First Year Implementation

GIS Faculty Institute: Community College of Aurora
National Science Foundation
Grant # 20100029

Aurora, Colorado
August 2010

Lisa A. Rue, PhD
Mary Siegrist, MS
# Contents

Executive Summary......................................................................................................................................... 3
  Description of the Program .......................................................................................................................... 3
  Process Level Outcomes ............................................................................................................................ 3
Full Report.......................................................................................................................................................... 5
  Description of the Program .......................................................................................................................... 5
  Evaluation Plan ........................................................................................................................................... 6
  Implementation Outcomes ........................................................................................................................... 8
  Coverage of Teacher Manual ...................................................................................................................... 8
  Qualitative Findings .................................................................................................................................... 13
Client Satisfaction............................................................................................................................................ 15
  Recommendations by Faculty ....................................................................................................................... 16
  Findings ....................................................................................................................................................... 18
  Limitations .................................................................................................................................................. 19
  References ................................................................................................................................................... 19
Appendix A Student Questionnaire.................................................................................................................. 20
Appendix B Faculty Implementation Questionnaire ........................................................................................ 24
Appendix C Faculty Interviews Questioning Route ....................................................................................... 27
Appendix D Student Focus Group Questioniong Route ................................................................................ 28
Executive Summary

Description of the Program

The Community College of Aurora’s GIS Faculty Institute was funded in 2009 to begin to build capacity toward implementing GIS technology in college coursework. The purpose of the program is to expand the use of GIS technology in education and addresses regional workforce needs for GIS-related skills by introducing students to GIS via an experiential, modular unit within a course of study.

The proposed project expects that faculty will learn to use basic GIS applications and receive support in designing/delivering their own module for use in a class in Spring semester of 2010, and faculty will learn about occupational applications of GIS in the Denver Metro region through guest lectures and industry field trips.

Students engaging in the GIS modules will gain valuable problem solving and collaborative skills while becoming aware of GIS career opportunities. GIS occupational information and learning experiences will also be included in a variety of student activities throughout the year.

Process Level Outcomes

The directors of the project developed a 12 module training for faculty at the Community College of Aurora. Their objective was to train 12 faculty to implement a GIS module during the first year.

- 14 faculty members were trained.
- 13 faculty members included a GIS lesson in their course
- The average lesson length was 74 minutes. Lessons ranged from 5 – 180 minutes in length.
- 212 students at the Community College of Aurora were introduced to GIS technology.
- The introduction was delivered in 3 history courses, 1 archaeology course, 3 biology courses, and 3 geology courses.

Implementation Findings and Suggestions for Improvement

The first year findings are reported by each associated research question that we are able to answer at this time.
1) What barriers need to be overcome to implement GIS across multiple disciplines?
The following barriers were identified during the implementation phase:
   • Complexity of the software and not enough tailored training time to learn to use it.
     - Possible solution to overcome the barrier: Tailoring the training sequence by prior faculty computer knowledge to create an introductory and advanced course. Follow-up with a faculty peer-to-peer mentoring model may help.
   • Time required collecting and entering data specific to each core subject is problematic.
     - Possible solution to overcome this barrier: Utilize advanced level students from each core subject who would earn course credit as a teaching assistant. These students could support faculty by collecting and entering content related data.

2) What systems need to be developed to effectively implement GIS across multiple disciplines?
   • Systems delivered on the conceptual level for training students.
   • An outside expert is an important component of systems development.
   • Faculty’s GIS skills were inadequate at this time to effectively implement across multiple disciplines.
     - Possible solution to overcome this barrier: Develop creative partnerships with local universities that will allow GIS graduate students credits for assisting Community College of Aurora with GIS data collection.

3) What are the perceptions of faculty regarding the usability and utility of GIS?
   • GIS modules were not implemented as planned for transferring GIS skills to students.
   • The usability for 1st year training did transfer a conceptual level of knowledge to students.
   • Faculty perceive the usability and utility of GIS as having great potential but the learning curve toward full implementation is cumbersome and difficult to implement.

