



Effects of Professional Learning Opportunities on Learner Growth: Cluster Analysis

Prepared for: Lindsay Unified School District Teacher and School Leader Initiative (TSL)

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Introduction

Based on the findings from previous examinations of the professional learning program in Lindsay Unified School District (LUSD), we decided to employ a modular approach in presenting our in-depth analysis of the three-year Empower Teacher and School Leader (TSL) Grant. Each module aligns to specific research questions, as illustrated by Table 1, and will build towards a broader examination of the personalized professional learning program and the performance-based compensation system (PBCS) implemented within the district.

Table 1: Description of Modules and Associated Research Questions

Module	Research Questions	Analysis & Content Overview
1	<p><i>RQ1a - Which clusters of professional learning opportunities (PLOs) emerged in terms of the combinations of professional learning types?</i></p> <p><i>RQ1b - What are the defining characteristics of each cluster?</i></p>	<p>RQ1a - K-means cluster analysis for each of the three grant years based on the structure of the professional learning (i.e., Focus Institutes, Learning Academies, etc).</p> <p>RQ1b -Descriptive analysis of each cluster to account for site-based conditions, focus areas, learning facilitator attributes, and the performance-based compensation strategies (PBCS).</p>
2	<p><i>RQ2 - Which combination(s) of PLOs had the greatest effect on K-8 learner growth?</i></p>	<p>Growth will be analyzed using formative data for reading as well as the pacing/progress data for the core content areas (ELA, math, science, history/social studies).</p> <p>PBCS Analysis: expand the analysis from module 1 to examine learner growth in relation to the district's investment in each cluster.</p>
3	<p><i>RQ3 - What are the characteristics of the clusters that could provide additional insights into the effects of professional learning on learner growth in K-8?</i></p>	<p>Identify cluster characteristics that might have contributed to learner growth and then conduct a cross-year analysis to see which professional learning characteristics, site-based conditions, or learning facilitator attributes manifested across the three years of the grant.</p> <p>Also look at the percentage of English Learners in each cluster to determine whether any combinations of professional learning had an effect on their growth.</p>
4	<p><i>RQ4 - Which combination(s) of PLOs had the greatest effect on 9-12 learner growth in Common Core literacy?</i></p>	<p>According to The Common Core, all educators at the secondary level are charged to develop learner literacy. Learner growth in literacy will be operationalized as a combination of SRI scores and ELA pacing/progress.</p> <p>After conducting a second cluster analysis with only the 9-12 learning facilitators, examine the relationships between participation in professional learning with</p>

The [introductory module](#) provided contextual information including discussion of the history of the research grant, a summary of learning facilitator participation during the three years, detailed descriptions of site-based conditions, and an overview of the learner data that will be used to measure the effects of the personalized professional learning opportunities (PLOs). Ultimately, all of these modules will be compiled into a single, summative report.

Purpose and Research Questions

All of the research and design work conducted in association with the TSL Empower Grant has been in service of an overarching question:

“Which professional learning pathways or combinations are most powerful for increasing learner growth?”

As such, this first module defines those pathways and combinations by addressing two specific research questions:

- **RQ1a** - Which clusters of professional learning opportunities emerged in terms of the combinations of professional learning types?
- **RQ1b** - What are the defining characteristics within each cluster?

Learning facilitators were classified into their respective groups using a statistical modeling strategy called *cluster analysis*. This is an approach to categorizing the total sample of learning facilitators into a manageable number of *clusters* based on a specific set of variables. We used participation in different types of professional learning opportunities (PLOs) as the clustering variable for each grant year. Each cluster then represents a homogeneous group of learning facilitators who participated in a similar pattern of the professional learning based on structure (e.g., Focus Institutes, Learning Academies, Micro Credentials, etc.).

It is important to understand that cluster analysis is a statistical modeling approach that incorporates an algorithm that randomly chooses values from a uniform distribution over the range of the data. We used a *k-means clustering algorithm* that identified cluster centers across the input variable - the number of each PLO type completed by each learning facilitator during each year - that minimized within-cluster variances to create similarly structured groups. These cluster centers emerged as a result of the random algorithm which generated *k initial group centers*. Since we did not have a theoretically pre-established model from which to work, we chose this random approach as the underlying statistical model. With each cluster analysis, we conducted a discriminant analysis to test the quality of the clustering solution.

Because learning facilitators had different PLO options each year, the analysis examined the grant years separately. At the same time, since learning facilitators often participated in multiple

PLOs, the clusters for Grant Years 2 and 3 were calculated as cumulative; they took the previous years' participation into account. However, if a learning facilitator did not complete any professional learning in a given year, then they were excluded from that specific year's cluster analysis. For example, a learning facilitator who participated in Grant Year 1 and Grant Year 3 but not Grant Year 2 would not be included in the Grant Year 2 analysis. This becomes a critical factor in later modules as it does influence the interpretation of the data.

After presenting the results of the cluster analysis, this module then describes the defining characteristics of each cluster. These attributes will be critical to understanding and interpreting the measured effects of personalized professional learning on learner growth in subsequent modules.

RQ1a - Results of the Cluster Analysis

Learning facilitators participated in multiple PLOs during the three TSL grant years. Therefore, we conducted analyses to identify groups who demonstrated similar patterns of participation over time by using k-means cluster analysis. This statistical approach employs an iterative algorithm to determine the optimal number of clusters in the data. The objective of this exploratory approach was to classify learning facilitators into clusters based on similarities in engagement with different types of professional learning.

