Lesson Plan: "Are We There Yet?"

"The world is complex, dynamic, multidimensional; the paper is static, flat. How are we to represent the rich visual world of experience and measurement on mere flatland?" [1]
-Edward Tufte

It is assumed that students have completed a reading assignment from their textbook on maps and spatial data and are familiar with the concepts. Students will learn first-hand that no single map can show everything, and the features depicted on a given map are selected to suit a particular purpose and can sometimes be distorted. Maps can depict not only visible surface features such as streets, rivers, and towns, but also underground features such as subway systems and tunnels. They can also depict abstract features such as political boundaries, population densities, and lines of latitude and longitude. They can also depict images compiled from our own experiences, knowledge and impressions of the world around us.

Objectives:

Students will perform several exercises to gain a better understanding of how geographic data can be depicted on maps based on:

- absolute terms with data arrangement as points, lines and areas on a map
- relative terms such as site, situation and route
- cognitive terms such as people's beliefs, impressions and perceptions

Content Area:

AP Human Geography:
I. Geography: Its Nature and Perspectives
    D. Key geographical skills
        1. How to use and think about maps and spatial data

Lesson Resources

1. Activity Worksheet
2. Map 1 - Washington, D.C. Metro Rail Red Line Route
3. Map 2 - Topological map of a portion of the Metro Rail System
4. Tape
5. Ruler
6. Answer Key

[1] Tufte, Edward, 'Envisioning Information' Graphics Press (May 1990)

Links to *Geography for Life: The National Geography Standards*:

Standard #1: How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.

Standard #3: How to analyze the spatial organization of people, places, and environments on Earth's surface.

Key concepts included in the lesson:

Latitude
Longitude
Prime Meridian
Spatial
Location
Distance (absolute, relative, cognitive)
Time-space convergence
Topological space
Central space

Instructions:

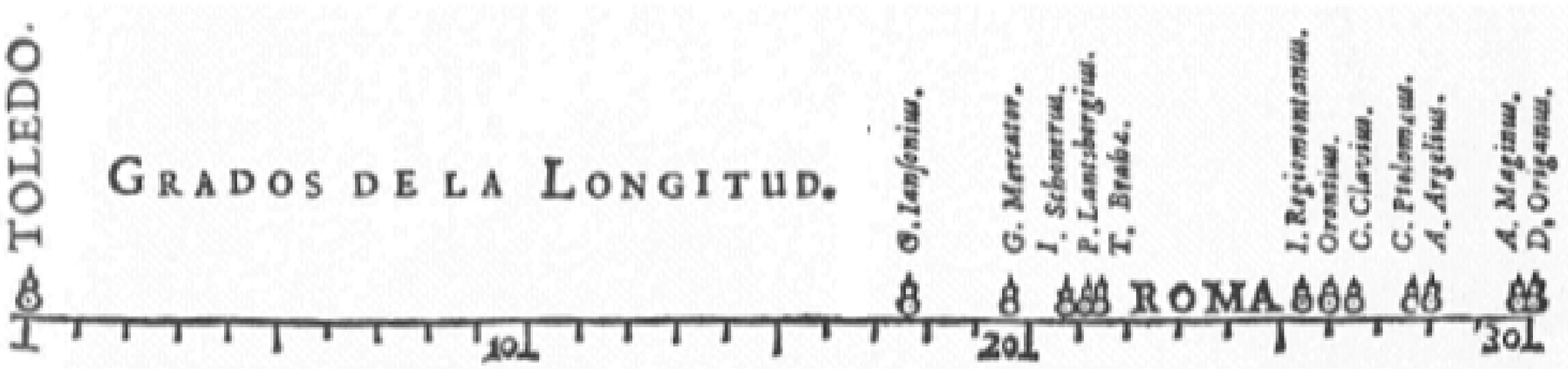
Give each student a copy of the Activity Worksheet (including Maps 1 and 2). Ask students to spend 30 minutes answering the questions posed in the Activity Worksheet and briefly summarize their conclusions. Students will need to tape together the two parts of Map 1 before beginning the exercise.

Assessment Plan:

Verify each student's Activity Worksheet for completeness and correct answers. In a follow-up discussion, it should be apparent to students that the Red Line Route in Map 1 shows the actual distance between subway stations, but that absolute distance is not the only important factor. Connectivity of people and places is also important -- whether they are linked and how they are linked. Map 2, a topological map, shows how specific points are joined within a particular network. Although Map 2 is distorted from the perspective of absolute distance between points, it is accurate in terms of time which is what people are most concerned about when commuting on the subway. The key point though is that the subway system creates a connection between different points in space that help determine the flow of people and the centrality of places. As advanced technologies make travel faster, places move closer together in terms of time (time-space convergence).

Activity Worksheet - Part I

Cartographers have worked diligently over the centuries to develop an accurate system of determining absolute distance. Michale Florent van Langren, an early cartographer and astronomer to the Spanish court, tallied the longitudinal distances from Toledo, Spain, to Rome, Italy, on the maps of his time that other cartographers has established as the distance between Toledo and Rome.[2] However, in 1644, accurate mapping was difficult due to limitations of instruments and knowledge of the world.



The latitudes and longitudes of Toledo and Rome based on our modern global coordinate system are as follows:

Toledo	**Rome**
Latitude: +39.86 (39°51'36"N)	Latitude: +41.89 (41°53'24"N)
Longitude: -4.03 (4°01'48"W)	Longitude: +12.5 (12°30'00"E)

Answer the following questions:

1. Why is Toledo's longitude expressed as a negative number, while Rome's longitude is expressed as a positive number?

2. What is the actual distance in longitude between Toledo and Rome?

3. Imagine yourself as a cartographer and mark this actual distance on van Langren's scale.

4. How far off were the worst and best measurements in 1644 compared to today's actual value?

5. Van Langren established Toledo as zero degrees longitude. What observatory is the basis of our modern zero degrees longitude?

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[2] van Langren, Michael Florent, *La Verdardera Longitude por Mar y Tierra*, (Antwerp, 1644) p. 3
van Langren, M. F. (1644). La Verdadera Longitud por Mar y Tierra. BL: 716.i.6.