4) Does the training adequately prepare faculty to implement GIS modules?
   • The modules that were covered the best and utilized most by faculty were modules 1 – 5 and 10 – 12. Overall however, the training as it was delivered during the first year did not adequately prepare faculty to implement GIS with the goal of transfer of GIS skills to students.
   • The training, however, did provide the opportunity for faculty to develop new conceptual projects for students in their courses.
     - Possible solution to overcome this barrier: Consider a two year sequence at minimum with an intro and advanced level offered both years. The addition of a faculty peer mentoring component following the training may suffice to increase and maintain efficacy of use in core subjects.
Full Report

Description of the Program
The Advanced Technological Education (ATE) program focuses on the education of technicians for the high-technology fields that drive our nation's economy. The program involves partnerships between academic institutions and employers to promote improvement in the education of science and engineering technicians at the undergraduate and secondary school levels. The ATE program supports: 1) curriculum development, 2) professional development of college faculty and secondary school teachers, 3) career pathways to two-year colleges from secondary schools and from two-year colleges to four-year institutions, and 4) other activities. A secondary goal is articulation between two-year and four-year programs for K-12 prospective teachers that focus on technological education. The program also invites proposals focusing on applied research relating to technician education (ATE Program Solicitation, NSF 07-530, p. 1).

The Community College of Aurora (CCA) will begin to address the need for building capacity to bring GIS studies to a broad range of courses at the college through a three-phase project. In the first phase, a cohort of faculty from various departments will be trained in the why and how to use GIS within their content area. In the second phase, a GIS specialist will work with the cohort as they develop their own module for use in one of the Spring 2010 semester classes. In the third phase, faculty will run modules in the classrooms and evaluate their success in preparation to continue incorporating GIS in future years.

Program Background
GIS is becoming an integral part of both the academic and work life of Americans. It is listed as one of the 14 national targets industry sectors in the President’s High Growth Job Training initiative (U.S. Dept. of Labor, 2010). GIS is currently used in a variety of industries, including real estate, commercial business, museums, urban planning departments, law enforcement, archaeology, mining companies, forestry services, utility companies, health services, transportation divisions, and telecommunications. (Kidman and Palmer, 2006; Wilke, 1998).

In Colorado, the Denver Metro Workforce Innovation in Regional Economic Development (W.I.R.E.D.) project, funded by U.S. Dept. of Labor, identified the following industries as high-growth, high-demand in Colorado: Information Technology; Energy; Bioscience; and Aerospace – and all of these industries utilize GIS in increasing ways. In a recent survey of Geospatial Information Technology Association (GIvTA)-member companies, 44% of Colorado companies who responded are “currently looking to hire employees with GIS skills” (U.S. Dept. of Labor, 2010) 88% of companies agree that “Colorado workers need to be better prepared with GIS-related skills as part of their education,” and 88% assert that a prospective employee’s GIS-related skills would count in their favor during a job interview. In difficult
economic times, GIS still appears to be a thriving area of employment in Colorado. (U.S. Dept. of Labor, 2010).

**Population Served**

In Colorado, 48% of minority students who matriculate in higher-education are attending a community college. The Community College of Aurora boasts the fastest-growing minority student population in the state, with a total of 6,315 students and 45% of population representing minority groups. Additionally, a majority of the students (59%) are females. The colleges’ demographics are extremely diverse, as Aurora is a first-stop for many refugee populations. (Community College of Aurora, 2010)

The GIS Institute is being conducted with approximately 17% of the total population of full time faculty, and 1 participant during the first year was adjunct faculty. \( N = 45 \) Full Time Faculty, \( N = 336 \) Adjunct Faculty

**Evaluation Plan**

**Formative Evaluation Phase.** This phase extended from March to August. Evaluation activities during this phase focused on the development of management information systems required to collect data, capacity building to finalize evaluation plans, development of data collection instruments such as satisfaction surveys, interview and focus group questions, as well as, baseline and post-test instruments that will be completed by GIS students. The evaluation team prepared and submitted an application to the Internal Review Board (IRB) at the University of Northern Colorado which was approved in July of 2010. Several conference calls and meetings were conducted while developing the evaluation tools. The student questionnaire, implementation questionnaire, interview questioning route and student focus group questions are included in Appendix A – D.

**Process Level Evaluation.** This level of evaluation is divided into two focus areas: 1) Development Components, and 2) Teaching and Instruction. The project staff collects process data over the course of the project. Process level data includes number of faculty trained, number of students receiving the program, the number of launching pad demonstrations conducted, the number of faculty participating in the launching pad demonstrations, and satisfaction surveys for faculty and students.

