Chapter 36
Layering Learning – Geographic Information Systems (GIS): Advancing Educational Methods in the Digital Age

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ABSTRACT

There are several issues that we urgently need to address regarding K-20 education, including engaging students in the learning process, preparing our youth for entry into the 21st century workplace, enabling them to become fully productive citizens, and providing them with the tools they will need to succeed. Our ability to flourish as a nation depends on this. In his article, "Place-Based Knowledge in the Digital Age," Thomas Fisher (2012) discusses the potential impact Geographic Information Systems (GIS) may have as our global society becomes more immersed in digital and spatial media. He suggests that "GIS will eventually become a major way—perhaps the dominant way—in which we will access information in the future because of the essentially spatial nature of that software" (Fisher, 2012, p. 5). While Fisher's notion of "spatializing education" may seem abstract, the reality is our ability to connect multiple layers of data based on place will afford a more informed insight into our past, present, and future by revealing relationships, trends, and patterns. Connecting data spatially shifts our way of thinking, and our way of doing business as well as education (Baker, 2012). This is explored in this chapter.

INTRODUCTION

On the World Education Rankings Scale, the USA ranks approximately nine points below the world average in math (World Math Average, 496; USA score, 487.40), only one point above the world average in science (World Science Average, 501; USA score 502), and approximately seven points above the world average in reading (World Reading Average, 493; USA score, 499.83). As the reader can deduct from Table 1, 23 (approximately) countries rank above the USA in math, 19 (approximately) countries

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Table 1. Brief comparison of reading, math and science scores across select countries worldwide

Country Name	Overall Reading Average: 493	Overall Math Average: 496	Overall Science Average: 501
Shanghai-China	556	600	575
Korea, South	539	546	538
Finland	536	541	554
Hong Kong-China	533	555	549
Singapore	526	562	542
Canada	524	527	529
New Zealand	521	519	532
Japan	520	529	539
Australia	515	514	527
Netherlands	508	526	522
Belgium	506	515	507
Norway	503	498	500
Estonia	501	512	528
Switzerland	501	534	517
Poland	500	495	508
Iceland	500	507	496
United States	500	487	502
Liechtenstein	499	536	520
Sweden	497	494	495
Germany	497	513	520
Ireland	496	487	508
France	496	497	498
Chinese Taipei	495	543	520
Denmark	495	503	499
United Kingdom	494	492	514

Source: OECD (2013). World education rankings. Retrieved from https://docs.google.com/spreadsheet/ccc?key=0AonYZs4MzlZbdEMzTjN5cHY1MmlJOHI3cmZCamRQWEE&hl=en#gid=1

rank above the USA in science, and 14 (approximately) rank above the USA in reading. For a more complete view, see Table 4.

The USA overall ranking is approximately 18th worldwide. The lack of math and science proficiency affects the science, technology, engineering and mathematics (STEM) areas and ultimately our future workforce and competitive edge in the world marketplace.

There has been a push from the federal level to increase the geospatial workforce, as this discipline has become integrated in almost every industry. An abundance of literature supports the inclusion of geospatial technologies, specifically GIS in the realm of academics. GIS can be a vital mechanism in our pursuit to answer the call to arms for advancing STEM education. Inclusion of geospatial technolo-