documentation for assessing participant evaluations (from a short post-workshop survey).

The SPACE financial commitment to conference workshop organizers/instructors is to cover travel, conference registration, lodging (only 2 nights) and per diem; SPACE will support the workshop instruction period rather than the full conference participation of workshop leaders. If you are bringing in a special guest presenter for the workshop, a modest honorarium may be considered. SPACE reserves the right to modify this formulation based on the cost considerations of meeting venues and on the availability of funds.

Follow-up Surveys

Follow-up surveys of workshop participants were administered over a secure website in spring 2005, 2006, 2007, and 2008, approximately 10 to 12 months following the annual workshops. Results are documented in the “Findings” section of this report.



NSF Proposal 0231263: NSF 02-043 CCLI National Dissemination

Final Report to NSF

June 2009

Findings

1. INTRODUCTION

In the past decade, significant interest has emerged beyond the traditionally spatial disciplines, such as geography or geology, to engage the analytical and theoretical understandings that can arise from adopting spatial perspectives and methodologies. In the social sciences, special issues of leading national and international journals (Table 1) have featured the role of maps in visualizing geographically referenced social data, geographic information systems (GIS) for exposing spatial relationships among variables and geographical patterns, and spatial econometrics for exploratory data analysis and model building. These special journal issues bracket the period associated with the founding of the NSF-supported Center for Spatially Integrated Social Science (CSISS) in 1999 and the last of its SPACE workshops in summer 2007. These journals document how the increasing availability of geo-referenced data, improvements in spatial software, and internet-enhanced accessibility to resources and training opportunities are contributing factors to this growing interest. They also confirm the important roles played by research funding agencies (especially the National Science Foundation), academic organizations, and businesses worldwide.

CSISS has as its mission the development and support of infrastructure to embed spatial analysis in the social and behavioral sciences. One of its most important strategies for fostering principles of spatially integrated social science has been a program of residential training workshops. Over the summers 2000–2008, more than

Table 1. Journals (1999–2007) Featuring Applications of Spatial Analysis in the Social Sciences
<i>Journal of Quantitative Criminology</i> 1999, 15 (4)
<i>Social Science History</i> 2000, 24 (3)
<i>Geographical & Environmental Modelling</i> 2001, 5 (1)
<i>Agricultural Economics</i> 2002, 27 (3)
<i>Political Analysis</i> 2002, 10 (3)
<i>Political Geography</i> 2002, 21 (2)
<i>Rural Sociology</i> 2002, 67 (4)
<i>International Regional Science Review</i> 2003, 26 (3)
<i>Journal of Economic Geography</i> 2004, 4 (1)
<i>Proceedings of the National Academy of Sciences</i> 2005, 102 (43)
<i>American Journal of Preventive Medicine</i> 2006, 30 (2)
<i>Geographical Analysis</i> 2006, 38 (1)
<i>Environmental and Ecological Statistics</i> 2007, 14 (1 & 2, 3)
<i>Population Research Policy Review</i> 2007, 26
<i>Journal of Econometrics</i> 2007, 140 (1)

800 scholars have received CSISS training in such technologies as GIS, cartographic visualization of social science data, remote sensing, spatial econometrics, spatial demography, and spatial data modeling. Early workshops focused on a young cohort of researchers (e.g., Ph.D. candidates and un-tenured professors), based on the rationale that dissemination would proceed through the demonstrations and the effects of improved scientific understanding for dissertations, publications, and grant proposals by active scholars. It was anticipated, also, that this approach would foster the inclusion of spatial methodologies in instructional practices at graduate and undergraduate levels.

STRUCTURING A PROGRAM FOR UNDERGRADUATE INSTRUCTORS IN THE SOCIAL SCIENCES

One of the CSISS training initiatives, featuring one 12-day, seven 6-day, and three 5-day-long residential workshops, was directed explicitly to serving the needs of undergraduate instructors in the social sciences—Spatial Perspectives on Analysis for Curriculum Enhancement. SPACE offered its

first set of workshops in summer 2004. By summer 2007, 218 university instructors and Ph.D. candidates had been introduced to applications of spatial tools to help enhance the integration of spatial thinking for undergraduates across the social sciences. SPACE promoted the value of spatial thinking and associated technologies as a basis for integrating knowledge among disciplines and motivating students through project-based learning on applications relevant to understanding society.

SPACE workshop participants lived together in university dormitory settings and took part in intensive daily training and discourse. Although there was a focus on selecting early-career scholars, participants spanned academic generations, and workshop activities encouraged collaborative networks among participants by stressing the commonality of the spatial perspective to problem identification and to research and teaching approaches. The disciplinary mix of SPACE participants spanned a range of knowledge domains and interest in workshop participation exceeded capacity by a significant margin (Table 2).

This report describes and analyzes SPACE workshop experiences in engaging social science instructors in discourse on enhancing the spatial analytic skills of undergraduate students and in serving as a platform for the sustained dissemination of spatial thinking in the social sciences.

The findings presented in this report are based on two analyses:

1. A review of SPACE participant selection and assessment of their entry, exit, and follow-up survey responses; and
2. A review of how workshop participants used SPACE's follow-up programs to deepen their understanding of spatial methodologies for spatial thinking and to facilitate national dissemination at campus, regional, and national levels.

These analyses are described and interpreted below under the following headings:

2. Applicants and Participants
3. Professional Development in SPACE
4. SPACE Resources for Teaching and Learning (SPACE website)
5. Follow-up Support for Workshop Participants: Educational Development Awards
6. Follow-up Support for Workshop Participants: Academic Conference Courses to Enhance Spatial Science (ACCESS)
7. Impact of SPACE from the Analysis of Participant Surveys
8. Conclusions

Appendices (survey forms, participants, and participant comments)

2. APPLICANTS AND PARTICIPANTS

In advertising the program, the general criteria for selecting participants included having experience with computers and a favorable disposition to rigorous analysis, enthusiasm and commitment to teaching undergraduate students, as well as assembling a group with representation from across social science disciplines.

Having a large number of applicants to choose from enabled a good fit between the expectations of the workshop leaders and the experience and abilities of participants. Thus, although faculty members were preferred for this program, a few Ph.D. candidates (showing a strong commitment to teaching undergraduate students) also participated. Participants agreed to include spatial perspectives and analysis in their undergraduate courses and to complete follow-up surveys on their uses of the workshop experience to enhance undergraduate courses and curriculum. In general, program applicants were comfortable with quantitative methodologies in the social sciences, although not necessarily from a spatial perspective.

The discipline breakdown for the aggregate of all 218 participants over all workshops reflects prevailing patterns of academic activity in spatial analysis within the social sciences and related specializations. The final distribution of participants across disciplines is also related to the program's deliberate attempts to achieve a broad representation of the social sciences, focusing on participants with high estimated potential for new dissemination.

Owing to their potential for achieving greater immediate dissemination, existing university faculty members with Ph.D.s were favored (72% of final participants) over applicants still in student status. Women (52%) were admitted at a slightly higher rate than men (48%). All eleven workshops had both male and female instructors.

Table 2. SPACE Workshop Participants and Applicants 2004–2007				
Disciplines	Applicants	Participants	Acceptance Rate	Percent of Total Participants
Anthropology	19	12	.63	5.5
Archaeology	14	11	.79	5.0
Art & Design	1	1	1.00	0.5
Communications	1	1	1.00	0.5
Computer Science	20	0	.00	0.0
Criminology	9	7	.78	3.2
Demography	8	6	.75	2.8
Economics	24	17	.71	7.8
Education	2	2	1.00	0.9
Environmental Studies	30	14	.47	6.4
GIS	75	27	.36	12.4
Geography	48	33	.69	15.1
History	7	4	.57	1.8
Political Science	24	17	.71	7.8
Psychology	20	0	.00	0.0
Public Health	11	9	.82	4.1
Public Policy & Management	3	1	.33	0.5
Regional Science	6	4	.67	1.8
Religious Studies	1	1	1.00	0.5
Sociology	46	33	.72	15.1
Statistics	3	2	.67	0.9
Tourism Planning	2	2	1.00	0.9
Urban/Region Planning	25	10	.40	4.6
Urban Studies	13	4	.31	1.8
Other	2	0	0.00	0.0
Total:	378	218	.58	
Gender/Minorities:				
Female	166	113	.68	51.8
Male	212	105	.50	48.2
Designated Minorities	59	43	.73	19.7
Completion:		% completed		
- workshop	216	99.1		
- entry survey	217	99.5		
- exit survey	202	92.7		
- follow-up survey	136	62.4		

The applicant pool for SPACE workshops was sufficiently large to allow **diversity** based on discipline, gender, and type of academic institution (e.g., liberal arts and technical colleges, and comprehensive research universities). Thus, as documented in Table 2, nearly 20 percent of workshop invitees were instructors from institutions that NSF designates as minority-serving (Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions, and Tribal Colleges). Diversity is regarded by NSF as a key factor in achieving national dissemination, providing opportunities to advance student learning with technologies that reflect growth in economic opportunities for minorities.

Success in reaching designated minority individuals exceeded our expectations—the result of focused initiatives, including extra financial stipends to encourage participation by qualified candidates. This resulted in 43 participants from Hispanic American, Native American, and African American communities (drawn from 59 applicants). The acceptance rate for minority applicants was 73 percent, compared with an acceptance rate of 53 percent for all 378 applicants.

3. PROFESSIONAL DEVELOPMENT IN SPACE

STRUCTURING WORKSHOPS AND PROGRAM OBJECTIVES

SPACE's specific **goal** was to assist faculty in becoming innovative teachers in the use of spatial analysis, enabling them to provide opportunities for their students to work directly with geo-referenced databases and the latest software. Correspondingly, each workshop featured outstanding computer and instructional facilities as well as support from workshop leaders recognized for their ability to communicate across disciplinary boundaries. Hands-on experience and customized support for each workshop participant were of critical importance to achieving workshop outcomes that participants could then transfer to their home institutions.

The **general objectives** of the workshops were to:

- demonstrate the value of knowledge integration through a common focus on spatial perspectives for enhanced understanding of problems traditional to the social sciences—a goal consistent with recent high-profile statements on the importance of the spatial perspective (Colwell, 2004; Butz & Torrey, 2006);
- promote the integration of technology in undergraduate education by exposing workshop participants to software tools that are both fiscally affordable for their institutions and cognitively accessible for their students;
- establish and encourage support networks based on strong peer-to-peer interaction throughout the workshop period and in follow-up activities; and
- lay the foundation for broad national dissemination of spatial thinking in the social sciences.

WORKSHOP PEDAGOGY

A primary concern of workshop organizers was to facilitate the transfer of the workshop experience to undergraduate teaching. This transfer influenced all aspects of workshop planning and was guided by the following questions:

- How can materials and concepts presented in workshops be reconciled with what participants can teach in their undergraduate courses?
- How can workshops be structured to illustrate the benefits of alternative teaching formats that participants might use to enhance the learning of their undergraduate students?
- How can workshops encourage and equip participants to adopt learning assessment practices with their students?
- How can workshops engage participants in useful strategies for finding and manipulating relevant data for use in their undergraduate teaching?

The pedagogy for different sections of the workshops was varied to help demonstrate the value of different types of instruction; for example, combinations of small-group discussions, individual laboratory assignments, and lectures can address a variety of learning goals and student learning styles (McCray, DeHaan, & Schuck, 2003).

Because workshop participants came from different disciplinary backgrounds and had varied levels of prior exposure to spatial thinking, exercises were designed to meet the needs of both novice and experienced users of GIS and spatial statistics. Participants were paired for some exercises so that one had more experience than the other. This not only provided teaching opportunities for more experienced participants, but also required that workshop exercises be designed to provide enough challenge and simultaneously offer a reasonable starting point for less experienced participants.

CURRICULUM DEVELOPMENT, LEARNING ASSESSMENT, AND THE WORKSHOP AGENDA

The actual structuring of the workshop agenda considered the characteristics of the participant group—their disciplines, prior knowledge and experiences, and stated personal objectives for participating, as determined by their responses in application and entry surveys. Using one of the workshops at the University of California, Santa Barbara (UCSB) as an example, the workshop's structure was sufficiently flexible to permit participant requests for topical discussions or instruction and for one-on-one consultation.

A stylized graphic agenda (Figure 1) provides a summary of the workshop syllabus for the 2007 workshop at UCSB. From left to right, the five columns (time arrows) reflect the general sequence of activities over the six days. They represent: (1) general logistics for academic and social events, (2) linking spatial theory and analysis with social science perspectives, (3) alignment of theory and analysis skills with pedagogic needs and assessment of student learning, (4) structured labs for the development of technical skills, and (5) preparation of individual projects for presentation on the final day of the workshop. See the full agenda at <http://www.csiss.org/SPACE/workshops/2007/UCSB/agenda.php>.

The workshop schedule provided early opportunities for participants to share previous experiences and expertise, especially in terms of curriculum development and assessment (see Figure 1, column 3, pedagogy and assessment). An early introduction to relevant cognitive theories about spatial learning (McCray, DeHaan, & Schuck, 2003; National Research Council, 2006) was motivated by the expectation that these would guide the design of participant presentations for the final day of the workshop (column 5). Research on the influence of prior knowledge was discussed and strategies for collecting data on the entry-level knowledge of students were suggested (Bransford, Brown, & Cocking, 1999). In practice, only a few workshop participants had experience in assessing the prior knowledge of their students.

Participants also shared experiences on course evaluations and learning assessments, frequently noting the benefits of short in-class exercises, individual projects, and group work on projects in local communities. These discussions supplemented ideas on in-class surveys for learning assessments for tracking the progression of student learning on such topics as data interpretation, synthesis, problem analysis, and modeling. Other discussions focused on matching course objectives and instruction with the final performance assessment of student achievement (Angelo & Cross, 1993), and on ideas of how to guide students in developing portfolios of their work to satisfy course requirements as well as for use in future careers.

PROFESSIONAL DEVELOPMENT ISSUES IN SPACE

To prompt discussion about SPACE professional development priorities for **program evaluation and student assessment**, Fiona Goodchild (SPACE Coordinator of Professional Development) provided guidance to instructors in the various workshops, raising questions and identifying goals that link SPACE program initiatives with NSF's CLLI objectives for learning in STEM disciplines. Annual planning meetings in December 2003, 2004, and 2005 were of exceptional value in sorting out priorities for program development, establishing criteria for selecting participants, determining the differentiation of workshops, initiating the organization of workshop materials, and planning final workshop agenda. They also provided an opportunity for workshop instructors to reach common understanding about the importance of program evaluation and the promotion of good practices of student assessment. In these meetings, Goodchild was assisted by Kathryn Plank (Associate Director, Faculty & TA Development, Ohio State University), Jon Pederson (Dean, College of Education, University of Oklahoma), Stacy Rebich-Hespanha (graduate student interested in student learning, UCSB).

Donald Cartwright (Coordinator, Faculty Mentor Program in the Teaching Support Centre, University of Western Ontario), Eric J. Fournier (Chair, Department of Geography and Co-Principal Investigator for an NSF-funded project on Academic Excellence through GIS project (AEGIS), Samford University), Richard Johnson and Stanley Nicholson (former directors, Office of Instructional Consultation, UCSB) participated as external consultants regarding professional development, pedagogy, and learning assessment for SPACE. Together, this team demonstrated exceptional leadership in directing the SPACE program toward an insightful incorporation of successful professional development practices that were valued highly by workshop participants.

Goodchild, Plank, Rebich-Hespanha, and Pederson were on hand for all the workshops at their institutions, providing lectures on pedagogy and learning assessment, guiding group discussion, and assisting workshop participants with issues of project and curriculum development and instrument design. In addition, Goodchild and Rebich-Hespanha provided professional development support for the workshops at San Diego State University (2004) and San Francisco State University (2005).

SPACE workshop 2007 - UCSB

participants ♦ instructors

prior knowledge ♦ experience ♦ expertise

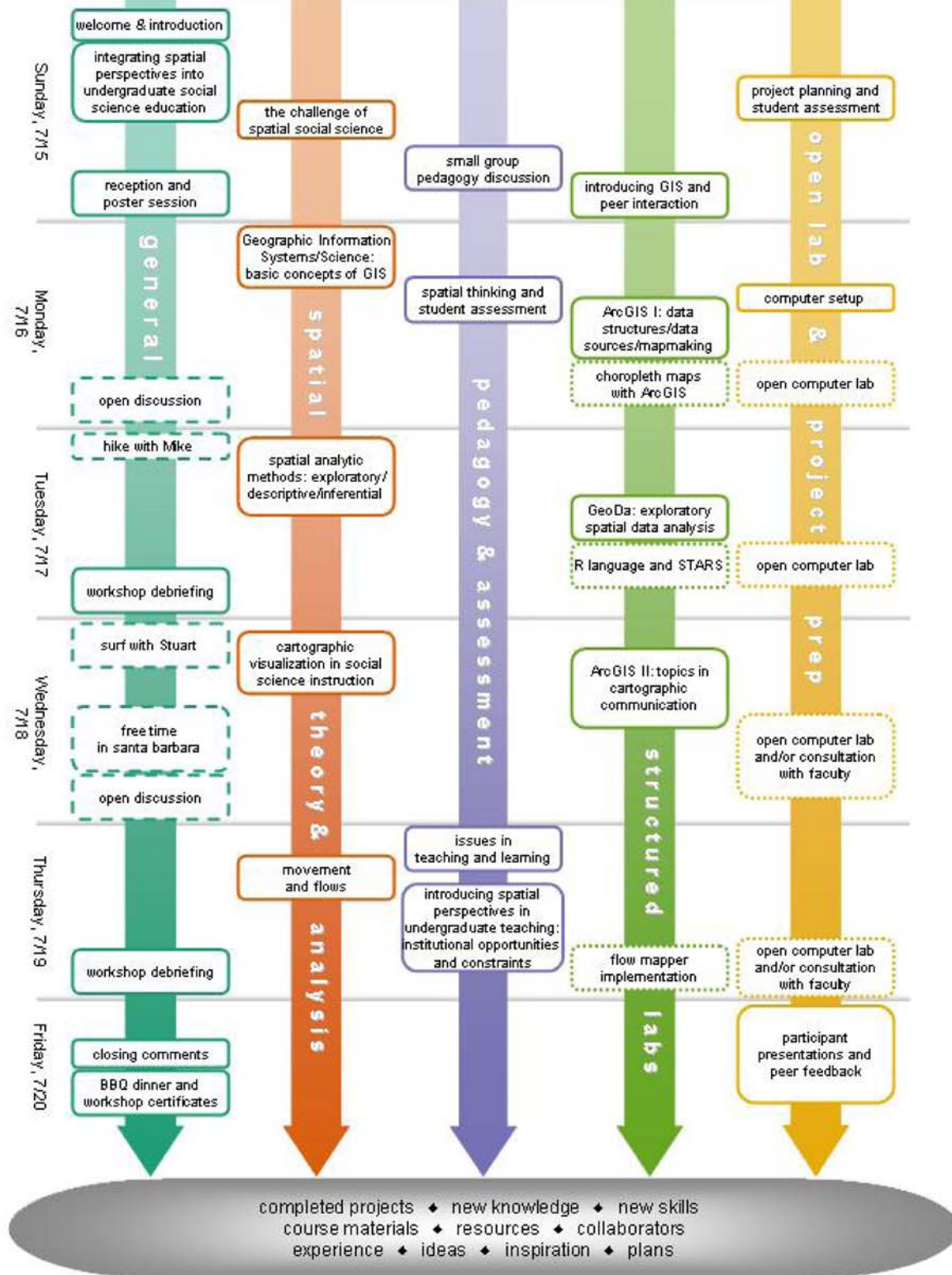


Figure 1. Summary of the workshop syllabus for the 2007 workshop

Two questions were of special significance for the development of SPACE workshops and for the transfer of workshop experiences to promote undergraduate learning opportunities:

1. To what extent will SPACE programs influence the incorporation of spatial perspectives and analysis into undergraduate courses?

Program Evaluation

- How do participants benefit from participation in SPACE workshops and follow-up activities?
- This question was considered for three suggested dimensions of **professional development objectives**, listed below.

PERSONAL:

- Improve fundamental understanding of spatial methods and principles.
- Improve ability to understand and use related software.

PROFESSIONAL:

- Engage faculty in development of curriculum, including lab exercises, demonstrations, and lectures.
- Engage faculty in collaboration with network of researchers who teach social science courses from a spatial perspective.
- Disseminate teaching resources on SPACE web site or at academic meetings (providing guidelines and criteria for identifying best practices).

INSTITUTIONAL:

- Enhance undergraduate curriculum with new concepts, principles, and techniques of spatial analysis.
- Implement new undergraduate courses that build on spatial thinking and perspectives, such as GIS and spatial pattern analysis.
- Conduct student evaluation of new initiatives.

These professional development objectives for SPACE provided a basis for designing questions that appeared on the workshop application form, as well as in the entry, exit, and follow-up surveys of workshop participants. This approach helped to document the prior knowledge of participants entering workshops and provided benchmarks for measuring and documenting relevant results and program success. Surveys included both open-ended questions and scaled rankings of specific items. They were supplemented in most workshops with instructor-directed discussions about technical issues in spatial analysis and with peer-group discussions about pedagogical and assessment practices.

2. How can SPACE help faculty to develop methods for assessing and grading student learning and performance in enhanced or new courses?

Student Assessment

- SPACE did not have the resources to conduct student assessment at remote sites. However, to make the claim that a spatial perspective is important to student achievement in social science disciplines, all SPACE workshops presented and discussed methods for faculty to use in documenting the impact of pedagogical initiatives on student learning.
- Workshop discussion focused on the types of questions and rubric designs that are matched to instructional and learning objectives and that demonstrate student learning and understanding of spatial concepts and analytical approaches.
- At UCSB the Office of Instructional Consultation offers help on certain topics (e.g., how to guide instruction, enhance learning, or assign grades), and provides examples of assessment used in various courses. Since many workshop participants work within the constraints of their local departments or institutions, they were encouraged to seek guidance from campus resource centers and local peers who are currently engaged with the design and use of assessment instruments.

REFERENCES CITED IN SECTION 3:

- Angelo, T. A., & K. P. Cross (1993) *Classroom Assessment Techniques: A Handbook for College Teachers*. San Francisco, CA: Jossey-Bass.
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- Butz, W., & B. B. Torrey (2006) Some frontiers in social science, *Science*, 312(5782): 1898–1900.
- Colwell, R. (2004) The new landscape of science: a geographic portal, *Annals of the Association of American Geographers*, 94(4): 703–708.
- McCray, R. A., R. L. DeHaan, & J. A. Schuck, Eds (2003) *Improving Undergraduate Instruction in Science, Technology, Engineering, and Mathematics: Report of a Workshop*, National Research Council Steering Committee on Criteria and Benchmarks for Increased Learning from Undergraduate STEM Instruction. Washington, DC: The National Academies Press.
- National Research Council (2006) *Learning to Think Spatially: GIS as a Support System in the K-12 Curriculum*. Washington, DC: The National Academies Press.

4. RESOURCES FOR TEACHING AND LEARNING (SPACE WEBSITE)

LEARNING AND TEACHING RESOURCES

Workshop participants had access to an extensive set of resources available on the CSISS and SPACE websites to assist their preparations for the workshop and to make use of in their own teaching. Through the CSISS Learning Resources portal at http://www.csiss.org/learning_resources, they had access to the following:

- The CSISS **GIS Cookbook**—simple tutorials on basic GIS operations aimed at social scientists with minimum knowledge of geography and GIS and its underlying principles.
- CSISS **edited video clips**—presentations by instructors from prior workshops on *Map Making and Visualization of Spatial Data in the Social Sciences*, *Spatial Pattern Analysis in a GIS Environment*, and *Geographically Weighted Regression* (Fotheringham, Brunsdon, & Charlton, 2002).
- The **CSISS Classics**—a collection of vignettes that feature summary discussion about contributions to spatial thinking by social scientists. The *Classics* give primary emphasis to research before 1980, with an attempt to capture and acknowledge the repository of spatial thinking from such disciplines as anthropology, economics, geography, history, political science, sociology, and urban studies over the past few centuries. This collection, visited by approximately 30,000 visitors per month, documents some of the intellectual inheritance of spatial thinking by social scientists and is a useful resource for students.

The spatial tools page (<http://www.csiss.org/clearinghouse/>) enabled the downloading of spatial statistics software, including:

- **GeoDa™** for exploratory spatial data analysis—one of the primary software tools used in SPACE workshops. Aside from its value as a serious research tool, it provides an excellent resource for engaging undergraduate social science students in rigorous data analysis and visualization exercises (Rey & Anselin, 2006).
- **FlowMapper**, developed by Waldo Tobler for mapping flows from interaction matrices, was another easy-to-use tool appropriate for exercises to use in undergraduate teaching.

In addition, the SPACE site offered an assembly of resources organized by discipline (including syllabi and exercises) and information on learning assessment and curriculum development. Guides for selecting GIS software and for using virtual globes (e.g., Google Earth) were oriented to applications in teaching. A special collection of instructional innovations from prior workshop participants illustrated the benefits of the SPACE program and provided pedagogic guidance for other social scientists seeking to adopt spatial perspectives in teaching (<http://www.csiss.org/SPACE/materials/participants/>).