The directors of the project developed a 12 module training for faculty at the Community College of Aurora. Their objective was to train 12 faculty to implement a GIS module during the first year.

- 14 faculty members were trained.
- 13 faculty members included a GIS lesson in their course
- The average lesson length was 74 minutes. Lessons ranged from 5 – 180 minutes in length.
- 212 students at the Community College of Aurora were introduced to GIS technology.
• The introduction was delivered in 3 history courses, 1 archaeology course, 3 biology courses, and 3 geology courses.

**Outcome Monitoring Evaluation.** Beginning the second and third semester (when appropriate), a single group mixed design will assess gains in student knowledge, attitudes, GIS skills and perceptions about using GIS before and after courses implementing GIS modules. Data generated for every student entered into the database will be linked at the individual level (repeated measures, reflexive controls), which will produce an estimate of program outcomes. Quantitative and qualitative data will be collected and triangulated to answer the research questions. We expect to employ multiple comparison strategies. Within this body of data, we will make a variety of subgroup comparisons, such as assessing differences with gender and race on outcome variables, and across cohorts.

**Research Questions**

**Development Component.** 1) What barriers need to be overcome to implement GIS across multiple disciplines? 2) What systems need to be developed to effectively implement GIS across multiple disciplines? 3) What are the perceptions of faculty regarding the usability and utility of GIS? 4) Does the training adequately prepare faculty to implement GIS modules?

**Teaching/Instruction Component.** 1) How do GIS modules support domain knowledge, work practices, skill development and reasoning across multiple disciplines in faculty and students? 2) Do students demonstrate increases on mediating variables such knowledge, confidence (self-efficacy), and skills after using GIS in their courses? 3) To what degree are diverse community college students and faculty satisfied with the use of GIS modules in their courses?

**Data Analysis.** Data will be combined with demographic and attendance data from class rosters. Changes in mediating variables such as knowledge, attitudes, and skills are assessed while controlling for demographic characteristics and program attendance including number and percent of sessions attended. Multiple strategies of data analysis will be used according to the specific data line. For interval response items, a repeated measures MANOVA will be utilized. Nominal data will be analyzed using chi-square techniques; odds ratios will also be calculated. Quantitative data analysis will be conducted with SAS and SPSS software version 15.5. Constant comparative analysis (Merriam, 1998) will be conducted with qualitative data in order to identify reoccurring themes related to use of GIS by faculty and students to identify the most valuable learning experiences. The qualitative analysis will be conducted with NVIVO version 7.5.
Implementation Outcomes

The evaluation team sent an implementation study form comprised of 8 questions to all the faculty who participated in the institute. Of the 9 implementation study forms distributed to the GIS Faculty Institute participants, 55% were completed and returned.

Faculty rated the percentage of coverage and their completion of the 12 session course. Sessions 3 – 5 (chapter 1 -2 tutorial, creating maps), and session 12 had the highest percent of coverage during the faculty training sessions. Faculty reported that sessions 7 – 8 (Geocoding and Georeferencing, Raster the Other GIS Data) had the least coverage of the manual. Please see Figures 1 and 2.

Coverage of Teacher Manual

![Coverage of Teacher Manual](image)

Percentage of Teacher’s Manual Covered in GIS Faculty Training

Figure 1
Teachers were asked to rate how closely they followed the manual for the given sessions of the faculty institute. Sessions 1 – 2 (Interactive GIS websites and Finding your Way Around the Software Interface), as well as Sessions 10 – 12 (Spatial Analysis and What are Your Project Ideas) were followed the closest in terms of instructions and prescribed activities. Sessions 8 – 9 had the lowest ratings in terms of how well faculty followed the instructions and prescribed activities (see Figures 3 & 4).
Figure 3

Percentage of Teacher’s Who Closely Followed
The Teacher’s Manual Instructions and
Prescribed Activities

- Session #6: Finding/preparing GIS data, editing in GIS
- Session #5: Creating map layouts
- Session #4: Chapter 2 Tutorial
- Session #3: Chapter 1 Tutorial
- Session #2: Finding your way around the software interface
- Session #1: Interactive GIS Websites

Legend:
- Purple: No response
- Green: Minimal/None
- Red: Some
- Blue: All/Most
In addition to covering the material in the training, faculty were asked to rate their level of confidence immediately after the training and at the end of the semester. Figures 5 and 6, below, demonstrate that faculty confidence improved from the time period immediately after the training to the end of the semester.
Figure 5

