

“Croplands up Close” and the Relevance to the Nature of Science and Mathematical Practices

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The article “Croplands Up Close” in the current publication of “American Scientist,” Fenella Saunders looks at how scientists are now able to determine where on Earth the most hectares of croplands are located. Using higher resolution images, scientists have discovered that their previous studies have proven to not be accurate. The article is filled with tenets of the Nature of Science as well as Mathematical Practices. Below I have broken out three of each.

Tenet of NGSS: “Scientific Investigations Use a Variety of Methods”

In the article, “Croplands Up Close,” scientists used high resolution pictures taken from space to reach their latest conclusion about the croplands on Earth. They had to use “satellite-acquired big-data analytics using machine learning algorithm on a cloud computing platform,” according to Prasad Thenkabail of the USGS, in order to determine when the best images without cloud coverage would be available. They also had to use weather maps, forecasts, and climate knowledge.

Tenet of NGSS: Scientific Knowledge is Open to Revision in Light of New Evidence”

Fenella Saunders (2018) wrote, “The increased accuracy of the map demonstrated that there is 15 to 20 percent more cropland on Earth than previous assessments...” This shows that with the revision of new evidence, meaning the ability to zoom in at a higher resolution to Earth, scientists have gathered new information to gain further knowledge. Before being able to zoom in to “0.09 hectares per pixel,” scientists believed that the United States and China had the highest net cropland area. Being able to better see the geography of our planet has given them new evidence and thus, created a better understanding. Scientists now know that India has the highest hectares of croplands.

Tenet of NGSS: “Science Addresses Questions about the Natural and Material World”

Science is always changing. It changes with the curiosity of human and their questioning of the happenings around them. Without a scientist wondering about the Earth and how many crops are grown and their location, this article would not have relevance. However, scientists continually ask questions of themselves and the world around them. They discover new evidence and challenge old theories. “Earlier Studies...” explains that the U.S. Geological Society looked at evidence found before and challenged those ideas with new images, finding their new results.

Mathematical Practice: “Make sense of problems and persevere in solving them”

The U.S. Geological Survey saw that after the earlier studies had concluded that the U.S and China were the largest cropland areas and new images had been discovered, they investigated this data and found the earlier studies to be inaccurate. USGS research geographer and Principal Investigator stated that, “this map is a baseline and starting point for higher level assessments...” which indicates that this research is not over and that they will continue to monitor the data to evolve their solutions to the changing world.

Mathematical Practice: “Attend to precision”

Realizing that satellite images can determine the exact crop, location, seasonal changes, and productivity of each within a resolution of 30 meters is remarkable. This takes the guess work out of scientific knowledge and places it into a very precise and accurate model.

Mathematical Practice: “Look for and express regularity in repeated reasoning”

The data and images provided took years to acquire due to weather conditions and inability to capture proper images. Using multiple images of a single location, scientists can determine the rotation of crops and whether water is irrigated and/or “rainfall fed” to those crops. Repeated crops, weather conditions, and locations has allowed scientists to make knowledgeable conclusions about the croplands on Earth.

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