The SPACE website was the principal vehicle for managing SPACE programs across different universities, distributing workshop materials to participants, and sharing teaching and learning resources. Resources organized by discipline have proven especially popular for visitors to the site (including workshop participants). In the no-cost extension period (October 2007–March 2009), the discipline section was enhanced, consolidating resources

from various places on the site (learning, teaching, and assessment materials; links, special collections (e.g., CSISS classics), workshop participant contributions, and conference sessions, etc.) around discipline names that are common search terms. It is anticipated that this will facilitate both academic and public accessibility to resources upon conclusion of the SPACE program.

Traffic logs for the site were analyzed using *WebTrends Log Analyzer*.

Table 3. Use of Website (www.csiss.org/SPACE) 1 January 2004–31 March 2009					
Reporting Period:	1/1/04– 7/31/04	8/1/04– 8/15/05	10/1/06– 9/30/07	10/1/07– 9/15/08	9/2/08– 3/31/09
Days in reporting period	213	380	365	351	211
Total hits	179,491	584,598	661,947	458,916	283,329
Average hits per day	843	1,538	1,814	1,307	1,342
Total visitors	11,730	54,760	114,993	77,892	43,477
Average visitors per day	55	144	315	223	206
Number of unique visitors	3,010	12,788	23,463	21,384	14,797
Percent repeat visitors	27	23	26	31	18
Average visitor length (minutes)	12.2	21.4	13.5	21.2	26.3
The Most Requested Areas on the Site (number in period / average number per day)					
Home page	2,059 / 10	6,354 / 17	7,676 / 21	6,164 / 18	6,184 / 29
Workshop home page	2,857 / 13	4,169 / 11	5,033 / 14	4,404 / 12	3,188 / 15
Discipline Resources	992 / 5	3,463 / 9	9,768 / 27	6,332 / 18	5,462 / 26
Learning resources	538 / 3	1,276 / 3	1,788 / 5	1,404 / 4	1,263 / 6
Teaching materials	582 / 3	1,269 / 3	1,777 / 5	1,307 / 4	1,282 / 6
Participant contributions			1,468 / 4	1,086 / 3	987 / 5
About the program			1,653 / 5	1,291 / 4	1,170 / 6
Choosing a GIS		1,139	2,095	993	
Forum	769	2,414			
My page	579				
UCSB workshop	889	1,591	1,717		
OSU workshop	772	1,289	1,702		
SDSU workshop	743				
SFSU workshop		1,160			
Oklahoma workshop			1,010		
Workshop application	502	1,100	1,123		

It was anticipated that use of the website would decline following the final SPACE workshops in 2007. This has been the case, however, the decline has not been substantial. Because the reporting periods vary in duration, raw number of hits and visitors are standardized to per-day measures. An increase in the average time that visitors spend on the site is a possible indicator that current users value the site; however a drop in the proportion of repeat users may be a sign that the absence of annual workshops has decreased its immediate attraction. Based on the exit surveys of workshop participants, an assessment of the site's value was presented in prior annual reports. Regrettably, the annual follow-up surveys did not track the persistence of its value for these participants.

REFERENCES CITED IN SECTION 4:

- Fotheringham, A. S., C. Brunsdon, & M. Charlton (2002) *Geographically Weighted Regression. The Analysis of Spatially Varying Relationships* (New York: John Wiley).
- Rey S., & L. Anselin, Eds (2006) Special issue on software for spatial analysis in the social sciences, *Geographical Analysis* 38(1).

5. FOLLOW-UP SUPPORT FOR WORKSHOP PARTICIPANTS

LEVERAGING WORKSHOPS THROUGH ACADEMIC DEVELOPMENT AWARDS

While the workshops were vehicles for dissemination of spatial thinking and methodologies to a number of scholars, their effectiveness was enhanced by follow-through professional development opportunities and active peer support networks established during the workshops. Special initiatives to maintain the momentum for workshop participants and to engage them as active agents of dissemination included a program of academic development awards.

Based on participants' accomplishments with instructional innovations at their home institutions, the awards program made modest funds available for the design of exercises, implementation of new courses, and organization of local workshops and seminars to expand resources and interest in spatial methodologies among faculty from different disciplines. These awards also supported their continued acquisition of skills by attending special training sessions and the building of databases that contribute to exercises based on social and environmental problems in local regions. These accomplishments are summarized in greater detail in Table 4 and on the SPACE website, where they represent resources for use and inspiration to other instructors and website users (see <http://www.csiss.org/SPACE/materials/participants/>).

Recipients represent the disciplines of anthropology, archaeology, communication, criminal justice, demography, economics, geography, health sciences, history, international studies, library science, political science, resources management, sociology, and urban studies/planning. This program has enabled SPACE to provide examples on its website of what workshop participants have accomplished, while simultaneously providing a resource base of ideas, exercises, and syllabi for website visitors and for other workshop participants. Awardees did not necessarily use all of the funds allocated to them; this allowed for a few additional awards during the no-extension period of NSF support.

Table 4. SPACE Instructional Development Awards 2004–2009

Award Recipients	Affiliation	Accomplishments	Use of Award
2004 Awards			
<p>Veronica Arias, Heather Richards, & Judith Van der Elst \$2250</p>	<p>Archaeology, University of New Mexico</p>	<p>Developed new undergraduate course on Geospatial Analysis in Archaeology.</p>	<p>Participated in a conference and workshop; organized a campus-wide symposium on spatial analysis for archaeologists, and completed further course development.</p>
<p>Kathleen Bell \$1000</p>	<p>Economics, University of Maine</p>	<p>Altered course on Resource Economics to include independent student projects and spatial thinking using GIS and spatial statistics.</p>	<p>Attended conference on Computers in Urban Planning and Urban Management, in London, to gain new ideas for course development.</p>
<p>Wendy Bigler \$750</p>	<p>Geography, Southern Illinois University Carbondale</p>	<p>Designed core curriculum class on “Environmental Conservation” that emphasizes critical spatial reasoning. Introduced GeoDA-based exercises for three other courses.</p>	<p>Collaborated with Chris Weiss on a “best practices” article about using GeoDA in undergraduate social science classrooms for presentation at the 2006 annual meeting of the American Association for the Advancement of Science (AAAS).</p>
<p>Mark Bjelland \$1000</p>	<p>Geography, Gustavus Adolphus College</p>	<p>Develop a new course syllabus that makes use of GeoDa and ArcView, introduced GeoDa to colleagues for undergraduate teaching, and developed plans for a college-wide workshop on why space matters in statistical analysis.</p>	<p>Attended conference on Computers in Urban Planning and Urban Management, in London, for purposes of further undergraduate course development.</p>
<p>Ulla Bunz \$1000</p>	<p>Communication, Rutgers University</p>	<p>Redesigned course syllabus to include “spatial perspectives on social change” and developed student field-research exercises.</p>	<p>Organized a short course on integrating spatial research in communication teaching for the International Communication Association meetings in Dresden (2006).</p>
<p>Owen Dwyer \$500</p>	<p>Geography, Indiana University, Indianapolis</p>	<p>Developed course exercise to measure the influence of distance on society, using the gravity model as a basis for students to apply and think critically about spatial modeling.</p>	<p>Participated in spatial analysis workshops at the annual meeting of the Association of American Geographers.</p>
<p>Jo Beth Mertens \$1250</p>	<p>Economics, Hobart & William Smith Colleges</p>	<p>Developed a course exercise “Introducing Spatial Analysis Using GeoDa” and gave related presentation at the “Teaching Economics: Instruction and Classroom-based Research” conference.</p>	<p>Attended a course by Luc Anselin on spatial statistics and offered a seminar on spatial analysis in teaching for undergraduate instructors at Hobart & William Smith Colleges.</p>

Award Recipients	Affiliation	Accomplishments	Use of Award
David Padgett \$750	History, Geography, & Political Science, Tennessee State University	Designed modules using student-gathered research data to demonstrate spatial concepts, using Arc GIS, GeoDa, and FlowMapper.	Gave presentation on “GIS-Supported Demonstration Modules in an Undergraduate Urban Geography Course” for the 2005 ESRI Education User Conference.
Susan Pulsipher \$500	Director, Library Services, Methodist College	Developed syllabus for course on <i>Introduction to Spatial Analysis</i> and planned a baseline survey on GIS use prior to incorporating GIS into the curriculum of the college.	Participated in workshops to enhance uses of GIS in studies of criminal justice and community participation, and presented papers on using GIS in teaching to conferences on library and information science.
Sumeeta Srinivasan \$500	Div. of Engineering & Applied Sciences, Harvard University	Introduced course on “Spatial Analysis of Environmental and Social Systems,” attracting students from Applied Mathematics, Economics, Environmental Sciences, the Kennedy School of Government, Earth and Planetary Sciences, and Environmental Engineering. GIS and GeoDa are featured.	Explored organization of a Harvard/ MIT/ BU community workshop on spatial analysis involving leading researchers in the GIS and spatial analysis fields. Presented a paper on teaching spatial analysis to a social science conference.
Christopher Weiss \$750	Sociology, Columbia University	Designed new courses for interdisciplinary Urban Studies undergraduate program at Columbia-Barnard: “Conceptual Issues in Spatial Analysis for the Social Sciences,” and “Methodological Issues in Spatial Analysis for the Social Sciences.” Both courses employ modules for students to use GIS and GeoDa software.	Collaborated with Wendy Bigler on a “best practices” article about using GeoDA in undergraduate social science classrooms for presentation at meetings of the AAAS and the Association for Public Policy Analysis and Management.
Petra Zimmermann \$1250	Geography, Ball State University	Enhanced GIS course for a broad audience of social science and environmental science students.	Organized an on-campus workshop on “An Introduction to Spatial Analysis” for faculty and graduate teaching assistants at Ball State University.
2005–2006 Awards			
Claude Barnes & Laurie Garo \$2,500	Political Science & Criminal Justice, North Carolina A&T State University; Geography & Earth Sciences, University of North Carolina at Charlotte	Created new GIS for Social Science courses at (HBCUs) in North Carolina, including <i>GIS in Criminology for Social Sciences</i> at Johnson C. Smith University and <i>GIS for Social Sciences</i> at North Carolina A & T University.	Organized a workshop and gave presentations on the introduction of GIS courses for social scientists at the Thirteenth National HBCU Faculty Development Symposium in Houston in October 2006.

Award Recipients	Affiliation	Accomplishments	Use of Award
Wenquan (Charles) Zhang \$1,250	Sociology, Brown University / Texas A&M University	Designed and implemented a GIS course at Brown University for sociologists and other social scientists.	Participated in an ESRI Arc-IMS training course.
Christopher Holoman \$1,000	Political Science, Hilbert College	Mentored students in Weapons and War course for modeling the projection of military force across space.	Organized a workshop in Fall 2006 to provide orientation in spatial analysis for Hilbert faculty.
Benjamin Forest \$1,250	Geography, Dartmouth College; currently at McGill University	Developed a GIS course project to help students understand social and economic consequences of space.	Revised course exercises to explore the political consequences of political representation and sovereignty in Quebec.
Adriana Abdenur \$1,250	International Affairs, The New School Cultural & Social Anthropology, Stanford University	Modified a course on Urbanization and Inequality in South Africa, initiated discussion on developing a more explicit spatial focus in studies of international development, published an article in the New School <i>International Affairs Bulletin</i> on the need for spatial perspective in teaching and research, and established a partnership with the New School's Parsons Institute for Information Mapping to create pedagogical materials on inequality in cities of the developing world.	Acquired data for student exercises and engaged students in the development, design, and publication of didactic materials for use in courses on urbanization and segregation of South African and Brazilian cities.
Paulla Ebron & Claudia Engel \$750	Sociology, Cornell University	Introduced GIS-based exercises and spatial perspectives in introductory courses on the anthropology of globalization.	Acquire geo-referenced demographic and economic data on non-US global cities and employed undergraduate research assistants to create a repository of shapefiles for developing teaching resources.
Joe D. Francis \$750	Political Science, University of California, Berkeley	Developed and taught course on Analytic Mapping and Spatial Modeling.	Participated in the 2007 summer workshops on Spatial Regression at the University of Illinois, Urbana-Champaign as a foundation for developing a new course on spatial statistics.
Iris Hui \$1,200	Geography, Indiana State	Developed a 2006–2007 seminar series at UCB on <i>Social Science in Place: GIS, Spatial Concepts and Applied Social Science</i> .	Organized a Panel discussion at the 2007 annual meeting of the American Political Science Association on “GIS, Spatial Statistics, and Political Science” and participated as a panelist

Award Recipients	Affiliation	Accomplishments	Use of Award
Nancy Obermeyer \$750	University, Terre Haute History, Geography, and Political Science, Fort Valley State University	Undertook several initiatives to expand GIS teaching applications across a range of disciplines at Indiana State.	to explore GIS applications in political science at the 2007 annual meeting of the Association of American Geographers. Organized campus workshops for creating teaching modules and for helping researchers in the use of GIS.
Iheanyi N. Osondu \$500	Office of the Vice President for Academic Affairs, Trinity University (San Antonio)	Developed a new undergraduate certificate course in GIS.	Organized a campus enlightenment event on the uses of GIS in undergraduate teaching and on the value of GIS in serving the local region of Fort Valley State University.
Claudia Scholz \$810	Geology & Geography, Georgia Southern University	Worked with colleagues and students on applications of GIS, mapping, and spatial thinking in teaching and research; and organized a panel of prior participants in SPACE workshops to explore <i>Integrating Spatial Thinking into the Sociology Curriculum</i> at the 2007 annual meeting of the American Sociological Association.	Participated in an ESRI training session on GIS to assist her development of content for sociology courses at Trinity University.
Wei Tu \$810	Geography & Environment, Boston University	Developed Internet GIS resources for teaching and enhancing existing courses in GIS and cartography.	Attended an advanced ArcIMS training session offered by ESRI to assist in expanding the use of Internet GIS in teaching.
Joan Walker \$750	Currently Transportation, University of California, Berkeley	Enhanced courses in GIS and in Economic Geography with greater hands-on GIS applications.	Initiated discussions on establishing a region-wide alliance of GIS instructors in the Boston area for sharing web resources on GIS case studies.
2007 Awards			
J. Kevin Byrne \$750	Visualization and Sustainable Design Program, Minneapolis College of Art and Design	Developed a one-month module on exploratory spatial data analysis for a 2 nd -/3 rd -year course on Visual Thinking and developed a proposal for a new course on Introduction to Geovisualization that will introduce students to uses of ArcGIS, GeoDa, and various Web resources.	Presented a tutorial on the use of Parallel Coordinate plots in GeoDa for the 2008 World Congress in Computer Science, Computer Engineering, and Applied Computing, titled "Parallel Coordinates at Age 30: Why and How GeoDa Works as a Powerful and Intuitive Method for

Award Recipients	Affiliation	Accomplishments	Use of Award
<p>Rajrani Kalra \$1,000</p>	<p>Geography, University of Central Arkansas / currently at California State University San Bernadino</p>	<p>Developed GeoDa-based exercises to introduce spatial thinking in undergraduate courses and worked on the organization of a campus-wide workshop on Thinking Spatially in the Social Sciences.</p>	<p>Geovisualizing Demographic Data.” Participated in a workshop on Advanced Analysis with ArcGIS.</p>
<p>Allan Joseph Medwick \$1,200</p>	<p>Office of Institutional Research and Department of Computer Science, Kean University</p>	<p>Developed a workbook on GIS for a 6-hour workshop on Spatial Analysis for Institutional Research and introduced GIS and spatial analysis in an undergraduate course on Technology and Information Systems in Modern Society.</p>	<p>Participated in a workshop on Advanced Analysis with ArcGIS.</p>
<p>Sookhee Oh \$1,200</p>	<p>Sociology, University of Missouri, Kansas City</p>	<p>Introduced spatial analytic approaches in an undergraduate course on Methods of Sociological Research, required for sociology and criminology majors. Initiated the development of a new course on Spatial Thinking in the Social Sciences.</p>	<p>Participated in the Advance Spatial Analysis Workshop on Spatial Pattern Analysis offered by the Center for Spatially Integrated Social Science at the University of California, Santa Barbara in 2008.</p>
<p>Heather Richards-Rissetto & Judith van der Elst \$1,225</p>	<p>Anthropology, University of New Mexico</p>	<p>Developed and taught new courses on GIS applications in anthropology and archaeology, promoted awareness of spatial methods for teaching and research at the University of New Mexico, organized a conference symposium on GIS in archaeology education, and developed a course in visualization in conjunction with UNM’s Art and Technology Lab.</p>	<p>Developed and implemented a summer 2008 class on spatial methodologies of relevance to local minority students and their communities in New Mexico.</p>
<p>Michael Strager \$1,200</p>	<p>Resource Management, West Virginia University</p>	<p>Developed a new course on Applied GIS for the Social Sciences to be taught for the first time in fall 2008.</p>	<p>Trained graduate assistants and acquired data and software for student exercises.</p>
<p>Steve Wuhs \$1,250</p>	<p>Government & International Relations, University of Redlands</p>	<p>Developed and taught a new course on Territorial Politics: Territory, Politics, and Economy, the first example of a lab-based social science course at UR. The labs provide students with exposure to spatial analytic software, such as GeoDa and</p>	<p>Created a speaker series of spatially inclined social scientists to complement the course on Territorial Politics and to illustrate the value of spatial perspectives for teaching more broadly across the university.</p>

Award Recipients	Affiliation	Accomplishments	Use of Award
		ArcMap, and to applications of the GoogleEarth geo-browser.	
2008—2009 Awards			
Diana Grigsby-Toussaint \$1550	Kinesiology & Community Health, University of Illinois at Urbana-Champaign	Developed a two-day Health GIS workshop (2008) to introduce undergraduate students in the College of Applied Health Sciences to the applications of GIS in health.	Developed and offered a GIS and Health workshop (2009) for students in the College of Applied Health Sciences.
Leah Greden Mathews \$750	Economics, University of North Carolina, Asheville	Added spatial components to a second-year multi-disciplinary course in Land Economics, and structured the final course project to focus on spatial dimensions of sustainable regional development.	Incorporated local spatial data sets and spatially oriented activities in two regularly taught classes. Activities, for example, included students' use of spatial methods to analyze local production and consumption patterns.
Linda Loubert \$1000	Institute for Urban Research, Morgan State University	Provided exposure to the value of geospatial science to multi-disciplinary faculty and students.	Participate in an ESRI ArcGIS course and developed an introductory GIS workshop to encourage other faculty members to use GIS tools in their curriculum.
Chris Mayda \$600	Geography & Geology, Eastern Michigan University	Encouraged original research by undergraduate students and facilitated their participation in a national academic conference.	Supported undergraduate students in the development of instructional resources relating to cultural landscapes and sustainable development.
Michelle M. Thompson \$1250	Planning & Urban Studies, University of New Orleans	Helped to develop an urban and regional information system that has assisted community recovery efforts in New Orleans and provided related resources for undergraduate and graduate	Promoted dissemination of project methodology among instructors and researchers in urban studies through conference presentations.

6. FOLLOW-UP SUPPORT FOR WORKSHOP PARTICIPANTS

LEVERAGING WORKSHOPS THROUGH ACCESS

The **Academic Conference Courses for Enhancing Spatial Science** (ACCESS) program supported workshop participants in the organization of conference sessions that align with the SPACE objective of national dissemination of spatial thinking in social science undergraduate education. This report provides brief summaries for each of the conference programs that received ACCESS awards. More complete details, including abstracts, full presentations, and related instructional resources are available at <http://www.csiss.org/SPACE/workshops/sessions.php>. These resources offer examples of curriculum development, student exercises, learning assessment, instructional strategies, uses of spatial data, and research (both student research and faculty).

The National Society of Black Engineers (NSBE)

A SPACE-sponsored workshop on GIS, GPS, and Remote Sensing Applications in Support of Analyzing Urban Accessibility Issues and Emergency Preparedness and Response

Las Vegas, Nevada, March 28, 2009

Objectives: The primary objective of this workshop was to expose NSBE attendees to geospatial technology. The focus upon emergency preparedness and response provided a holistic educational approach that unites technical aspects of engineering with the social issues involved in mitigating the impacts of natural and anthropogenic hazards. Although geospatial technology applications are now a staple within the engineering profession, many HBCU students are not exposed to them in their collegiate curriculums. Relatively few HBCU engineering programs are known to have a significant presence of GIS-based courses.

This workshop targeted college and university faculty, practicing engineers, and students with little to no experience with geospatial technology. The workshop instructors encouraged student attendees to seek out GIS training opportunities, even if they must venture outside of their engineering colleges. Faculty attendees were presented with guidelines on how to push for the development of GIS-based courses on their campuses and were encouraged to find ways to work with geographers or other social scientists that are GIS-savvy in promoting student experiences in interdisciplinary applications of GIS. Information on career opportunities for students with GIS competency as presented.

NSBE is one of the largest student-managed organizations in the country and the annual convention attracts students, academicians, and technical professionals from the United States and two dozen other nations. The agenda includes professional workshops, a career/college fair, and technical exhibits (see <http://national.nsbe.org/>). With a convention attendance of about 10,000 each year, this was an excellent opportunity to expose geospatial technology to a new, ethnically diverse audience.

Workshop Instructors and Consultant:

Pamela Bingham, Director, Bingham Consulting Services, Silver Spring, Maryland. She is a former director of the Historically Black College and Universities (HBCU) Summer Faculty GIS Workshops. She was the NSBE liaison for this workshop.

Talia McCray, Assistant Professor of Community & Regional Planning, University of Texas at Austin. She led off the workshop with a presentation demonstrating innovative methods to address activity patterns of disadvantaged populations. She shared her research on mobility constraints and accessibility challenges for low-income women and youth and emphasized the great potential for GIS applications in transportation planning and engineering work.

David A. Padgett, Associate Professor of Geography and Director of the Geographic Information Sciences Laboratory, Tennessee State University. His presentation was on the importance of geospatial technology in emergency planning and response, especially in inner-city areas. He provided information about opportunities for training in GIS, obtaining GIS software, and developing a GIS-based curriculum. He also gave a "crash course" in the basics of GPS. Approximately 20 participants completed a GPS exercise simulating inner-city community-based efforts to locate emergency shelters. Each participant had a chance to work with a hand-held GPS receiver. Point locations of "potential emergency shelters" were logged, pertinent shelter attribute data were recorded on a worksheet, and the points were later mapped using ArcGIS to create a high-resolution image covering Las Vegas, Nevada.

Africa Map SPACE Workshop

Center for Geographic Analysis (CGA), Harvard University, Cambridge MA March 25, 2009



SPACE helped in the sponsorship of a one-day workshop to introduce and evaluate [AfricaMap](#) (a GeoPortal for Assisting Research and Teaching in the Humanities and Social Sciences). The event was hosted by the Center for Geographic Analysis at Harvard University, founded in 2006 as a technology platform in the Institute for Quantitative Social Science. Participants in the workshop came mostly from academic institutions and non-governmental organizations located in the northeastern portion of the United States.

Objectives: This workshop explored new perspectives in geospatial technology and new approaches to Africa humanities and social science research using **AfricaMap** as an interactive, open access technology framework. The technology is intended to provide key spatial and temporal data on Africa and could provide a framework for making spatial data accessible for less developed countries all over the world. AfricaMap offers a virtual space where scholars, practitioners, and students from around the globe and across disciplines can collaborate.

Many countries in Africa have been underserved in geospatial technologies. Spatial data exists, but it is difficult to find. In addition, gathered data is often lost because central archives are lacking. To address these problems, AfricaMap will:

- Map Africa with a high level of resolution online
- Allow users to explore Africa at different resolutions
- Accumulate both contemporary and historical data supplied by researchers and make them permanently accessible online
- Work with other spatial information sources for Africa in an online environment

Workshop Instructors

Wendy Guan, Director of GIS Research Services, CGA, Harvard University

Ben Lewis, Senior GIS Specialist, CGA, Harvard University

Sumeeta Srinivasan, Preceptor in Geospatial Methods, Department of Government, Harvard University. She is affiliated with the China Project at Harvard and teaches courses on GIS, spatial analysis, and modeling. She was a participant in the 2004 SPACE workshop at Ohio State University.

Workshop Schedule:

9:00–9:30	Signing in, logistics, getting set up.
9:30–10:00	Presentation by Wendy Guan, Director of GIS Research Services at CGA: Trends in Geographic Information Systems (GIS)
10:00–10:30	Presentation by Paul Cote, Graduate School of Design: Introduction to GIS Technology.
10:30–10:45	Break
10:30–11:15	Presentation by Ben Lewis of CGA: Introduction to the AfricaMap Framework
11:15–12:00	Demonstrations by Ben Lewis: System with reference to research tasks
12:00–1:00	Lunch
1:00–2:00	Hands-on Lab. Attendees will work through a series of exercises designed to cover the system's main functions. Help will be provided (see details on page 6 of the AfricaMap SPACE Workshop Handout.pdf).
2:00–2:30	Instructor summary of key functions with hands-on demo.
2:30–2:45	Break
2:45–3:30	Group Level Critique. We will divide into 5 groups and critique the AfricaMap system, developing ideas for improvement (see details on page 15 of the AfricaMap SPACE Workshop Handout.pdf).
3:30–4:00	Workshop Level Recommendations for Improvement. We will reconvene and derive a set of prioritized recommendations for future enhancements (see details on page 15 of the AfricaMap SPACE Workshop Handout.pdf).