Level of Confidence to Implement GIS
Immediately After the Training
Qualitative Findings
The evaluation team conducted interviews with 3 randomly selected instructors out of the 9 instructors who attended GIS Faculty Institute training. Four themes were identified from the interview process. Within these themes, subcategories were identified (see Table 1).
### Table 1
*Emergent Themes from GIS Faculty Institute*

<table>
<thead>
<tr>
<th>GIS Module</th>
<th>Survey Process</th>
<th>Textbook</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Confidence Level:</strong> Right now it is fairly little, but I could get back to basic level with the textbook and time to play with it.</td>
<td><strong>Part of Student Grades:</strong> It could be worth a small part of the grade. Points given, like extra credit points.</td>
<td><strong>Lack of Format:</strong> A chapter would say this is how you do something, now apply. It didn’t refer back to a part of the textbook to help with it. You expected to hold onto this knowledge.</td>
<td><strong>Training Instructor Support:</strong> He was always available out of class training as well. He was always willing to help.</td>
</tr>
<tr>
<td><strong>Ease of Use:</strong> I didn’t use the software. I found my own map-based programs to use. I struggled to find data to use in GIS and found another map-based program already with data. I used this instead. Very complicated and robust software system to use. ARC is not user-friendly.</td>
<td><strong>Student Concerns:</strong> None of the students expressed any concerns with taking either survey.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Relevance to Course:</strong> It never felt like the modules were particularly pertinent. It felt like I needed more explanation on why things worked the way they did and why I was doing something.</td>
<td><strong>Timeframe for surveys:</strong> By the time I got the surveys I was practically done with the module. The pre-survey wasn’t done.</td>
<td></td>
<td><strong>Attendance:</strong> I didn’t make it to the first or second meeting. When I did start showing up it seemed the trainer held our hands a lot of the time. It turned into lab time to do our assignments so I stopped attending and worked on it myself. I stopped going because I could do it on my own. The lab I went to I was the only person there.</td>
</tr>
<tr>
<td><strong>Level of IT Knowledge:</strong> Another huge problem with faculty training was that faculty did not have the level of technology knowledge necessary for this software. Faculty should be handpicked based on IT knowledge. A lot of time wasted on teaching faculty how to use a computer, which is one reason why I lost interest in attending.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In order to increase the internal validity of the evaluation, qualitative data were coded by two researchers and checked using NVIVO v. 7 coding comparisons function. Discrepancies were rectified to the final coding structure which achieved an inter-rater reliability of between 90% - 98% for all coding.

**Client Satisfaction**

Faculty were asked to comment about what they liked the best and the least regarding the GIS Faculty Institute. Table 2 outlines the five significant themes regarding what faculty liked the best.

Table 2  
*Best Aspects of the GIS Faculty Institute*

<table>
<thead>
<tr>
<th>Interdisciplinary Approach</th>
<th>Instructor</th>
<th>Exploring Project Ideas</th>
<th>Mapping</th>
<th>Independent Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hands on Work As Team for interdisciplinary Work</td>
<td>Working with a trained instructor</td>
<td>Looking at existing GIS applications</td>
<td>Creating Maps from Data Points</td>
<td>Being left alone to study and learn GIS on my own as the faculty training workshops were not helpful at all.</td>
</tr>
<tr>
<td>Seeing what other members of the institute were doing</td>
<td></td>
<td></td>
<td>I was finally able to locate a way to get the mapping data necessary to implement the project</td>
<td></td>
</tr>
<tr>
<td>Working with peers on suitable modules</td>
<td></td>
<td></td>
<td>I felt like I contributed in a meaningful way when it came to developing related graphic and technical content</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 outlines what was least helpful about the GIS Faculty Institute. The most frequently reported finding was the lack of time given for learning the software.
Table 3
Least Helpful Aspect of GIS Faculty Institute

