

Connecting GIS to Social Studies Education

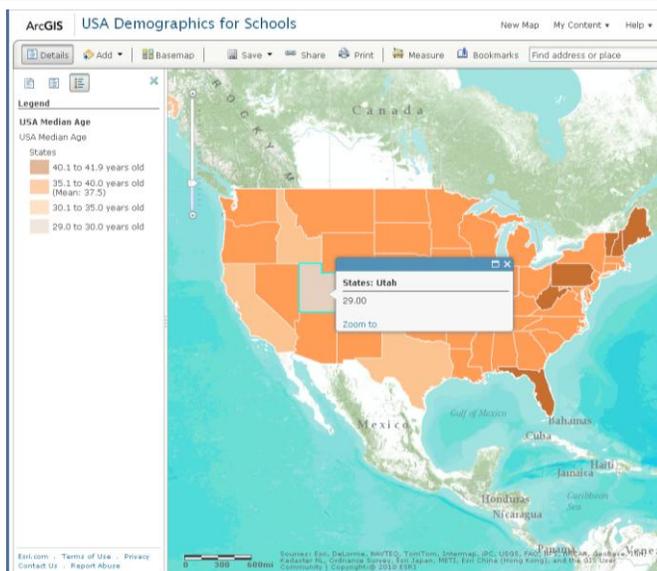
11 Linkages Between GIS and Social Studies Education

GIS and social studies education are inextricably linked. How can social studies be more effectively taught and learned using GIS? Let's explore 11 ways.

It might first be helpful to define what is meant by the “social studies,” since the term might have different meanings to different educators around the world. In this paper, we define the social studies in terms defined in 1992 by the National Council for the Social Studies (www.ncss.org), as “The integrated study of the social sciences and humanities to promote civic competence.” “Social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences. The primary purpose of social studies is to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world.”

First, social studies is plural—it is not “social **study**” but rather, “social **studies**”, and this name as well as its definition imply that it is multidisciplinary. GIS is by its very nature a multidisciplinary tool. Not only can it use data and maps stemming from a variety of disciplines, but its statistical and analytical toolkit draws deeply from decades of research and development in a variety of fields. Therefore, students and educators using GIS in the social studies are using a tool to study phenomena from a wide variety of disciplinary perspectives.

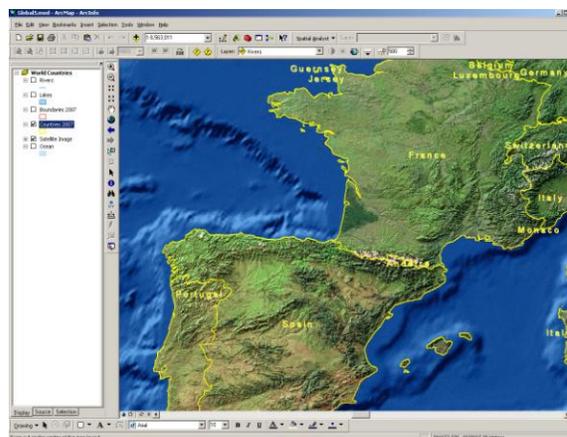
Second, using GIS adheres to the 10 themes of the social studies (National Council for the Social Studies 2010a). In particular, global connections and studying cultures are particularly well suited to study from a spatial perspective using GIS. In terms of the “time, continuity, and change” theme, GIS enables space and time to be analyzed together, through animations, enabling the time component to databases, and comparing how variables change through graphs, tables, and maps. The societal impact of science and technology theme is prominent when students critically analyze where that data came from and who



Analyzing demographic phenomena, patterns, and processes is a key component of social studies education and one of many components that is enhanced through the use of spatial analysis with GIS. The above map depicts median age of the population and was created within seconds using ArcGIS Online (www.arcgis.com).

created it, and whether it will be suitable for their study. GIS has been shown as effective in promoting global citizenship awareness (Van der Schee 2003, Kerski 2004), which adheres to the social studies theme of civic ideals and practices.