The NONAP Community GIS Technology Workshop

University of New Orleans, New Orleans, Louisiana, February 22, 2008

Michelle M. Thompson, SPACE participant in 2004, is the founder and Director of the New Orleans Neighborhood Analysis Project (NONAP), an organization to help with the recovery of New Orleans after Hurricane Katrina. She was a Visiting Scholar in the Department of City & Regional Planning Cornell University at the time of NONAP workshop. She is currently a professor of urban planning at the University of New Orleans.

The "NONAP Community GIS Technology Workshop" provided students and Community Based/Neighborhood Organizations with GIS Mapping through hands-on exercises and demonstrations. NONAP is developing an information portal with geospatial tools, training, and technology that can be adapted for use by communities but also expandable to support academic research and education.

The **objectives of NONAP** are to:

1. Train student teams on how to use web-enabled information technology systems with relational databases.
2. Create a web portal of shared data services that will continue to be populated through a free, public, online environment for use by multiple asynchronous users.
3. Support existing public property community information systems, such as the City of New Orleans "Community on One Page" and Greater New Orleans Community Data Center.
4. Provide technical documentation to train community and university professionals on the use of the Internet mapping service through a custom interface.
5. Share ideas and information with universities and stakeholders to support intra-university, and community-university, resource sharing and research support.

For more Information, see: <http://www.csiss.org/SPACE/workshops/sessions.php#anc10> and <http://www.csiss.org/SPACE/materials/participants/2008/Thompson.php>.

2008 Annual Meeting of the American Society for Environmental History Workshop on Using GIS for Environmental History

Hosted by Idaho State University, Boise State University, and the University of Idaho, Boise, Idaho, March 14, 2008

Objectives: Spatial analysis is an important part of environmental history. This half-day workshop focused on ways to expand the interest in and awareness of GIS as a tool for teachers and scholars. Central goals were to make participants more aware of what GIS offers and how it works and to give them personal experience in analyzing spatial datasets and files so that they are more prepared to incorporate the tools into their own classrooms.

Kevin R. Marsh, Department of History, Idaho State University, organized the workshop. Kevin participated in the

SPACE workshop at UCSB in 2005. SPACE co-sponsored the workshop with Bionomics Environmental, Inc. Participants came from a number of countries and from across the United States, representing disciplines such as geography, geology, climate science, environmental studies, and history.

Workshop Instructors:

Geoff Cunfer, a historian at the University of Saskatchewan, uses GIS extensively to analyze changing agricultural use of the Great Plains since the 1800s. He is author of *On the Great Plains: Agriculture and Environment* (College Station, 2005).

Sally Hermansen is a geographer at the University of British Columbia. She has used GIS for published research on land use change and shifting attitudes regarding urban wetlands, and frequently teaches classes in GIS and Historical GIS.

Sarah Hinman is a geographer in the History Department at Idaho State University. She has used GIS to study disease outbreaks and infant mortality in turn-of-the-century Baltimore and Washington, DC. Dr. Hinman teaches in the GIS-based graduate program in Historical Resources Management at ISU.

Keith Rice, a geographer at the University of Wisconsin, Stevens Point, has long-term expertise in teaching students to conduct spatial analysis of historic land use in Wisconsin.

Keith Weber is director of the GIS Training and Research Center at Idaho State University.

Derrick Sharp and **Matthew Finn** served as lab assistants for the workshop. Both are students in the GIS-based M.A. program in Historical Resources Management at Idaho State University.

National Conference on Agriculture and Natural Resource Conservation and Management, Panel Discussion on Teaching of GIS and Remote Sensing

Delaware State University, Dover, Delaware, April 17–19, 2008

The panel was organized by **Shobha Sriharan** (Department of Agriculture & Human Ecology at Virginia State University), SPACE Workshop Participant in 2006 at the University of Oklahoma and in 2007 at the University of California, Santa Barbara.

Panelists included:

Shobha Sriharan, Virginia State University

Linda Hayden, **Francisco San Juan**, and **Elizabeth Noble**, Elizabeth City State University

Godfrey Uzochukwu, North Carolina A & T University

Gulnihal Ozbay and **Zhiming Yang**, Delaware State University

Panelists discussed course content and strategies for offering hands-on software experiences for “**1890 Institutions**” and **Historically Black Colleges and Universities** (HBCUs), how to avail the assistance from providers of software (ArcGIS by ESRI and Erdas Imagine by Leica Geosystems) and GPS (Garmin), the design of user-friendly exercises, and drawing on the expertise of GIS educators from nearby institutions and agencies. They also reviewed the current enrollment of students in GIS courses; strategies to publicize courses across campus; and ways to advise students from the sciences, liberal arts, and business.

The panel was followed by a **poster session**, featuring the research of undergraduate students from the institutions represented on the panel. In addition, high school students and teachers from the local Dover area attended the session and focused on issues of building awareness of GIS opportunities for precollege audiences and discussed successes and limitations of teaching introductory-level GIS at schools.

The **National Conference on Agriculture and Natural Resource Conservation and Management** is an initiative of the College of Agriculture and Related Sciences at Delaware State University to bring agriculture and natural resource faculty and students together for exchange of ideas.

American Sociological Association—102nd Annual Meeting Integrating Spatial Thinking into the Sociology Curriculum

New York City, August 2007

The Session was organized by **Claudia Scholz**, Research Programs Coordinator at Trinity University in San Antonio. Claudia participated in two SPACE workshops (UCSB in 2006 and Ohio State University in 2007). The presentation titles and authors follow:

- Beyond the Field Trip: On Tourism as a Pedagogical Strategy, **Shaul Kelner** and **George Sanders**, Vanderbilt University

- Spatial Sociopoly: Understanding the Role of Space in Inequality using “Monopoly” Board Game, **Kishi Ducre**, Syracuse University
- Teaching Residential Segregation in Undergraduate Classes Using Spatial Methods, **Laurel Cornell**, Indiana University
- Race and Space: Crime, Joblessness and the American Apartheid, **Karen Hayslett-McCall**, University of Texas at Dallas
- Integrating GIS Across Disciplines in a Liberal Arts College, **Jeana Abromeit**, Alverno College

Minorities in Agriculture, Natural Resources, and Related Sciences (MANRRS), 22nd Annual Career Fair and Training Conference

Birmingham, Alabama, March 2007

Workshop on GIS, GPS, and Remote Sensing Applications in Support of Community and Urban Forestry

David A. Padgett, Associate Professor of Geography and Director of the Geographic Information Sciences Laboratory at Tennessee State University, led the half-day workshop with the following content:

- The background and methodology of three urban forestry projects developed by undergraduate students as Power Point presentations;
- Live demonstrations of GIS software;
- An outdoor tree inventory exercise to demonstrate the use of GPS receivers;
- Importing the inventory data into ArcGIS for display on a digital ortho quarter quadrangle;
- Discussion of the results and procedures of the exercise; and
- An overview of opportunities for training in GIS, acquisition of GIS software, and the development of GIS-based curriculum.

National HBCU Faculty Development Symposium “Leading and Learning in an Age of Accountability,” Workshop on GIS and Spatial Analysis Methods in Social Sciences Teaching and Research

Houston, Texas, October 2006

Workshop leaders included **David A. Padgett**, Associate Professor of Geography and Director of the Geographic Information Sciences Laboratory at Tennessee State University, **Charles Barnes**, Department of Political Science at North Carolina A&T State University, and **Laurie Garo**, Department of Geography at University of North Carolina at Charlotte, and instructor at Johnson C. Smith University.

Workshop Objectives:

- Expose HBCU (Historically Black Colleges and Universities) faculty to innovative ways that geographic information systems (GIS), spatial analysis, and related technologies may be used to enhance social sciences teaching and research;
- Provide HBCU faculty with information on how to obtain affordable GIS and spatial analysis software, and how and where to get training;
- Demonstrate how students may directly benefit by adding GIS and spatial analysis applications to their professional skill sets;
- Encourage those in attendance to attend GIS-related workshops, such as the **SPACE** workshops sponsored by the Center for Spatially Integrated Social Science (CSISS) and the **HBCU Faculty GIS Workshops**; and
- Invite attendees to join the **HBCU GIS user’s online discussion group**.

University Consortium for Geographic Information Science (UCGIS) Summer Assembly

Vancouver, Washington, July 2006

Instructors and participants in the SFSU SPACE/UCGIS 2005 workshop at San Francisco State University (SFSU) made a plenary presentation describing the workshop. Delegates from 70 UCGIS member institutions, students, and others attended the presentation.

Presentations featured a description of the workshop by **Richard LeGates** (workshop PI and Professor of Urban Studies at SFSU) and **XiaoHang Liu** (workshop Co-PI and Assistant Professor of Geography at SFSU), a video that describes the workshop experience, presentations from three faculty workshop participants, and discussion.

Jeana Abromeit (Professor of Sociology at Alverno College) described how she used SPACE workshop material to create the college's first GIS course, establish a GIS lab, and create materials to integrate spatial thinking into Alverno's curriculum.

Chris Holoman (Associate professor of Political Science at Hilbert College) described his use of workshop material and a CSISS Instructional Development award to help create Hilbert's first two GIS courses, establish a GIS lab, expose every Hilbert student to basic spatial thinking concepts in a course that he teaches, and organize a one-day faculty development workshop on GIS and spatial thinking for Hilbert faculty.

Benjamin Forest (Associate professor of Geography, at McGill University) described an exercise he developed using material from Houston, Texas to teach Dartmouth University students about the politics of gerrymandering and how he will use information from the workshop and support from a SPACE Instructional Development award to develop a new module using ArcGIS' redistricting extension to teach McGill students about redistricting in Quebec city and to simulate spatial consequences of sovereignty for Quebec.

Society for American Archaeology (SAA) 71st Annual Meeting Symposium on Integrating Geospatial Perspectives and Education in Archaeology *San Juan, Puerto Rico, April 2006*

2004 and 2005 SPACE workshop participants, **Veronica Arias**, **Heather Richards**, and **Judith van der Elst** (Department of Anthropology, University of New Mexico), organized this symposium to focus on pedagogical approaches, innovative teaching methodologies, instructional development, and dissemination of teaching strategies suited for teaching geospatial methods and techniques. Presentations included the following:

- Spatial Thinking and Technologies in the Undergraduate Social Science Classroom
Stacy Rebich-Hespanha, **Fiona Goodchild**, and **Don Janelle**, UC Santa Barbara
- Using Cultural Resource Information System Geospatial Data in Scholarly Research and Public Education
Karyn DeDufour, Archeological Records Management Section, N.M. Historic Preservation Division, and **Jeremy Kulisheck**, Detail Project Archeologist, Gila National Forest
- Developing Spatial Thinking in Archaeology through GeoScience
Veronica Arias, **Heather Richards**, and **Judith van der Elst**, University of New Mexico
- The Student Perspective on Geospatial Education
David Plaza and **Mona Angel**, University of New Mexico
- GIS and Spatial Statistical Tools for Archaeological Work,
Joe D. Francis and **Antoni Magri**, Cornell University
- GIS, Faunal Remains, and Public Archaeology in the Gulf of Maine
Matthew Bampton, **Nathan Hamilton**, and **Rosemary Mosher**, University of Southern Maine
- Eco's Eye: Semiotic Approaches to Designing a New Computer Application for Visualization of Spatially Distributed Archaeological Data
Kevin Schwarz, ASC Group, Inc., and **Jerry Mount**, University of Iowa
- Representing Maya Architecture: Techniques for Research and Education
Jennifer Ahlfeldt, University of New Mexico. **Heather Richards**, University of New Mexico, and **Laura Ackley**, University of California, Berkeley
- Mindscapes and Virtual Ecosystems
Maurizio Forte, Istituto per le Tecnologie Applicate ai Beni Culturali, Rome
- Positive side-effects of the implementation of GIS on heritage management in developing countries
Rolf Schütt, Architect—World Heritage Consultant, Santa Cruz, Bolivia
- Nasca archaeology in 3D: Interdisciplinary research and education in Palpa on the south coast of Peru
Karsten Lambers, German Archaeological Institute, KAAK Bonn
- Learning and Teaching: Using a Public Planning Process as a Teaching Tool
Sarah Schlanger, New Mexico Bureau of Land Management
- Session Discussant: **Stacy Rebich-Hespanha**, SPACE, University of California, Santa Barbara

Abstracts for all of the above presentations are available at <http://www.csiss.org/SPACE/materials/participants/docs/SAA%20Session%20abstracts.pdf>.

Association of Collegiate Schools of Planning Annual Conference, Roundtable and Workshop on Integrating GIS and Spatial Analysis into the Undergraduate Planning Curriculum

Kansas City, Missouri, October 2005

Richard LeGates, Professor of Urban Studies at San Francisco State University, and coordinator of the 2005 SPACE workshop at SFSU, organized a set of events related to curriculum development. The objective was to encourage greater use of spatial concepts in planning courses and to introduce resources and tools to make this possible.

The **Roundtable** introduced teaching materials developed by the panelists and reviewed open-source software appropriate for teaching spatial concepts to students of urban planning.

A **Drop-in Workshop**, equipped with laptop computers, permitted meeting attendees to review demonstrations of GIS instructional modules for ArcGIS software and to experiment with open-source software for spatial analysis (GeoDa, FlowMapper, and STARS).

Panelists and demonstrators for this program included **Ayse Pamuk**, Associate Professor of Urban Studies at SFSU; **Brian Paar**, Workbook project manager for ESRI Virtual Campus; and **Stuart Sweeney**, Assistant Professor, Department of Geography, University of California Santa Barbara and Coordinator for the 2004–2007 UCSB SPACE summer workshops.

National Technology and Social Science Conference, Workshop on GIS, GPS, and Spatial Analysis Tools in Support of Service Learning

Las Vegas, NV, April 2005

2004 SPACE workshop participant, **David Padgett**, organized a hands-on workshop demonstrating the integration of locational information from field surveys using GIS and GPS. Participants represented the disciplines of anthropology, economics, education, ethnic studies, geography, history, psychology, political science, sociology, and women's studies. The agenda follows:

Introductions

Introduction to Global Positioning Systems and Basic Principles of Cartography

Discussion Service Learning Experiences in Social Science Courses

Break

Divide into groups Each group prepared its GPS units for a mock neighborhood audit. Some groups used low-cost GPS units, one group worked with a more expensive unit.

Mock neighborhood audit Groups collected GPS positions, recorded attribute information, and took photographs of "sites of potential neighborhood problems and/or physical barriers to public transit accessibility."

Break

Instructor Demonstration How to import data and photos into a Geographic Information System.

Instructor Demonstration How to layout maps for most effective use in spatial analysis.

Attendees shared ideas for implementing GIS, GPS, and spatial analysis tools to enhance their own curriculums.

Wrap-up, evaluation, and adjournment

Association of Social and Behavioral Scientists, Panel on GIS and Spatial Analysis Tools to Enhance Social Science Course Content and Research

Nashville, TN, March 11, 2005

2004 SPACE workshop participants, **David Padgett** and **Nikitah Imani**, organized a Panel Session for the 70th Anniversary Annual Meeting of ASBS. ASBS membership is drawn primarily from academics representing Historically Black Colleges and Universities (HBCUs), spanning a broad range of disciplines in the social and behavioral sciences. The session included three presentations and follow-up discussions:

- Geographic Information Systems (GIS) in Support of Service Learning Course Content in an Undergraduate Urban Geography Course—**David A. Padgett**, Tennessee State University
- Notes on Building a Critical Sociological Pedagogy for Spatial Analysis: Adventures in Oxymorons—**Nikitah Imani**, James Madison University
- Applications of GIS and Spatial Analysis Tools in the Development of Demonstration Modules for an Urban Geography Course—**David A. Padgett**, Tennessee State University

The University Consortium for Geographic Information Science (UCGIS) was a collaborating partner in the SPACE program and was responsible for offering one of the program's three annual workshops. A feature of the UCGIS workshop was that participants might be invited to give presentations and to participate in mini-workshop sessions in conjunction with the UCGIS Assemblies and Meetings. Some of the results of the 2004 SPACE workshop at San Diego State University were showcased at the UCGIS Winter Meeting.

- Introduction, **John R. Weeks**, San Diego State University, Chair (Coordinator of SPACE workshop at SDSU)
- The Role of UCGIS as a Cooperating Agency for GIScience Education, **Arthur Getis**, San Diego State University
- Bringing Space to the Core: Developing Undergraduate Curriculum in Spatial Reasoning, **Wendy Bigler**, Arizona State University
- Introducing Space in a Non-Computational Context, **Timothy M. Bray**, University of Texas at Dallas
- Integrating GIS and Urban Geography in the Classroom (& Beyond), **David R. Rain**, George Washington University
- Adaptation and Implementation of an Undergraduate Spatial Analysis Curriculum for Social Science Majors, **Christopher C. Weiss**, Columbia University

7. IMPACT OF SPACE FROM THE ANALYSIS OF PARTICIPANT SURVEYS

WORKSHOP OUTCOMES AND EVALUATION

As shown in Figure 1, the graphic syllabus for the UCSB workshop, the desired outcomes for participants included the acquisition of new knowledge and skills, completion of projects, access to course materials and resources, collaboration with peers and workshop instructors, inspiration, and plans for future applications. Many of these positive outcomes are reflected in project presentations on the final day of the workshop.

FINAL PROJECTS

Final projects included the design of exercises to engage students in spatial thinking and in applications of GIS or *GeoDa*, the development of new course syllabi, and ideas for project-based student learning through exposure to issues in local communities. Titles of some of the presentations by participants in UCSB workshops are listed in Table 5.

Table 5. Titles of Participant Presentations at UCSB SPACE Workshops
2005–2007
<p>Integrating Spatial Perspectives in Lectures and Labs</p> <ul style="list-style-type: none"> • Redistricting Labs in Political Science • Exploring the Social Geography of Civil Rights Tourism • Quantitative Methods in Archaeology: Students’ Final Project • Infusing Basic Spatial Thinking through Exercises and a Final Student Project • Spatial Thinking in Public Affairs: Example Module • Interpreting Landscape
<p>Introducing Spatial Perspectives in Curriculum and Course Design</p> <ul style="list-style-type: none"> • A Curriculum Sequence for Landscape Analysis and Planning • Incorporating Spatial Analysis Options in Economic Geography and Quantitative Methods Courses • Integrating Sociological Research with Spatial Concepts in Sociology and Area Courses • Redesign of GIS Course in Anthropology
<p>Using Spatial Methods for Regional and Global Perspectives in Undergraduate Teaching</p> <ul style="list-style-type: none"> • Trade among Nations • Foreign Direct Investment: Global Flows and Mapping the Global Commodity Chains • Visualizing Borders and Diasporas • HIV/AIDS Around the World • Exploring New Mexico Landscapes • Location Patterns of R&D in India • Italian Regional Immigrant Integration • Mapping Prehistoric Economy in Central California • Spatial Dimensions and Perceptions of Idaho Irrigation Communities, 1900–1945 • Race, Politics, and Redistricting in North Carolina
<p>Spatial Understanding of Social Issues through Project-based Case Studies</p> <ul style="list-style-type: none"> • Distributions of Prison Populations over Time in the United States • Spatial Analysis of Juvenile Delinquency Risk Factors • Spatial Patterns and Flows in Congressional Campaign Contributions • Mapping Retail “Predatory” Landscapes • Mapping New Orleans: Spatial Variation in the Impact of Hurricane Katrina • Baltimore Public Schools: Structure, Place, and Outcomes • Visualizing Urban Growth: San Antonio 1960–2000 • Disparities in Infant Mortality Rates in Greensboro, NC • Understanding the Geography of Disease in the US • Spatial Units, Urban Environments, and Health Outcomes

ENTRY-EXIT SURVEY COMPARISON

The workshop exit survey was completed online, usually after participants returned to their home institutions. The design of the exit survey was intended to match the workshop goals that participants cited in their entry surveys. The entry and exit surveys included questions about:

- the perceived barriers to the adoption of spatial analysis in undergraduate teaching;
- participants’ aspirations for gaining technical content knowledge and insights for teaching and assessment;
- participant expectations of engagement with fellow workshop participants; and
- participant expectations of workshop instruction in spatial analysis concepts and pedagogical strategies.

Table 6 provides the matched average values for entry and exit surveys for all of the participants in the three 2006 SPACE workshops. In general, these surveys revealed significant gains in removing the barriers to technical skills, good progress with learning assessment and teaching strategies, expanded knowledge about the tools, theories, and problems of spatial analysis and data visualization, and new strategies for helping students learn. The mixed results for meeting expectations about specific technologies reflect the ambition of participants to master more than can be achieved in six days and the realization that additional work will be required beyond the workshop experience. Although most participants revealed in their mastery of techniques, such as GIS, they also acknowledged that understanding the fundamental concepts of spatial thinking (e.g., scale, neighborhood, spatial dependence, and spatial heterogeneity) is not easily assimilated in a short period and that they will need to invest even more effort to achieve solid theoretical grounding for their work.

By the second year of the SPACE workshops, more attention was given to the theoretical understanding of concepts of spatial thinking and less to the mastery of tools. This shift was expanded in subsequent years, coinciding with the publication of *Learning to Think Spatially* (National Research Council, 2006), and capturing a theme of growing interest in research and teaching, as seen in such recent publications as Gersmehl & Gersmehl (2007), Marsh, *et al.* (2007), Golledge, *et al.* (2008), Janelle and Goodchild (2009), and Lee & Bednarz (2009).

<i>What Did Those Accepted into 2006 SPACE Workshops Perceive as Barriers and Expect as Outcomes for Teaching Spatial Analysis?</i>		<i>How Did SPACE Workshop Participants Rate the 2006 Workshops?</i>	
	Entry¹	Exit²	
Pedagogical Knowledge Barrier (B)	2.62	3.32	Removed Barriers (RB) –Knowledge
GIS Experience B	2.38	3.67	RB –GIS
Data Access B	2.18	3.46	RB –Data Access
Software Access B	2.05	3.68	RB –Software Use
Technical Support B	2.45	3.42	RB –Spatial Teaching
Workshop Expectation (WS Exp)			Met Expectations (ME)
WS Exp–Spatial Statistics	3.45	3.39	ME –Spatial Statistics
WS Exp–Data Visualization	3.48	3.46	ME –Data Visualization
WS Exp–GIS Software Use	3.15	3.52	ME –GIS
WS Exp–Data for Classes	3.48	3.50	ME –Data for Classes
Discuss (D) Learning Assessment	3.30	3.56	Gained Ideas (GI) about Student Learning
–	–	3.24	GI –Assess Student Learning
D Strategies for Teaching	3.15	3.63	GI –Spatial Methods for Teaching
–	–	3.29	GI –Pedagogical Strategies
D Curricula/Class Activities	3.63	3.76	GI –Develop Curricula
D Student Projects	3.25	3.61	GI –Student Projects
Learn (L) Spatial Analysis Tools	3.40	3.71	Expanded Knowledge (EK) –Spatial Tools
L Data Visualization Theory	3.08	3.33	EK –Theory of Data Visualization
L Answers to Problems in Spatial Analysis	2.67	3.38	EK –Problems in Spatial Analysis
L Pedagogical Strategies	3.48	3.49	EK –Strategies to Help Students
¹ 1= not an obstacle at all / not important; 4= very significant obstacle / very important ² 1=did not help at all / of no value; 4=helped significantly / exceeded expectations			

FOLLOW-UP SURVEYS

Results from the follow-up survey of participants from the 2007 workshops at the University of California Santa Barbara (UCSB) and Ohio State University (OSU) are provided in Table 7. Follow-up surveys were administered to participants approximately one year following their participation in a workshop. Completed by 68 percent of workshop participants, the results show generally positive experiences at the workshops and moderate to significant impacts on subsequent teaching and dissemination efforts (discussion with others / presentations to colleagues and at meetings). The OSU workshop received generally higher scores on most survey items than in prior years. Although UCSB's scores fell slightly from previous years, the overall assessment was positive.

Table 7. Summer Workshops 2007 Follow-up Survey—Results		
Measures	UCSB	OSU
WORKSHOP EXPERIENCE¹		
Collaboration with participants	3.8	4.3
Instructor presentations	4.4	4.3
Workshop content	4.2	4.4
Workshop lab exercises	3.6	4.0
Workshop organization	4.1	4.4
Materials and handouts	4.1	4.4
Workshop facilities	4.0	4.5
Local organization	4.2	4.5
Housing facilities	4.4	3.7
Overall experience	4.4	4.3
IMPACTS OF WORKSHOP²		
New ideas for content in undergraduate courses	3.9	4.3
New labs or exercises for undergraduate courses	3.9	3.9
New courses for student learning about spatial analysis	3.5	3.7
New modules to engage undergrads in spatial analysis	4.2	3.9
Assessment of student ability to use spatial analysis	3.6	3.1
Discussion with teaching colleagues teaching spatial analysis	3.7	4.1
Presentations to colleagues about teaching spatial analysis	2.7	3.3
Plans for presentations about SPACE at professional meetings	2.7	2.3
^{1/2} Average values, scaled from 1 to 5. 1= unsuccessful/no impact; 2= somewhat successful/very little impact; 3= moderately successful/some impact; 4= successful/moderate impact; 5= very successful/strong impact. See survey form in Appendix.		