<table>
<thead>
<tr>
<th>Not enough time with software</th>
<th>Having to go to faculty workshops</th>
<th>Not having access to data</th>
<th>Learning the software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trying to learn the software in the weekly sessions was very frustrating. I couldn’t follow the tutorials fast enough to keep up in the sessions and had too little time and expertise to work on my own between sessions</td>
<td>Having to go to faculty workshops</td>
<td>Because I could not find data, I did not actually end up using GIS software that we were trained in; instead I took ideas generated from the training to implement my module in a different way.</td>
<td>Trouble with ARC view software was mitigated by strong content knowledge</td>
</tr>
<tr>
<td>Lack of repeated experience with software so I could teach students how to work with it.</td>
<td></td>
<td></td>
<td>It is the nature of non-intuitive software, but step by step rituals are hard to follow.</td>
</tr>
<tr>
<td>Not enough time With Software</td>
<td></td>
<td>Not having access to data</td>
<td>Learning software</td>
</tr>
</tbody>
</table>

**Recommendations by Faculty**
Faculty gave some useful suggestions about how to modify the training. This included tailoring the training by screening for level of computer competency and then developing two levels for the training based on initial computer competency. Table 4 highlights the overarching recommendations by staff.
Table 4

*Recommendations for Future Training*

<table>
<thead>
<tr>
<th></th>
<th>Need to vary the course by skill level</th>
<th>More time to Master Software</th>
<th>Time with Instructor</th>
<th>Change Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our instructor was a professional geographer who uses GIS daily. He was very patient and accommodating. However, the differences in skill levels in using PCs and software created a two-tier class that didn’t serve the process well.</td>
<td>The class was too dependent on us working on our own time with a difficult software program. If the process were flipped – seeing and brainstorming applications first – we might have had more success and participation.</td>
<td>Individualized instruction</td>
<td>Less emphasis on up-front manual mastery and more on help once projects chosen and developed – support from experts on whether projects are reasonable and feasible</td>
<td></td>
</tr>
<tr>
<td>The Institute could roughly be divided into two groups (not evenly and it wasn’t in any way actually divided. a) those who had advanced proficiency in computer software applications such as Excel and Access, and b) those who had minimal or no prior knowledge.</td>
<td>This program is difficult to work with and it will take more time than the given training sessions for me to become comfortable enough to have students delve into the topic more</td>
<td></td>
<td>Team approach to projects</td>
<td></td>
</tr>
<tr>
<td>The class had CIS instructors who could easily master the manual, and Social Sciences faculty who are used to teaching online, and not complete computer dummies, but who found the program very difficult. Quite a few basically gave up on doing their own curriculum designs. Those of us who banded together to do team projects seemed more successful when we worked on our applications and actually piloted them in our courses.</td>
<td>More hands on time with software More time to master software</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Findings
The evidence presented from the implementation study and the faculty interviews was used to answer the implementation questions below.

1) What barriers need to be overcome to implement GIS across multiple disciplines?

The complexity of the software is a barrier to implementation. Therefore, the training time should be tailored more by prescreening for computer competency and building the faculty training using an introductory sequence and then include an advanced sequence for more advanced faculty.

One barrier to implementation is the time it takes to learn the software to become competent. Additionally, faculty did not implement their own content specific data because of the time required to collect their own data and to enter the data into the software program in time to implement it into the course. One suggestion to assist faculty with mastering the software and developing content related activities would be to develop a faculty mentoring structure which would provide ongoing support after the training.

Tailoring the training to the computer competency level is simple from a practical sense. It will likely require more time for tailored classes and more resources for training.

Time required to collect and enter data is also a barrier. Faculty may be able to overcome this barrier by utilizing advanced level teaching assistants who can collect and enter GIS data to implement content specific and meaningful GIS activities in the classrooms.

2) What systems need to be developed to effectively implement GIS across multiple disciplines?

We are not able to answer this question at this time. The evaluation team will explore this question more during the second year. It is imperative that only faculty who demonstrate a high level of efficacy with the software and have a dosage of 75 – 180 minutes in core content are included in the evaluation for student outcomes. Adjustments will be made to the student survey so that measures are less GIS skill focused and reflect introductory or conceptual level knowledge.

3) What are the perceptions of faculty regarding the usability and utility of GIS?

At this time, the GIS modules were not implemented as planned because faculty perceived it as too confusing and cumbersome to implement. Implementation into student courses for this pilot year was primarily at a demonstration and introductory level.

4) Does the training adequately prepare faculty to implement GIS modules?

