The NCGIA GIS Core Curriculum for Technical Programs

INSTRUCTOR'S GUIDE

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This guide is designed to provide a quick overview for the GIS instructor on the use of the CCTP resources to create GIS course modules and design GIS courses.

Overview

The Core Curriculum for Technical Programs concentrates on providing course content assistance for instructors. The CCTP is intended to support a full range of courses that would be taught at a 2-yr. college. The materials are textbook and course independent, providing a generic task-oriented approach. While the NCGIA core curriculum in GIS (GISCC) focuses on Geographic Information Science, the CCTP focuses on information that instructors need to present to students so they can perform the technical activities associated with geographic information systems.

This guide suggests some ways that the CCTP units can be used to support class preparation and new course development . For more information on the purpose of the CCTP and development philosophy see the "About" section.

How can I use the CCTP for Course Development?

The CCTP units can be put together in whatever order and quantity best serves the overall objective. It does not imply that any given course must include specific units. Course content and programs at technical and community colleges are generally reflective of the needs of local industry. Thus, courses may lean toward competency in CAD/GIS in one community, natural resource management applications in another and mining applications in still another. Instructors are encouraged to choose amongst the materials in order to develop courses suited specifically for their students.

There are numerous approaches to course development. The following list recommends ways to use the CCTP to plan and develop one or more courses. For those putting together an entire program, it is assumed that some sort of survey has been made to assess local needs for GIS training. Likely a steering committee has been already been set up to discuss what types of courses would best meet those needs.

To make it easier to use this section it is provided in the form of a list. Work through the steps, which make the most sense for the phase of course development that you are in.

1. PROGRAM AND COURSE OFFERINGS

   Check out what other colleges are offering in the way of GIS courses, certificates, and AA degrees. The CCTP Resources section includes a growing list of Example Courses and Programs. Another source for more courses in GIS and related technologies is the Virtual Geography Department at the University of Texas at Austin. Currently, all the courses listed under this link are taught at 4 + year colleges and Universities.

   The course titles, descriptions and, in some cases, syllabi illustrate the variety of courses offered in GIS and GIS related technology. Courses vary both in content and approach. Some courses provide software specific training such as *Introduction to MapInfo* and *Introduction to ArcView*, while others focus on concepts or a combination of concepts and software training, such as *GIS Database Development*, and *Introduction to GIS.*

2. TEXTBOOKS

   Under the Resource roots check out the link to Textbooks and Lab Resources. Additionally, many of the courses that you found in step one list a textbook. Check to see if your library has a copy or contact the publisher to order an evaluation copy of books for courses similar to what you are developing. Most publishers have hyperlinks for their textbooks that display the table of contents and sometimes more. Next, scan the table of contents, chapter objectives and

chapter contents, for one or more books, while keeping in mind how well it fits the objectives for your course. This will help you to refine your objectives and determine whether or not the textbook will suit your needs.

3. CTTP ORGANIZATION

The Background Trunk, Task Branches structure provides an example structure for developing a single course or program of courses (see below).

Background Trunk

- What is GIS
- Geography for GIS
- Computing for GIS
- GIS Application Case Studies

Task Branches

- Accessing Spatial Data Sources (Units 1-11)
- Creating Digital Spatial Data (Units 12-25)
- Managing Spatial Data (Units 26-32)
- Analyzing Spatial Data (Units 33-46)
- Reporting on Spatial Data (Units 47-51)
- Implementing and Managing GIS (Units 52-53)

For example an "Introduction to GIS" course would pull from the Background Information - Trunk as well as selected units from the Spatial Data Tasks - Branches. Due to the emphasis on breadth rather than depth, most areas would be primarily covered at a learning outcome level of Awareness. See the Unit Format Template for an outline of the structure that each unit follows.

A course in Spatial Analysis would likely pull heavily from the units under the "Analyzing Spatial Data" branch, covering most of them at the level of Competency or Mastery. For an example of how one unit writer outlined the goals and objectives for each of the learning outcome levels for a unit under the Analyzing Spatial Data Branch scroll through Unit 33, Using Buffers.