Table 8 shows the average scores on items in the follow-up surveys for all SPACE workshops aggregated by year, from 2004 to 2007. The average values are on a scale from 1 to 5, calculated for 136 respondents (62 percent of all workshop participants) on surveys conducted one year after the 2004, 2005, 2006, and 2007 workshops. In general, SPACE achieved its broad mission of promoting the dissemination of spatial technologies to enhance undergraduate education in the social sciences. Its focus on diversity resulted in representation of participants across gender, ethnicity, and race from all regions of the United States. More than 70 workshop participants, representing more than a dozen disciplines, reported on the role of SPACE in their introduction of new courses on spatial analysis and spatial thinking, and nearly 100 participants credited SPACE workshops as instrumental in their introduction of new course exercises and teaching modules. The workshops, in general, exceeded participant expectations in removing barriers to applications of spatial technologies in teaching, expanding participant knowledge about uses of tools for spatial analysis, and introducing strategies for success-

ful teaching. More than 100 participants reported on actively sharing their workshop experiences with colleagues at their own institutions and at conferences.

1 = No Impact, 2 = Very Little Impact, 3 = Some Impact, 4 = Moderate Impact, 5 = Strong Impact					
	2004	2005	2006	2007	%*
• Gained and implemented new ideas for content in undergraduate courses	4.1	4.1	4.2	4.1	77
• Developed new labs and exercises for undergraduate courses	3.8	3.9	4.0	3.9	73
• Introduced new course(s) that include student learning about spatial analysis	3.2	3.1	3.4	3.6	60
• Developed plans for new course modules that will engage undergrads in spatial analysis theory and/or techniques	3.9	3.8	4.1	4.1	73
• Initiated assessment of student ability/learning in use spatial analysis	3.1	3.3	3.3	3.3	47
• Held discussion(s) with teaching colleagues about new resources for teaching spatial analysis	4.1	3.8	4.1	3.9	60
• Made formal presentation(s) to teaching colleagues about new resources for teaching spatial analysis	3.4	2.4	3.4	3.0	40
• Have plans to make presentations about SPACE at professional meetings	2.8	2.3	3.1	2.5	20
• Have already made presentations about SPACE at professional meetings	2.1	1.5	2.3	2.2	20
Overall Workshop Experience					%**
1= unsuccessful, 2 = a little successful, 3 = moderately successful, 4 = successful, 5 = very successful	4.3	4.2	4.5	4.3	90
* indicating “moderate” to “strong” impact of SPACE					
** indicating workshop “successful” to “very successful”					

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8. CONCLUSIONS

Findings are derived from the follow-up and entry/exit surveys, discussed in this final report and in prior annual reports, and from voluntary comments within surveys by participants in the SPACE program (see appendix).

SPACE achieved its general mission for promoting the dissemination of spatial technologies to enhance undergraduate education in the social sciences.

- A focus on **diversity** resulted in representation of participants across gender, ethnicity, and race from all regions of the United States.
- More than 70 workshop participants, representing more than a dozen disciplines, reported on the role of SPACE in their introduction of **new courses** on spatial analysis and spatial thinking.

- Nearly a hundred participants cited SPACE workshops as instrumental in their introduction of **new course exercises and teaching modules**.
- The workshops, in general, **exceeded participant expectations** in removing barriers to applications of spatial technologies in teaching, expanding participant knowledge about uses of tools for spatial analysis, and introducing strategies for successful teaching.
- More than 100 participants reported on actively **sharing their workshop experience with colleagues** at their own institutions and with colleagues at conferences.
- The first-generation of **multiplier effects of SPACE workshop participation** are beyond our capability to estimate with great accuracy, but combinations of exposure through campus seminars and workshops organized by participants and through the fourteen special conference sessions sponsored by the SPACE ACCESS program place peer interaction with workshop attendees at about 1,000. In addition, a conservative estimate is that up to 16,000 students may have benefited through new courses and altered approaches to teaching as result of SPACE involvement by their instructors. Assumptions for this estimate are: 190 courses, 25 students per course, impact commences one year following workshop participation, and the impact continues to accumulate from year to year (i.e., 40 courses from the 2004 workshops equal 1,000 students who will have benefitted beginning in 2005, continuing through 2009, for a total of 5,000).

The objective of SPACE to initiate systemic change in undergraduate education for the social sciences was ambitious. By no logical standard could a workshop program that served 218 undergraduate instructors possibly achieve systemic change across a range of disciplines in the social and behavioral sciences that claimed more than 102,000 instructors in 2003 (NSF, *Science and Engineering Indicators*, 2008). However, by focusing the workshop program on the value of spatial thinking and associated technologies, the 218 workshop participants tapped into a range of developments in geo-spatial technologies that have placed spatial information processing at the center of major changes in society and science. Over the past decade, broad public and scientific exposure to such recent innovations as geo-browsers (typified by Google Earth and global positioning systems (GPS) have magnified the areas of application of maps and spatial statistics. In addition, advances in geographic information systems (GIS) and exploratory spatial data analysis (ESDA) have made the tools of spatial analysis increasingly accessible for research and teaching. However, while data and tools have advanced, there is a serious lag in the dissemination of sound conceptual understandings of the spatial concepts that must inform best practices in spatial analysis.

Over the course of its existence, the SPACE program has with each successive workshop given increasing attention to the underlying spatial concepts that users of spatial tools must understand. These include the different ways of specifying location, the importance of scale, and the advanced and less intuitively understood concepts of spatial dependence and spatial heterogeneity that underlie scientific inference in the spatial domain. In an era when spatial tools have become more commonplace, the conceptual foundations of spatial literacy become increasingly important. Unfortunately, the expansion in awareness of spatial technologies is not matched by an education system that gives adequate attention to spatial intelligence and spatial reasoning skills.

With their origins in geography, CSISS personnel had to acknowledge early on that the perspectives of geography must complement rather than dominate the theoretical and methodological orientations of other social sciences. Applications of spatial analysis by prominent representatives of specific disciplines were, in general, most persuasive in building support for spatial methodologies in specific research and teaching communities. Co-opting participants in training workshops and specialist research meetings as agents of dissemination were useful approaches, but such strategies must be in the interests of the participants and be seen as valuable by peers in their own disciplines. Peer networks formed through intensive residential workshops can be of significant help to sustaining the momentum required to move from research to instructional uses of spatial methods. Dissemination of spatial analysis beyond its core disciplinary origins requires multiple strategies. In the case of CSISS, distinct but mutually reinforcing programs addressed the needs for (a) exemplary applications relevant to interests of different disciplines, (b) resources and analytic tools, (c) training opportunities, and (d) special efforts to service traditionally underrepresented populations.

The timing of NSF support for SPACE through the Division of Undergraduate Education's CCLI program has been especially significant, corresponding with the popularization of spatial technologies through handheld devices and web delivery. It also corresponds with increasing capabilities to geo-code scientific and other observations, and the ability to integrate spatial data and scientific perspectives across disciplines, leading to

Appendices

- Appendix 1* List of Participants in SPACE Workshops
- Appendix 2* Voluntary comments from space workshop participants, derived from surveys
- Appendix 3* From the NSF Fastlane Report:
 - a. Project Participants
 - b. Organization Partners
 - c. Activities and Findings
 - d. Contributions
- Appendix 4* Survey Forms Used for SPACE Workshops

Appendix I—Participant Listings for 2004, 2005, 2006, 2007

SPACE WORKSHOPS:

SUMMER 2004

Ohio State University

- Veronica Arias Archaeology, University of New Mexico
- Kathleen Bell Economics, University of Maine
- Ulla Bunz Communications and Information Systems, Rutgers University
- Maria Conroy Urban and Regional Planning, The Ohio State University
- Owen Dwyer Human Geography, Indiana University, Indianapolis
- Douglas Feldman Anthropology, SUNY Brockport
- Robert Greenbaum Urban and Regional Economic Development, School of Public Policy & Management, Ohio State University
- Gregory Hooks Sociology, Washington State University
- Nikitah Imani Sociology, James Madison University
- Meadow Linder Sociology, University of Michigan
- Sandy Marquart-Pyatt Sociology,
- Leah Mathews Economics, UNC Asheville
- Heather Richards Archaeology, University of New Mexico
- Arun Srinivasan Economics, Indiana University Southeast
- Sumeeta Srinivasan Environmental Studies & Policy Harvard University
- Sarah Surface-Evans Archaeology, Michigan State University
- Michelle Thompson Geographic Information Science, Cornell University
- Judith Van der Elst Archaeology, University of New Mexico
- Marie-helene Vandersmissen Geographic Information Science, Laval University
- Joan Walker Human Geography, Boston University
- Lu Wang Geographic Information Science, Queen's University,
- Petra Zimmermann Geographic Information Science, Ball State University

University of California, Santa Barbara

- Carlos Balsas Urban and Regional Planning, University of Massachusetts
- Tapan Deka Socio-Economics, Gauhati University and UGC Govt. of India
- Karen Donahue Criminology, University of La Verne
- Julie Ford Sociology, SUNY-Brockport
- Madelyn Glickfeld Environmental Studies & Policy, UCLA Institute of the Environment
- Pavlina Latkova Tourism, Parks and Recreation, Michigan State University,
- April Linton Sociology, Princeton University, University of California, San Diego
- Stephen Lipscomb Economics, UC, Santa Barbara
- Jo Beth Mertens Economics, Hobart and William Smith Colleges
- David Padgett Urban Studies, Tennessee State University
- William S. Payne Tourism Management, NC State University
- Wenquan Zhang *Teaching Interest:* Sociology, University at Albany, State University of New York

San Diego State University

- Katrin Anacker Urban and Regional Planning, The Ohio State University
- Wendy Bigler Environmental Studies & Policy, Arizona State University
- Mark Bjelland Human Geography, Gustavus Adolphus College
- Timothy Bray Criminology, University of Texas at Dallas
- Randy Gainey Sociology, Old Dominion University
- Sukumar Ganapati Urban and Regional Planning, University of Southern California
- David Guertin Watershed Management, University of Arizona
- Karen Hayslett-McCall Criminology, University of Texas at Dallas
- Amy Hessl Environmental Studies & Policy, West Virginia University,
- David Iaquina Sociology, Nebraska Wesleyan University
- Christine Jocoy Human Geography, California State University, Long Beach
- Jani Little Human Geography, University of Colorado

- Loretta Lynch
Economics, University of Maryland
- Wendy Miller
Geographic Information Science, Washington College
- Susan Pulsipher
Geographic Information Science, Methodist College
- David Rain
Geographic Information Science, George Washington University
- Jungyul Sohn
Regional Science, University of Memphis
- Christopher Weiss
Sociology, Columbia University
- Eric Yamashita
Urban and Regional Planning, University of Hawaii

SUMMER 2005

Ohio State University

- Adegoke Ademiluyi
Human Geography, Fayetteville State University
- Samuel Adu-Prah
Geographic Information Science, Alcorn State University
- Nairne Cameron
Geographic Information Science, University of Alberta
- Jinmu Choi
Geographic Information Science, University of Georgia
- Christopher Cusack
Human Geography, Keene State College
- Bernadette De Leon
Public Health, Indiana University
- Yuri Gorokhovich
Geographic Information Science, Columbia University
- Lynn Harvey
Sociology, Winston-Salem State University
- Rajrani Kalra
Urban Studies, Kent State University
- Sunwoong Kim
Economics, University of Wisconsin-Milwaukee
- Kevin Leander
Human Geography, Vanderbilt University
- Jiyeong Lee
Geographic Information Science, University of North Carolina-Charlotte
- Sun Park
Geographic Information Science, University of Hawaii-Hilo
- Karin Pfeffer
Geographic Information Science, University of Amsterdam
- Clara Popa
Communication Studies, Rowan University
- Alexander Prishchepov
Geographic Information Science, Oklahoma State University
- Julio Rivera
Human Geography, Carthage College
- Shouraseni Sen Roy
Geographic Information Science, Arizona State University
- Talar Sahsuvaroglu
Human Geography, McMaster University
- Jungyul Sohn
Regional Science, University of Memphis
- Stephen Truhon
Psychology, Winston-Salem State University
- Paul Von Hippel
Sociology, Ohio State University
- Cecile Yancu
Public Health, Winston-Salem State University
- Li Yin
Urban and Regional Planning, State University of New York-Buffalo

University of California, Santa Barbara

- Claude Barnes
Political Science, North Carolina A&T State University
- Janice Bell
Public Health, University of Washington
- Sheryl Breen
Political Science, St. Olaf College
- Sung Chun
Sociology, University of Notre Dame
- Marlese Durr
Sociology, Wright State University
- Owen Dwyer
Human Geography, Indiana University-Indianapolis
- Jennifer Earl
Sociology, University of California-Santa Barbara
- Joe D. Francis
Sociology, Cornell University
- Kurt Fuellhart
Human Geography, Shippensburg University
- Laurie Garo
Geographic Information Science, University of North Carolina-Charlotte
- Randolph Horn
Political Science, Samford University
- Mary Lou Larson
Anthropology, University of Wyoming
- Brian Lee
Landscape Architecture, University of Kentucky
- Kevin Marsh
History, Idaho State University
- Georgina Moreno
Economics, Scripps College
- Steven Perlmutter
Political Science, College of William and Mary
- Heather Richards
Archaeology, University of New Mexico
- Glenwood Ross
Economics, Morehouse College
- Diana Sinton
Geographic Information Science, National Institute for Technology & Liberal Education
- Jon Sonstelie
Economics, University of California-Santa Barbara

- **Sudhir Thakur** Human Geography, University of North Dakota
- **Judith Van der Elst** Archaeology, University of New Mexico

San Francisco State University (for UCGIS)

- **Jeana Abromeit**, Sociology, Alverno College
- **Philip Birge-Liberman**, Human Geography, Syracuse University
- **Bettina Bergmann**, Humanities, Mount Holyoke College
- **Giovanna di Chiro**, Environmental Studies & Policy, Mount Holyoke College
- **Vernon Domingo**, Human Geography, Bridgewater State College
- **Paulla Ebron**, Research and Technology, Stanford University
- **Robert Eng**, History, University of Redlands
- **Claudia Engel**, Education, Stanford University
- **Annalise Fonza**, Urban Planning and Politics, Mount Holyoke College
- **Benjamin Forest**, Human Geography, Dartmouth College
- **Theresa Garvin**, Human Geography, University of Alberta
- **Susan Handy**, Environmental Studies & Policy, University of California-Davis
- **Kathryn Henderson**, Sociology, Texas A&M University
- **Christopher Holoman**, Political Science, Hilbert College
- **Gareth John** Human Geography, Gustavus Adolphus College
- **Ka mutombo Kabasele** Demography, Xavier University
- **Mona Ray** Economics, Morehouse College
- **Isaac Robinson** Sociology, North Carolina Central University
- **Sue Steiner** Community Studies/Policy, Arizona State University
- **Alan Trevithick** Anthropology, Westchester Community College
- **Anibal Yanez-Chavez** Human Geography, California State University-San Marcos

SUMMER 2006

Ohio State University

- **Babette Audant** CUNY Kingsborough Community College, Human Geography
- **Laura Blanciforti** WVU/NIOSH/CDC, Economics
- **Lincoln D. Chandler** Florida Memorial University, Criminology
- **Ke Chen** University of Cincinnati, Geography
- **Joe D. Francis** Cornell University, Sociology
- **Peng Gao** Syracuse University, Statistics
- **Jamie Griffiths** University of South Florida, Public Health
- **Iris Hui** University of California, Berkeley, Political Science
- **Andres Jauregui** Columbus State University, Economics
- **Changjoo Kim** Minnesota State University, Geographic Information Science
- **Enrique Lopez** UPR-Cayey Instituto Investigaciones Interdisciplinarias, Statistics
- **Rolin Mainuddin** North Carolina Central University, Political Science
- **Timothy Miller** Denison University, Economics
- **Brian Nicholls** University of Wisconsin-Milwaukee, Archaeology
- **Nancy Obermeyer** Indiana State University, Human Geography
- **Sunhee Sang** Minnesota State University, Geographic Information Science
- **Michael Strager** West Virginia University
- **Michele Villinski** DePauw University, Economics
- **Khodr Zaarour** Shaw University, Political Science

University of Oklahoma

- **Adegoke Ademiluyi** Fayetteville State University, Human Geography
- **Veronica Arias** University of New Mexico, Archaeology
- **Joe Bowersox** Willamette University, Political Science
- **William Brown** Texas Southern University, Human Geography
- **Hongmian Gong** Hunter College, Human Geography
- **Daikwon Han** Morehead State University, Institute for Regional Analysis & Public Policy
- **Ge Lin** West Virginia University, Geographic Information Science

- Chris Mayda Eastern Michigan University, Human Geography
- Iheanyichukwu Osondu Fort Valley State University, Human Geography
- Jungyul Sohn University of Memphis, Regional Science
- Shobha Sriharan Virginia State University, Environmental Studies & Policy
- Judith van der Elst University of New Mexico, Archaeology

University of California, Santa Barbara

- Adriana Abdenur The New School, Sociology and urban studies
- Kishi Animashaun Syracuse University, Environmental sociology and African-American studies
- Marit Berntson Roanoke College, Sociology
- Neil Carlson Calvin College, Political science and research methods
- Jon Christensen Stanford University, History
- Alexandra Cole California State University, Northridge, Political science
- Charlotte Cooper University of California, Santa Cruz, Archaeology
- Laurel Cornell Indiana University, Demography, sociology, East Asian culture
- Albert Esteve-Palos Universitat Autònoma de Barcelona, Spatial demography
- Steve Graves California State University, Northridge, Human geography
- Daikwon Han Morehead State University, Spatial demography and epidemiology, regional analysis
- Yamuranai Kurewa Bennett College, Social work
- Jean LaVigne Gustavus Adolphus College
- Linda Loubert Morgan State University, Urban studies and GIS
- James Loucky Western Washington University, Anthropology, international migrations and borderlands
- Susan Maguire University at Buffalo, Historical archaeology
- Lisa Oliver Simon Fraser University, Human geography
- Jacqueline Olvera Connecticut College, Urban sociology
- Claudia Scholz University of Texas, San Antonio, Environmental sociology and community development
- Sue Steiner Arizona State University, Social work and community change
- Wei Tu Georgia Southern University, Geographic information science
- Ming Wen University of Utah, Medical sociology and social epidemiology
- Zhirong Zhao Eastern Michigan University, Political science and public administration

SUMMER 2007

Ohio State University

- Gregory Bohr California Polytechnic State University, Environmental Studies & Policy; Geography
- Olga Bychkova The Ohio State University, Political Science
- Marlese Durr Wright State University, Sociology
- Fazlay Faruque University of Mississippi Medical Center, Public Health; GI Science
- John Gossom The Ohio State University, Human Geography
- Diana Grigsby-Toussaint University of Illinois Chicago, Public Health
- Elizabeth Groff Temple University, Criminology; Geography
- Randolph Horn Samford University, Political Science
- Antwan Jones Bowling Green State University, Demography
- Ranbir Kang Oklahoma State University, Geographic Information Science
- Yushim Kim The Ohio State University, Criminal Justice; Geographic Information Science
- Katherine King University of Michigan, Demography
- Marilyn Krogh Loyola University Chicago, Sociology; Urban Studies
- Zhe Li Clark University, Geographic Information Science
- L Joe Morgan UNC Greensboro, Geographic Information Science
- Kenyatta Phelps Bowling Green State University, Sociology; Criminology
- Claudia Scholz Trinity University (TX), Sociology; International Development
- Sarah Smith Delta College (MI), Sociology
- Jeffery Strickland Montclair State University, History; Historical Geography
- Wei Tu Georgia Southern University, Geographic Information Science
- Xi Zhang University of Pittsburgh, Sociology
- Jennifer Ziemke University of Wisconsin-Madison, Political Science

University of California, Santa Barbara

- **Sean Anderson** California State University Channel Islands, Environmental Studies & Policy
- **Wesley Bernardini** University of Redlands, Archaeology
- **Kevin Byrne** Minneapolis College of Art and Design, Visualization and creative management
- **Valentina David** Bethune-Cookman College, Environmental Science
- **Alex De Pinto** University of Redlands, Economics
- **Joshua Dyck** University at Buffalo, SUNY, Political Science
- **Jill Grigsby** Pomona College, Sociology
- **Hiroyuki Iseki** University of Toledo, Urban and Regional Planning
- **Esther John** Northwest Indian College, Education and Curriculum Development
- **Rajrani Kalra** University of Central Arkansas/Kent State University, Human Geography
- **Sharla Lair** Florida State University, Geographic Information Science
- **Lillian Larsen** University of Redlands, Religious Studies, History
- **Allan Joseph Medwick** Kean University, Education Management; Asian and Chinese Studies
- **Sookhee Oh** Brown University, Sociology
- **Kerry Pannell** DePauw University, Economics
- **Jen Petersen** New York University, Sociology; Urban Studies
- **Ana Simão** University of Coimbra, Resources Management and GIS
- **Shobha Sriharan** Virginia State University, Environmental Science
- **Jun Sunseri** University of California, Santa Cruz, Anthropology
- **William Van Lopik** College of Menominee Nation, Geographic Information Science
- **Steve Wuhs** University of Redlands, Political Science
- **Li Yin** University at Buffalo (SUNY), Urban and Regional Planning

Appendix 2—Comments from SPACE Workshop Participants' Exit Surveys

RESPONSES TO OPEN-ENDED ITEMS ON THE 2004 AND 2007 EXIT SURVEYS

Please describe how you plan to use what you have learned in this workshop to enhance the exposure of spatial methods to students in your undergraduate courses and programs (e.g., describe exercises that you will introduce, modifications to course syllabi, new course proposals, or changes in an academic program, etc).

As a result of this workshop, describe how you will alter your approach to the evaluation of courses and to the assessment of student learning.

Enter any additional comments, suggestions, or concerns here.

WORKSHOP EXIT SURVEYS 2004:

- The workshop helped me to better think through the balance between teaching GIS purely as a tool and providing more theory/intuition. Also, the wide range of topics and scenarios that people presented was very useful because my own future instruction is likely to involve different topical areas, student abilities, and even course length (entire class versus a component of another class).
- I have taken my existing syllabus and inserted multiple changes—places where I will use data visualization instead of mere graphs, places where I will have students engage in exercises using data visualization software, modifications to the course project, etc. I noted eight discrete changes to my existing course syllabus!
- I was especially excited about the use of student portfolios for assessment, and the varied approaches to group work (i.e., building in student-student evaluation) and weekly progress reports as well as the option to do the project alone. I also think that I will include daily surveys administered at the beginning of class that ask students to evaluate how well they understand key concepts from the reading and then a follow-up at the end of the class to assess how the lecture clarified things.
- Before this workshop, I was skeptical about using GIS in content classes, but now I am glad to report that I am much more optimistic. GeoDa is sophisticated yet intuitive enough to use that I believe my undergrads will be able to effectively explore their own data and create independent projects.
- As my responses above indicate, I have been very impressed with the workshop. I learned a great deal in terms of both undergraduate education and spatial methods. In some ways, I wish there was more time, though I have been to workshops that seem to go on too long. This was a very compact week but, overall, I could not be happier. Cheers to all of the facilitators, they made this a very special learning experience for me.
- I enjoyed the workshop and thought it was very useful. At times, the emphasis seemed to get away from teaching the topics, but that was fine since we all both teach and do research. One suggestion would be to present a clearer overview/preview of the week both before everyone arrives and again first thing on the first day. I enjoyed the topical preview on the first day in which we learned a bit about what we would hear more about later, but I did not initially have a good sense of the main goals for the workshop, how the goals would be met, and what the expectations for the group project would be.
- Great workshop! I learned a lot! (1) I would have benefitted from more structured additional pedagogical components. Since the focus on this was teaching, it would have been ideal to have some teaching session at the beginning (basics, what to think about as you listen to the lectures and perform the labs, etc) and then again at the end (instead of being focused primarily at the end of the week. GREAT idea to have multiple disciplines together—I learned a lot from the participants as well as the instructors!
- The lecture interspersed with demo style (like the presentation given by Shaw) was a great model, especially since it followed up with links to do exercises on our own if we wanted to pursue them.
- A very worthwhile week. I'd like to do one of these every summer if I could!
- My evaluation probably sounds negative, but that is not an accurate rendering of my experience. I learned quite a bit, but not perhaps in the main ways the workshop anticipated. It will just take more time than I anticipated maturing the experience into useable classroom tools.
- I will definitely use some of the software to enhance the visual part of spatial learning. I am considering using the toxic clean-up site software as a project in my class. I will attempt to figure out and use an assessment tool(s). I would have liked to have more information on assessment and evaluation techniques—to have used them or to have seen how others have used them and what was/was not effective. The workshop as whole was strong on

spatial issues but weak on curriculum development theoretical background information, example curriculum, and assessment tools. I wish I had walked away with a better sense of things I could incorporate this fall rather than just sources I can look at to develop things in the future

- The workshop helped enhance and refine a class syllabus that I am helping to develop for a course to be taught in the spring 2005. We definitely plan to incorporate ideas and exercises presented by other participants as well as the workshop instructors.
- My group members and I devised a portfolio plan that will help students evaluate themselves throughout the course of the semester. Also, weekly reflections will help assess what the students think they have learned in the week and its applicability.
- Overall, the workshop was very beneficial, and I am grateful to have had an opportunity to participate. I thought the instructors were well prepared, dynamic, and very enthusiastic.
- My baseline knowledge of GIS and spatial models seemed a little higher than that of other participants. Hence, much of the content of the workshop was not new. This is not meant to be a criticism of the workshop. What I found most valuable was the opportunity to swap “tales of the trenches” with other instructors. I plan on re-organizing the structure of my course and re-designing my course labs. Lastly, I am going to incorporate student projects into my course design. I will incorporate assessment methods into my curriculum. I recognize the importance of understanding where the students are coming from—their baseline knowledge, skills, and expectations.
- I did like Kathryn’s advice to think of the goal first, and then of the assessment, and then of the syllabus. Ideally, that’s how it should be, and our exercise on defining what we mean by “reading” helped me see that I need to take these steps more consciously. Student assessment after the fact was not discussed, but there are some links on the website that I marked with “my page” and will check out.
- I have decided to separate the syllabus/lecture topics/exercises into three main perspectives on social change. One of these will be a spatial perspective. I will use some of the materials presented in the workshop, and some other diffusion related materials that I have for that section. I want the students to realize that social change almost always has a spatial dimension!
- The presentations and group work helped me to modify my syllabus to enhance the spatial component—from a 1.5-day lecture on GIS plus an elementary tutorial, to a course-long modular exercise in which students learn not only the basics of GIS, but also more directly how to use it for environmental analysis and its limitations and challenges. Yes! I plan to incorporate background assessments and am considering incorporating portfolio style assessments as well. I will be enhancing my group evaluation process to provide timelier monitoring.
- This was a very worthwhile workshop—I found myself frequently noting techniques and ideas brought up in presentations and discussions that I want to try in the class setting. Presentations overall were excellent, though more lab time would have been helpful for me.
- The presentations were excellent. Bravo! Some of the laboratory sessions were better than others. The labs that were accompanied by a written tutorial were most effective. I especially enjoyed the excellent questions that my classmates asked, and the interesting responses they generated. I should be doing more group work in my classes, and I will rearrange my curricula this fall to encourage more group work.
- I was especially excited about the use of student portfolios for assessment, and the varied approaches to group work (i.e., building in student-student evaluation) and weekly progress reports as well as the option to do the project alone. I also think that I will include daily surveys administered at the beginning of class that ask students to evaluate how well they understand key concepts from the reading and then a follow-up at the end of the class to assess how the lecture clarified things.
- I plan to incorporate the material learned in an upcoming course that I am designing for the spring semester. I have begun to use these ideas in the syllabus, to develop lab exercises, and a semester project. The ideas from this workshop have been very useful in developing the course as it is in its formative stages.
- I will think of student learning in terms of process rather than solution, i.e., focus on having students think more about why they are learning what they are doing and more about potential applications for the tools, concepts, etc. that they are learning.
- In general, I thought the workshop was wonderful. The presenters provided very useful information on not only spatial concepts and tools, but also applications. This information on applications for spatial analyses and tools will be invaluable in future teaching and course development.

