

Cartographic Principles Final Project

Learning Outcomes

Cartography is the science and art of visualizing and communicating geospatial data. Throughout the course, you have learned a variety of cartographic techniques for creating thematic maps such as dot density, proportional symbol, flow maps, and choropleths.

For your final project in the course, you are going to research a topic of your choice and present that information. The goals of this final project is to have students:

- *Employ cartographic design principles to create and edit visual representations of geospatial data, including maps, graphs, and diagrams*
 - *Demonstrate how the selection of data classification and/or symbolization techniques affects the message of the thematic map*
 - *Critique the design of a given map in light of its intended audience and purpose*
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Research

Research the problem and answer the following questions before you begin:

1. What is the geographic area of study?
 2. What is the interest in this area and who are the stakeholders?
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Obtain Spatial and Non-spatial Data

Do you have access to baseline data? The Internet provides many of the layers of data that are needed for project work. Be sure to pay particular attention to the source of data and get the latest version. Older versions of spatial data are useful for temporal comparison, but make you are conscious of that.

Below is a list of potential data sources for spatial and non spatial data that you could use for your project:

- Automated Geographic Reference Center (AGRC)
- Data.gov
- ESRI Data & Maps
- U.S. Census Bureau
- Geospatial One Stop
- The National Atlas
- U.S. Geological Survey Seamless Data Warehouse

Project Workflow

After researching the problem and obtaining the data, you should do the following:

Problem/Scenario

Write a brief problem statement and/or scenario of the geographic situation you will be studying. This is perhaps the most difficult part of the entire process. You must define what issue you are trying to address from an often complicated sea of information and perhaps competing interests. You should always try to focus on the core issue in any situation calling for geospatial analysis. What decision needs to be made? Who is going to make it? What do people need to know to make a rational decision?

One approach is to write down a short description of the problem, including the general scenario, the stakeholders, and the specific issues that need to be addressed. It also helps to think about what decisions will ultimately be made using the data.

Deliverables Needed

After you have defined the problem or scenario, you need to think about what maps and other visualizations you will produce to help you analyze and solve the problem. By envisioning these maps, you will be able to identify the data required of your analysis. You will also be able to determine if you have defined your problem in sufficient detail to develop a solution. Along with specifying your data requirements, your list of deliverables will also guide your analysis. These first steps of your workflow are very iterative. You may need to go through them a few times before you feel ready to begin your analysis. In many projects, they are also the most complicated steps.

Identify, Collect, Organize, and Examine the Data

Once you have defined your problem or scenario and identified the deliverables, it is time to search for data. As a starting point, you should identify data for a basemap and data to solve the problem you have defined. In many instances, you will have data at hand that will allow you to pursue your analysis. These data may have been provided for you or it may be part of a collection of data where you are working. This data may also come from the Internet or you may need to collect your own data. If you need to do some sort of field study to collect your data, you will want to be sure to develop a clear protocol for taking data and follow it consistently. You will also want to think carefully about the design of a database to hold your measurements.

In all cases, you should be careful to identify your data sources and make sure you have permission to use the data for your particular problem. Make sure all data layers have appropriate metadata that describes various aspects of the data, including the creator of the data, the map projection, and the attributes included. You will also want to know if you have vector or raster data layers and the accuracy or resolution of each layer.

As you collect the data for your analysis, it is strongly recommended that you adopt a standard for how you organize and store these data. This organization will make your analysis much easier, and you will be able to quickly find different layers and share your work with others. If you obtain data from outside sources, make sure you understand what the data actually represents.

Document Your Work

Documenting your project and creating a process summary is critical to keeping track of the various steps in your analysis. To document your project, go to the File menu and select Document Properties. In the dialog box that appears, you can enter some of the basic information about your project. A process summary is simply a text document that keeps track of the different steps you use in your analysis. Start the process summary early in your project and keep it up to date throughout the process.

Prepare Your Data

Accurate GIS analysis may call for changing the units in which measurements will be made. You will also want to know the units in which various quantities are measured. You may need to provide geographic references to certain quantities, such as properly locating addresses or adding GPS-based data to your map display.

Creating a Basemap

Create your basemap that shows the geographic area you tend to study. A basemap will typically contain the major features of the area such as roads and streams, and it will help orient you geographically to the area and its features. This is a good practice when solving any geospatial problem as it will give you a sense of the scale of your study area and the different features that may dominate that area.

