
NASA STEM EPDC Long-Duration Professional Development Leads to Positive Changes in Educator Professional Practices

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"I think that this really helped me see how I can integrate science with other subjects while I teach... [the PD] helped me to use different lessons that could integrate science into them."

For decades, research has been conducted on the effects of professional development in educator teaching practices, attitudes, and skills (Desimone 2009; Deglau and Sullivan 2006). Usually these studies are small case studies or based on national surveys reporting on the status of professional development (PD) activities (Deglau and Sullivan 2006; NCES 2017). With such limited data, researchers have not been able to identify a threshold for the duration of PD that will result in sustainable positive changes in instructional practices (Darling-Hammond et al. 2017; Desimone 2009). This paper seeks to contribute to this research agenda and shares the results of a large-scale study on the effects of long-duration STEM PD on educator professional practices.

In the summer of 2017, close to 500 educators attended a 5-day NASA Minority University Research and Education Project (MUREP) Educator Institute (MEI) at ten NASA Centers located across the United States. This learning experience was designed by a collaborative team of Texas State University faculty collaborating with NASA Education staff at the various NASA Centers. Each educator institute included over 40 hours of pre and post work and programming at a NASA Center delivered over five days. Programming included STEM hands-on activities leveraging NASA resources, information on best practices in STEM education, and culturally relevant pedagogy. In addition, scientists, engineers and other NASA experts shared with the groups their research and professional experiences.

MEI participants received an invitation by email to participate in pre and post administrations of the "Long Duration Professional Learning Educator Assessment Survey (PLEAS3) (Ortiz & Cano, Amaya, 2017). PLEAS3 is part of a comprehensive research agenda on STEM PD with a range of research methodological approaches.

The LBJ Institute for STEM Education and Research through the NASA STEM Educator Professional Development Collaborative (EPDC) developed this survey.

- MEI participants that responded to the survey represented 64 Minority Serving Institutions around the nation and Puerto Rico.
- Of the MEI participants that took the survey, 69% were college students seeking teacher certification and 14% were teacher education faculty. The other 17% were other types of educators.
- At the end of their MEI summer experience, 396 participants completed the Post-PLEAS3. The reduced number of participants in the post-survey resulted from students that didn't attend the summer session and students that didn't complete the survey.



Almost 400 MEI participants took the Pre- and Post-PLEAS3 survey regarding their experience with the 2017 MEI summer 5-day experience.

Participant	Current Role	Frequency	Valid Percent
Valid	Higher Education Student Seeking Teacher Certification (Undergraduate or Graduate)	317	68.8
	Higher Education Student Not Seeking Teacher Certification	6	1.3
	Higher Education Teacher Education Faculty	64	13.9
	Higher Education Faculty Not Teacher Education	4	.9
	Higher Education Administrator	7	1.5
	PK-12 Student	5	1.1
	PK-12 Teacher (including paraprofessionals & teacher aides)	33	7.2
	PK-12 Assistant Principal	2	.4
	Home School Educator (including parents)	1	.2
	Informal Educator (Museum, Summer Camp, Scouts, etc.)	4	.9
	Other Educator	10	2.2
	Other Non-Educator	8	1.7
	Total	461	100.0
Missing	System	5	
Total		466	

Figure 1: Pre-PLEAS3 Data from Question 11

Key Selected Findings

This paper reports on the direct changes in educator professional practices of NASA PD as reported by participants. These changes were assessed through the question (composed of 11 sub-questions) below in the PLEAS3 survey:

Concerning the NASA professional development in which you have participated in the past 18 months to what extent has it directly led to or involved changes in any of the following professional practices?



	None	Small	Moderate	Large
Your classroom management practices				
Your knowledge of your main subject field(s)				
Your understanding of your main subject field(s)				
Your knowledge of national curriculum standards [e.g. NGSS and common core]				
Your understanding of national curriculum standards [e.g. NGSS and common core]				
Your knowledge on how to apply in your teaching national curriculum standards [e.g. NGSS and common core]				
Your understanding on how to apply in your teaching national curriculum standards [e.g. NGSS and common core]				
Your knowledge of instructional practices (knowledge mediation) in your main subject field(s)				
Your understanding of of instructional practices (knowledge mediation) in your main subject field(s)				
Your teaching of students in a multicultural setting				
Cultural responsive/relevant teaching				

Figure 2: PLEAS3 instructional impact areas after NASA EPD subquestions

"I would like for more resources in Spanish because I am a bilingual educator and some of the subjects are offered in Spanish. I personally believe that students will benefit from resources offered in the native language."

A Paired Sample t Test in SPSS was conducted with the matched PLEAS3 pre and post surveys. The SPSS paired samples t-test is a procedure for testing whether the means of two metric variables are equal in some population. Data results showed promising results. Out of the 96 respondents of the pre-survey that stated that they had participated in a NASA PD, 82 records were matched with a post-survey after the MEI summer learning experience.

Results of the paired sample t test show that the means of the responses for all 11 sub-questions are statistically significant at the 95% confidence level. This indicates that the NASA PD positively impacted changes in educators' professional practices as self-reported by respondents. All sub-questions show on average about 20% increase on the number of respondents that stated a moderate or large direct change in their professional practices.

The results shown in this paper reported on one question of the PLEAS3 survey. The promising results on the direct changes in educator professional practices after participating in the NASA MEI summer

learning experience are significant.

Remarks:

These results corroborate anecdotal information received from participants on the impact of professional development upon their teaching practices. It should certainly be noted that this analysis is based upon self-reported data and therefore contain self-report bias. However, these findings are based on a large sample size and begin to lay a foundation for drawing more concrete conclusions. Further research will yield additional types of evidence on the impact of long-duration professional development.

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

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