Even more importantly, every major key issue of our time, from climate change to political instability to protecting the environment and beyond has a social component, and therefore, it can be examined from a social studies perspective using GIS. Each of these issues occurs somewhere, and typically occurs in multiple locations and at a variety of scales. For example, protecting human rights is a social issue that has experienced much change in how it is perceived and implemented throughout history, and it varies widely in perception and implementation across the globe. The same could be said about many social issues—they exhibit a spatial pattern. Each arose somewhere, diffused somehow, and each changes over space and time. Each affects the ways that individuals and societies interact. The geographic perspective is therefore important in understanding social issues, and GIS provides a rich toolset in which to use the geographic perspective. GIS allows for the multiple variables necessary in social studies to be used as map and image layers and at multiple scales. Social issues can be analyzed in two dimensions and even in three dimensions. For example, voter participation in elections can be mapped as hills and valleys on a map of a community or country, with demographic characteristics mapped with different symbols and cartographic techniques on that same “social landscape.”



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Third, not only are social studies enhanced by GIS, but conversely, the use of GIS is enhanced by a firm grounding in the social studies. This grounding provides the framework by which questions can be formulated and problems designed. Asking questions is the first part of scientific inquiry: It forms the basis for knowing what types of social data to collect, what data to analyze, and what decisions to make. The GIS does not ask the questions. Rather, it is the user that has a firm foundation in understanding such social studies topics as past and present land use policy, cultural and social norms, and political systems who asks the questions. Social systems have shaped human behavior and interaction, and conversely, humans have created social systems. Understanding these interactions is fundamental to asking questions and solving problems with GIS.

Fourth, the social studies includes the study of the cultural environment and the physical environment. This includes the interaction between humans and the environment. How does the environment, through such characteristics as daily weather and long-term climate, native plants and animals, landforms, the availability of water, local and regional natural hazards, and the type of predominant soils, affect people? How do these factors affect the growth of cities, sustainable agriculture, water quality and quantity, tourism, culture, and population growth and change? Conversely, how do humans affect their environment? Humans represent the largest change agent on our planet today, affecting their local and regional environments. Particularly over the past 200 years, the impact of humans has

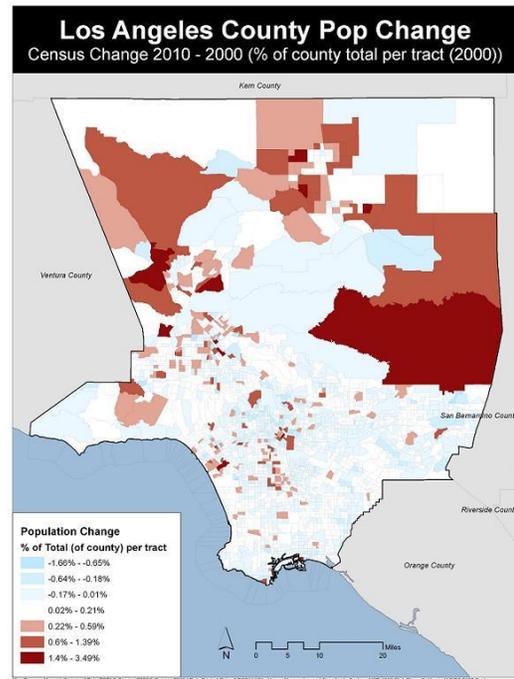


been increasingly noticeable on a global scale. These impacts include the clearing of forests and other natural vegetation for agriculture, urbanization, water-related projects from the building of dams to the widening and deepening of river channels to groundwater withdrawals, burning of fossil fuels, building seawalls, mining, construction, and in thousands of other ways. Environmental issues are bound up in scale, in place, in cultural practices, in the biosphere, atmosphere, lithosphere, hydrosphere, and anthrosphere. Thus, to use GIS effectively to examine human-environment interaction requires a firm foundation in the content of the social studies, as well as geographic skills and the geographic perspective.

Fifth, investigating social studies with GIS lends relevancy and real-world contexts to social issues. The central themes that social scientists have studied for years have in recent decades become topics on daily newscasts. Globalization in trade and culture, the threat to and measures protecting indigenous cultures and languages, learning lessons from history, and many other topics have raised awareness to the need for studying these issues not in isolation but rather through the context provided by the social studies.