- I will introduce a new course that will expose students to several of the spatial analytic methods that we touched upon in the course.
- To assess my students learning, I will be weighing my grade heavily on lab and projects rather than in-class exam. Assigning them small projects and lab exercises for a grade would help my students learn better and apply the techniques learnt in class to practical problems.
- Kathryn provided some new strategies for evaluating student knowledge and learning throughout a semester. I am looking forward to implementing some ideas such as weekly evaluations/thought papers and portfolios. The other lecturers provided useful examples on how to present the difficult concepts of spatial thinking and analysis. I noticed several common themes in the lectures and will use them when developing my course.
- The goals of the SPACE workshops should be explicit and the application processes more detailed to select those who already have some experience with GIS and spatial analysis. This workshop has been very valuable and I appreciated the chance to make new professional connections and develop my skills as an educator.
- This was a phenomenal experience, Thank you!
- The project that we presented as a group at the end of the workshop, which incorporated the information that was provided during the workshop will serve as a solid starting point for the course that we will teach during spring 2005. We now have a structure to work from for designing our lab exercises and lectures.
- The workshop helped enormously in better defining course goals. This in turn helped in formulating ways of how to reach those goals and designing tools for assessment. Prior to this workshop, I was more concerned with course content than with assessment.
- This workshop for me came at the right time, it helped me focus on and understand the pedagogical side of course designs. The project that we had to do at the end of the workshop was very important to bringing all the information together and it will serve as a framework for our course development in archaeology.
- One of the very useful aspects of the course was learning about various assessment methods. Because of the workshop, I will introduce assessment techniques throughout the semester and in forms other than exams. This is definitely a shift from what I would have done otherwise.
- Some of the methods introduced (e.g., student poll and problem identification) are quite useful and can be used to evaluate student learning. I will consider using them in my teaching.
- I am definitely going to find out how much my students know BEFORE beginning the course, so better to gear it to an appropriate level.
- I will encourage students to include spatial thinking in their research design, and analysis.
- The workshop provided valuable strategies and examples on class engagement of students, lab design and management, and homework assignments for GIS related projects.
- I plan to pre-test and then post-test my students on their mastery of spatial concepts such as scale, direction, and location. I will also test their understanding of GIS, GPS, and remote sensing. I had all but abandoned exams due to my students' lack of interest and seriousness.
- Congratulations on your outstanding workshop. I very much enjoyed those lectures, but needed more time in the lab. I also would have liked another lab that really gave me the time to explore some of the techniques that Sara discussed. The lectures were just wonderful, but the one lab was not enough to give us a taste of cartographic issues in mapmaking. I thought I had a good sense of visualization, but it turns out that I need more of that. Thank you all for the incredible work that you did in putting together this workshop. I have been to many and put together many and this is one of the best, with a great group of participants as well.
- One of the things I have learned is the value of having several types of assessment methods to account for students' differing forms of learning. I have also talked with other participants about developing assessment rubrics, which I have not (at least formally) utilized extensively. I plan to develop for the projects in my classes a formal rubric for assessing those projects.
- Overall, I found the workshop extremely helpful, and I have had my eyes opened to new ways of thinking about data spatially. I also feel prepared to increase my technical knowledge of both spatial econometric issues as well as with GIS software to enhance both my teaching and my research. Being here with people from many different departments was very beneficial, in that I saw how my colleagues might be using spatial analysis in the classroom and research, and gave me ideas about collaboration opportunities. It is obvious that you thought carefully about the content and presentation of the workshop, and it was very effective.

- My assessment techniques will incorporate questions that tap not just the student's comprehension of the topic, but also their ability to place the importance of that topic in its spatial and temporal context.
- The workshop experience was incredibly beneficial. I was exposed to a variety of skills that will improve my research, and learned a number of techniques to translate that research experience into teaching activities. A wonderful and enriching experience.
- I will place more weight on spatial concepts in my evaluation. I will create multiple choice questions and short essay questions that will require spatial analytical thinking from the students.
- The pedagogical discussions were very useful and I appreciated the fact that we were allowed to have these discussions. Thank you for a great workshop. I am honored to be a participant.
- I will take more time in lecture to expose students to basics of reading tables and maps and making inferences about those tables and maps. I will introduce a participatory decision making exercises that draw on GIS as a tool. I would like to use FlowMapper to assist in discussion of trade data and globalization.
- I will probably design more student projects that involve hands-on exercises for the local situation.
- Thank you very much for this wonderful week—the activities exceeded my expectations. I look forward to teaching a spatial analysis class at my new academic home.
- Before this workshop, I was skeptical about using GIS in content classes, but now I am glad to report that I am much more optimistic. GeoDa is sophisticated yet intuitive enough to use that I believe my undergrads will be able to effectively explore their own data and create independent projects.
- My original goal was to develop a course on the spatial analysis of crime. Over the course of the workshop, I found a great deal of resources that I plan to use for demonstrations, exercises, assignments, and exams. In addition, I am very impressed with the possibilities of GeoDa and plan to develop a workbook of criminological/criminal justice type assignments that could be used in a variety of courses.
- I have never really used pre-testing in any systematic way other than to get an idea about where the class stands and to orient the start-up of the class. I am seriously considering a more systematic approach where I give a test similar to the baseline test to see how far individual students have come.
- I learned a great deal both in terms of undergraduate education and in terms of spatial methods. In some ways, I wish there was more time, though I have been to workshops that seem to go on too long. This was a very compact week but, overall, I could not be happier. Cheers to all of the facilitators, they made this a very special learning experience for me.
- Like many university professors, I have no formal background in education theory. The workshop has introduced new concepts that I will use. The group discussions with the other faculty and seeing how they handled problems were very useful.
- I am going to be pulling spatial thinking into all of my courses. I have already developed some new rubrics for use in my classes (for projects). I am also working on exam questions and homework activities.
- I will stop labs several times to generate discussion and evaluate progress instead of letting students proceed independently through their whole lab.
- Because of workshop, I am inspired to rework my quant methods course to include spatial analysis from the outset. Techniques that I can use to promote this are: 1) emphasis on spatial analysis as compared to standard analysis, 2) GeoDa software that is easy to teach and to use, 3) emphasis on visual techniques in lectures, and 4) use of a lecturing style that focuses on explaining concepts.
- I really gathered many ideas that I would like to implement in my course and in my presentations in other courses. The software awareness alone was invaluable because it seems such a shame to teach a geography course with only one software package! I feel much more comfortable including small exercises in my labs and lectures. I really enjoyed this workshop and got much more out of it than I had expected. I feel more secure that I can teach spatial concepts and I will value and use the contacts I made here. Thank you!
- This workshop was terrific—each component was really just fantastic. You did a wonderful job putting this together. Thanks so much for an outstanding week of learning.

WORKSHOP EXIT SURVEYS 2007

- More hands-on exercises in my GIS classes. I am going to use the worksheet method as demonstrated by Dr. Murray and Dr. O'Kelly to help students understand the theoretical foundations of models before letting them run the model. I will try to be more a facilitator in the classroom than a lecturer. For example, let students do more readings before the class instead of me doing all the talks.
- I will alter my assessment of courses and student learning based on a hands-on approach and using a rubric, which details what they have learned. I found the rubric idea very helpful and necessary when evaluating a class that will use GIS.
- For the environmental criminology class I developed an exercise where students catalogue their own activities for five days, turn them in via Excel and then I map the whole class. This will facilitate discussions about the role of activity spaces in criminal events
- I plan to implement labs into my state politics course and integrate spatial analysis into student research projects and presentations. While there was some variation in the design of the OSU lab exercises I performed, I picked up several good ideas about exercise construction.
- I am very appreciative of the opportunity to participate in SPACE workshops. The effect of this training on my teaching and my research has been dramatic. Thank you
- I have learned to get the goals out there first, followed by how to assess the goals BEFORE the actual concoction and implementation of the project or assignment. Evaluation for me will be more structured with consideration of the type of student (novice, competent and expert) as well as the difficulty of the task.
- I learned so much here at the workshop. It fueled my desire to create and enhance research projects and it taught me to think of things in a different realm—space. It was such a great experience. I am lucky and grateful that I had the opportunity to learn from the best (instructors and participants). I created various research networks that I will have access to for years to come. An overall great job.
- This workshop was extremely useful to develop my undergraduate teaching skills. GEODA was something very new to me. It is a very useful resource to develop some exercises for exploring spatial data.
- I was extremely impressed by all the arrangements made by the Dr. Kwan and others. I go to a few conferences every year. However, this was the first such event where I learned a lot and made very good friends. Above all, I got to see OSU—very nice experience!
- I already use a version of rubrics, but have learned to use Primary Traits to describe the range of outcomes more clearly. I now realize I could have the students do “pre-work” before coming to class in contexts where it had not occurred to me before.
- I obtained knowledge as I expected. I enjoyed the lectures and labs very much. Especially, I like the software GeoDa. I will introduce it to my future class, both GIS and landscape ecology. I believe this will enrich my class and give my students a better understanding of spatial concepts and spatial thinking!
- I will use various ways like quizzes, exams, projects, presentations, etc., to assess student learning, to ensure they learn something.
- This is the most successful workshop I have ever attended. It greatly enriched my knowledge and it is very helpful to my future course development. I had a very good time at OSU. Although the duration was short, it impressed me very much!
- Using the information presented, I expect to construct better syllabi and methods of assessment for the use of GIS to help students visualize their findings. The pedagogical approaches to objects and assessment have been a weakness of mine. Using the technologies and tools provided, I believe I will be able to reach a higher plateau and assist students in a more complete understanding of data and spatial analysis.
- I found the workshop very well organized and the new approaches to teaching and learning well constructed. I think that some of the information was very (maybe too) elementary and some of it was quit sophisticated. A happy medium would have been more appropriate—I do not feel that it was a significant detraction however.
- I learned a lot on this topic. I will include several assessments throughout the semester to make sure students are learning the assigned material and I am meeting my learning goals for the class.
- I will modify my sociology course syllabi to incorporate spatial thinking and cartographic maps to demonstrate visually urban/social problems.

- I am very grateful for the opportunity to learn about spatial thinking and modeling. I have learned a wealth of information that I will apply to the courses I teach. I hope that in the future you will incorporate more basic or fundamental workshops for individuals new to GIS. Thank you! Thank you! Thank you!
- I am especially interested teaching a course similar to Professor Kwan's spring 2008 course on GIS for the Social Sciences. Moreover, I plan to build upon my relationship with faculty in the Geography Department.
- In the past, I did not structure my course well enough. Mainly, I overburdened novice students with data collection. Now, I plan to scaffold my lessons and provide data for each.
- This was a first-rate workshop. I continue to think about Professor Janelle's comments on the first day. He discussed "space" as a way to conceptualize the interaction of a variety of disciplines. Professor Kwan continued to emphasize that same idea throughout the week. It reaffirmed my belief in authentic interdisciplinary studies. Thank you.
- The workshop helped me to understand that teaching spatial thinking need not be linked to teaching technologies used in spatial analysis.
- Workshops would benefit from more small-group interactions, especially if groups are segregated by experience in the topic being covered (e.g., GIS, spatial statistics, etc.). Also, a greater focus on producing applied teaching products, rather than discussions of general theory, would be more useful in the classroom.
- I intend to alter the labs that I teach by incorporating more spatial thinking with several resources I was exposed to at the workshop. Those resources included learning and cognition theories and research project ideas. I also intend to design a course for teaching GIS to pre-service social science teachers.
- I will alter my approach by actually considering the learner first when I approach my teaching, evaluations, and assessments. I will always ask myself, "What do I want my students to learn? What is the best teaching approach that will facilitate that learning?"
- I would like to incorporate spatial analysis in my Research Methods and Urban Sociology. I would like to introduce ESDA and spatial autocorrelation analysis with the GeoDa program. I also plan to propose a new course, Spatial Thinking in the Social Sciences in the near future that introduces the concept of spatial effects and their research applications. This course would be integrated with lab sessions that teach GIS techniques.
- Thank you for the workshop. It was well organized. The instructors were very committed to make the workshop go smoothly and helpful for us to produce our final projects.
- We look at a number of data sets in my classes, particularly as they relate to world and national demographics. Because of this workshop, I plan to integrate some of the data visualization skills that I have learned and turn these datasets into visual maps.
- I will attempt to provide more structured peer feedback to student presentations.
- I will probably modify my course syllabi for the GIS introduction class to: 1) introduce fundamental concepts of spatial thinking and spatial analysis, 2) provide examples of spatial analysis, visualization, and applications, using GIS, 3) test students on important concepts of spatial analysis and thinking, and 4) provide a more concrete framework for a student project, compared to a wide range of applications that students could pick from last year.
- I came away with a range of introductory strategies for incorporating spatial methods in teaching my undergraduate courses. Perhaps more importantly, however, is the spectrum of conversation partners I now have available as I continue to seek input and advice in implementing these ideas.
- Already, I had begun to incorporate spatial evaluation in my course assessments but was somewhat ambivalent about my approach. This week was a wonderful confirmation of my rather tentative early experimentation. I am anxious to explore further. I am going to buy a copy of Classroom Assessment Techniques and begin experimenting with alternative assessment methods
- Excellent workshop, but some sessions and exercises could have been more difficult. Too much repetition of what was in the labs and readings that were assigned before the workshop.
- At our institution, there is great emphasis on student assessment. There are several approaches and the Institution for Planning and Assessment, have come out with models. Our Faculty senate are working on the issue and coming out with an electronic method of evaluation. The topics discussed at the SPACE workshop are already under consideration by our campus.
- I have a better idea of how to integrate specific concepts (such as scale) into the exercises that I use already and some new ones that I will try to incorporate into future classes.

- Thank you for continuing to be one of the most influential and supportive resources for me in my attempts to integrate spatial analysis and thinking into my work!
- I certainly wish these workshops could continue. I was only able to attend this one, and it has been a real eye-opener. Making these connections between GIS and RS, and its implications for my undergraduate teaching as well as my research has been extremely valuable for my professional development. Additionally, it has allowed me to come back to my institution and spread the word about the implications of GIS/RS in the social science curriculum. My institution will be moving forward on this with grant writing and curriculum development in the next two years. Thanks again for this opportunity and the hard work that went into its organization and execution.

Appendix 3—From the NSF Fastlane Report

The following responses from D. Janelle were copied from the NSF Fastlane Report:

Final Report for Period: 10/2008–03/2009

Submitted on: 06/29/2009

Principal Investigator: Janelle, Donald G.

Award ID: 0231263

Organization: U of Cal Santa Barbara

Submitted By: Janelle, Donald, Principal Investigator

Title: Spatial Perspectives on Analysis for Curriculum Enhancement (SPACE)

Appendix 3a—Project Participants

SENIOR PERSONNEL

Name: Janelle, Donald

Worked for more than 160 Hours: Yes

Contribution to Project:

Don Janelle served as Principal Investigator and Program Director for SPACE. He planned and coordinated all project activities with the overall objectives for the NSF CCLI national dissemination program. He worked with the workshop coordinators for UCSB, OSU, and UCGIS on the development of workshop programs, directed the advertising for applicants and the selection process, cooperated with the SPACE Educational Development Coordinator on the implementation of instructional development components in the workshops and in the design of instruments for evaluating workshop results. He supervised the work of the project administrator and webmaster, hired and supervised graduate student assistants at UCSB, organized planning meetings for project leaders from the three partner institutions and workshop planning meetings for UCSB, arranged for SPACE participation in national academic conferences, visited and instructed at all SPACE workshops, represented the SPACE project at annual academic conferences in the social sciences, and prepared documentation for annual reports to NSF and to UCSB's Institute for Social, Behavioral, and Economic Research.

Name: Appelbaum, Richard

Worked for more than 160 Hours: Yes

Contribution to Project:

As co-PI on the project, he participated in the December 2003, 2004, and 2005 planning meetings of the project team and has assisted in advertising the workshop program. As an award-winning teacher at UCSB, he gave a featured presentation to the 2004 workshop at UCSB. He featured the SPACE program workshops in a presentation to the Annual Meeting of the American Sociological Association in mid August 2004. His primary role in SPACE commenced in year two (2004–2005) of the project in helping to implement its program of short workshops at the annual meetings of academic societies. Several such workshops have taken place over the four primary years of SPACE, all of which are described at www.csiss.org/SPACE.

Name: Getis, Arthur

Worked for more than 160 Hours: No

Contribution to Project:

Arthur Getis was PI for the UCGIS subcontract on the SPACE project. He participated in the planning meeting for the SPACE project in December 2003 and 2004, and served as Co-coordinator with John Weeks for the 2004 UCGIS SPACE workshop at San Diego State University. He was responsible for workshop development, was a principal workshop instructor, tutored participants, and supervised the work of Jared Aldstadt. In 2005 he worked with John Weeks to organize a special session on the SPACE program for the UCGIS Spring Assembly in Washington DC. He also monitored participation of UCGIS in the SPACE project and assisted in disseminating information about the program.

Name: Goodchild, Fiona

Worked for more than 160 Hours: Yes

Contribution to Project:

Fiona Goodchild served as the Educational Development Coordinator for the Space Project. Her primary obligations were in planning, documentation and evaluation of workshop outcomes. She prepared resources for and attended the SPACE planning meetings in December 2003, 2004, and 2005. She participated in the design of survey instruments for selecting participants and for workshop entry and exit surveys for all of the program workshops in 2004 through 2007. In addition, she provided instruction about curriculum development and student assessment in 2004, 2005, 2006, and 2007 for the UCSB workshops and for the 2004 SDSU summer workshop. She was also a consultant to instructors in the OSU workshop. She worked with D. Janelle in supervising the assistance of Stacy Rebich-Hespanha and communicated with all workshop

instructors on the pedagogical goals of the program. In fall 2004, 2005, 2007, and 2008, she assisted Don Janelle with pedagogical aspects of the annual SPACE report to the National Science Foundation.

Name: Goodchild, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

As a Co-PI on the project, he assisted in the overall design for the SPACE program and was one of the primary instructors in 2004, 2005, 2006, and 2007 workshops at UCSB and at San Diego State University in 2004. He was also a guest presenter at the workshop hosted by the University of Oklahoma in 2006. For the workshops at UCSB, he participated in planning meetings, provided advice to the graduate students involved in setting up exercises, and worked closely with the PI and workshop coordinators in setting the workshop agenda.

Name: Kwan, Mei-Po

Worked for more than 160 Hours: Yes

Contribution to Project:

Mei-Po Kwan served as the PI for the subcontract to Ohio State University. She was responsible for designing, implementing, coordinating the workshop program at Ohio State University. She took part in the SPACE planning meetings in Santa Barbara in December 2003, 2004, and 2005. She supervised other personnel working on the project at OSU, developed lecture plans and lab exercises, and taught part of the 2004, 2005, 2006, and 2007 workshops.

POST-DOC

Name: Keuper, Alex

Worked for more than 160 Hours: No

Contribution to Project:

He completed his PhD in June 2004. He was the primary lab instructor for the UCSB workshop in 2004, he prepared the workshop-related exercises on the use of GIS, and tutored participants on their educational development projects.

GRADUATE STUDENT

Name: Aldstadt, Jared

Worked for more than 160 Hours: No

Contribution to Project:

Jared Aldstadt prepared lab exercises and instructed and tutored participants in the use of GIS and GeoDa software exercises at the 2004 workshop held at San Diego State University (host university for the UCGIS SPACE workshop). He completed his PhD in 2005.

Name: Battersby, Sarah

Worked for more than 160 Hours: No

Contribution to Project:

She was a workshop lab instructor and project consultant for participants in the 2005 UCSB workshop. In 2006, Sara was the primary cartography and graphic visualization instructor for the workshop. She completed her PhD in 2006.

Name: Boschmann, Eric

Worked for more than 160 Hours: Yes

Contribution to Project:

As a PhD student, Eric Boschmann assisted with overall project coordination for the 2004, 2005, and 2006 workshops at Ohio State University, assisted in advertising the workshops, contributed to workshop logistics, helped in the development of lab exercises, and provided tutorial support during the lab sessions.

Name: Bothwell, James

Worked for more than 160 Hours: No

Contribution to Project:

James worked as a student consultant to participants in the 2006 remote sensing workshop at the University of Oklahoma. Funding was provided from the OU Center for Spatial Analysis.

Name: Cheuk, Mang Lung

Worked for more than 160 Hours: No

Contribution to Project:

Mang Lung worked as a student consultant to participants in the 2006 remote sensing workshop at the University of Oklahoma. Funding was provided from the OU Center for Spatial Analysis.

Name: Collier, Matthew

Worked for more than 160 Hours: No

Contribution to Project:

Matthew worked as a student consultant to participants in the 2006 remote sensing workshop at the University of Oklahoma. Funding was provided from the OU Center for Spatial Analysis.

Name: Davis, Jason

Worked for more than 160 Hours: No

Contribution to Project:

Provided assistance with logistics for the 2004 and 2005 workshops at Ohio State University. This work was funded by the Department of Geography at OSU.

Name: Ding, Guoxiang

Worked for more than 160 Hours: No

Contribution to Project:

Guoxiang (PhD candidate in Geography) assisted with logistics and served as a lab instructor for the 2006 and 2007 workshops at Ohio State University.

Name: Farrell, Rob

Worked for more than 160 Hours: No

Contribution to Project:

He provided tutorial assistance on GIS and spatial statistics to participants in the 2004 UCSB workshop. He worked with the workshop coordinator in setting up exercises on the use of the GeoDa software (exploratory spatial data analysis).

Name: Folch, David

Worked for more than 160 Hours: No

Contribution to Project:

David was a PhD candidate in the joint program between UCSB and San Diego State University. He participated as a lab instructor in the 2007 UCSB workshop, with responsibility for helping participants with applications of spatial econometric analysis.

Name: Glennon, Alan

Worked for more than 160 Hours: No

Contribution to Project:

Alan, a PhD student at UCSB, gave a guest presentation on geo-browser technologies to the December 2005 Planning Meeting and to the participants in the 2006 SPACE workshop at UCSB.

Name: Goldsberry, Kirk

Worked for more than 160 Hours: No

Contribution to Project:

Kirk was the primary instructor for cartographic visualization of social science data for the 2007 UCSB workshop. He completed his PhD immediately after the workshop.