Some of the training modules were covered and utilized more than others. Overall, the training, as it was delivered last year, did not adequately prepare faculty to implement GIS modules into
content specific course to a level which would develop GIS Skills in community college students beyond a conceptual level of introduction. This year the training needs to be better tailored according to skill sets of faculty and computer competency. More time is required for hands on experience in working with the ARCview software.

More labor resources are required to assist faculty with collecting their own content specific data in order to allow students to learn to use GIS software in a variety of courses. The labor may be found by utilizing advanced students or teaching assistants who can collect and enter the GIS relevant data for the faculty member. Students may be able to earn internship or assistantship credit for their work.

**Teaching/Instruction Component**

None of the teaching and instruction research questions are answerable at this time. None of the faculty members were able to actually implement GIS skills and data specific to their core content during the first year.

**Limitations**

This first year implementation study is formative in nature. This design is appropriate for improving new projects. At this stage, the project is monitoring outcomes identified as appropriate for the program. Formative studies build capacity toward fidelity of implementation in preparation for a more summative study appropriate for measuring student outcomes.

**References**


Appendix A
Student Pre/Post Questionnaire

Pre-Survey
SUBJECT CONSENT
Project Description
You have been asked to be in this study because you are currently enrolled in a course with a Geographic Information Systems (GIS) module. This is a two phase survey that is part of a study to learn what students know about Geographic Information Systems. You will be asked to complete the first phase survey before you take the course and phase two survey after you have completed the course. Your participation in this study is voluntary.

Procedures
If you agree to participate you will be asked to complete an electronic survey. This survey will take approximately 15 minutes and consists of 15 questions.

Discomforts and Risks
There is very little risk to you as a participant. You are not required to participate; you may stop participating at any time without any consequences to you. We will not reveal your identity to anyone at your facility.

Benefits
You will receive no benefit from participating in this research study other than the knowledge that you have contributed to an important study for future students. There is no cost to you for participating in this study. You will not be paid for participating in the study.

Invitation for Questions
If you have questions about this study and how the data will be used, please contact Lorraine Evans at Lorraine.evans@ccaurora.edu or (303) 360-4790.

Confidentiality
The researcher will treat your identity with confidentiality. Your name and 7-digit alpha/numeric code will be stored separately from the completed surveys so that your name cannot be linked to the surveys. The information obtained in this study may be published in professional journals, but your identity will not be revealed.

AUTHORIZATION:
I have read the consent form about this study. I know what will happen, both the possible good and bad (benefits and risks). I choose to be in this study: I know I can decide not to participate or to stop participating at any time without any repercussions. And that I may also request a copy of the Subject Consent form.

1. Enter 3 digit numeric code you received from your teacher.
2. Your Course Prefix and Number
3. Age
4. Gender
5. Ethnicity - choose all that apply
6. If you chose Ethnicity: other above please use this line to describe your ethnicity
7. Is English your second language?
8. Have you ever received free and/or reduced lunches in public schools?
9. Were you aware this course included a Geographic Information Systems module prior to registering for this course?

10. If you answered Yes to the above question, was the inclusion of a GIS module a factor in why you are taking this class?

11. Select the plan of study or studies you are currently pursuing at CCA.

12. If you selected Other in the above question, please list the plan of study you are currently pursuing at CCA here.

13. Do you have a long range plan of obtaining a Geographic Information Systems degree or certificate program?

14. Describe your level of knowledge regarding the use of GIS in your occupational field
   i. _____I don’t have any knowledge
   ii. _____I have some knowledge
   iii. _____I have a lot of knowledge

15. Rate your level of computer knowledge:
   i. _____Beginner
   ii. _____Intermediate
   iii. _____Expert

16. On a scale of 1 to 4 rate your level of knowledge on the following below:
   17. 1 = Expert 2 = Intermediate 3=Beginner 4=No knowledge
   i. _____data collection
   ii. _____data management
   iii. _____query data
   iv. _____data files
   v. _____data logging
   vi. _____data layers

18. I was familiar with the following concepts prior to taking this course. (Mark all that apply)
   i. _____Distance
   ii. _____Scale
   iii. _____Direction

19. Have you taken a Geography course prior to this GIS course?
   i. _____Yes
   ii. _____No

**Post-Survey**

**SUBJECT CONSENT**

**Project Description**

You have been asked to be in this study because you are currently enrolled in a course with a Geographic Information Systems (GIS) module. This is a two phase survey that is part of a study to learn what students know about Geographic Information Systems. You will be asked to complete the first phase survey before you take the course and phase two survey after you have completed the course. Your participation in this study is voluntary.