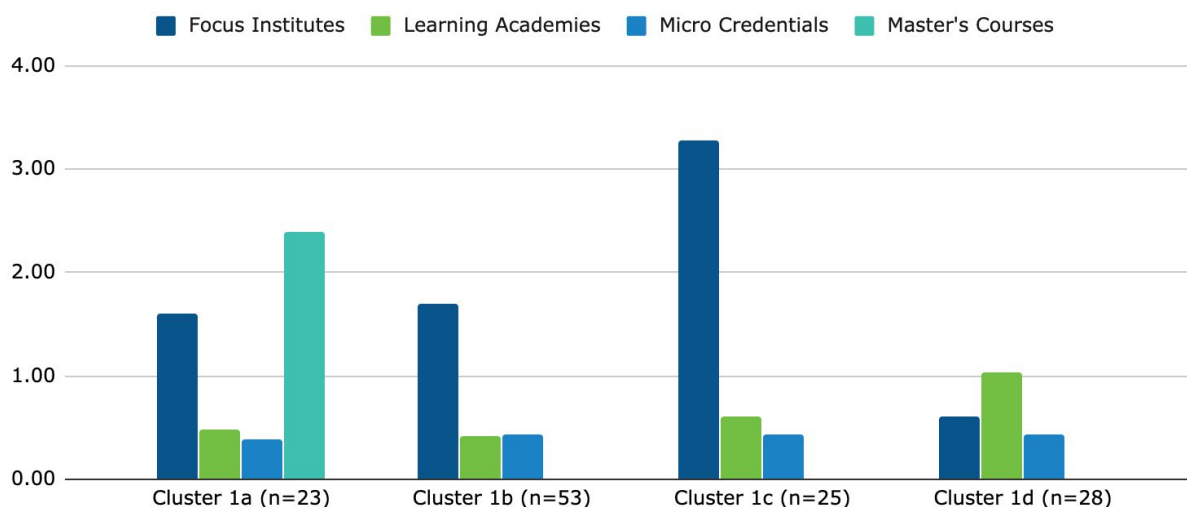
In the analysis, each cluster consists of distinct combinations of professional learning opportunities. The different PLOs are represented by their type as well as their average participation rate based on the mean count. Many learning facilitators completed more than one of the various PLOs, and the cluster analysis factored that into the model. The model also accounted for zeroes in the dataset, so PLO types with lower participation rates have their means represented as decimals even though learning facilitators did not complete a fraction of a PLO.

After completing each cluster analysis, we ran a discriminant analysis to determine the quality of the model fit, meaning the statistical likelihood that the analysis adequately placed the learning facilitators into the correct combinations. This discriminant analysis allowed us to statistically determine that four clusters ($k=4$) would be the optimum number for each grant year.

Grant Year 1 (2017-18 School Year) Clusters

For Grant Year 1, we used combinations of participation in four PLO types – Focus Institutes, Learning Academies, Micro Credentials, and Master's Courses completed as part of various degree programs – as input to form the clusters. As illustrated by Figure 1, each cluster had distinct characteristics with regards to its size and average participation rates in each type of PLO.

Figure 1: Illustration of the Grant Year 1 Clusters by PLO Type



- Cluster 1a (n=23)** - Although this cluster may have been the *smallest in terms of number of learning facilitators, it included the highest average participation in Master's Courses completed as part of degree programs*. Collectively, the learning facilitators in this cluster completed 37 Focus Institutes, 11 Learning Academies, 9 Micro Credentials, and 55 Master's Courses. In total, they completed 112 PLOs. Of note, Cluster 1a was the only one to include participation in Master's Courses.
- Cluster 1b (n=53)** - The largest of the four clusters, learning facilitators participated in a total of 135 PLOs: 90 Focus Institutes, 22 Learning Academies, and 23 Micro Credentials. *Given the size of the sample in Cluster 1b, average participation was lower than in Clusters 1a and 1c.*
- Cluster 1c (n=25)** - Learning facilitators in this cluster completed 82 Focus Institutes - resulting in the highest average completion rate (3.28) across clusters, 15 Learning Academies, and 11 Micro Credentials. In total, they completed 108 PLOs.
- Cluster 1d (n=28)** - This cluster completed a total of 58 PLOs: 17 Focus Institutes, 29 Learning Academies, and 12 Micro Credentials. *On average, Cluster 1d completed the fewest professional learning opportunities; and yet, learning facilitators did participate in the most Learning Academies which required a greater investment in time.*

Table 2 further describes the participation in each cluster. In addition to showing the average (mean) number of each type of PLO completed by each cluster, it also includes the minimum and maximum. Analysis of the table illustrates how Clusters 1a (mean = 4.87) and 1c (mean = 4.32) had almost twice the average participation rate as Clusters 1b (mean = 2.55) and 1d (mean = 2.07). When examining the ranges of participation, it became apparent that every learning facilitator completed at least one Focus Institute in Cluster 1b and three in Cluster 1c. Finally, a close

examination of Cluster 1d revealed that only two learning facilitators did not complete a Learning Academy. This finding explains the high average rate of participation (mean = 1.04) in that specific type of PLO.

Table 2: Average Participation by Cluster for each PLO Type in Grant Year 1

	Cluster 1a n=23		Cluster 1b n=53		Cluster 1c n=25		Cluster 1d n=28	
	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
Focus Institutes	1.61	0-3	1.70	1-2	3.28	3-5	0.61	0-1
Learning Academies	0.48	0-2	0.42	0-1	0.60	0-2	1.04	0-2
Micro Credentials	0.39	0-1	0.43	0-1	0.44	0-1	0.43	0-1
Master's Courses	2.39	2-4	0.00	---	0.00	---	0.00	---
Total	4.87	2-7	2.55	1-4	4.32	1-4	2.07	1-4