EXAMPLE COURSE DEVELOPMENT SCENARIO

[The GIS steering committee at your college has determined that a course in Spatial Data Development and Acquisition is needed. This 3 unit course will cover Data Input and conversion issues and skills such as digitizing and scanning and GPS. Accessing and using data from the internet, and spatial data transfer standards. Your steering committee determined that it is especially important for students to develop mastery in GIS data searches, and metadata creation.

1. COURSE OFFERINGS

A search through the sample programs under the CCTP link Example Courses and Programs finds that American River College has a course listed called "Data Acquisition" with the following description, which covers much of what you want to cover in your course:

Geography 26 - Data Acquisition in GIS (3 Units)

This course provides students with the knowledge and practical experience necessary to develop skills in the acquisition, management, conversion, analysis, and creation of spatial data. Topics include acquisition of existing data sets, data format conversion, and acquisition of data from remote sensing sources and the global positioning system (GPS), an integral part of the development and implementation of geographic information systems.

2. TEXTBOOKS

As the CCTP is designed for instructors and not students, you are interested in locating a book that is suitable for the course you are designing. Listed in the Resource Roots section of the CCTP is a hyperlink to Instructor Resources, where numerous books are listed. One of these books is the "GIS Data Conversion: Strategies, Techniques and Management" by Pat Hohl Ed., published by OnWord Press. An expanded outline is available at the publisher's site for you to view and print. From the table of contents, it appears that this book covers a number of the areas considered

important to the steering committee, such as Scanning, global positioning systems and Spatial Data Transfer. You request an evaluation copy of the book.

3. CTTP ORGANIZATION

Your next step is to check out which branches of the CCTP cover the topics of interest. Looking at the CCTP Table of Contents (see left frame), you note that the first three branches (Accessing Spatial Data Sources, Creating Digital Spatial Data, and Managing Spatial Data) cover topics relevant to GIS data acquisition and creation. You scan through each of the units for these three branches. The sections on goals and objectives at each of the learning outcome levels of Awareness, Competency and Mastery help you decide how much to include in your course.

As the book requested in step 2 above doesn't have a section on the Internet, you are pleased to find that branch one, Accessing Spatial Data Sources will be of great help in developing a course outline (and later for lecture). See Unit One Data Acquisition for an example

How can I use the CCTP for Class Preparation?

The units are intended to contain enough information about each topic to assist an instructor in preparing a lecture. The Unit Format Template displays and explains the format that was followed for each unit. Briefly, each unit contains the following elements:

- Context
- Example Application
- Learning Outcomes
  - Awareness
  - Competency
  - Mastery
- Preparatory Units
  - Recommended Units:
  - Complementary Units:
- Follow-up Units Resources
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The following section contains examples of how some of these unit elements can be used to prepare for a portion of a class session, entire lecture, or other class activity.

CONTEXT/EXAMPLE APPLICATION

Students learn GIS more easily in the context of real world examples. Each Unit contains an example application, for the particular concept or skill discussed in the Unit.

For example: In Unit 18: Scanning Air Photos the unit author begins by describing why, when and where scanning is used. This is followed by an example application which describes a national and statewide agency that must determine to what extent agricultural land use has changed both spatially and temporally in the Southern Appalachian region. Ultimately, the agencies will perform soil erosion modeling. In order to meet the project analysis requirements multiple years of air photo coverage will be scanned.

A real world example such as this can lead to further discussion of available airphoto coverage, scale and specific steps to accomplish the scanning.

LEARNING OUTCOMES

This useful section of each CCTP unit can help you decide what is most important to cover on a given topic given the level of the course you are teaching and the time available. For example, an introduction to Geographic Information Systems instructor using Unit 10: Projecting Data will likely cover projections at the Awareness level. The author of this unit lists the

following objectives:

The student will be able to:

1. Define "map projection" and the basic classes of map projections
2. Discuss the types of distortion inherent in map projections
3. Demonstrate familiarity with some commonly-used map projections and coordinate systems
4. Discuss the required parameters for several common map projections

The course may include one or both objectives from the competency level as well:

1. Identify an appropriate map projection for some example applications.
2. Create a custom map projection.

The unit contains several useful figures. Figure 2 shows the extreme area distortion in the polar regions of the Mercator projection, which is conformal and not equal-area. Figure 3 shows the world on an equal-area projection, the Mollweide. If you have a lab with a desktop GIS software this idea could be extended to an active learning experience. Most desktop GIS's contain a sample data set including countries of the world that can be displayed in a number of different projections.

