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Geospatial Technologies and Geovisualization: Powerful Instructional Tools for Meaningful STEM Teaching

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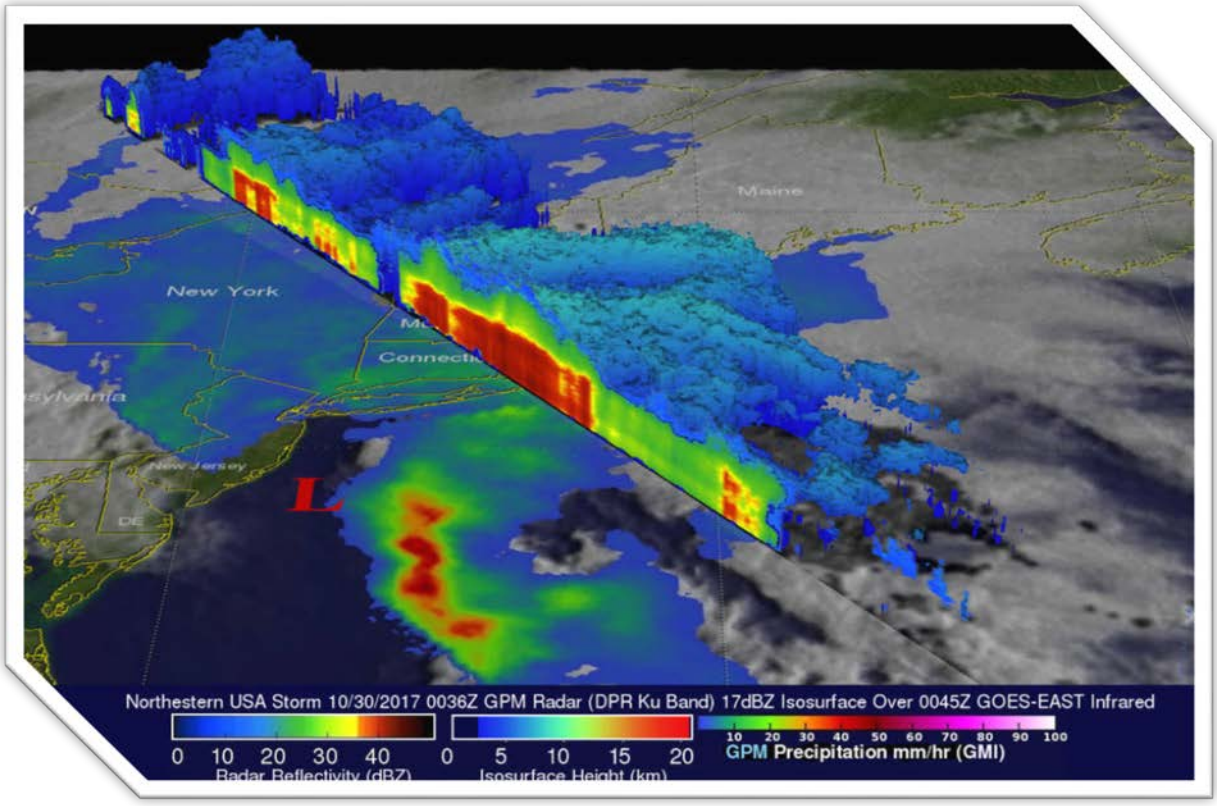

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Professional Learning Educator Assessment Survey - Moderate-Duration (PLEAS2) is a survey used to examine educator STEM professional development experiences, beliefs and attitudes and PD impact on instructional practices after moderate duration PD.

Moderate duration PD is defined as an experience of 4 hours to 24 hours (equivalent to 3 days of full-day PD).

Geospatial technologies (GST) and geo-visualization are powerful instructional tools that can support meaningful STEM teaching and learning. These tools provide an engaging way to make content relevant, culturally responsive, and conducive to inquiry-based theory. Although research has shown technology's positive effect towards supporting the learning of academic content in STEM disciplines, professional development (PD) experiences in these instructional tools and practices in not widespread (Lee et al., 2010; Baker et al., 2015).