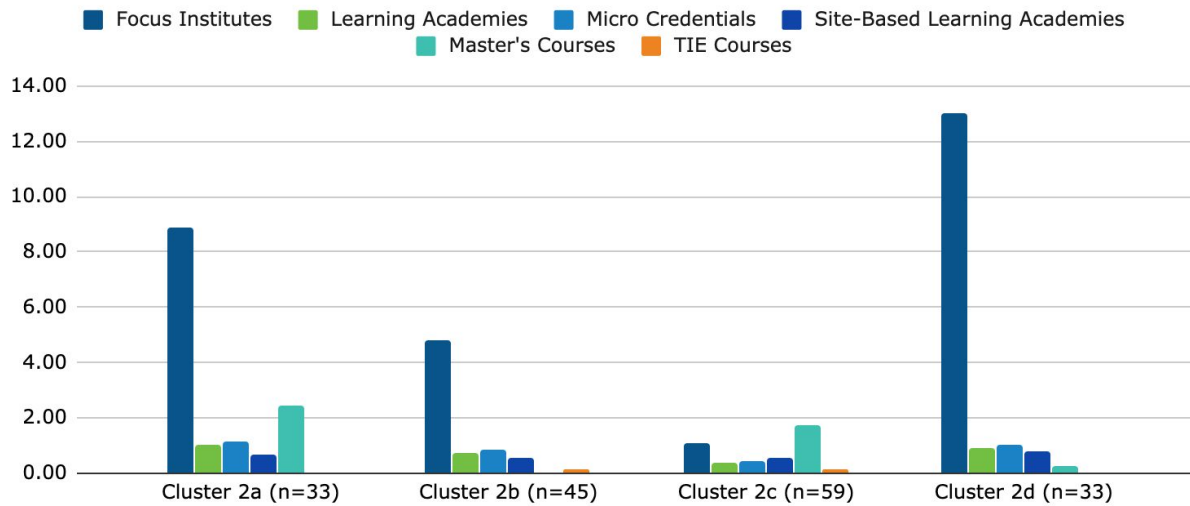
Grant Year 2 (2018-19 School Year) Clusters

During Grant Year 2, learning facilitators in LUSD could choose to participate in an even greater number of professional learning opportunities. In addition to an expanded number of Focus Institutes, Learning Academies, Micro Credentials, and Master's Courses, the district also offered Site-Based Learning Academies and saw its first completion of the Technology, Innovation & Education (TIE) Courses that began during Grant Year 1.

The clusters in Grant Year 2 were cumulative and included participation from Grant Year 1. We made this decision under the assumption that professional learning completed in the prior year would affect a learning facilitator's knowledge moving forward. However, a learning facilitator who did not complete any PLOs in Grant Year 2 was excluded from the analysis.

Following the same procedure as with Grant Year 1, after conducting the cluster analysis with multiple numbers of potential clusters, we tested the final solutions using discriminant analysis. Once again, it determined that the model would best fit using four distinct clusters (k=4).

Figure 2: Illustration of the Grant Year 2 Clusters by PLO Type



- Cluster 2a (n=33)** - This cluster completed 469 PLOs during both Grant Years 1 and 2, representing ***an increase of 339 PLOs in just the second year***. In total, learning facilitators participated in 294 Focus Institutes, 34 Learning Academies, 37 Micro Credentials, 23 Site-Based Learning Academies, 80 Master's Courses, and 1 TIE Course.
- Cluster 2b (n=45)** - Though one of the larger clusters in terms of sample size, participants only completed 320 PLOs during the first two years including 216 Focus Institutes, 33 Learning Academies, 38 Micro Credentials, 26 Site-Based Learning Academies, and 7 TIE Courses taken by six different learning facilitators (one took 2). No one in Cluster 2b participated in a Master's Course during either of the first two grant years.
- Cluster 2c (n=59)** - ***This cluster may have included the largest number of participants, but they had some of the lowest average participation rates and completed the fewest number of PLOs.*** Within their total of 256 PLOs completed during the first two years, learning facilitators participated in 63 Focus Institutes, 22 Learning Academies, 26 Micro Credentials, 32 Site-Based Learning Academies, and 9 TIE Courses taken by four different learning facilitators. Despite completing 104 Master's Courses, Cluster 2c still had a lower average participation rate for this specific PLO type given its large sample size.
- Cluster 2d (n=33)** - This cluster may have had the same number of learning facilitators as Cluster 2a, but ***completed 530 different PLOs over the first two grant years including almost twice as many Focus Institutes (429)***. Additionally, learning facilitators participated in 31 Learning Academies, 34 Micro Credentials, 26 Site-Based Learning Academies, 9 Master's Courses completed by only two learning facilitators, and 1 TIE Course.

In addition to showing the average (mean) number of each type of PLO completed by each cluster during the first two grant years, Table 3 also includes the minimum and maximum number

of different types of PLOs. As mentioned, Clusters 2a and 2d might have both included the same number of learning facilitators, but Cluster 2d completed substantially more Focus Institutes with learning facilitators participating in a range of 11-21 separate PLOs during the first two years.

Both of those clusters had much higher participation rates than Clusters 2b and 2c despite having fewer participants. Interestingly, Cluster 2c completed the most number of Master's Courses, however, a closer examination revealed that only 18 of the 59 learning facilitators actually participated in one of those courses. This discovery helps to explain the relatively low average as it included 41 zeroes in the calculation.

Table 3: Average Participation by Cluster for each PLO Type in Grant Year 2

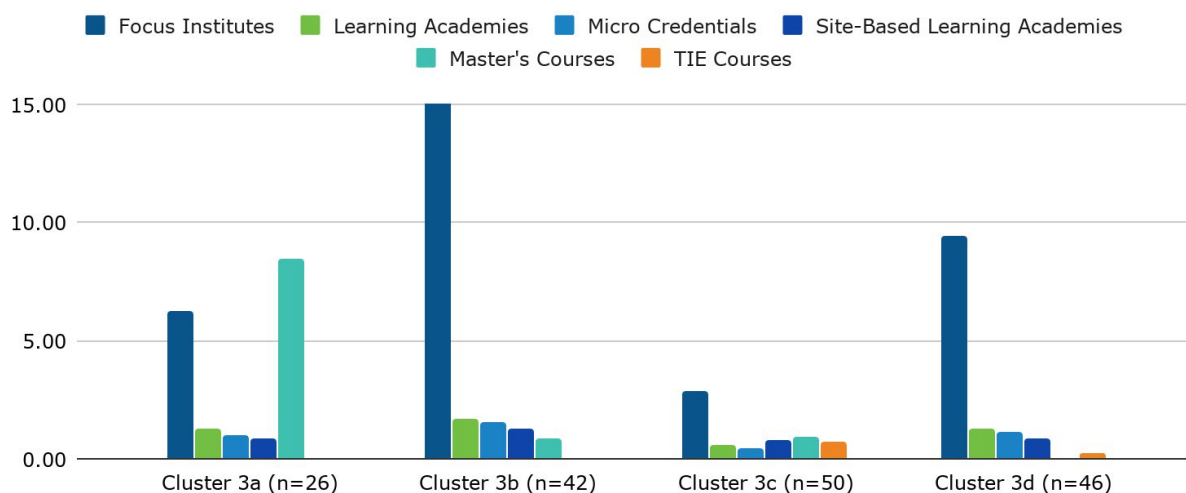
	Cluster 2a n=33		Cluster 2b n=45		Cluster 2c n=59		Cluster 2d n=33	
	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
Focus Institutes	8.91	6-12	4.80	3-7	1.07	0-4	13.00	11-21
Learning Academies	1.03	0-2	0.73	0-3	0.37	0-2	0.94	0-2
Micro Credentials	1.12	0-3	0.84	0-3	0.44	0-3	1.03	0-4
Site-Based Learning Academies	0.70	0-1	0.58	0-1	0.54	0-1	0.79	0-2
Master's Courses	2.42	0-12	0.00	---	1.76	0-8	0.27	0-5
TIE Courses	0.03	0-1	0.16	0-2	0.15	0-4	0.03	0-1
Total	14.21	10-27	7.11	4-12	4.34	1-12	16.06	12-24