**Procedures**

If you agree to participate you will be asked to complete an electronic survey. This survey will take approximately 15 minutes and consists of 15 questions.
Discomforts and Risks
There is very little risk to you as a participant. You are not required to participate; you may stop participating at any time without any consequences to you. We will not reveal your identity to anyone at your facility.
Benefits
You will receive no benefit from participating in this research study other than the knowledge that you have contributed to an important study for future students. There is no cost to you for participating in this study. You will not be paid for participating in the study.
Invitation for Questions
If you have questions about this study and how the data will be used, please contact Lorraine Evans at Lorraine.evans@ccaurora.edu or (303) 360-4790.
Confidentiality
The researcher will treat your identity with confidentiality. Your name and 7-digit alpha/numeric code will be stored separately from the completed surveys so that your name cannot be linked to the surveys. The information obtained in this study may be published in professional journals, but your identity will not be revealed.
AUTHORIZATION:
I have read the consent form about this study. I know what will happen, both the possible good and bad (benefits and risks). I choose to be in this study: I know I can decide not to participate or to stop participating at any time without any repercussions. And that I may also request a copy of the Subject Consent form.

1. Enter 3 digit numeric code you received from your teacher.
2. Your Course Prefix and Number
3. Age
4. Gender
5. Ethnicity - choose all that apply
6. If you chose Ethnicity: other above please use this line to describe your ethnicity
7. Please rate your experience with the organization of the content of GIS curriculum:

<table>
<thead>
<tr>
<th>Poorly</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organized</td>
<td>Somewhat Organized</td>
<td>Very Organized</td>
<td></td>
</tr>
</tbody>
</table>

8. The learning sequence of the GIS curriculum was structured in a way that was:
   ____ Mostly confusing and hard to follow
   ____ Confusing at times and clear at other times
   ____ Mostly clear and easy to follow

9. How sure are you that you would be able to use the following GIS components on your own in the field:
   1 = Not Sure At All   2 = Somewhat Sure   3 = Sure   4 = Very Sure
   ____ Computer software (need specific name used for this coursework)
   ____ data collection
   ____ data management
   ____ query data
   ____ data files
   ____ data logging
   ____ data layers

One a scale of 1 – 5, 1 being poor and 5 being excellent rate the following:
10. The GIS Instructor’s knowledge of GIS:
11. The Instructor’s interactions with students:
12. The textbook used with the course:
13. Rate your experience with the lab exercises:
   _____ Not enough lab exercise
   _____ Appropriate number of lab exercises
14. Please mark the situation that best describes your experience with this GIS course:
   (choose only one)
   _____ The course was too difficult so I dropped the class
   _____ I lost interest in the subject matter so I dropped the class
   _____ The course was manageable so I complete the class
   _____ The course was engaging so I completed the class
15. How valuable was the GIS experience for your major course of study?
   _____ Not valuable at all
   _____ Somewhat valuable
   _____ Extremely valuable
Appendix B

Community College of Aurora

GIS Faculty Institute
Implementation Study
Spring 2010

1. For each class of the curriculum, circle the number that best describes how much of the material in the teacher’s manual was covered?

<table>
<thead>
<tr>
<th>Class #: Lesson Name</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #1 Interactive GIS web sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #2 Finding your way around the software interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #3 Chapter 1 tutorial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #4 Chapter 2 tutorial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #5 Creating Map layouts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #6 Finding and preparing GIS data, editing in GIS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #7 Geocoding &amp; Georeferencing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. For each class of the curriculum, circle the number that best describes how closely you followed the teacher manual instructions and prescribed activities.

<table>
<thead>
<tr>
<th>Class #: Lesson Name</th>
<th>5 All</th>
<th>4 Most</th>
<th>3 Some</th>
<th>2 Minimal</th>
<th>1 None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session #1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session #6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Session #7

Session #8

Session #9

Session #10

Session #11

Session #12

3. On a scale of 1 to 3, 1 being not confident at all, and 3 being extremely confident, rate your level of confidence to implement GIS into your curriculum immediately after the training.