Geoprocessing Analysis

Perform your analysis using geoprocessing techniques and other analysis tools. These tools include selecting by attribute or location, classifying, interpolating, map algebra, measuring area, or a wide variety of other techniques. The point of your analysis is to produce the deliverables that you specified above and allow you to develop a solution to the problem you defined. Often you will find that the first set of analysis tools may not provide results that help solve the problem and you will need to refine your analysis and try other tools or techniques. Even if you have been very careful and thorough in your planning to this point, geographic data never lose their ability to surprise you.

Questions to consider when assess your work.

- **Map composition:** Did you properly consider scale and map composition (i.e. title, legend, scale, author, source data, potential north arrow) when creating your maps.
- **Map classification:** Did you make reasonable choices for the classifications you created with different GIS layers. Is the symbology appropriate for the various layers? If it is quantitative data, is there a logical progress from low to high values and are they clearly labeled? If it is qualitative, did you make sure not to imply any rankings in your legend?
- **Map scale and projections:** Is the map scale and projections appropriate for the geographic problem?
- **Geospatial analysis:** Did you correctly interpret the color, patterns, and shape of your symbologies? Does any text you have written inform the reader of the map's intended use?
- **Map design and aesthetics:** Are your maps visually balanced and attractive? Can you distinguish the various symbols for different layers in your maps?
- **Effectiveness of the map:** How well do the map components communicate the story of your map? Do the map components take into account the interests and expertise of the intended audience? Are the map components of appropriate size

Project Presentation

To prepare for your presentation consider the deliverables, how you will draw conclusions, and how to present the results. You will first need to complete your deliverables. This may mean making map layouts, graphs, charts, or tables. You will want to finish documenting your analysis process. Remember to keep the principles of good cartographic design in mind when you make your deliverables. ESRI has a great resource on helping you create better maps at their Mapping Center: <http://mappingcenter.esri.com>

There are many ways, ranging from simple to advanced, that you can use to prepare a geospatial presentation. Whatever method of presentation you choose has to include a report documenting your analysis and addressing the spatial patterns you observed. As you work through this project, consider different ways or styles of presentation media. Pick the presentation medium that best fits your audience. Remember that your audience probably lacks your in-depth knowledge of GIS, so you will need to communicate your results in a way they will be able to understand and use.

Listed below are various presentation formats. It's important to remember that employers want to see that you can present geospatial information in a variety of formats. So if you are familiar with one style, it is HIGHLY recommended that you look for other presentation formats to improve on.

- Create a text document with inserted maps.
- Show your findings in a digital slide presentation.
- Use ArcGIS Explorer, which is free, as a way to explore, visualize, share, and present geographic information. These maps can also be shared with others. <http://www.esri.com/software/arcgis/explorer/>
- Create layer packages or map packages and share your maps with your classmates.
- use ArcGIS Online to produce an interactive online geospatial presentation that can be shared. <http://www.arcgis.com/features/>

Reflection

An important component of critical thinking is metacognition of the process you just went through and the knowledge and skill sets you acquired along the way. This can be accomplished through self-monitoring, reflection, or self-correction analysis. After completing your final project, write a 500 word response on the following two topics.

- *What problems did you encounter in completing your final project? How did you troubleshoot them?*
- *How did you scrutinize any potential or errors to determine ways to avoid them in the future?*

Project Evaluation

This assignment also meets the college's learning outcome for **critical thinking**. This includes reasoning effectively from available evidence; demonstrating effective problem solving; demonstrating higher-order skills such as analysis, synthesis, and evaluation; making connections across disciplines; applying scientific methods to the inquiry process.

Your final project will be assessed based on the critical thinking grading rubric provided in this assignment. While working on your project, consider the following expectations:

- Are you **exploring** spatial patterns running through the data by explaining patterns and trends?
- Are you **exploring** ways to categorize information to improve meaning.
- Are you **appraising** the options at length to make a more informed decision.
- How are you **justifying** the decisions you are making?
- Are you **scrutinizing** errors to determine ways to avoid errors in the future.

Project Submission

Submit your final project along with the reflection within the course page of your academic ePortfolio. You will submit your published ePortfolio URL within Canvas for grading.