Grant Year 3 (2019-20 School Year) Clusters

The district offered a similar array of professional learning opportunities during the last year of the TSL Grant. However, it is important to note that due to school closure as a result of the COVID-19 global pandemic, learning facilitators did not get the opportunity to complete all of the scheduled PLOs. In future modules, school closure will continue to influence our analysis.

Regardless, we followed a similar procedure as the previous year to conduct the cluster analysis. The discriminant analysis determined that the model would once again best fit using four distinct clusters ($k=4$). Additionally, the clusters in Grant Year 3 included participation from the previous two years such that these clusters represent the cumulative professional learning experience of all three years of the TSL Grant.

Figure 3: Illustration of the Grant Year 3 Clusters by PLO Type



- Cluster 3a (n=26)** - Learning facilitators completed 135 PLOs during the third grant year for a cluster total of 464 PLOs. ***This cluster included the majority of Master's Courses — 220 over the three years of the grant and 55 completed in Grant Year 3 alone.*** Additionally, learning facilitators participated in 162 Focus Institutes (54 during this last year); 33 Learning Academies (12 completed in Grant Year 3); 26 Micro Credentials (only four learning facilitators completed a total of five in the last year); 22 Site-Based Learning Academies (10 of which occurred in Grant Year 3; and one TIE Course which occurred during a previous year).
- Cluster 3b (n=42)** - Over the three years of the grant, learning facilitators completed 768, and in Grant Year 3, every learning facilitator completed at least one Focus Institute for a total of 256. ***This cluster participated in almost twice as many Focus Institutes as any other cluster.*** In addition, learning facilitators completed a total of 71 Learning Academies, with 29 occurring in this last year, and 64 Micro Credentials. ***This cluster also includes the most Site Based Learning Academies.*** Learning facilitators participated in 54 over the three years with almost half occurring during Grant Year 3. Only five learning facilitators did not participate in a Site-Based Learning Academy. Similarly, five learning facilitators in the cluster completed 35 Master's Courses during the three years of the grant. The cluster only includes 1 TIE course that was completed in a previous year. In all, learning facilitators in this cluster completed 993 over three years including 333 in the last year.
- Cluster 3c (n=50)** - ***This cluster had the largest sample size and the lowest participation rate.*** Learning facilitators only participated in 245 PLOs during the grant with 147 occurring in the third year. More specifically, 101 of the 143 Focus Institutes, 16 of 29 Learning Academies, 14 of 26 Site-Based Learning Academies, and 8 of 13 Master's

Courses took place during Grant Year 3. Learning facilitators also participated in 24 Micro Credentials, with 6 occurring in the last grant year, and 10 TIE Courses completed by four learning facilitators.

- **Cluster 3d (n=46)** - Learning facilitators in this cluster completed 596 PLOs over three years, with 209 occurring in Grant Year 3. However, ***given the large sample size, this did not translate into one of the higher average participation rates.*** In all, this cluster included participation in 433 Focus Institutes (153 in the last year); 57 Learning Academies (almost half occurring in Grant Year 3); 53 total Micro Credentials (14 different learning facilitators each completed one in the last year); and 41 Site-Based Learning Academies (only 15 occurred during Grant Year 3). The 2 Master's Courses can be attributed to a single learning facilitator who completed both in this last year. Learning facilitators also participated in a total of 10 TIE Courses.

Analysis of Table 4 provides additional insights. Clusters 3a and 3b not only had the highest average participation rates but also completed the most distinct PLOs. On the contrary, Cluster 3c had both the lowest participation rate and the most number of zeroes in the ranges.

Close examination of the data in Cluster 3c revealed that while all of the learning facilitators completed at least one PLO during Grant Year 3, only 56% completed at least one in Grant Year 2 and 26% in Grant Year 1.

Table 4: Average Participation by Cluster for each PLO Type in Grant Year 3

	Cluster 3a n=26		Cluster 3b n=42		Cluster 3c n=50		Cluster 3d n=46	
	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
Focus Institutes	6.23	0-16	18.29	14-33	2.86	0-6	9.41	6-13
Learning Academies	1.27	0-3	1.69	0-4	0.58	0-3	1.24	0-4
Micro Credentials	1.00	0-3	1.52	0-5	0.48	0-3	1.15	0-4
Site-Based Learning Academies	0.85	0-3	1.29	0-3	0.76	0-3	0.89	0-3
Master's Courses	8.46	5-12	0.83	0-7	0.96	0-5	0.04	0-2
TIE Courses	0.04	0-1	0.02	0-1	0.73	0-4	0.23	0-2
Total	17.85	9-36	23.64	16-36	4.9	1-10	12.96	7-17

Summary of Observations

Each year presented learning facilitators with different PLO combinations in terms of quantity and type. However, in looking across the three years, a few trends emerged.