Name: Grace, Kathryn

Worked for more than 160 Hours: No

Contribution to Project:

Kathryn was a PhD candidate who served as a lab instructor for the 2005, 2006, and 2007 workshops at UCSB, responsible for instruction and assistance to workshop participants in the area of spatial statistics.

Name: Griswold, Julia

Worked for more than 160 Hours: No

Contribution to Project:

Julia Griswold is an MA candidate in the Department of Geography at SFSU. She prepared census lab exercise and lab materials on ArcCatalog and map projections. She assisted with exercise preparation and testing, and helped participants during workshop labs for the SFSU workshop in 2005.

Name: Hawthorne, Tim

Worked for more than 160 Hours: No

Contribution to Project:

Tim (PhD candidate in Geography) assisted with logistics and served as a lab instructor for the 2007 workshop at Ohio State University.

Name: Hemphill, Jeff

Worked for more than 160 Hours: No

Contribution to Project:

PhD candidate at UCSB. He was a workshop lab instructor and project consultant for participants in the 2005 and 2006 UCSB workshops. He designed some of the lab exercises.

Name: Howard, Dustin

Worked for more than 160 Hours: No

Contribution to Project:

Dustin worked as a student consultant to participants in the 2006 remote sensing workshop at the University of Oklahoma. Funding was provided from the University's Office of the Vice President for Research.

Name: Howarth, Jeff

Worked for more than 160 Hours: Yes

Contribution to Project:

He worked on a 35% graduate appointment in the Spring 2004 quarter and a 25% appointment in the summer to prepare resources for the 2004 workshop at UCSB. He prepared a document to assist undergraduate instructors in choosing a GIS software package suitable for their needs and he gave a presentation on his work to participants in the UCSB workshop. In 2007 Jeff was a primary instructor for GIS in the UCSB workshop. He completed his PhD in 2007.

Name: Hui, Wei

Worked for more than 160 Hours: No

Contribution to Project:

Provided assistance with logistics for the 2004 workshop at Ohio State University. This work was funded by the Department of Geography at OSU.

Name: Klaf, Suzanna

Worked for more than 160 Hours: No

Contribution to Project:

She helped with logistics during the 2004, 2005, and 2006 workshops at Ohio State University. She sent out fliers to more than 100 academic departments, helped to coordinate the workshops, and assisted in the development of lab exercises.

Name: Kuehl, Marcie

Worked for more than 160 Hours: No

Contribution to Project:

Marcie worked as a student consultant to participants in the 2006 remote sensing workshop at the University of Oklahoma. Funding was provided from the University's Office of the Vice President for Research.

Name: Nuernberger, Andrea

Worked for more than 160 Hours: Yes

Contribution to Project:

As a PhD student at UCSB, Andrea Nuernberger assisted with workshop logistics in 2006 and 2007 and with web resource development in 2006 and 2008.

Name: Rebich-Hespanha, Stacy

Worked for more than 160 Hours: Yes

Contribution to Project:

Stacy Rebich-Hespanha is a PhD student with an interest in educational development and learning assessment. She provided educational development support for the SPACE project in 2004 through 2007, assisting Fiona Goodchild in the refinement of survey instruments, grouping of workshop participants according to expertise and needs, providing tutorial support and instruction for workshop participants in the SDSU workshop in 2004, the SFSU workshop in 2005, and the UCSB workshops from 2004 through 2007. She maintained the workshop library for participant use and designed UCSB workshop exercises and resources for educational development initiatives. In addition, she was involved in processing data and interpreting results on program evaluation. She contributed to instructor orientation for the 2004 and 2005 planning meeting and worked closely with the PI and webmaster to enhance resources on the SPACE website.

Name: Ren, Fang

Worked for more than 160 Hours: Yes

Contribution to Project:

She helped to advertise and coordinate the 2004 workshop at Ohio State University, assisted in the development of lab exercises, and provided tutorial support in the lab sessions.

Name: Richards, Heather

Worked for more than 160 Hours: No

Contribution to Project:

Heather is a PhD Candidate in the Department of Anthropology at the University of New Mexico. She participated in the 2004 workshop at Ohio State University and the 2006 workshop at UCSB. She provided guidance to the SPACE Planning meeting in December 2005 and helped to organize a session on undergraduate training in GIS for the 2006 meetings of the American Archaeological Society.

Name: Rich, Katy

Worked for more than 160 Hours: No

Contribution to Project:

Katy worked as a student consultant to participants in the 2006 remote sensing workshop at the University of Oklahoma. Funding was provided from the University's Office of the Vice President for Research.

Name: White, Eric

Worked for more than 160 Hours: Yes

Contribution to Project:

A PhD candidate in Anthropology and an expert on the development of Internet search engines, he held a 35 % appointment in the Fall 2003 and Winter 2004 quarters. His role was to locate web resources that feature educational curriculum development and learning assessment. These are presented on the SPACE website (www.csiss.org/SPACE). He also identified course syllabi on the Web that feature spatial perspectives in a range of social science disciplines. These were examined by workshop participants as examples for critique and emulation.

Name: Yoo, Eun-Hye

Worked for more than 160 Hours: No

Contribution to Project:

Enki was a workshop lab instructor and project consultant for participants in the 2005 and 2006 UCSB workshops. She completed her PhD in 2006.

UNDERGRADUATE STUDENT

Name: DeJesus, Anthony

Worked for more than 160 Hours: No

Contribution to Project:

Anthony DeJesus is an undergraduate SFSU film major who prepared a short documentary video of the 2005 SFSU workshop.

This was used to illustrate the SPACE program at a 2006 Assembly of the UCGIS and appears on the SPACE website.

Name: Pennucci, Aly

Worked for more than 160 Hours: No

Contribution to Project:

Aly Pennucci is an undergraduate student in the SFSU Urban Studies program who assisted with the 2005 workshop preparation re: liaison to participants about housing arrangements. She assisted with photocopying.

Name: Williams, Andrew

Worked for more than 160 Hours: No

Contribution to Project:

An undergraduate student in the SFSU Urban Studies program who assisted with the 2005 workshop preparation (Xeroxing, assembling packets and exercise binders).

TECHNICIAN, PROGRAMMER

Name: Cohen, Jesse

Worked for more than 160 Hours: No

Contribution to Project:

Jesse Cohen provides technical support for the SFSU Institute for Geographical Information Science. He assisted Barry Nickel with technical aspects of the 2005 workshop. He also helped with workshop organization: overseeing preparation of materials, preparing exercise materials, managing logistics, and liaison to workshop participants.

Name: Gadal, Guylene

Worked for more than 160 Hours: Yes

Contribution to Project:

Guylene assumed duties as project web developer beginning in January 2006 through completion of the project in March 2009. She also managed the implementation of web-based databases associated with SPACE and coordinated with workshop participants in the organization of resources that are useful for teaching and assessment. During the UCSB workshops in 2006 and 2007, she provided logistical support for computer facilities.

Name: James, Ann

Worked for more than 160 Hours: No

Contribution to Project:

Ann James provided technical and logistical support for the 2006 workshop on remote sensing at the University of Oklahoma

Name: Nickel, Barry

Worked for more than 160 Hours: Yes

Contribution to Project:

Barry Nickel is the Associate Director of the SFSU Institute for Geographical Information Science. He oversaw all technical aspects of the 2005 workshop, including preparation of labs, data installation, and trouble shooting. He assisted in designing workshop content and he developed and delivered lectures on attribute tables, vector GIS analysis, and GIS resources for social scientists. He attended all workshop sessions.

Name: Zavala, Gamaiel

Worked for more than 160 Hours: Yes

Contribution to Project:

Gamaiel Zavala handled web development and database development and management for the SPACE project. In 2003–2004, he developed the project's website (www.csiss.org/SPACE) as a basis for web advertising and project dissemination of instructional and course development resources. He designed all of the automated database management systems for participant applications and processing, and for workshop entry and exit surveys, providing a range of output to enable the PI and workshop organizers for all three annual workshops to assess applicants and to understand the backgrounds and needs of workshop participants. In addition, he created a customized web forum for participant-instructor dialog during and after workshops and developed a 'My Page' resource for workshop participants to store and retrieve customized teaching and learning resources that they find useful in their curriculum development efforts. He also served as liaison with the systems director of the computer labs used in the 2004 and 2005 workshops at UCSB. In 2005 he worked closely with SPACE award recipients and conference workshop presenters in documenting their undergraduate instructional activities. The interface developed for these presentations was also used for displaying the work of workshop participants—providing examples for instructors from a broad range of social science disciplines and interdisciplinary programs. Gamaiel took a position in the private sector in October 2005.

OTHER PARTICIPANT

Name: Ahlqvist, Ola

Worked for more than 160 Hours: No

Contribution to Project:

Professor Ola Ahlqvist was the primary cartography instructor for the 2006 and 2007 workshops at Ohio State University.

Name: Brown, Christian

Worked for more than 160 Hours: Yes

Contribution to Project:

Project administrator for the SPACE program, October 2003 to July 2006. He provided assistance to the PI on workshop advertising and application processing, processed all invoices on expenses for the UCSB workshops—publications, printing, software, etc. He organized accommodations, reserved classroom and lab space, and provided logistical assistance to the

workshop organizers and participants at the UCSB workshops. He handled the preparation of participant stipends and certificates of completion for all three SPACE workshop sites and was responsible for all correspondence with workshop participants. He reviewed all instructions to participants that appear on the SPACE website for accuracy and compliance with NSF regulations.

Name: Brown, Melisa

Worked for more than 160 Hours: No

Contribution to Project:

Melisa Brown provided administrative support for the 2006 workshop at the University of Oklahoma, including logistical support for all of the participants.

Name: Brown, Philip

Worked for more than 160 Hours: No

Contribution to Project:

Professor Brown (History at OSU) was a guest presenter on the role of maps and spatial thinking in history for the 2006 and 2007 workshops at Ohio State University.

Name: Cartwright, Donald

Worked for more than 160 Hours: No

Contribution to Project:

Professor Cartwright is one of the most highly recognized teachers in Canada—a recipient of the highest possible awards for the University of Western Ontario (UWO), for the Province of Ontario, and for Canada. He participated as a project advisor at the December 2003, 2004, and 2005 SPACE planning meetings, sharing ideas about the faculty mentor program that he coordinates for the Teaching Support Center at the University of Western Ontario. He continued as a primary educational development advisor to the SPACE project through 2007.

Name: Clarke, Keith

Worked for more than 160 Hours: No

Contribution to Project:

Keith Clarke is a Professor of Geography, U.C. Santa Barbara. He delivered the keynote address at the 2005 SFSU workshop and led discussion on use of GIS in social science teaching.

Name: Doehner, Karen

Worked for more than 160 Hours: No

Contribution to Project:

Karen worked as the Administrative Coordinator with the Center for Spatially Integrated Social Science (starting in March 2008) and has assisted with administering awards provided to participants in SPACE workshops through March 2009.

Name: Fabrikant, Sara

Worked for more than 160 Hours: No

Contribution to Project:

A Professor of Geography with expertise in cartographic visualization of research data, Sara Fabrikant worked with the PI and with Stuart Sweeney in co-organizing the 2004 UCSB workshop. She was a primary instructor for the 2004, 2005, and 2006 UCSB workshops. She prepared lab exercises on the integration of GIS with other data visualization tools, lectured, and provided consultation for participants on their workshop projects.

Name: Fournier, Eric

Worked for more than 160 Hours: No

Contribution to Project:

Professor Fournier (Samford University in Alabama) participated as a project adviser at the December 2003, 2004, and 2005 SPACE planning meetings in Santa Barbara. He shared ideas based on his experience as Co-Principal Investigator in an NSF-supported program for GIS instruction for science and social science instructors at Samford (Academic Excellence through GIS project (AEGIS)). He also shared ideas from his involvement as an instructor in the NSF-supported Geography Faculty Development Alliance Workshops, led by Kenneth Foote at the University of Colorado.

Name: Freudenberg, William

Worked for more than 160 Hours: No

Contribution to Project:

Professor of Environmental Studies and Sociology. He gave a presentation to the 2004 UCSB workshop participants.

Name: Herr-Harthorn, Barbara

Worked for more than 160 Hours: No

Contribution to Project:

Research Professor in Anthropology and faculty member in the Department of Woman's Studies at UCSB. She gave a guest presentation on spatial perspectives on risk assessment in public health for the 2004 workshop at UCSB.

Name: Holoman, Christopher

Worked for more than 160 Hours: No

Contribution to Project:

Christopher is a political scientist from the Liberal Studies Department of Hilbert College. He participated in the 2005 workshop at San Francisco State University, gave a guest presentation about his SPACE workshop experience to the UCGIS 2006 Summer Assembly, and provided guidance to the SPACE Planning meeting in December 2005.

Name: Jankowski, Piotr

Worked for more than 160 Hours: No

Contribution to Project:

He was an instructor at the 2004 workshop at San Diego State University, responsible for presentations and exercises on public participation GIS and for tutoring participants.

Name: Jocoy, Christine

Worked for more than 160 Hours: No

Contribution to Project:

A Professor of Geography at California State University, Long Beach who attended the 2004 workshop at San Diego State University. She presented a participant's perspective on the SPACE program at the 2004 SPACE Planning Meeting.

Name: Johnson, Richard

Worked for more than 160 Hours: No

Contribution to Project:

As a Senior Instructional Consultant with the UCSB Office for Instructional Consultation, he participated in the SPACE planning meetings in December 2003, 2004, and 2005, and provided advisory support and resources for the project's Educational Development Coordinator.

Name: Kirkeberg, Max

Worked for more than 160 Hours: No

Contribution to Project:

Max Kirkeberg is a Professor of Geography at SFSU. He led a walking tour of San Francisco's South of Market district for the participants of the 2005 SFSU workshop, several with teaching interests in urban studies.

Name: Kuhn, Peter

Worked for more than 160 Hours: No

Contribution to Project:

Professor of Economics (UCSB), Peter Kuhn gave a guest presentation to the 2004 UCSB workshop on applications of spatial thinking in economics, with examples of how he treats this in undergraduate teaching.

Name: Lam, Nina

Worked for more than 160 Hours: No

Contribution to Project:

Nina Lam, Professor of Geography at Louisiana State University, participated in the December 2004 SPACE Planning Meeting in her advisory role as President of the UCGIS.

Name: Lee, Jiyeong

Worked for more than 160 Hours: No

Contribution to Project:

Professor Lee was a guest presenter on GIS applications for the 2006 and 2007 workshops at Ohio State University. He is a professor at the University of North Carolina, Charlotte.

Name: LeGates, Richard

Worked for more than 160 Hours: Yes

Contribution to Project:

Richard LeGates served as Coordinator of the 2005 SFSU workshop and as project principal investigator on behalf of the

University Consortium for Geographic Information Science for the second year of the SPACE project. He contributed to the SPACE Planning meeting in Santa Barbara in December 2004, managed personnel and budget, and played the lead role in designing the SFSU workshop content. He developed and taught lectures introducing ArcGIS, on vector GIS, on computerized cartography, and on GIS resources for social scientists. He attended all workshop sessions and prepared a final report on the SFSU workshop. He also organized a SPACE session for the 2006 UCGIS Assembly, and organized a special session on pedagogy in urban planning for the Association of Collegiate Schools of Planning Annual Conference, in 2005.

Name: Liu, Desheng

Worked for more than 160 Hours: No

Contribution to Project:

Desheng was an instructor in the 2007 workshop at Ohio State University, responsible for instruction on spatial statistics, using GeoDa software.

Name: Liu, XiaoHang

Worked for more than 160 Hours: Yes

Contribution to Project:

XiaoHang Liu is an Assistant Professor of Geography at SFSU who served as the 2005 SFSU workshop project co-principal investigator. She contributed to the SPACE Planning meeting in Santa Barbara in December 2004 and played lead role in designing the SFSU workshop content. For the workshop, she developed and delivered lectures on GIS and GIS data, raster GIS, and GIS data acquisition. She developed a geocoding lab exercise and oversaw labs on raster GIS and geocoding. She attended all workshop sessions.

Name: Lobao, Linda

Worked for more than 160 Hours: No

Contribution to Project:

A professor in the Department of Sociology, OSU, Linda Lobao gave guest lectures in the workshops at Ohio State University from 2004 through 2007. In 2005 she joined the panel discussion on teaching.

Name: McLafferty, Sara

Worked for more than 160 Hours: No

Contribution to Project:

As a professor of Geography at the University of Illinois, Urbana-Champaign, Dr. McLafferty gave guest lectures in the 2004, 2005, 2006, and 2007 workshops at Ohio State University, illustrating the role of GIS and spatial analysis in health studies and in teaching.

Name: Mesev, Victor

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Mesev is a professor of geography at Florida State University. He was one of the primary remote sensing instructors for the 2006 workshop at the University of Oklahoma and also participated in the December 2005 planning meeting.

Name: Munroe, Darla

Worked for more than 160 Hours: No

Contribution to Project:

Darla was an instructor in the 2006 workshop at Ohio State University, responsible for instruction on spatial statistics, using GeoDa software.

Name: Murray, Allan

Worked for more than 160 Hours: No

Contribution to Project:

He was an instructor in the 2004, 2005, 2006, and 2007 workshops at Ohio State University. He developed related teaching materials and lab exercises.

Name: Nicholson, Stanley

Worked for more than 160 Hours: No

Contribution to Project:

As Director of the Office of Instructional Consultation at UCSB, Dr. Nicholson participated in the SPACE planning meeting in December 2003 and provided advisory support and resources for the project's Educational Development Coordinator.

Name: O'Kelly, Morton

Worked for more than 160 Hours: No

Contribution to Project:

He was an instructor in the 2004, 2005, 2006, and 2007 workshops at Ohio State University. He developed related teaching materials and lab exercises.

Name: Padgett, David

Worked for more than 160 Hours: No

Contribution to Project:

David Padgett is a Professor of Urban Studies at Tennessee State University who attended the 2004 SPACE workshop at UCSB. He presented a participant's perspective on the SPACE program at the 2004 SPACE Planning Meeting, assisted with applicant recruitment from HBCUs, and organized five SPACE sessions at academic conferences in the period 2005–2009. He also contributed extensively to instructional resources for the SPACE website.

Name: Pamuk, Ayse

Worked for more than 160 Hours: No

Contribution to Project:

Ayse Pamuk is an Associate professor of Urban Studies at SFSU. She prepared and delivered a lecture on the use of census data in spatial analysis at the 2005 SFSU SPACE workshop, and oversaw a lab exercise on the use of census data in GIS.

Name: Plank, Kathryn

Worked for more than 160 Hours: No

Contribution to Project:

As Associate Director of the Office of Faculty & TA Development at Ohio State University, Dr. Plank helped in designing the educational development component of the OSU workshops, facilitated the activities of participant focus groups, and taught parts of the 2004, 2005, 2006, and 2007 workshops at Ohio State University. She also took part in the 2004 and 2005 SPACE planning meetings in Santa Barbara, providing workshop instructors with guidance on student learning styles.

Name: Pedersen, Jon

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Pedersen is the Dean of Education at the University of Oklahoma. He was an instructor in the workshop in 2006, working with participants on questions regarding curriculum development, pedagogy, and learning assessment. He also took part in the December 2005 SPACE planning meeting.

Name: Popa, Clara

Worked for more than 160 Hours: Yes

Contribution to Project:

Clara is on the faculty in the Department of Communication Studies of Rowan University. She participated in the 2005 workshop at Ohio State University and provided guidance to the SPACE Planning meeting in December 2005.

Name: Powell, Rebecca

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Powell completed her PhD at UCSB just prior to the 2006 workshop at the University of Oklahoma. She was one of the primary instructors in applications of, and teaching with, remote sensing.

Name: Proctor, James

Worked for more than 160 Hours: No

Contribution to Project:

As a professor of Religious Studies and Geography at UCSB, Dr. Proctor gave a presentation to the 2004 UCSB workshop participants on spatial perspectives in the regionalization of cultural values and attitudes.

Name: Rashed, Tarek

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Rashed was the principal organizer for the workshop on remote sensing on behalf of the UCGIS, hosted at the University of Oklahoma in 2006. He participated in the SPACE planning meeting in December 2005. He arranged for instructors, solicited additional support from within the university, and taught during the workshop.

Name: Rey, Serge

Worked for more than 160 Hours: No

Contribution to Project:

Serge Rey was an instructor in the 2004 workshop at San Diego State University, demonstrating the STARS (Space-Time Analysis of Regional Systems) open-source software and its potential uses in undergraduate social science education.

Name: Ross, Glenwood

Worked for more than 160 Hours: No

Contribution to Project:

Glen is a Professor of Economics at Morehouse College. He participated in the 2005 UCSB workshop and in the December 2005 Planning Meeting as an Advisor.

Name: Shaw, Shih-Lung

Worked for more than 160 Hours: No

Contribution to Project:

A professor of Geography at the University of Tennessee, Dr. Shaw gave guest lectures in the 2004, 2005, and 2006 workshops at Ohio State University.

Name: Sweeney, Stuart

Worked for more than 160 Hours: Yes

Contribution to Project:

Stewart Sweeney is a Professor of Geography with expertise in spatial analysis. He worked with the PI and with Sara Fabrikant to organize the workshop agenda for the 2004 UCSB workshop and was the primary coordinator for the 2005, 2006, and 2007 UCSB workshops. He supervised graduate students in the development of exercises using the GeoDa software (exploratory spatial data analysis) and presented instruction and offered tutorial support to participants throughout the workshop. He also played an important role in the December 2003, 2004, and 2005 SPACE planning meetings.

Name: Tiefelsdorf, Michael

Worked for more than 160 Hours: No

Contribution to Project:

He was an instructor in the 2004 and 2005 workshops at Ohio State University. He developed related teaching materials and lab exercises. He also participated in the SPACE project planning meeting in Santa Barbara in December 2003 and was involved in designing the original workshop program for OSU.

Name: Tobler, Waldo

Worked for more than 160 Hours: No

Contribution to Project:

Emeritus Professor and one of the World's leading analytical and theoretical cartographers, he was one of the lead instructors in the 2004, 2005, 2006, and 2007 UCSB workshops. He developed tutorials, exercises, and data sets to accompany the customized software that he developed (FlowMapper) for free download by workshop participants and their students. He also participated in the December 2003, 2004, and 2005 planning meetings for the SPACE project and contributed to planning the agenda of UCSB workshops.

Name: Usery, Lynn

Worked for more than 160 Hours: No

Contribution to Project:

As 2003–2004 President of the University Consortium for Geographic Information Science (UCGIS), Dr. Usery was responsible for selecting San Diego State University to host the UCGIS SPACE workshop in 2004 and for overseeing management of the UCGIS subcontract on the SPACE project. He also participated in the December 2003 SPACE project planning meeting in Santa Barbara.

Name: van der Elst, Judith

Worked for more than 160 Hours: No

Contribution to Project:

Judith van der Elst was a PhD Candidate in Archaeology at the University of New Mexico who attended the 2004 workshop at Ohio State University. She presented a participant's perspective on the SPACE program at the 2004 SPACE Planning Meeting, assisted with applicant recruitment in her discipline, organized a SPACE-sponsored Forum on teaching GIS in the social sciences at the University of New Mexico, and contributed to instructional resources on the SPACE website. She also helped organize a SPACE session for the meeting of the Society for American Archaeology in 2006.

Name: Weeks, John

Worked for more than 160 Hours: No

Contribution to Project:

John Weeks co-coordinated (with Art Getis) the development and implementation of the 2004 workshop at San Diego State University. He handled the workshop logistics, budgeting and related issues, and was a primary instructor in the workshop, responsible for presentations and for tutoring participants. He also participated in the December 2003 and 2004 SPACE planning meetings—representing SDSU and UCGIS. In 2005 he coordinated a special session featuring the teaching accomplishments of SPACE workshop participants at the Spring Assembly of the UCGIS in Washington DC.

Name: Wilson, John

Worked for more than 160 Hours: No

Contribution to Project:

Professor of Geography at the University of Southern California, participated in the December 2005 SPACE Planning Meeting in his advisory role as President of the UCGIS.

Name: Xiao, Ningchuan

Worked for more than 160 Hours: No

Contribution to Project:

He was an instructor in the 2004, 2005, 2006, and 2007 workshops at Ohio State University. He developed related teaching materials and lab exercises.

Name: Yuan, May

Worked for more than 160 Hours: No

Contribution to Project:

Professor Yuan was one of the primary instructors in the 2006 workshop on remote sensing applications in the undergraduate classroom, hosted by the University of Oklahoma. The Center for Spatial Analysis at OU provided a cost share for hiring Professor Yuan as a workshop instructor.

Appendix 3b—Organizational Partners

OHIO STATE UNIVERSITY

Under the direction of Professor Mei-Po Kwan, Ohio State University's Geography Department was a partner in the SPACE program under a subcontract from UCSB. OSU's primary role was in offering a one-week workshops on 'GIS and Spatial Modeling for Use in Undergraduate Education' for 2004 through 2007.

The Department provided additional funding for graduate students working during the workshops and for social events for workshop participants. In addition, it provided lab and classroom space and contributed staff support time for organizing workshop events.

