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Towards a Different Worldview: Legislative Efforts to Update Map Projections in Education

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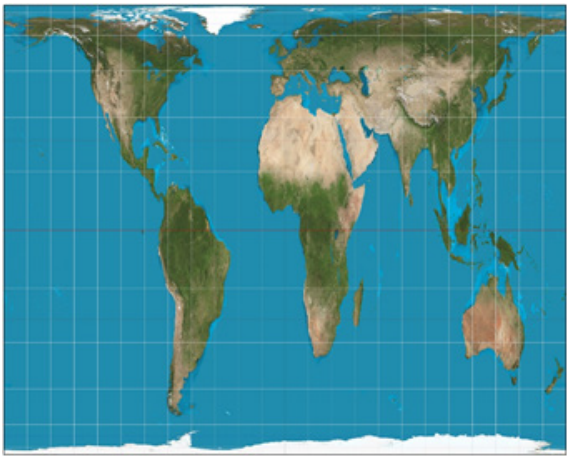
The significance of map-making processes and the choice of geographic information system projections rarely surface in legislative discussions. Thus, the introduction of a bill concerning this topic by Senator Wayne offers a unique opportunity to delve into the intricacies of map projections and their implications for educational settings. Senator Wayne presented a bill, LB 962, to the Education Committee on February 20, 2024. The bill requires public school districts to restrict the use of a Mercator projection map in schools and switch to the use of the Gall-Peters projection map or AuthaGraph projection map for display in classrooms beginning with the 2024-2025 school year. The bill also allows for the use of Mercator projection maps in the classroom but only as a method to "demonstrate that all maps are flawed in some way and different projections serve different functions and may affect how an individual views of the world." It also requires each public school district to adopt a policy to implement the requirements outlined in the bill.

Cartographers generally agree that no projection can take a circular shape of the earth and make a flat map perfectly shaped and contoured. (Wilford, 1988) There are flaws that come with all the projections.

The Mercator system of laying out the shape of the earth started with Gerardus Mercator in 1569 A.D. (National Geographic Society, 2023) It became one of the standard map projections because of its north – south orientation (north as up and south as down) everywhere, while preserving local directions and shapes. The Mercator projection is considered a "conformal cylindrical map projection."

Projection Type: WGS 1984 Web Mercator (auxiliary sphere)

Projection Type: Cylindrical Equal Area (World)



Source: Legislative Research Office

This means it preserves angles but not necessarily lengths and widths. (Snyder, 1987) As a result, some land masses appear far larger than they actually are relative to landmasses near the equator. It was well-suited for marine navigation in western Europe and North America. Several theories exist that Mercator may have used work of other individuals and cultures in the development of the maps but the ties are not substantiated directly. (Snyder J. P., 1993) The math behind the projection was involved (cylindrical geometry) and could not be proven at the time of its publication, mostly due to the fact that distance across the ocean was an inexact science at the time. (Snyder J. P., Flattening the Earth: Two thousand Years of Map Projections, 1993)

Today, the Mercator projection is found in marine charts, world maps and web mapping services. Commercial atlases previously used it extensively, as well as wall maps. The Mercator projection was also used in text books, but now wall maps, globes, and atlases all feature various different projections. Google maps previously used Mercator on its maps and still incorporates it into its local area maps, but dropped the projection from desktop platforms in 2017 for everything but local area searches. Many other online mapping services still exclusively use the Web Mercator projections.

As discussed, the Mercator projection exaggerates areas farther from the equator. The most common example of the size distortion is the appearance of Greenland, which in the Mercator projection appears to be the same size as Africa. In addition, Alaska appears to be the same size as Australia, and the size of Madagascar appears to be the same as Great Britain.