- **Master's Courses clustered together.** Each year, one cluster contained a large proportion of Master's Courses. Across the three Grant Years, Clusters 1a, 2a, and 3a had the highest participation rates in Master's Courses.
- **The clusters with the largest sizes also had the lowest participation rates.** This implies that those clusters who completed the fewest PLOs tended to group together, and that a large number of learning facilitators completed the least amount. Clusters 1b, 2c, and 3c each included over 50 learning facilitators who averaged less than half as many PLOs as the other, smaller clusters.
- **The district offered more Focus Institutes, therefore each cluster consisted of more Focus Institutes than the other PLO types.** Of note, learning facilitators who completed multiple Focus Institutes comprised Clusters 1c, 2d, and 3b. In Grant Years 2 and 3, learning facilitators in those clusters completed twice as many Focus Institutes as the others.

The following section will further describe the characteristics of each cluster in terms of its learner, learning community, and specific PLO attributes.

RQ1b - Cluster Characteristics

According to Bronfenbrenner's Ecological Systems Theory¹, children develop within a set of nested systems. For example, the development of a child is influenced by their immediate relationships with friends and family, their surrounding environment, and even global forces such as federal policy and the economy. Relatedly, learners are nested in environments with learning facilitators, which are nested in learning communities, which are nested within the district. Therefore, to understand the effects of the personalized professional learning program on learner growth, it is also critical to understand the broader ecology in which the learner exists.

This section examines both the learning facilitator and community attributes as well as the different PLO attributes associated with each cluster. The results of these descriptive analyses will ultimately inform our understanding of the findings in later modules.

¹ Bronfenbrenner, U. (1979). *The Ecology of Human Development*. Harvard University Press

Grant Year 1 (2017-18) School Year

During the first year of the TSL grant, 129 of 203 learning facilitators completed at least one PLO for a participation rate of approximately 63%. As explained in the previous analysis, and reiterated by Figure 4, each cluster consisted of unique combinations of PLOs. This section expands on these findings and describes the clusters based on specific attributes beyond the structure of the professional learning.

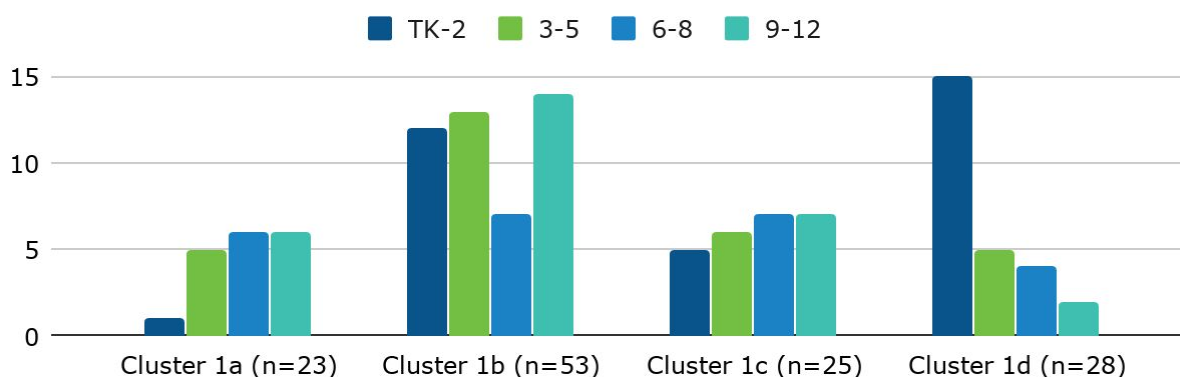
Figure 4: Heat Map of PLO Types by Cluster for Grant Year 1

	Focus Institutes	Learning Academies	Micro Credentials	Master's Courses
Cluster 1a (n=23)	1.61	0.48	0.39	2.39
Cluster 1b (n=53)	1.70	0.42	0.43	0.00
Cluster 1c (n=25)	3.28	0.60	0.44	0.00
Cluster 1d (n=28)	0.61	1.04	0.43	0.00

Year 1 Clusters: Learning Facilitator and Community Attributes

Within the sample who participated in Grant Year 1, over half identified as working with TK-8 learners (see Figure 5 for cluster composition). When comparing the content level ranges and PLO clusters, a few observations emerged. First, Cluster 1a included only one TK-2 learning facilitator. This will influence analysis of learner reading growth in future modules. On the contrary, Cluster 1d had over three times as many TK-2 learning facilitators as the other content level ranges. Again, this will affect future analyses of learner growth, particularly since this cluster only includes two learning facilitators at the secondary level.

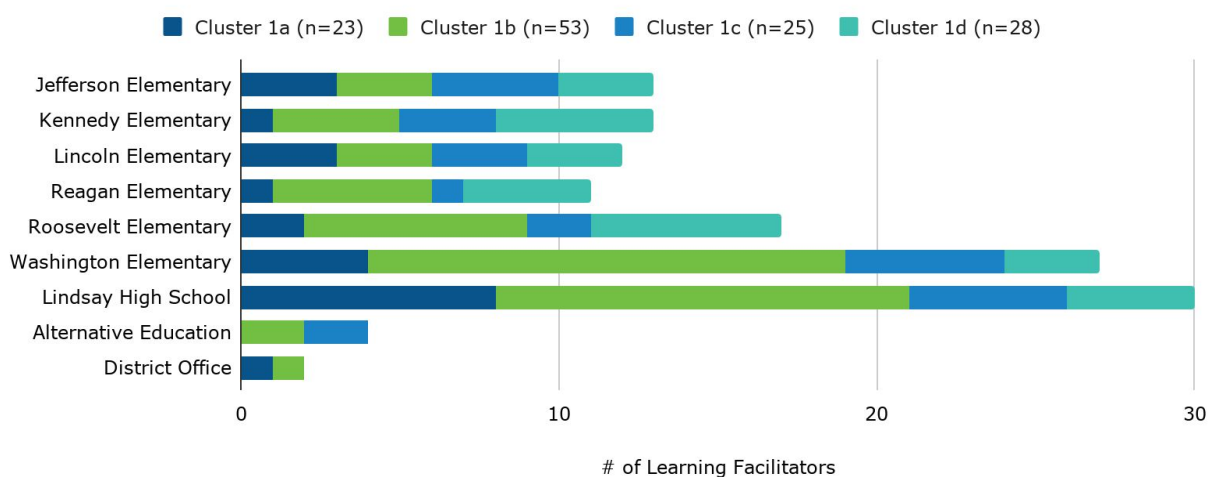
Figure 5: Cluster Composition by Content Level for Grant Year 1



We then examined the cluster composition by learning community (see [Appendix Table A1](#) for more information). As shown in Figure 6, Washington and Roosevelt had the highest participation

rates at 87.10% and 77.27% respectively. Although more learning facilitators from Lindsay High School participated in Grant Year 1 (n=30), this number represents only 55.56% of the faculty.