OSU Geography contributed a teaching laboratory with 50 PCs running all the GIS and statistical software needed for the workshop. The department also reserved two additional teaching laboratories with about 10 seats of computers and three classrooms (including one classroom with a capacity of 75, and two seminar rooms). The department also helped participants with needs on xeroxing and faxing. The department contributed \$1000 for each year to help with costs like providing social activities and hiring students to help with logistics. The department also paid for the tuition and fees for two graduate student assistants for each year.

Professor Kwan assisted in the design of workshop survey instruments (application, entry, and exit); she and Professor Michael Tiefelsdorf participated in a two-day planning meeting for the SPACE program in December 2003; and she contributed to the 2004 and 2005 planning meeting, as well.

SAN DIEGO STATE UNIVERSITY

In 2004, San Diego State University's Department of Geography was selected to host a SPACE workshop on behalf of the UCGIS under a subcontract to UCSB. This occurred on 2–6 August. The Department's support included funding for social events for workshop participants and the use of in-kind and facility resources. Facilities included a 'smart' classroom, a seminar room, and a laboratory that enabled each participant to work independently at a properly loaded computer with software for all workshop activities.

The SDSU Department of Geography boasts outstanding GIS laboratories and considerable experience in conducting workshops and short-courses. The workshop took place on the third floor of Storm Hall. The main classroom was equipped with the latest presentation technology. The facility used for this workshop was the Richard Wright Laboratory for Spatial Analysis, a state of the art facility with two-dozen workstations. All machines were loaded with the new software, GEODA, a creation of Luc Anselin (University of Illinois) as part of the NSF funding to the Center for Spatially Integrated Social Science (CSISS). In addition, participants were in a position to use STARS, a new time-space analytic package by Serge Rey (SDSU), and FlowMapper, a spatial interaction package created by Waldo Tobler of UCSB with support from CSISS. Participants could use the laboratory at all times during the week. In addition, display material was available in the Center for Earth Systems Analysis and Research (CESAR), an advanced spatial analytic laboratory of the Department of Geography and in a large seminar room. Professor Douglas Stow (SDSU) took the participants on a tour of the specialized facilities in CESAR. Coffee and cookies were available each day in the seminar room and on the veranda of Storm Hall.

SAN FRANCISCO STATE UNIVERSITY

SFSU's Geography Department and Institute for Geographic Information Science provided infrastructure support for the 2005 SPC workshop. The workshop was taught in the Geography Department's GIS classroom (HSS 290), a state-of-the-art facility with the appropriate software licenses, individual working areas, powerful computers for each participant, an overhead projection system, and comfortable discussion space. On-campus housing was made available by SFSU in apartments and dormitories. The lending library of ESRI Press books was housed in the Geography Department map library immediately adjacent to the teaching laboratory. The workshop reception was held in the Blakeslee Room, a university facility often used for this purpose.

The University assisted the project financially by not charging overhead on the subcontract and by front ending expenditures on project development and implementation for reimbursement from the SPACE subcontract to UCGIS later.

Professor LeGates and his colleagues worked collaboratively with the SPACE staff at UCSB to create appropriate web infrastructure for offering the SFSU workshop. A special contribution was the preparation of a video presentation about the SFSU workshop that appears on the SPACE website.

UNIVERSITY CONSORTIUM FOR GEOGRAPHIC INFORMATION SCIENCE

The University Consortium for Geographic Information Science (UCGIS) was a partner in the SPACE program under subcontract to UCSB. The UCGIA presidents (Lynn Usery in 2004; Nina Lam in 2005; John Wilson in 2006; Sean Ahearn in 2007) were responsible for the selection of member institutions to offer a week-long workshop on 'Spatial Analysis and GIS for Undergraduate Course Enhancement in the Social Sciences.'

For 2004 this workshop was offered by San Diego State University (2–6 August 2004), with Arthur Getis and John Weeks

as workshop coordinators. For 2005 Richard LeGates of San Francisco State University organized and offered the workshop. For 2006 the University of Oklahoma, under the leadership of Tarek Rashid offered a workshop on using Remote Sensing in undergraduate social science education. In 2007 UCGIS contributed a portion of its SPACE subcontract to support the workshops at Ohio State University and at the University of California, Santa Barbara. This made it possible to have a workshop program in a no-cost extension year for SPACE.

UCGIS also assisted in advertising the SPACE program through its website (www.ucgis.org) and through member institutions, and provided the assistance of UCGIS presidents at the December 2003, 2004, and 2005 planning meetings for the SPACE program. It also sponsored a SPACE sessions at its 2005 Spring Assembly in Washington DC and at its Summer 2006 Summer Assembly in Vancouver WA. In June 2007 SPACE PI (Don Janelle) gave a presentation on spatial thinking in the social sciences, based on outcomes of the SPACE program, to the UCGIS Summer Assembly at Yellowstone National Park.

UNIVERSITY OF OKLAHOMA NORMAN CAMPUS

The University of Oklahoma, under the leadership of Dr. Tarek Rashed, hosted a workshop on 'Remote Sensing and GIS Technologies for Undergraduate Curricula in the Social Sciences', July 23–28, 2006, in Norman, OK.

The OU Office of the Vice President for Research provided a 22% cost share to support salary for three student consultants and the airfare of Mike Goodchild (a workshop keynote speaker). The Center for Spatial Analysis at OU provided a cost share for a workshop instructor (May Yuan) and three full time students. In addition, the Sasaki Institute and College of Atmospheric and Geographic Sciences at OU contributed \$1,000 and \$500 respectively toward social activities for workshop participants.

OTHER COLLABORATORS OR CONTACTS

The Department of Geography, University of California, Santa Barbara, provided a lecture room, a computer lab with 24 fully equipped computers, and technical assistance for the two-week-long workshop at UCSB in 2004 and for the six-day-long workshops in 2005, 2006, and 2007. Resources for the program's website development have continued through the no-cost extension period to March 2009. This site will be maintained for the foreseeable future through active support from the Center for Spatial Studies.

Luc Anselin (Spatial Analysis Laboratory, Department of Geography, University of Illinois, Urbana-Champaign) provided copies of the GeoDa software for exploratory spatial data analysis for all space workshop participants—on disk for the UCSB workshop and as a free download from <https://geoda.uiuc.edu> for participants in the other workshops. The GeoDa software was featured as a tool for direct application in undergraduate social science courses in the UCSB 2004/2005/2006/2007 workshops, in the OSU 2005/2006/2007 workshops, and in the 2004 SDSU workshop. Dr. Anselin's lab moved to Arizona State University in 2008.

Intergraph Inc. provided one-year trial licenses of their GeoMedia Professional GIS software for all SPACE workshop participants in 2004, along with information on the Intergraph program for educational support. In 2006 Intergraph provided a one-year license of GeoMedia for each participant in the workshop at the University of Oklahoma.

The ESRI Press provided a complimentary library of more than fifty books on GIS applications in the social sciences for each of the SPACE workshops in 2004, 2005, 2006, 2007 (approximate retail value \$5,250). ESRI also donated 1-year licenses of ArcGIS 9.0/9.1/9.2 to all participants in the 2005 workshops at UCSB and SFSU, 2006–2007 workshops at UCSB and OSU, and 2006 workshop at the University of Oklahoma.

Clark Labs (Clark University) provided evaluation copies of its Kilimanjaro Idrisi GIS software for workshop participants in each of the 2004 SPACE workshops.

ITT Visual Information Solutions donated a full version lab license of ENVI to use during the workshop and an evaluation single-user version for each of the participants in the 2006 workshop at the University of Oklahoma.

Oxford University Press granted its deepest discounted price, and Donald Janelle and Mike Goodchild waived their royalties on the book 'Spatially Integrated Social Science' to permit a SPACE purchase of the book for each participant in the 2005–2006 workshops at SFSU, OU, OSU, and UCSB.

Arc2Earth provided all participants and instructors in the 2006 workshops (OU, OSU, UCSB) with a 30-day trial use of their software for integrating information on Google Earth.

Appendix 3c—Activities and Findings

TRAINING AND DEVELOPMENT:

The SPACE project employed a total of 29 graduate students to assist with the organization and delivery of instructional materials at eleven workshops. These students gained appreciation for how to design materials with clear instructions, how to assist in the instruction of labs and tutorials, and how to work with university professors from a variety of disciplines and different types of educational institutions. In working with workshop participants over the course of one or two weeks, they also acquired professional contacts within the academic teaching and research communities. At the 2005 workshop at San Francisco State University, three undergraduate students also assisted in creating lab exercises, teaching in the labs, and handling general workshop logistics.

Several of the graduate students served as consultants to workshop participants and as instructors, and others have participated in the organization of web resources for the SPACE web site. Specific examples include:

- A PhD candidate in Anthropology (Eric White), with expertise in the design of customized search engines, helped in the search and organization of educational development resources for the SPACE website. These include links to course syllabi that demonstrate instructional strategies for using spatial analysis in a range of social science disciplines. He also gained familiarity with tools for the assessment of learning.
- A Geography PhD student (Stacy Rebich-Hespanha), with a strong interest in education, played a significant role in the project, helping to design survey instruments used in evaluating applicants for selection as workshop participants and in the development of entry and exit surveys to evaluate the program and to assess progress made by participants. She also assisted with instruction and in one-on-one discussions with participants about their pedagogical goals and projects during the workshops at SDSU (2004), SFSU (2005), and UCSB (2004 through 2007). She participated in conference sessions in Geography and in Archaeology, where she gave presentations on the SPACE program. In addition, she co-authored two papers that have been accepted for publication in the 'Journal of Geography for Higher Education.' Both papers feature outcomes of the SPACE program.
- A PhD student in geography (Jeff Howarth) developed a tool for assessing various GIS software that workshop participants might consider for use in undergraduate teaching. He gave a presentation on this to the UCSB workshop (2005) and, based on feedback from participants, the GIS selection guide is now a resource available on the SPACE website. In 2007, Jeff was a primary instructor for GIS in the UCSB workshop, just prior to entering a faculty position at Middlebury College.
- Other graduate students at UCSB have shared similar success. Sarah Battersby was a primary instructor on the visualization of social science data in the 2006 workshop and directed lab exercises for the 2005 workshop. She is now a professor at the University of South Carolina. Enki Yoo, responsible for spatial statistics labs in the 2005 and 2006 workshops, is now on the faculty at the University of Texas at Dallas. Kirk Goldsberry (primary workshop instructor for data visualization in 2007) now holds a tenure-track position at Michigan State University. David Folch (graduate student at San Diego State University/ currently at Arizona State University) was a lab consultant in the 2007 workshop, drawing on his expertise in spatial econometrics. Kathryn Grace, who completed three years as a workshop lab consultant on applications of spatial statistics, completed her PhD and is currently investigating academic career opportunities. All of these students credit the SPACE workshop experience as an important factor in their ability to relate to students and to communicate with broad audiences of scholars.
- At San Diego State University in 2004, a PhD candidate (Jared Aldstadt) designed the exercises and taught the lab component of the workshop for the use of GeoDA an exploratory spatial data software package for spatial econometrics. This software, an outcome of the CSISS program, was provided to all workshop participants for use in both teaching and research. He is now a professor at the University at Buffalo (SUNY).

At the University of Oklahoma in the 2006 workshop, six graduate students contributed expertise in remote sensing, helping to design exercises and assisting workshop participants from several disciplines in how to incorporate this technology into undergraduate teaching.

- At Ohio State University, Eric Boschmann, Fang Ren, Jason Van Horn Suzanna Klaf, Tim Hawthorne, and Guoxiang Ding (all PhD students) played lead roles in workshop management and contributed to instruc-

tion of workshop lab exercises. In doing so, they and several other graduate students acquired an appreciation of the benefits and challenges of cross-discipline communication, awareness of different teaching issues, and exposure to different disciplinary perspectives on applications of spatial analytic methods.

- At SFSU, an undergraduate film major was hired to produce a short documentary film on the workshop and its participants. This was featured by Richard LeGates in presentations to the SPACE planning meeting in December 2005 and to a special session on the SPACE program at the 2006 Summer Assembly of UCGIS. It is also available on the SPACE website.
- More than four dozen university faculty were involved in some aspect of instruction, ranging from primary workshop instructors to visiting presenters. They also benefited from interactions with workshop participants from diverse disciplinary and institutional backgrounds.

OUTREACH ACTIVITIES:

The SPACE program was oriented largely to serving university undergraduate social science instructors who were interested in enhancing student spatial literacy and spatial analytical skills. Nonetheless, dissemination of project resources benefited many other groups. For example, the SPACE website helped to open communications with a broad public of diverse interests. Inquiries arrive regularly from high school teachers, university instructors from outside the social sciences, and students from across the country and from abroad. As a result, some workshop instructors and workshop participants were invited to meet with environmental and community interest groups and to give guest presentations at academic institutions and conferences.

SPACE directed its advertising fliers and email announcements to the full range of undergraduate social science programs across the United States and made a special effort to reach designated minority-serving institutions. A positive outcome of this initiative was that approximately 20 % (43 of 218) of workshop participants came from Historically Black Colleges and Universities, designated Hispanic-serving institutions, and Tribal Colleges and Universities.

SPACE supported one participant from the developing region of Assam in India an international outreach that also enriched the experience for other participants at the 2004 UCSB workshop. Additional international participants came from Canada, England, The Netherlands, and Portugal.

SPACE workshops engaged participants as agents of dissemination as a way to leverage the workshop program through outreach efforts. Thus, approximately one-quarter of all workshop participants gave presentations and organized forums at their own institutions to expose other faculty to the potentials of spatial analytic methods in teaching and research. With financial assistance from the SPACE ACCESS (Academic Conference Courses to Enhance Spatial Science) program, described elsewhere in this report, workshop participants organized special sessions and workshops at national and regional conferences of academic and professional societies. Five of these events were directed to organizations that serve, primarily, undergraduate students and professional academic scholars from the African American community.

Through a no-cost extension (1 October 2007 to 31 March 2009) and budget supplement (October 2008), the SPACE ACCESS program was able to support an initiative by a workshop participant (Michelle Thompson) to foster community student/instructor involvement to improve the understanding of neighborhood recovery in post-Katrina New Orleans and to support anthropology students (prior SPACE workshop participants) at the University of New Mexico in efforts to work with Native communities to better understand community cultural resources (described in more detail elsewhere in the report).

JOURNAL PUBLICATIONS

Richard LeGates, “Introducing Social Science Educators to GIS and Spatial Thinking,” *GIS Educator*, p. 9, vol. Winter, (2007). Published.

Stacy Rebich Hespanha, Fiona Goodchild, and Donald G. Janelle, “Spatial Thinking and Technologies in the Undergraduate Social Science Classroom,” *Journal of Geography in Higher Education*, p., vol., (2009). Accepted.

Donald G. Janelle, Stacy Rebich Hespanha, Fiona Goodchild, and Michael F. Goodchild, “Workshops and National Dissemination of Geographic Analysis in the Social Sciences: The CSISS Experience in the USA,” *Journal of Geography in Higher Education*, p. , vol. , (2009). Accepted.

BOOKS OR OTHER ONE-TIME PUBLICATIONS

Donald G. Janelle, “Spatial Social Science,” (2004). Booklet, 16 pages, published.

Bibliography: Center for Spatially Integrated Social Science, University of California, Santa Barbara

Donald G. Janelle, *Expanding the social sciences with mapping and GIS*, (2007). Book, published.

Editor(s): Diana Stuart Sinton and Jennifer J. Lund

Collection: Understanding Place. GIS and Mapping across the Curriculum

Bibliography: Redlands, CA: ESRI Press

Donald G. Janelle and Michael F. Goodchild, *Spatially Integrated Social Science*, (2006). Book, published.

Editor(s): Barney Warf

Bibliography: Encyclopedia of Human Geography,

(Thousand Oaks, CA: SAGE Publications) pp. 455–457.

D. G. Janelle and M. F. Goodchild, Concepts, *Principles, Tools, and Challenges in Spatially Integrated Social Science*, (2009). Book, accepted.

Editor(s): T. Nyerges, R. McMaster, and H. Couclelis, eds.

Collection: Handbook of GIS and Society Research

Bibliography: Sage Publications

D. G. Janelle and M. F. Goodchild, *Location across Disciplines: Reflections on the CSISS Experience*, (2009). Book, accepted.

Editor(s): H. J. Scholten, R. van de Velde, and N. van Manen, eds.

Collection: Geo-ICT and the Role of Location within Science

Bibliography: Dordrecht, The Netherlands: Springer

WEB/INTERNET SITE

URL(s):

www.csiss.org/SPACE

Description:

The SPACE website was the principal means of advertising the workshop program; it was the primary means for submitting applications to participate in workshops, and it was used to administer the program. Workshop instructors used a secure database on the site to evaluate applicants and to make decisions on admission. The site also conveyed information about the workshop agenda and logistics and was a repository of resources for workshop participants. Back-end databases provide the means for administering web-based entry and exit surveys. See “Findings” section for detailed information on the actual use of the SPACE website.

The SPACE website will be sustained as an active repository for social science instructors following the cessation of NSF funding in March 2009. Its collections of syllabi, learning materials, assessment instruments, etc. will be of continuing value. In 2005 the website was enhanced to search for discipline-based instructional resources and to display resources and details on initiatives created by workshop participants to share with others over the Web. In 2009 a new website was created and launched—<http://TeachSpatial.org>. It is a direct outgrowth of the SPACE program and of the emerging interdisciplinary research and teaching interests on spatial thinking in STEM disciplines.

OTHER SPECIFIC PRODUCTS

PRODUCT TYPE:

SPACE PROGRAM FLIER

Product Description:

A two-sided bi-fold brochure describing the SPACE program and resources for use in introducing spatial analysis to undergraduate social science students was produced in 2005.

Sharing Information:

1,500 copies of the brochure were distributed at workshops and through academic conferences attended by SPACE personnel and former participants in SPACE workshops in 2005 and 2006.

Appendix 3d—Contributions

CONTRIBUTIONS WITHIN DISCIPLINE:

The host discipline for this project is arguably Geography. However, the project's origin in the NSF-supported Center for Spatially Integrated Social Science enhances the importance of original instructional contributions from scholars in a range of disciplines. Accordingly, aside from geography, SPACE workshop instructors have academic origins in other social science disciplines (e.g., John Weeks, coordinator for the workshop at SDSU, is a demographer; Stuart Sweeney, coordinator for the workshop at UCSB, holds degrees in urban and regional planning;

Richard LeGates, coordinator of the SFSU workshop is an urban planner; and Fiona Goodchild, the Educational Development Coordinator for

SPACE, has degrees in history, education, and psychology). Co-PI Richard Appelbaum is a sociologist and Co-PI Michael Goodchild holds a degree in physics, in addition to geography. Most of the featured guest lecturers came from outside of the discipline of geography—anthropology, economics, education, environmental studies, health studies, history, and sociology. Workshop participants from this broad range of social science disciplines were expected to use the workshop experience to engage actively in exposing their students to the importance of spatial thinking in tackling a wide variety of social science problems.

Spatially integrated social science (SISS) derives its principles and practices from the integration of spatial analytical methods with the theories and thematic problems of the social sciences (see Goodchild and Janelle, 2004—*Spatially Integrated Social Science*, Oxford University Press). SISS is based on the premise that a wide variety of social processes and problems are more clearly understood through the mapping of phenomena and the analysis of spatial patterns. The locational properties of information are often obscured in tabular formats that are traditional to most social sciences. Maps permit the visualization of this information to reveal patterns and trends not easily seen in a table.

Spatial association, regional differentiation, diffusion, spatial interaction, and pattern detection are key concepts of spatial thinking. Through applications of analytical cartography, spatial statistics, spatial econometrics, and geographic information systems (GIS), these concepts facilitate the integration of theory with empirical analysis and aid both the interpretation of research findings and the presentation of research results. The integration perspective of SISS focuses on location as a natural basis for ordering and combining diverse information sources and for seeing the resolution of social science problems as fundamentally multi-discipline in character. For example, GIS and other spatial tools can facilitate an integration of perspectives from several disciplines (e.g., anthropology, economics, geography, political science, and sociology) to help understand social processes such as economic globalization or gentrification. Confining investigations of such issues to the realm of one discipline fails to capture the complexity of processes and interactions across geographic scales. Some examples follow:

- maps of environmental quality and human health can be overlaid to examine correlations that may suggest clues for further research.
- the territorial division of cities, based on ethnicity, demographic processes and social class, can be analyzed spatially as a key driver of social changes and as a basis for assessing social needs.
- public health researchers are concerned with contagion effects in the spread of diseases.
- changes in public opinion may reflect social diffusion processes that underlie spatial patterns of political movements, shifts in value systems, and changing norms of human behavior.
- cartographic visualization of these processes through animated maps represents one method to depict temporal patterns in the geographic spread of such phenomena.
- the analysis and modeling of spatial flows is an important focus for resolving problems in transportation studies, in explaining trade patterns in relationship to regional development issues, and in understanding demographic changes that alter the demand for social services.
- physical arrangement and clustering of phenomena are keys to pattern detection—for identifying the patterns of crime occurrences in cities and in being able to discern whether such patterns arise by chance or through some underlying associations of social and economic conditions that occur within regions and their surrounding areas.

Imparting these ideas and skills to undergraduates will yield significant benefits to their further education and to the knowledge that they will bring to their post-university careers.

A special section of the SPACE website was developed to feature contributions from workshop participants (<http://www.csiss.org/SPACE/materials/participants/>). This resource has examples of instructional innovations (syllabi for new courses, student exercises, assessment practices, etc.) from instructors in archaeology, communication studies, criminology, cultural anthropology, demography, economics, education management, environmental studies, history, human geography, political science, sociology, and urban studies. These resources provide examples that other instructors can review and build upon for their own courses and offer some guidance on what can be done to foster spatial analytic skills in courses and instructional programs.

CONTRIBUTIONS TO OTHER DISCIPLINES:

SPACE developed a special program to foster spatial perspectives broadly across a range of disciplines. Its Academic Conference Courses to Enhance Spatial Science (ACCESS) program funded, in full or partially, fourteen conference and workshop events in 2005 through 2009. All of these events involved SPACE workshop participants as primary organizers and instructors. They included the following:

- (1) The Center for Geographic Analysis at Harvard University hosted a one-day Workshop to introduce and evaluate teaching and research applications of AfricaMap (Cambridge MA, March 25, 2009). AfricaMap is a geoportal to key spatial and temporal data on Africa that provides a framework for collaboration among scholars, practitioners, and students from around the globe. Sumeeta Srinivasan, Preceptor in Geospatial Methods for the Department of Government at Harvard University and a prior SPACE workshop participant, was an instructor in the workshop.
- (2) David Padgett, Associate Professor of Geography at Tennessee State University and Talia McCray, Assistant Professor of Community & Regional Planning, University of Texas at Austin, organized and presented a workshop on “Geographic Information Systems (GIS), Global Positioning Systems (GPS), and Remote Sensing Applications in Support of Analyzing Urban Accessibility Issues and Emergency Preparedness and Response” for the National Society of Black Engineers (NSBE) 35th Annual National Convention, in Las Vegas, Nevada, in March, 2009. The focus on emergency preparedness and response illustrated how an holistic educational approach could bring together the technical aspects of engineering with the social issues involved in mitigating the impacts of natural and anthropocentric hazards. NSBE is a student-managed professional organization.
- (3) Michelle M. Thompson, (formerly with the Department of City & Regional Planning at Cornell University, currently a professor of urban planning at the University of New Orleans, and a prior SPACE participant at Ohio State University) is the founder and Director of the New Orleans Neighborhood Analysis Project (NONAP) to help with the recovery of New Orleans after Hurricane Katrina. She organized The NONAP Community GIS Technology Workshop at the University of New Orleans on February 22, 2008 to provide students and Community Based/Neighborhood Organizations with GIS Mapping capabilities through hands-on exercises and demonstrations.
- (4) Kevin Marsh (Department of History at Idaho State University organized a Workshop on Using GIS for Environmental History for the 2008 Annual Meeting of the American Society for Environmental History Boise, Idaho, March 14, 2008.
- (5) Shobha Sriharan (Department of Agriculture & Human Ecology at Virginia State University) organized a Panel Discussion on Teaching of GIS and Remote Sensing for the National Conference on Agriculture and Natural Resource Conservation and Management, Delaware State University, Dover, Delaware, April 17–19, 2008.
- (6) The 2007 annual meeting of the American Political Science Association featured a session on “GIS, Spatial Statistics, and Political Science,” organized by Iris Hui, a Political Science PhD candidate from the University of California, Berkeley, who participated in the 2006 SPACE workshop at Ohio State University.
- (7) The 2007 annual meeting of the American Sociological Association in New York City featured a panel session on “Integrating Spatial Thinking into the Sociology Curriculum.” The panel of prior SPACE workshop participants was organized by Claudia Scholz (Research Programs Coordinator at Trinity University in San Antonio).
- (8) The 2007 Annual Career Fair and Training Conference for Minorities in Agriculture, Natural Resources,

and Related Sciences (MANRRS), in Birmingham Alabama, featured a half-day workshop on “Geographic Information Systems (GIS), Global Positioning Systems (GPS), and Remote Sensing Applications in Support of Community and Urban Forestry.” This was presented by David A. Padgett, Director of the Geographic Information Sciences Laboratory at Tennessee State University and a prior SPACE workshop participant.