Many studies on GST PD are small-scale studies that have investigated PD implementation (Moore et al., 2014; Trautmann and MaKinster, 2014; Baker et al., 2015). To better understand the impact of GST and geo-visualization PD and its impact in STEM teaching, a large-scale study was designed by the LBJ Institute for STEM Education and Research through its NASA STEM Educator Professional Development Collaborative (EPDC) project.

NASA STEM EPDC is a national, diversity-focused professional development system that leverages NASA assets and resources to achieve excellence in STEM Education. As a cooperative effort between NASA and Texas State University, EPDC provides a multitude of face-to-face and online professional development opportunities and NASA resources for educators in K-12, university, and community settings. Specifically, EPDC is guided by the NASA strategic objective to advance NASA and the nations STEM education and workforce pipeline.

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Educators Exploring Remote Sensing Technology

Professional Learning Educator Assessment Survey (PLEAS2) – Moderate-Duration

PLEAS2 is a comprehensive research survey designed to evaluate the impact of moderate-duration NASA PD. For this analysis, a sample of participants from selected PD events from September 2016 to August 2017 were invited to take the PLEAS2 survey.

The convenience sampling methodology was utilized, based on the selected event geographic area and expected attendance. A total of 412 NASA EPDC participants completed the survey. Given the benefits of GST in STEM teaching, PLEAS2 incorporated four questions concerning the use of GST and geovisualization in teaching.

This White Paper reports on the results of one question on the prevalence of GST and geovisualization PD, and its impact on educators' teaching practices as self-reported by the participating educators.

The question posed to educators for this analysis is noted below:

Q2: Did the professional development activities you participated in during the last <u>18 months</u>, including this one, cover the following topics? If so, rate the positive impact these had on your teaching.

	(A) Topic		(B) Positive Impact			
	Yes	No	None	Small	Moderate	Large
s) Geographic Technologies *Geographic Information Systems (GIS), Remote Sensing, Global Positioning Systems (GPS), online mapping such as Google Earth.*						
i) From NASA						
ii) Non-NASA						
t) Geographic Visualization *Visualization of real or simulated geographical information using interactive maps. Mapping. Displaying spatial information.*						
i) From NASA						
ii) Non-NASA						

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Educators that took the survey included pre-service and in-service teachers, higher education faculty, and informal educators-among others. These educators represented all content areas in K-16 education. Participant self-reported data concerning their participation in PD topics in Geographic Technologies and Geo-visualization were compared between NASA and Non-NASA PD.

Key findings:

"I use these tools [GST] as a means of solving problems and basic inquiry"
- teacher

NASA	**Non-NASA**
Geographic Technologies (GT)	
33% of 357 respondents stated that "yes" they had participated in a **NASA** sponsored PD where geographic technologies were discussed.	**25% of 342** respondents stated that "yes" they had participated in a **Non-NASA** sponsored PD where geographic technologies were discussed.
58% of 152 participants that responded as to the impact of the PD reported a moderate or large positive impact	**49% of 140** participants that responded as to the impact of the PD reported a moderate or large positive impact
Geo-visualization	
27% of 354 respondents stated that "yes" they had participated in a **NASA** sponsored PD where geovisualization was discussed.	**22% of 342** respondents stated that "yes" they had participated in a **Non-NASA** sponsored PD where geovisualization was discussed.
53% of 134 participants that responded as to the impact of the PD reported a moderate or large positive impact	**41% of 130** participants that responded as to the impact of the PD reported a moderate or large positive impact

The data show that participants are more likely to receive geographic technology and geo-visualization topics of professional development from NASA than outside NASA. This is not surprising given NASA's position as a leading expert in the use of these technologies. Data also show that 50% of the educators that reported having taken a GST or geo-visualization PD from NASA reported a moderate or large positive impact to their teaching.

NASA's iconic meatball has come to represent generations of excitement about space exploration. What is less known about NASA is its unique position to lead the study of our own planet. By making Earth-observation data and resources accessible to the scientific and education communities, NASA contributes to our understanding of important global challenges such as food security, natural disasters, and air pollution.

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For more information about NASA EPDC, please visit txstate-epdc.net.

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