Figure 6: Cluster Composition by Learning Community for Grant Year 1 (2017-18)



In examining the specific compositions of the clusters, additional observations emerged:

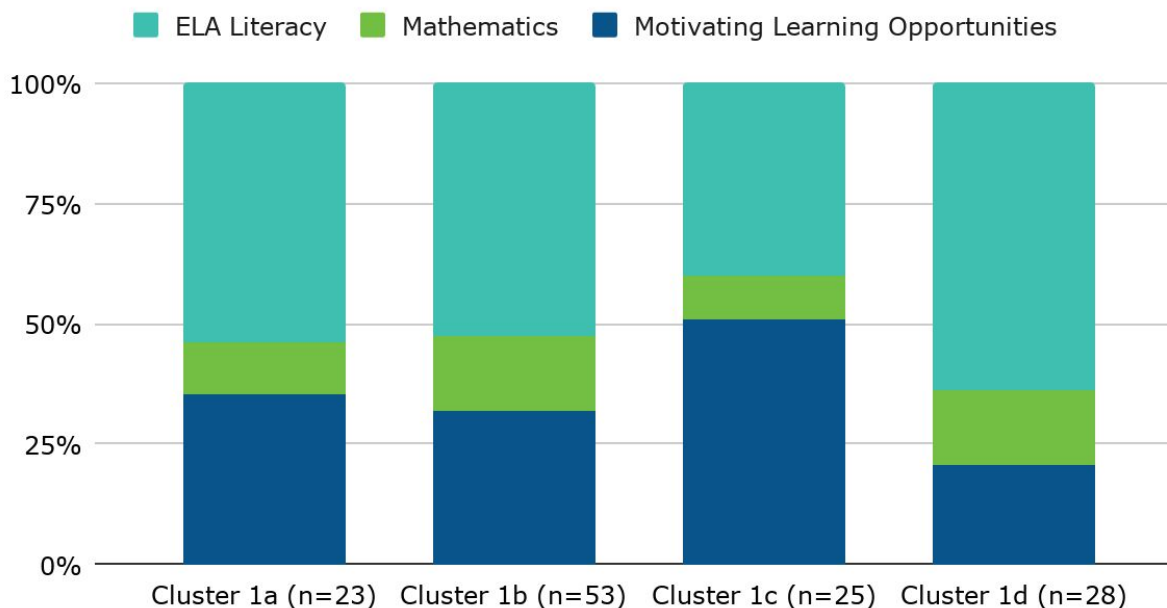
- **Cluster 1a** - Learning facilitators from the high school account for 35% of the sample. This cluster also included all of the Master's Courses. The correlation between high school learning facilitators and concentrations of Master's Courses will continue to emerge in subsequent years.
- **Cluster 1b** - This cluster had the largest sample as well as a high concentration of learning facilitators from Washington Elementary and Lindsay High School. Both of these learning communities also have larger faculties.
- **Cluster 1c** - Based on the cluster analysis, this cluster consists of the most PLOs and the highest participation rate for Focus Institutes. It also had the smallest sample with learning facilitators distributed across the various learning communities.
- **Cluster 1d** - Approximately half of this cluster can be attributed to learning facilitators from Roosevelt and Kennedy, and they averaged the highest rate of participation in Learning Academies.

Year 1 Clusters: PLO Attributes

In addition to being grouped by structure, professional learning opportunities also fell within three focus areas: ELA Literacy (which included English Learner Development), Mathematics, and Motivating Learning Opportunities. This last focus area included PLOs that addressed a range of topics such as Project Based Learning (PBL), Lifelong Learning, and Personalized Learning. During the first year, 180 learning facilitators participated in a PLO related to ELA Literacy, 129 completed a Motivating Learning Opportunity, and 46 engaged in a Mathematics focused PLO. It

is important to note that Master's Courses were not organized by focus area and are therefore not included in this portion of the analysis. Figure 7 shows the percentage of PLOs by focus area for each cluster.

Figure 7: Cluster Focus Areas for Grant Year 1



With the exception of Cluster 1c, ELA Literacy represented the primary focus area. During Grant Year 1, the district placed an instructional focus on [Guided Reading](#); therefore, this revelation is not surprising. Table 5 further describes the composition of each cluster and helps to elucidate this finding. Across clusters, the Guided Reading 101 Learning Academy emerged as one of the most attended PLOs. In Cluster 1d, 25 of 28 learning facilitators participated in that PLO. Interestingly, Cluster 1d included the only Mathematics-focused PLO as one of the top three attended opportunities.