In recent years, three aspects of social concerns have become evident:

1. First, social concerns have become global issues.
2. Second, social issues increasingly impact the everyday lives of everyone on the planet.
3. Third, social issues are complex and require a different kind of thinking, a thinking that not only crosses borders of countries or ecoregions, but also that crosses traditional disciplinary boundaries.



Social studies provide the means by which students can develop the kind of thinking that will help them make sense of these issues on multiple levels. For students to understand how social processes work, they need to understand the connections between their own actions and that of their fellow human beings to global processes, and therefore, they need to understand the principles of those processes. These processes include such diverse topics as the how political systems work, how beliefs and values form and change, and how trade evolved and how trade functions. Furthermore, because social studies have become increasingly quantitative, experimental, and analytical during the past century, GIS is the perfect tool in which to study social processes through databases, maps, and spatial statistics.

Sixth, teaching social studies using GIS requires a grounding in core concepts in geography. It is not enough to know only *content*. Social phenomena interact, move, and change. Therefore, relationships



and processes are critical to understanding. GIS allows variables to be input, modeled, and modified, so that the dynamics of environmental processes can be studied.

Seventh, students who use GIS in tandem with social studies develop key critical thinking skills. These skills include understanding how to carefully evaluate and use data. This is especially critical in assessing social data, due to its increasing volume and diversity, and given its often sensitive and politically-charged nature. In addition, “crowdsourced” data is now appearing from “citizen science” initiatives all over the world, where ordinary people collect information on social zones in a city, the locations of key historical events, the date of the first frost, and a host of other data. These data are more frequently being tied to real-world coordinates, mapped, and analyzed. Students and graduates using GIS and who are grounded in social studies will be in demand to help make sense of this deluge of incoming data.

Eighth, students immersed in social studies at all levels of education can apply geotechnologies to understand social issues. Grappling with complex social issues requires tools that can handle a large volume and a wide variety of data, so that scenarios can be modeled and patterns can be analyzed. These tools include Geographic Information Systems (GIS), Remote Sensing, Global Positioning Systems (GPS), and scientific probes and sensors of all kinds that can record a position on the earth’s surface as they are collecting data. The data can be on human health across a region, evidence of multilingualism in a community, or any other phenomena. Students using these tools can map phenomena and features such as demographic variables, educational attainment, or flows of information or trade. They can use the tools to answer such questions as “why and how do diseases, poverty, and crime vary among ethnic groups and among regions?” “How does access to technology create opportunity but also show evidence of a “digital divide”? GIS was created and developed specifically to solve problems. As such, they are key tools used not only by social studies students, but also by hundreds of thousands of practicing social scientists around the world on a daily basis.

Students using these tools in the classroom and in the field therefore also gain key skills that will help them secure careers that are in demand in the workforce. Students using these tools are primed for social studies careers as geographers, linguists, program managers, social workers, health workers, and in hundreds of other positions.

Ninth, students who are well grounded in the spatial perspective through GIS are better able to, during school and after graduation, use data at a variety of scales, in a variety of contexts, think systematically and holistically, use quantitative and qualitative approaches to solve problems. In short, these graduates are better decision makers. Students engaged in GIS and social studies make heavy use of the geographic inquiry process. This involves asking geographic questions, acquiring geographic resources, analyzing geographic data, assessing and making decisions from resulting geographic information, and acting on that geographic information. This adheres to the tenet that learning includes turning information into knowledge using multiple media (National Council for the Social Studies 2010b). This often leads to additional geographic questions, and the cycle continues. Social studies is an applied science—it leads to action. As social issues such as poverty, crime, and public health increasingly transcend cultures and regions and become increasingly complex, an integrative decision-making tool such as GIS is critically needed. Students using these tools can make the kind of decisions that will positively impact people and the planet.

Tenth, GIS through social studies adheres to the tenet that learning is often most effective when it takes place outdoors. Fieldwork has such a long and rich history within social sciences that it is almost like stating the obvious. However, in a world where outdoor education is often cut due to budgetary constraints, and when a frighteningly large proportion of the population has almost no connection with the outdoors, it bears emphasizing. In social studies, conducting research is often best done in the field—in neighborhoods, in groups of people attending events, in rural areas and in cities, close to home and halfway around the world.