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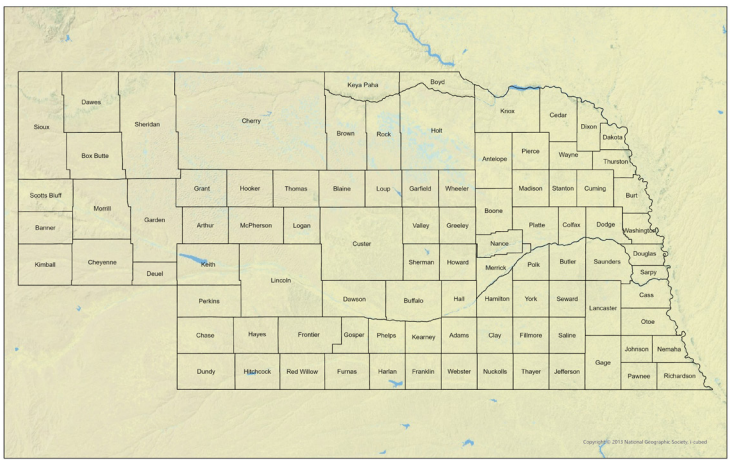
In reality, Africa's area is actually 14 times larger than Greenland; Australia is 4.5 times larger than Alaska in area; and Madagascar is in fact more than twice as large as Great Britain. (Dataviz, 2019)

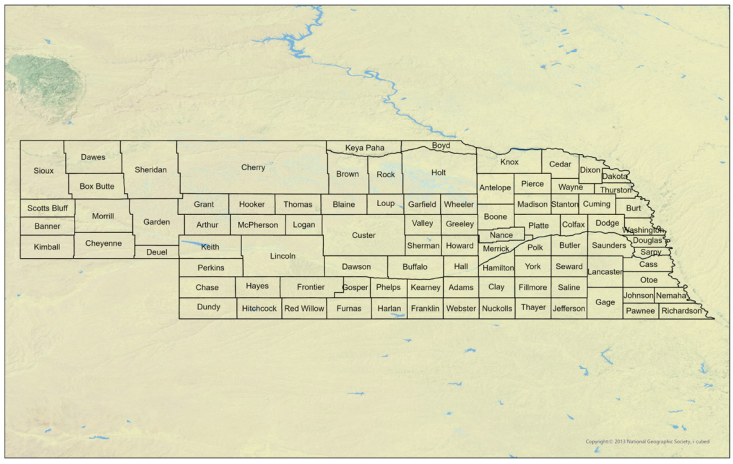
Arno Peters stirred controversy beginning in 1972 when he proposed what is now called the Gall-Peters projection to remedy the problems of the Mercator projection. Peters raised the issue of using the Gall maps in 1973 as a superior alternative to the Mercator projection, with the argument that Mercator greatly distorts the relative sizes of regions on a map and causes Europe and North America to appear very large relative to poorer Africa and South America. He used the prior work of cartographers such as James Gall from 1855 to create a specific parameterization of the Cylindrical equal-area projection. The Gall-Peters projection is what is known as an equal-area map projection. Gall-Peters projection is criticized as it distorts shapes but is more accurate when depicting area and distance. (Rosenberg, 2019) The Gall-Peters projection is promoted by United Nations Educational, Scientific and Cultural Organization, (UNESCO) and used extensively by British schools. The State of Massachusetts and Boston Public Schools started integrating Gall-Peters into its Schools in 2017. The Gall-Peters projection was endorsed by the National Council of Churches and other organizations.

Currently, hundreds of different projections are available (Snyder J. P., An Album of Map Projections, 1994), including Mercator, Gall-Peters and AuthaGraph projections. The AuthaGraph projection aims to address the limitations of both Mercator and Gall-Peters projections, by attempting to represent all landmasses and oceans with minimal distortion of both size and shape, using a complex tessellation method.

Projection Type: WGS 1984 Web Mercator (auxiliary sphere)



Projection Type: Cylindrical Equal Area (World)*



**Gall-Peters Projection requires a special License to use. Cylindrical Equal Area (World) Projection is an equal area style map and would be close to a Gall-Peters projection map.*

Source: Legislative Research Office

Each of the different projections is based on mathematical equations that are slightly or significantly different than the two-system mentioned in the bill.

The Cartography and Geographic Information Society, formerly known as the American Cartographers Association, has not endorsed any of the projection systems as the clear favorite.

When the author first started as a GIS Analyst in the Legislature, he was using a different projection and was asked to change it because it didn't look like "Nebraska". If it helps show the data more accurately, the author may use a different projection in the future and you'll know why it may not look like what you have seen previously. It is important to select the most appropriate projection for the data being represented. The choice of projection can significantly affect the accuracy and interpretation of geographic information, a consideration that will continue to guide our work and, potentially, the educational experiences of students across our state.

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