Table 5: Most Attended PLOs per Cluster and Focus Area for Grant Year 1

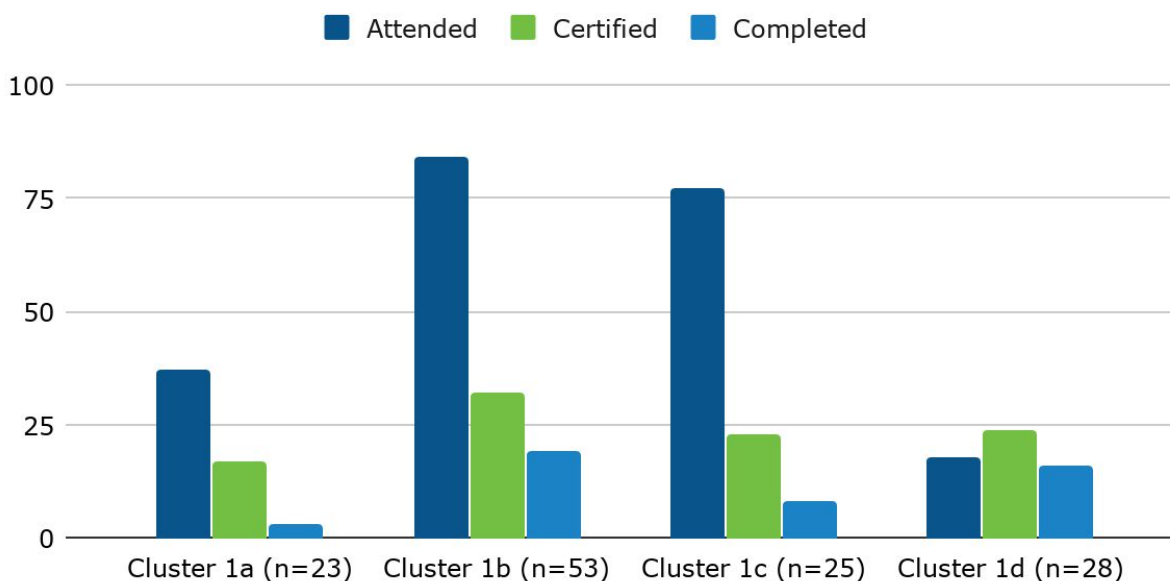
	Total # of Distinct PLOs	3 Most Attended PLOs per Cluster	PLO Focus Area
Cluster 1a (n=23)	41*	GY 1 - Content Literacy #1 - Nonfiction Now (n=7)	ELA Literacy
		GY 1 - Guided Reading 101 (n=7)	ELA Literacy
		GY 1 - Content Literacy #2 - Big Book of Literacy Tasks (n=5)	ELA Literacy
Cluster 1b (n=53)	19	GY 1 - Guided Reading 101 (n=18)	ELA Literacy
		GY 1 - Designated ELD (n=15)	ELA Literacy
		GY 1 - Better Lesson- Coaching and Personalized Learning (n=7)	Motivating Learning Opportunities
Cluster 1c (n=25)	21	GY 1 - Empower- Session 2 (n=11)	Motivating Learning Opportunities
		GY 1 - Empower- Session 1 (n=11)	Motivating Learning Opportunities
		GY 1 - Guided Reading 101 (n=10)	ELA Literacy
Cluster 1d (n=28)	13	GY 1 - Guided Reading 101 (n=25)	ELA Literacy
		GY 1 - Math Big 5- CLs K-2 (n= 8)	Mathematics
		GY 1 - Better Lesson- Coaching and Personalized Learning (n=7)	Motivating Learning Opportunities

* Within the 41 distinct PLOs in Cluster 1a, learning facilitators completed 25 different Master's Courses that were not categorized by focus area.

Beyond looking at the focus area and specific content of the professional learning within each cluster, we also examined the level of participation (Figure 8). Learning facilitators had the opportunity to either *Attend*, *Certify*, or *Complete* different offerings. Only Learning Academies and Micro Credentials offered the possibility to earn certification. Learning facilitators received an additional stipend if they chose to do so and demonstrated proficiency in the certification

process. A designation of *Complete* indicates that a learning facilitator completed all facets of the Learning Academy or Micro Credential but did not pass their certification. Master’s Courses were not included in this analysis.

Figure 8: Participation Level by Cluster For Grant Year 1



Since participation levels correspond to the structure of the PLO, it is expected that learning facilitators attended more than they certified or completed. That makes the finding in Cluster 1d somewhat curious. More learning facilitators certified than attended or completed. However, in returning to the results of the cluster analysis, this becomes less perplexing as Cluster 1d also completed more Learning Academies than Focus Institutes or Micro Credentials.

By further investigating the participation levels by focus area (see [Appendix Table A2](#) for more details), we could make three observations:

- Across clusters, no learning facilitators certified in Mathematics as those Focus Institutes did not include certification as an option.
- In Clusters 1a and 1d, over twice as many learning facilitators certified in ELA Literacy PLOs than in Motivating Learning Opportunities.
- More learning facilitators in Clusters 1b and 1c certified in PLOs within the Motivating Learning Opportunities focus area

Year 1: Performance Based Compensation Strategies (PBCS)

During this first year of the grant, LUSD invested a moderate amount in the personalized professional learning program — approximately 25% more than in Grant Year 3 and yet almost half of Grant Year 2. To analyze the total Performance Based Compensation Strategies (PBCS),

we looked at both the amount provided directly to learning facilitators as either a daily stipend or a certification award, and the total district investment in supplies, program support, and trainer or consultancy fees. As a result of the focus on Guided Reading during this first year, which required the purchase of a significant amount of materials, only 46.23% of the total amount of performance based compensation funds went directly to the learning facilitators.

Over the subsequent years, this relationship between investing in program support vs investing in learning facilitators changed. By the third year, 81.22% of the total investment went directly to learning facilitators.

Figure 9: Heat Map of Investment by Cluster for Grant Year 1

	Relative Investment	Description
Cluster 1a (n=23)	Minimum	20% more than the Minimum investment made in Grant Year 3 yet 1.5 times less than in Grant Year 2
Cluster 1b (n=53)	Maximum	Over twice as much as the Minimum investment made in this grant year
Cluster 1c (n=25)	Moderate	20% more than the Minimum investment in this grant year
Cluster 1d (n=28)	Significant	30% more than the Minimum investment in this grant year

An interesting relationship emerged with regards to the amount of performance based compensation funds invested in each cluster. The district invested more in Cluster 1b than the other clusters even though it had the lowest overall participation rate. This can be attributed to the number of learning facilitators in the cluster, the relatively large number of learning facilitators who earned a certification stipend, and the rate of participation in two of the PLOs with relatively high per-capita costs – *Guided Reading 101* (n=18) and *Better Lesson - Coaching and Personalized Learning* (n=7).