In the field, students can collect data on a myriad of phenomena, such as the types of businesses in a community, the examination of a historic battlefield, lifestyle habits of people in a specific neighborhood, cultural norms of people in a region, and more. In so doing, they gain a better understanding of processes, scale, and the region or neighborhood in a way that they might not be able to do in the classroom or laboratory. They can sketch, record audio and video, take photographs, or simply use their five senses, and bring that data into the GIS environment for analysis.

Eleventh, given the widespread social concerns faced by the modern world, it is imperative that students study and understand about these issues not only to equip them for life in the 21st Century, but to ensure that we emerge at the end of the 21st Century in a sustainable way. How can we expect decision-makers to care about the planet and its people unless they have learned about the planet and its people as students? And how can they learn about our world unless they engage in social studies and use GIS as students?

Resources Connecting GIS to Social Studies

Esri develops and connects educators to resources that enable the effective use of GIS in social studies education. Many of these resources, such as lessons, data sets, and tools, can be accessed via the Esri Education Community (<http://edcommunity.esri.com>). Let's explore just a few of these resources.

EdCommunity Blog

Every few days, the Esri education staff writes a column in the EdCommunity blog (<http://edcommunity.esri.com/blog>) about the application of GIS to education, and frequently these columns focus on social studies. Topics include examining the world of 7 billion people, mapping sports allegiances, examining human health variables, analyzing changing population by neighborhood, county, and state over time and by weighted mean population centers, and much more.

ArcGIS Online

ArcGIS Online (<http://www.arcgis.com>) offers a free, powerful, and easy-to-use web-based toolkit where students and educators can construct, save, and share their own customized maps on an infinite



variety of topics and scales. These maps can be compared in a variety of ways and panels, all using a standard web browser (see lesson <http://edcommunity.esri.com/arclessons/lesson.cfm?id=641>). The content is rich, ranging from population, demographics, natural hazards, land use, agriculture, food expenditures (see lesson <http://edcommunity.esri.com/arclessons/lesson.cfm?id=563>) to unusual imagery around the world (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=558>), and much more. Data can be compared in many ways, such as in side-by-side maps, through altering the transparency or symbology of specific variables, and through analyzing the attributes. For more rigorous analysis with additional tools, ArcGIS Desktop (<http://www.esri.com/arcgis>) offers further capabilities.

Lessons

Numerous lessons on the ArcLessons library, (<http://edcommunity.esri.com/arclessons>) can be used in social studies education. Educators can use these activities to encourage spatial thinking, to teach and learn social studies content, and to foster GIS skills. For example, building an analytical story (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=650>) shows how to use ArcGIS online to create, analyze, and present a map-based story about a social issue. Another such story is analyzing the book *The Watsons Go to Birmingham* (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=643>). Analyzing population (and other variables) in 3D is the focus of the lesson on Analyzing Data in 3D in ArcGIS Desktop (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=647>), while other lessons focus on examining world demography (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=605>), analyzing the social and environmental impact and pattern of fires in Africa (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=606>) and selecting the best site for cultivating tea in Kenya (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=616>). Other lessons focus on historic events, such as the War of 1812 (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=595>) or the World War II journey of the Pacific Clipper, which made an emergency first flight around the world by a commercial airplane (<http://edcommunity.esri.com/arclessons/lesson.cfm?id=539>).

GPS to GIS Video Series

A series of [videos on the Esri Education Team's YouTube Channel](#) and on [a geography channel](#) describes the process of gathering field data with GPS and mapping and analyzing it with GIS in educational contexts. The videos feature explanations and demonstrations not only on the technical procedures involved with gathering data on locations and characteristics of data and then analyzing its spatial patterns, but also the pedagogical advantages to using these technologies within the context of spatial thinking in instruction. In short, they focus not only the “hows”, but also the “whys”. Embedded throughout the series are issues of data and project management, scale, accuracy, precision, metadata, and appropriateness. At present, 25 titles exist in the series with more to be added in the future. Educators can use these videos, and more importantly, the methodologies presented here, in their instruction.

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