- (9) The National HBCU Faculty Development Symposium “Leading and Learning in an Age of Accountability,” in Houston, Texas, included a ‘Workshop on Geographic Information Systems and Spatial Analysis Methods in Social Sciences Teaching and Research.’ The organizers and presenters were all prior SPACE workshop participants—Charles Barnes, Department of Political Science at North Carolina A&T State University; Laurie Garo, Department of Geography at University of North Carolina at Charlotte, and instructor in Criminal Justice at Johnson C. Smith University; and David A. Padgett.
- (10) Instructors and participants in the SPACE workshop at San Francisco State University in 2005 made a plenary presentation to the University Consortium for Geographic Information Science (UCGIS) Summer Assembly in Vancouver, Washington in July 2006 describing the workshop. Delegates from 70 UCGIS member institutions, students, and others attended the presentation. This was organized by Richard LeGates, Professor of Urban Studies and coordinator of the SFSU workshop.
- (11) A Symposium on “Integrating Geospatial Perspectives and Education in Archaeology” took place at the annual meeting of the Society for American Archaeology in San Juan, Puerto Rico, April 2006. This was organized by prior participants in the OSU 2004 SPACE workshop—Veronica Arias, Heather Richards, and Judith van der Elst (all from the University of New Mexico).
- (12) A workshop on “Integrating GIS and Spatial Analysis into the Undergraduate Planning Curriculum,” was organized by Richard LeGates (SFSU SPACE workshop leader in 2005) and Stuart Sweeney (UCSB SPACE workshop coordinator in 2004 through 2007) for the annual meeting of the Association of Collegiate Schools of Planning, in Charleston, South Carolina, October 2005.
- (13) A Demonstration Workshop on “GIS, GPS, and Spatial Analysis Tools in Support of Service Learning,” was presented at the April 2005 meeting of the National Technology and Social Science Conference, in Las Vegas, NV. David Padgett, a participant in the 2004 UCSB SPACE workshop was the organizer and instructor.
- (14) A Panel Session on “GIS and Spatial Analysis Tools to Enhance Social Science Course Content and Research” was presented to the annual meeting of the Association of Social and Behavioral Scientist in Nashville TN, in March 2005. David Padgett and Nikitah Imani (sociologist from James Madison University and participant in the 2004 OSU SPACE workshop) organized this session to help enhance knowledge about the SPACE program across the historically black colleges and universities. Several SPACE workshop participants (approximately 20 percent) were from application-oriented areas of the social sciences—criminology, public policy and management, environmental policy studies, health studies, tourism and recreational resource management, and urban and regional planning. These areas have made significant strides in applying spatial methodologies in research. However, instructional uses of GIS and spatial statistics are only recently making their way into the curricula of these fields. The SPACE program offered a focused exposure to both the methods of analysis and the instructional issues that must be understood to introduce these powerful tools within the university curricula of these fields.

Specific presentations by SPACE personnel to interdisciplinary audiences have included the following:

- Richard Applebaum (SPACE co-PI) gave a presentation on the SPACE workshop program to the August 2004 annual meeting of the American Sociological Association, in San Francisco.
- Donald Janelle discussed strategies for implementing GIS in the social science curricula at the November 2004 annual meeting of the multi-disciplinary Social Science History Association, in Chicago.
- In September 2005, Janelle gave a presentation to more than 100 participants in the annual Crime Mapping Research Conference, hosted by the U.S. Department of Justice’s National Institute of Justice, in Savannah.
- Janelle reviewed “GIScience, Learning, and Knowledge Transfer in the United States,” for the “Symposium on Spatial Literacy in Teaching and Communicating GIScience,” hosted by the Royal Geographical Society, in London, in February 2006.

- Janelle organized a panel session on “Interdisciplinary Spatial Analysis Programs for Undergraduate and Graduate Education” for the annual meeting of the Association of American Geographers, in Chicago in March 2006. Mei-Po Kwan, coordinator for the SPACE workshop at Ohio State University, and Diana Sinton, a prior participant in a UCSB SPACE workshop, were among the members of the panel. This panel session is the focus for a special issue on the uses of GIS in undergraduate teaching for the *Journal of Geography for Higher Education* (in press 2009).
- Stacy Rebich-Hespanha (presenter), Fiona Goodchild, and Don Janelle discussed “Spatial Thinking and Technologies in the Undergraduate Social Science Classroom,” at a meeting of the Society for American Archaeology in San Juan, PR, in April 2006.
- Janelle reviewed “Location across Disciplines: Reflections on the CSISS Experience” for a Symposium on Geo-ICT and Location within Science, Vrij Universiteit, Amsterdam, 26 September 2007.
- Janelle presented an overview of “Spatially Integrated Social Science” for the Federal University of Bahia, Salvador, Brazil, 23 August 2007.
- Janelle presented a poster on the SPACE program to the interdisciplinary 2008 Course Curriculum and Laboratory Improvement (CCLI) PI Conference, sponsored by the National Science Foundation (NSF) Division of Undergraduate Education (DUE) and the American Association for the Advancement of Science (AAAS) in Washington, D.C., on 13–15 August 2008.
- Janelle drew on experience with the SPACE program to discuss “Spatial Concepts and Spatial Reasoning in the Social Sciences” to the International Workshop on Spatial Cognition and Learning, Freiburg, Germany, on 13–14 September 2008.
- Janelle gave a poster-paper presentation about “Spatial Perspectives on Analysis for Curriculum Enhancement in the Social Sciences” at the “Annual meeting of the Association of American Geographers” in March 2009.

CONTRIBUTIONS TO HUMAN RESOURCE DEVELOPMENT:

The dissemination of spatial technologies among undergraduates has the potential to enhance the conceptualizing of problems by students in several social science disciplines, providing them with new tools to explore and process information for use in studying societal and environmental issues. Many of the faculty participants in the SPACE workshops are from applied disciplines (such as urban planning, criminology, and health studies), whose teaching of spatial methodologies to undergraduates has enhanced analytical skills for direct application in the workforce. Many workshop participants indicated in exit surveys and follow-up surveys (one year after the workshop) that they have engaged undergraduate students in group project-based studies that require teamwork and experience with spatial analytic tools—important skills for an increasing number of jobs in business, policing, investment, assessment, etc. The concepts and skills imparted by

SPACE workshop participants to their undergraduate students have helped to intensify the diffusion of spatial methodologies into a variety of work and study environments, a process that is anticipated to grow rapidly in the years to come.

The participant contribution section of the SPACE website provides examples of what students trained to think spatially in such disciplines as economics, human geography, and sociology are capable of after completing new courses offered by prior SPACE workshop participants. Excellent examples are illustrated by PowerPoint presentation based on the original research by undergraduate students in Resource Economics at the University of Maine (taught by Dr. Kathleen Bell, a SPACE workshop participant at Ohio State University in 2004). As illustrated at <http://csiss.org/SPACE/materials/participants/2004/bell.php>, their course projects illustrate applications of GIS and spatial econometrics to explore such topics as: Vehicle Markets in Maine: A Preliminary Spatial Analysis, Assessing Fishing Effort in the Maine Lobster Fishery, Neighborhood Effects and the Exit Decision, An Analysis of Sea Surface Temperatures, Spatial Comparison of Fishery Dependent Datasets, Deciphering the Salt Pannes of Southern Maine, and Mapping Malaria and Identifying Risk Factors in Mali, W. Africa.

Another outstanding example is the work of two undergraduate geography students at Eastern Michigan University (Douglas Rivet and Donald Lafreniere), who used historical archival research, remote sensing, GIS, cartographic analysis to create an online atlas, “The Forgotten Capital: A Historical Atlas of Sandwich, Ontario,” currently available on the SPACE website (<http://csiss.org/SPACE/materials/participants/2008/Mayda.php>). They gave their first professional presentation on this accomplishment at the 2009 annual meeting of the Asso-

ciation of American Geographers, funded partially by a SPACE Academic Development Award to their instructor (Dr. Chris Mayda). She learned about instructional applications of remote sensing at the 2006 SPACE workshop at the University of Oklahoma.

There are many other examples of such student accomplishments on the SPACE website.

CONTRIBUTIONS TO RESOURCES FOR RESEARCH AND EDUCATION:

Since SPACE focused on the national dissemination of existing spatial technologies within undergraduate social science education, it attempted to consolidate resources at www.csiss.org/SPACE to make it easier for busy educators to access information resources that they might find difficult to uncover on their own. For example, a collection of discipline-based syllabi from educators who teach spatial analysis gives instructors starting points for developing their own courses. SPACE also worked with commercial vendors to help facilitate access to GIS software for instructors and institutions that have not yet moved in this direction. All SPACE workshop participants received one-year licenses to ArcGIS (a leading software package for geographic information systems) and GeoDa (a spatial econometric software package that facilitates exploratory spatial data analysis and that is available free of charge for use in classrooms).

SPACE provided each of 116 workshop participants in 2005 and 2006 with a copy of the edited book *Spatially Integrated Social Science*. The editors (Goodchild and Janelle) waived all royalties and the publisher (Oxford University Press) provided its deepest level of discount to reduce the price of the book. This book features 21 chapters of research examples from a dozen disciplines and interdisciplinary areas. It provided workshop participants with a timely reference on applications of spatial analysis for classroom discussion. Funding did not permit this contribution for participants in the 2007 workshops (workshops offered as a no-cost extension).

On the research front, the data collected via application forms and entry / exit / follow-up surveys provided a rich set of resources for analysis on the pedagogic value of different approaches in structuring workshop programs and on their relative value in achieving national dissemination. SPACE PI (Don Janelle), the Education Development Coordinator (Fiona Goodchild), and a graduate student (Stacy Rebich-Hespanha) analyzed these data, resulting in two manuscripts (described elsewhere in this report). In addition, Don Janelle and Michael Goodchild prepared two overview chapters for books that will be published in 2009 (described elsewhere).

The SPACE workshop program provided impetus for the development of a new web resource at <http://TeachSpatial.org>. Launched in March 2009, TeachSpatial is an interactive site for instructors who are interested in introducing spatial thinking as an explicit component of undergraduate courses across a range of disciplines. It provides an inventory of fundamental spatial concepts, allows for blogs and modeled representations of spatial reasoning, and offers an opportunity to share teaching resources and strategies (syllabi, lesson plans, exercises, examples of student work, etc.). Ongoing work will lay the foundation for a Spatial Literacy Map of educational objectives to aid curriculum development and to interface with repositories of educational modules, such as the National Science Digital Library (NSDL).

CONTRIBUTIONS BEYOND SCIENCE AND ENGINEERING:

Citizen groups increasingly use spatial technologies, such as GIS, GPS, and remote sensing. The emergence of a movement referred to as Public Participation GIS (PPGIS) demonstrates the perceived power associated with being spatially informed in how one characterizes and resolves societal issues. And, possibly of greater importance, since about year 2004, geo-browsers (such as Google Earth and Microsoft's Virtual Earth) have lured millions of web users to exploring maps in a serious way for the first time.

By seeking the dissemination of spatial analytic methods among undergraduate students in a wide range of disciplines, the SPACE project has indirectly helped to foster a more deeply informed use of these technologies. Spatial understanding is fraught with problems regarding scale, with alternative methods for the aggregation of data, and with difficulties in interpretation of spatial analytic results. Exposure to these concerns at the undergraduate level and from the perspective of the underlying theories of different disciplines will in the long run enhance significantly the spatial literacy of citizen groups and policy makers.

Don Janelle's presentation on the SPACE program to the Crime Mapping Research Conference in September 2005 reached practitioners of law enforcement from across the United States in addition to academic criminologists who teach undergraduate students going into the fields of law enforcement. Instructors in health

studies have also participated in SPACE workshops, and there is growing application of spatial methodologies in health fields to evaluate the effectiveness of health dissemination practices. Similarly, interdisciplinary and community interest in environmental justice is increasingly reliant on spatial analysis to interpret data and to display evidence for public participation events. Several SPACE workshop participants feature issues in environmental justice for their courses—this is especially the case for participants from urban studies, human geography, and sociology.

Appendix 4—Survey Forms Used for SPACE Workshops

Summer Workshops 2007 Application Form

To apply to for the workshops complete and submit the form below.

Application deadline is *April 23, 2007*.

The Workshops

Please **rank** the following workshops in your order of preference to attend (1 being most preferred; 2 least preferred; 0 not interested):

Ohio State University (June 18-June 23, 2007):

UC Santa Barbara (July 15-20, 2007):

Not sure? See [Which workshop should I apply for?](#)

Laptop Access

Participation in the UC Santa Barbara and in the Ohio State University workshops requires that you bring a laptop computer for use during the workshop. **Recommended Laptop Requirements:** Windows XP/2000, 512 MB RAM, 1.0 GHz Processor, Internet Browser, CD-ROM, USB, and a Wireless card. Minimum free disk space is 1 GB (1,000 MB). See requirements for [all ESRI software](#).

Personal Information

First Name:

Last Name:

Affiliation:

Address:	<input type="text"/>
City:	<input type="text"/>
State:	<input type="text"/>
Postal Code:	<input type="text"/>
Country:	<input type="text"/>
Citizenship:	<input type="checkbox"/> US citizen <input type="checkbox"/> US Permanent Resident <input type="checkbox"/> Other (describe below): <input type="text"/>
Email:	<input type="text"/>
Phone:	<input type="text"/>
Gender:	<input type="checkbox"/> Female <input type="checkbox"/> Male
Ethnicity:*	<input type="checkbox"/> African American <input type="checkbox"/> Hispanic American <input type="checkbox"/> Native American <input type="checkbox"/> Other (describe below):

* *SPACE* encourages applications to achieve a broad representation of all citizen groups, including underrepresented minorities and applicants from designated minority-serving institutions. This field is optional.

Academic Background

Note: *SPACE* workshops are limited to individuals with instructional appointments at colleges and universities and to Ph.D. students who are strongly committed to careers that will involve instructing undergraduate students.

Discipline /
Teaching interest:

Highest Academic Degree
Attained:

- MA
- MSc
- PhD
- Other (describe below):

Academic Rank:

- Graduate Student
- Post Doctoral Fellow
- Lecturer
- Assistant Professor
- Associate Professor
- Professor
- Other (describe below):

Academic Appointment:

- Limited-term appointment
- Untenured academic appointment
- Tenured academic appointment
- Other (describe below):

Teaching Experience

How many years have you been teaching at the college/university level?

Please list the titles and academic levels of courses you have taught in the past 2 years.

Do you currently teach spatial approaches in your undergraduate courses? If so, please describe.

Have you participated in instructional development and professional development programs offered through your institution, discipline organizations, or other agencies? Please describe.

Please describe your experience with course evaluation and student assessment.

Please list any previous CSISS, SPACE, or ICPSR spatial analytic workshops that you completed.

Concept Familiarity

Rate your proficiency in the following areas where:

- 1 = No familiarity
- 2 = Familiar with concepts
- 3 = Experience with applications
- 4 = Know enough to teach
- 5 = Expert

	1	2	3	4	5
Spatial thinking:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cartography/map making:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data and computer file management:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet search and information retrieval:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Graphic visualization of data:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Qualitative methods in social science:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Quantitative methods in social science:

Undergraduate curriculum development:

Geographic Information Systems (GIS):

Spatial statistics:

Geocoding:

Global Positioning Systems:

Remote sensing:

Other (describe below):

Software Experience

Please list any software that you currently use for research:

Please list any software that you have students use in your classes:

Do you and your students have access to spatial analytic software at your institution? Please describe:

SPACE Workshop Referral

How did you learn about the SPACE Workshop Program?

- The SPACE/CSISS Website
- SPACE Workshop flyer
- Colleague
- Newsletter (please specify below)
- List Serve (please specify below)
- Other (please specify below)

Personal Workshop Goals

How do you hope/plan to use the workshop experience to enhance your undergraduate courses, programs, and student learning experiences?:

Other Comments:

Scholarship Support

There are no fees required for participation in the CSISS SPACE Workshops.

However, participants are encouraged to seek funding from their own institutions to cover transportation, lodging, meals, books, and access to a laptop (required for UCSB and OSU workshops, [see above](#)).

Stipends are available for all qualifying applicants, with a priority given to candidates that best fit the profile for meeting the objectives of SPACE.

Please indicate the level of stipend support that you are applying for:

All workshop participants are expected to attend the full six days of workshop instruction.

Decisions on acceptance of applications will be made by May 1, 2007 and invited applicants will be expected to confirm attendance by May 8, 2007. Confirmation of acceptance will require the completion of a entry survey that will allow the organizers to tailor the workshop content to the needs of the audience.

I have read the above statement. If I am selected for the workshop, I agree to cover the expenses noted and to participate for the full duration of the workshop. By submitting this application, I confirm my agreement with the above statement.

[Reset Form](#)

[Submit Form](#)

Thank you very much for completing the application form. Any analysis of surveys will be at aggregate levels to protect your identity and confidentiality. The Center for Spatially Integrated Social Science at UC Santa Barbara is administering this applicant survey.

Mei-Po Kwan

Dr. Donald Janelle

Summer Workshops 2007 Entry Survey

This survey will assist instructors in tailoring SPACE workshops for the needs of participants. Results from the analysis of surveys will be used for annual reports at aggregate levels that protect your identity and confidentiality. The survey is being administered on behalf of SPACE, an NSF-supported program for national dissemination of spatial analysis in undergraduate education in the social sciences.

Please have a productive and enjoyable workshop.

Donald G. Janelle
Principal Investigator, SPACE
University of California, Santa Barbara

The Workshops

Please select the workshop you are attending:

- Workshop: GIS and Spatial Modeling for the Undergraduate Social Science Curriculum (OSU)
 Spatial Analysis in the Social Science Curriculum: Enhancing Undergraduate Learning (UCSB)

Personal Information

First Name:

Last Name:

Email:

Discipline / Teaching interest:

Highest Academic Degree Attained:

Barriers to Spatial Approaches

To what degree are the following issues obstacles for you in teaching spatial approaches to undergraduates in the social sciences? If you see additional barriers to the use of spatial methods in undergraduate social science education, please add them in the available spaces.

Rate on a scale of 1-4 where:

- 1 = not an obstacle at all
- 4 = very significant obstacle

	1	2	3	4
Limited knowledge of appropriate pedagogical strategies:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of experience with GIS and spatial analysis tools:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inaccessibility of necessary data:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inadequate access to necessary software/facilities:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of technical support for spatial analysis tools at my institution:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of student readiness to grasp the concepts behind spatial analysis:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (describe below):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (describe below):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Workshop Expectations

How important is it for you to acquire or gain experience with each of these things through the SPACE workshop?

Rate on a scale of 1-4 where:

- 1 = not important at all
- 4 = very important

1 2 3 4

Practical Work

Practical hands-on experience with spatial statistical software:

Practical hands-on experience with data visualization software:

Practical hands-on experience with a variety of GIS software packages:

Data sets that can be used for course/classroom activities:

Discussion with Other Participants

Discussion of how to assess how learning through spatial analysis enhances student understanding of the target material and ideas:

Opportunities to discuss yours or others experiences using spatial analytical methods for teaching; problems you may have encountered and pedagogical strategies to address them:

General ideas that I can use after the workshop is over to develop my own curricula or classroom/lab activities:

Ideas for student projects:

Learning from Lectures by Experts

More knowledge about specific spatial analysis tools:

Theoretical framework for appropriate data visualization:

Answers to specific problems that I have encountered when using spatial analysis methods:

Pedagogical strategies for helping students learn successfully:

Other (describe below):

Other (describe below):

Current Teaching Practices

What are some concepts that you currently illustrate for your students through the use of data? What datasets do you use, and how do you analyze them?

Do you have a specific topic or dataset you would like to develop instructional activities around during this workshop? If so, provide information about scale, region, topic, type of data.

How are your courses currently evaluated?

Please write a brief paragraph describing your teaching philosophy and how you expect to enhance your undergraduate teaching through attending this workshop.

Consent for use of Survey Data in Research

Subject to the removal of any information that would permit my identification and to the aggregation of data to protect the confidentiality of my specific responses,

I grant permission to the principal investigator and SPACE-project personnel designated by him to use information that I provide in this survey for research purposes.

I do not want the information that I provide in this survey to be used for research purposes by SPACE-project personnel.

[Reset Form](#)

[Submit Form](#)

Summer Workshops 2007 Exit Survey

The Workshops

Please select the workshop you attended:

- Workshop: GIS and Spatial Modeling for the Undergraduate Social Science Curriculum (OSU)
 Spatial Analysis in the Social Science Curriculum: Enhancing Undergraduate Learning (UCSB)

Personal Information

First Name (optional):

Last Name (optional):

Barriers to Spatial Approaches

To what degree did the workshops help in overcoming obstacles for you in teaching spatial approaches to undergraduates in the social sciences? If the workshop helped you in overcoming additional barriers, please add them in the available spaces.

Rate on a scale of 1-4 where:

- 1 = did not help at all
- 4 = helped significantly

1 2 3 4 N/A

Provided knowledge of appropriate pedagogical strategies:

Provided experience with GIS and spatial analysis tools:

Enhanced awareness on how to access data for use in exercises:

Improved awareness of software resources appropriate for use in undergraduate education:

Removed technical barriers to the likelihood of using spatial analytical approaches in my undergraduate teaching:

Other (describe below):

Other (describe below):

Workshop Expectations

To what extent did the workshop experience meet your expectations in the areas listed?

Rate on a scale of 1-4 where:

- 1 = of no value
- 4 = exceeded my expectations

1 2 3 4 N/A

Practical Work

Hands-on experience with spatial statistical software:

Hands-on experience with data visualization software:

Hands-on experience with GIS software:

Suggested or provided data sets that can be used for course/classroom activities:

Discussion with Instructors and Other Participants

Acquired a better understanding of how learning through spatial analysis enhances student understanding of the target material and ideas:

Gained ideas about assessment methods that allow observation of how spatial analysis has enhanced student understanding:

Learned from others' experiences with using spatial analytical methods for teaching:

Learned pedagogical strategies that will be helpful when teaching material or techniques that students find especially difficult:

Received ideas that I can use after the workshop to develop my own curricula or classroom/lab activities:

Gained ideas for student projects:

Workshop Lectures

Expanded my knowledge about specific spatial analysis tools:

Provided a theoretical framework for appropriate data visualization:

Provided answers to specific problems that I have encountered when using spatial analysis methods:

Suggested worthwhile pedagogical strategies for helping students learn successfully:

Other (describe below):

Teaching Practices

Please describe how you plan to use what you have learned in this workshop to enhance the exposure of spatial methods to students in your undergraduate courses and programs (e.g., describe exercises that you will introduce, modifications to course syllabi, new course proposals, or changes in an academic program, etc).

As a result of this workshop, describe how you will alter your approach to the evaluation of courses and to the assessment of student learning.

Workshop Management and Facilities

Rate the following items on a scale of 1-4 where:

- 1 = totally unacceptable
- 4 = excellent

	1	2	3	4	N/A
Lecture Room and Laboratory Facilities:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Workshop Organization:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level of Instruction:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of Exercises:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall Quality of Guest Presenters:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Events:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Housing Arrangements:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On-line Application Procedures:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information Provided for Planning for Workshop Participation:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Adequacy of Participant Funding:



Website Resources

Did you make use of the website resources and how helpful did you find them?

Web links to Course Syllabi of social science courses:

Web links to Instructional Assessment resources:

Web links to Instructional Discipline resources:

CSISS Classics:

GIS Cookbook:

Choosing a GIS/Virtual Globes Review:

Contribution from Past Workshop Participants:

Please suggest ways in which these resources could be improved.

Additional Comments

Enter any additional comments, suggestions, or concerns here.

Summer Workshops 2006 Follow-up Survey

May 2007

Dear CSISS workshop participant,

CSISS is seeking to evaluate the success of SPACE summer workshop offerings in 2006. We wish to document the impressions of participants about how significant the workshops have been in their teaching and related activities. Please take a few minutes to reflect and provide the information requested below. Results from the analysis of surveys will be at aggregate levels that protect your identity and confidentiality.

Yours sincerely,

Donald G. Janelle, SPACE PI and Program Director

The Workshops

Please select the workshop you attended in summer 2006:

- Workshop: GIS and Spatial Modeling for the Undergraduate Education (OSU)
- Spatial Analysis for the Undergraduate Social Science Curriculum (UCSB)
- Remote Sensing and GIS Technologies for Undergraduate Curricula in the Social Sciences (OU)

Workshop Experience

How successful was each element of the workshop in achieving the workshop's goals? For each element listed below, please choose the best response on the given scale:

- 1 = Unsuccessful
- 2 = Somewhat Successful
- 3 = Moderately Successful
- 4 = Successful
- 5 = Very Successful

1 2 3 4 5

Collaboration with Participants:

Instructor presentations:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Workshop content:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Workshop laboratory exercises:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Workshop organization:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Workshop materials and handouts:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Workshop facilities:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local organization:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Housing facilities:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall experience:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Impacts of the Workshop

What impact has the workshop had on your own work? For each element listed below, please choose the best response on the given scale:

- 1 = No Impact
- 2 = Very Little Impact
- 3 = Some Impact
- 4 = Moderate Impact
- 5 = Strong Impact

1 2 3 4 5

Other (describe below):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New ideas for content of undergraduate courses:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New labs or exercises for undergraduate courses:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

