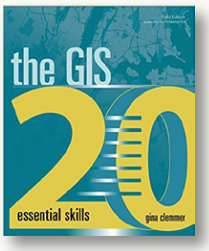
THE GIS 20: ESSENTIAL SKILLS, THIRD EDITION



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Based upon a student-friendly and project-centered writing strategy, *The GIS 20: Essential Skills* provides those new to GIS technology with a well-structured textbook to start their journey. The book has only 182 pages in total—which is very short compared with some other mainstream textbooks available in the market—but it covers a wide range of the topics with which every student of GIS must become familiar. In particular, the 20 chapters of this book address five essential aspects of modern GIS technology: software environment, input, output, data, and operations. By limiting her scope to only the most frequently used GIS concepts and operations, the author has constructed a convenient and practical handbook for students and other entry-level GIS practitioners. The key concepts are explained with as little technical jargon as possible, and there are screenshots and images illustrating almost every page.

The book begins with an introduction that briefly explains where and how to get the software platform needed for the exercises—ArcGIS Desktop—and provides tips about how to install it. The ArcGIS Desktop platform includes ArcMap, ArcCatalog, and other utilities, although *The GIS 20: Essential Skills* focuses on the use of ArcMap. Chapter 1 introduces concepts like the shapefile and demographic data, and also provides an introduction to the ArcMap interface. Chapter 2 deals primarily with basic operations in ArcMap, such as working with layers, changing map colors, and adding/editing map elements, in order to give students a taste both of using ArcMap and of mapmaking.

The third chapter introduces readers to the essentials of spatial reference systems, including map projections and coordinate systems, and their application in practice. The ability to handle spatially referenced data constitutes a primary difference between GIS software, like ArcGIS, and other vector and raster graphic programs that can be used to make maps as well. The role of some commonly used spatial reference systems like the State Plane Coordinate System (SPCS) and Universal Transverse Mercator (UTM) are demonstrated in the exercise. Chapters 4, 5, and 7 expose students to some basic data operations in ArcMap, through exercises employing data from the US Census Bureau. Methods for importing data from external sources and ways to clean raw data are included in these chapters. In particular, the *Join* operation—one of the most frequently used tools in relational database management—is introduced in detail. Other fundamentals of data manipulation, such as some of the functions available through the *Field Calculator* in ArcMap, are also briefly introduced. The explanation of how to use a spreadsheet like Excel to clean up raw data is of great usefulness, and the discussion of data cleaning serves to remind students that ArcMap operates on an advanced relational database management system.

The author guides readers through some basic GIS mapmaking in Chapter 6, covering concepts like data classification and color ramps useful for dealing with quantitative data, while the visualization of categorical data is explained in Chapter 9.

Chapter 8 introduces the concept and practice of geocoding through an exercise that exposes students to the power of spatial databases and the great potential of geospatial technologies in general. Students learn that the capability of translating non-spatial tabular data into spatial features is one of the unique and defining powers of GIS. Certain key concepts, like those behind ArcMap's *Address Locator* tool, are introduced to a level of detail sufficient for understanding. Chapter 10 also deals with physical addresses, albeit from a different perspective. This time, it is the coordinates collected by GPS that are used to pinpoint features on the surface of the earth. With the increasing use of mobile devices for data acquisition, the content of both of these chapters is essential to students and practitioners of GIS.

Chapter 11 is about editing in ArcMap—introducing students not only to the step-by-step editing of existing maps, but also to the creation of new datasets. Through this, students come to a practical understanding of how vector data models work and learn how they, themselves, can build spatial models to represent geographic features. With a clear understanding of vector data in mind, students are ready to learn about other spatial models, such as raster data, which is outlined later, in Chapter 17. Chapters 12, 13, and 16 turn again to some core ArcMap database table manipulation functions. Through detailed demonstrations of how to conduct *Select by Attributes*, *Select by Location*, and *Spatial Join* operations, these chapters teach students additional ways to work with GIS data, which are usually made up of both spatial and non-spatial components.

Chapter 14 shows students how to manipulate the geometries of spatial data using the *Buffer*, *Merge*, *Union*, *Append*, *Clip*, and *Dissolve* tools in ArcMap. This is followed by an introduction, in Chapter 15, of an advanced GIS data model: the geodatabase. Geodatabases come with many powerful data management functions and can handle complex spatial relations among spatial features that shapefiles cannot.

Chapter 17 deals with raster data and their relevant functions. Students learn not only the major differences between the vector and raster data models, but also the advantages of using raster data. In particular, georeferencing procedures are introduced in good detail.

The last three chapters—18, 19, and 20—are all about what to do with GIS outputs. Students learn, for example, how to create and export reports in ArcMap and how to share their map products with other GIS professionals and users. There are also instructions on how to publish maps through ArcGIS Online, the increasingly popular online map platform hosted by Esri. This short book covers some essential GIS topics in a direct and basic manner. It can be used as a convenient entry-level study guide, or as a useful "cheat sheet," by anyone interested in learning GIS. The book is well designed and is easy to read, with no lengthy paragraphs, long sentences, or confusing jargon used anywhere in the book. Each chapter is made up of small sections that deal with particular key concepts in just a few steps, with all the key steps highlighted in black and bold. In comparison with the lengthy exercises found in some mainstream GIS textbooks, the well designed and focused mini-exercises—normally of just three to nine steps, start to finish—are of great value to students. In my opinion, the "smallness" of the exercises is the biggest strength of this book. This is because even students who are detail-oriented can be confused by wordy exercises, and that confusion can lead, as a result, to lost interest in learning GIS.

Even though the merits of this book are considerable, there are some noticeable shortcomings. For example, the book does not have a chapter that conceptually explains what GIS *is*. Nowhere is it really spelled out that while maps are just outputs, the core function of a GIS is actually about spatial data modeling and database management. While hands-on experience is definitely important to students, knowing that the framework of GIS covers much more than just mapmaking will encourage them to explore the great potential of GIS as a spatial science. I have seen many of my own students who perceive GIS as simply a computer-assisted map-drawing platform, and don't seem to be aware that there are a host of spatial reference systems and a powerful spatial database management system behind the software interface.

In addition, the book is not clear on the relationships among the essential spatial references system elements such as datums, map projections, and coordinate systems. It is worth pointing out that the importance of spatial reference systems to a functioning GIS can never be overestimated. The sheer proportion of hard drive space (nearly half) in an ArcGIS Desktop installation taken up by spatial reference system support files is just one indication of that fact. Without sufficient knowledge about these systems, it is hard for students to deal with the variety of real-world data that are commonly collected and managed through different reference systems by GIS professionals worldwide, let alone become capable of working independently and creatively. In fact, for students interested in GIS, a thorough conceptual understanding of the spatial dimensions of data—what spatial reference systems are and how they work in GIS—is necessary right from the beginning of their study.

In short, *The GIS 20: Essential Skills* is a good kick-starter for working with ArcGIS, even though it really only opens the door. Considering its modest size, scope, and ambition, it is, taken as a whole, a success.