Not Confident At All 1  Somewhat Confident 2  Very Confident 3

4. On a scale from 1 to 3, 1 being not confident at all, and 3 being extremely confident, rate your level of confidence to implement GIS into your curriculum now?

Not Confident At All 1  Somewhat Confident 2  Very Confident 3

5. In your opinion, what was the most helpful to you to implement GIS into your curriculum?

6. In your opinion, what was the least helpful to you to implement GIS into your curriculum?

7. What recommendations would you like to make to improve the curriculum scope and sequence?

8. What recommendations would you like to make to improve the GIS Faculty training?
Appendix C

Faculty Interview Questioning Route

1. What was it like to go through the teacher training process for GIS Module implementation into your curriculum?

2. What is your confidence with the software?

3. How were you compensated for your time?

4. Describe the support structure for questions or concerns during the teacher training process?

5. How did the students respond to the GIS software?

6. How did this compare to before the GIS module was added to your curriculum?

7. Tell me how you handled the pre- and post-survey process?

8. Do you have any suggestions to improve this process?

9. Any suggestions on how to improve the faculty training?
Appendix D

Student Focus Group Questioning Route

Consent Script for Student Focus Groups

The purpose of the focus group is to get your thoughts and ideas about the training and implementation of the GIS modules in your courses at the Community College of Aurora. The study will help us to learn about the benefits of using GIS to teach in your content area.

The focus group will take approximately 1 hour to complete. You will be asked to respond to some general questions about the training you received for GIS technology and your experiences with implementation of GIS course activities.

You will not benefit directly by your participation, but sharing your experiences and recommendations will help improve courses which offer GIS technology. Your name will not be associated with the research findings in any way. It is important to know, you are free to not participate. If you choose not to participate, you are free to leave. If you choose to stay, your participation in the focus group will imply your consent.

Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please sign below if you would like to participate in this research. A copy of this form will be given to you to retain for future reference. If you have any concerns about your selection or treatment as a research participant, please contact the Office of Sponsored Programs, Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-2161.
I. INTRODUCTION

Thank you for agreeing to meet with me today. My name is ______________. I am the evaluator of the GIS Faculty Institute offered to you through your classes here at the Community College of Aurora.

The purpose of this focus group is to gather information about GIS technology and its effect on learning the content of your course. Your perceptions and views will assist us in evaluating the use of GIS Technology. There are no right or wrong answers, but rather different points of view. Feel free to share your point of view, even if it differs from someone else’s.

Before we get started, let’s share some ground rules. We will be recording the session because we do not want to miss any of your comments. We ask that only one person speaks at a time. The best way we have found to help with this is to pass around the recorder (or microphone). When your turn comes, if you choose to share, please hold the recorder (or microphone) about 4 inches from your mouth and speak clearly. If you do not wish to share, just pass the recorder (or microphone) to the next person. Everyone will get a chance to share.

We will be on a first name basis today, and later in our reports there will not be any names associated with the comments. The evaluators will keep your names confidential. We also ask that you keep the comments made in this focus group confidential.

This session will last about an hour followed by refreshments being served in the ______ when the session ends. The rest rooms are located ______ and water bottles are on the table. <Can we have incentives?>

II. OPENING QUESTION (ROUND ROBIN)

To begin, I would like to ask each of you to introduce yourself – using just your first name – and tell us how long you have been a student at the Community College of Aurora. Tell us what courses you are taking now.

III. GENERAL GIS QUESTIONS

The next set of questions is related to your perceptions about the GIS Class. Everyone will have a chance to share if they want to.

1. What influenced your decision to take the course offering GIS technology?
2. What do you expect to get out of this class?
3. How do you think using GIS might help you?
4. Can you think of any downsides or disadvantages of this class?

IV. SPECIFIC GIS COURSE QUESTIONS

1. Please describe how GIS technology enhanced your learning of the course content.
2. Please describe how GIS technology inhibited your learning of the course content.
3. Describe your level of confidence using GIS technology now that you have almost completed the course. What do you need to feel more confident in using the technology?
4. What did you like the most? What did you like the least?

5. Do you have any recommendations for how your teachers could improve the course?

V. CONCLUSION
Let me see if I can summarize what I’ve heard you say. ______summarizes. Did I summarize your thoughts very well? Did I misunderstand anything? What else would need to be included in a summary?

I want to thank you for sharing your thoughts and feelings with us. This has been valuable information for us.