An advanced GIS course would cover this topic at the competency level, likely including one or more objectives from the Mastery level. At this level a students will complete a project, using a GIS which offers true projection capability. Thematic layers could be projected or re-projected to create a GIS database with all the layers on one projection.

Examples of the use of the CCTP to create GIS Teaching Resources

The following is an example of how an instructor uses several units to support a Digitizing Tutorial

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TUTORIAL FOR DESIGNING A DIGITIZING PROJECT

Created by Lesley-Ann Dupigny-Giroux at the University of Vermont to demonstrate the use of the CCTP units to create a resource that an instructor can use in their class. (See Lesley-Ann's CCTP Unit: UNIT 13 - Digitizing Maps)

This tutorial is designed to provide an example of the ways in which a series of units from the Core Curriculum for Technical Programs (CCTP) can be synthesized into a teaching exercise of varying lengths. The example given here is the creation of a digitizing project using Units 12-15 of the CCTP. The goal is the generation of a coherent series of tasks that students need to implement from the start of a digitizing project to its completion. Key questions/issues that need to be pre-determined by the instructor form the basis for the development of this tutorial.

STEP ONE - ROLE OF THE INSTRUCTOR

The instructor needs to predetermine:

- digitizing goals to be accomplished (*Unit 12 outlines some considerations in planning an entire digitizing project*)
- choice of digitizing software (*if the GIS package doesn't feature a digitizing module*)
- map/image input format medium (large map, aerial photo etc.)
- map preparation needed
- type of digitizing required a) on-screen b) tablet
- labeling to be attached a) while digitizing b) as a post-digitizing task
- post digitizing tasks

STEP TWO - GOALS OF THE DIGITIZING EXERCISE

Digitizing goals to be accomplished may include one of the following:

- introducing the students to digitizing (*ideal for a two-hour laboratory*)

- setting the framework needed to allow the students to become competent in the tasks involved (*ideal for an assigned exercise once the students have become familiar with the software and hardware*)
- rigorous development on the part of students of the entire digitizing project (*ideal as an extended project involving a lot of repetition and attention to detail*)

More details on the specific tasks to be accomplished at each of these stages can be found in the competency, awareness and mastery sections of unit 13.

STEP THREE - INPUT FORMAT

The source of the data to be entered will help to determine whether manual digitizing, on-screen digitizing or scanning is appropriate. For the various contexts within which the three techniques may be applied, refer to the links below.

CHOICE OF DIGITIZING TYPE

The choice between manual and on-screen digitizing will depend on the nature of the input medium as well as on the goals to be accomplished with the end product. For the advantages of on-screen digitizing refer to Unit 14, while Unit 13 discusses the techniques of manual digitizing.

STEP FOUR - MAP PREPARATION

Regardless of the type of digitizing to be performed, map preparation is crucial in the reduction of unnecessary repetition of tasks, as well as helping to ensure an accurate end product. In addition to the list of predigitizing tasks outlined in Unit 13, other key decisions include:

- identifying the section of the map and exact locations of features to be digitized
- determining a method by which to keep count of the features already completed
- allowing the map/medium in question to adjust to the room's temperature and humidity before taping it to the digitizer

STEP FIVE - ATTACHING LABELS

The usefulness of the spatial data entered via digitizing or scanning will be a function of the attribute data attached. This labeling can be done while digitizing (for students who have mastered the basics) or as a separate exercise as outlined in Unit 15.

STEP SIX - POST-DIGITIZING TASKS

In order to ensure an accurate end product, a number of issues must be addressed. These include the identification and elimination of errors, coverage editing and labeling (if necessary). These are outlined in Unit 13.

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