Grant Year 2 (2018-19) School Year

Not only did the district offer more professional learning options during the second year, but it also had more participation from learning facilitators. In Grant Year 2, 170 of 198 learning facilitators completed at least one PLO for a participation rate of 85.86%. As discussed previously, LUSD also offered two new PLO types — Site-Based Learning Academies and TIE Courses. The k-means cluster analysis incorporated these types as illustrated by Figure 10. This section further describes the clusters based on the same learning facilitator, community, and PLO attributes as discussed in Grant Year 1.

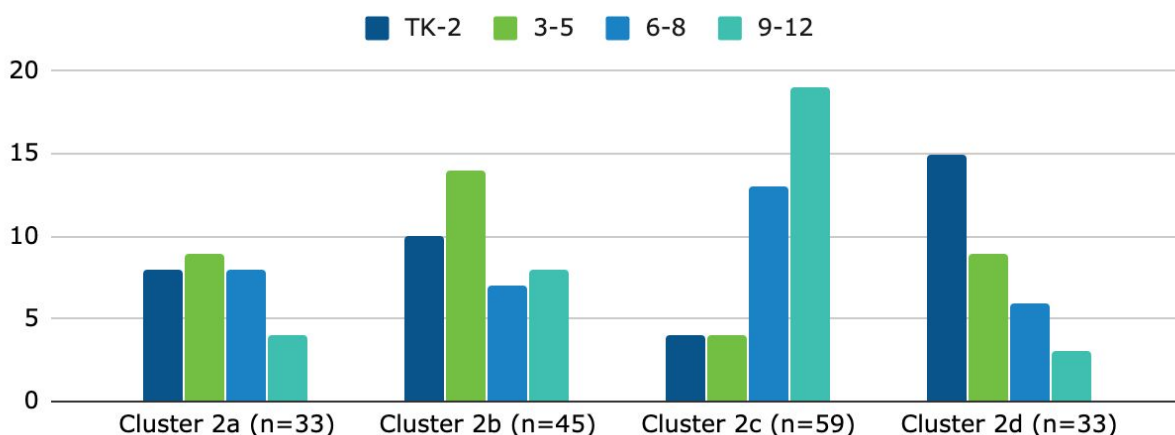
Figure 10: Heat Map of PLO Types by Cluster for Grant Year 2

	Focus Institutes	Learning Academies	Micro Credentials	Site-Based Learning Academies	Master's Courses	TIE Courses
Cluster 2a (n=33)	8.91	1.03	1.12	0.70	2.42	0.03
Cluster 2b (n=45)	4.80	0.73	0.84	0.58	0.00	0.16
Cluster 2c (n=59)	1.07	0.37	0.44	0.54	1.76	0.15
Cluster 2d (n=33)	13.00	0.94	1.03	0.79	0.27	0.03

Year 2 Clusters: Learning Facilitator and Community Attributes

During the second year, relatively equal numbers of learning facilitators at each content level range participated in professional learning. However, it is important to note that of the 170 individuals who completed some form of professional learning, 29 identified as a *specialist* that spanned multiple content level ranges. As such, Figure 11 does not include those individuals.

Figure 11: Cluster Composition by Content Level for Grant Year 2



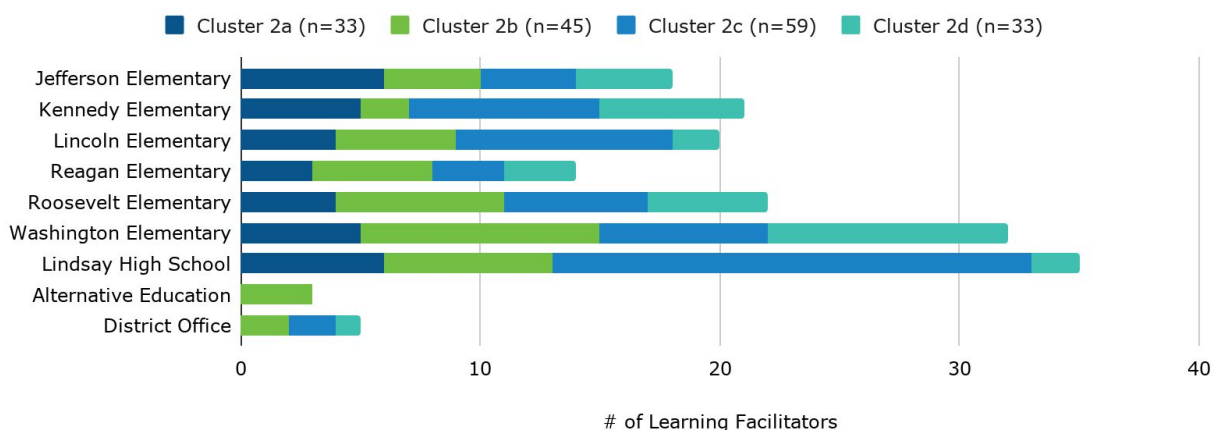
Two trends emerged in the analysis of the Grant Year 2 clusters by content level that reinforced a finding from the previous year. First, the majority of Cluster 2c consisted of learning facilitators from the secondary level and had the lowest participation rates across PLO types with the exception of Master's Courses. Second, Cluster 2d had both the highest rate of TK-2 learning facilitators and completed the most individual Focus Institutes.

Once again, we then examined the clusters by learning community (see [Appendix Table A3](#) for more detail). Although Washington Elementary and Lindsay High School seemed to have the

most learning facilitators who participated (Figure 12), it is critical to note that the 35 from Lindsay High School represent 63.64% of the faculty and the 32 from Washington indicates 100% participation. Additionally, learning facilitators from Washington comprise approximately 22% of Cluster 2b and 30% of Cluster 2d. Since both of these clusters had relatively high participation rates in Learning Academies and Micro Credentials (both of which offer certification) this finding could influence our understanding of the analysis of learner data in future modules.

Two other observations are worth noting. First, the three learning facilitators from Alternative Education were all classified into Cluster 2b. Next, Reagan once again had the lowest overall participation rate (77.78%) of the elementary schools.

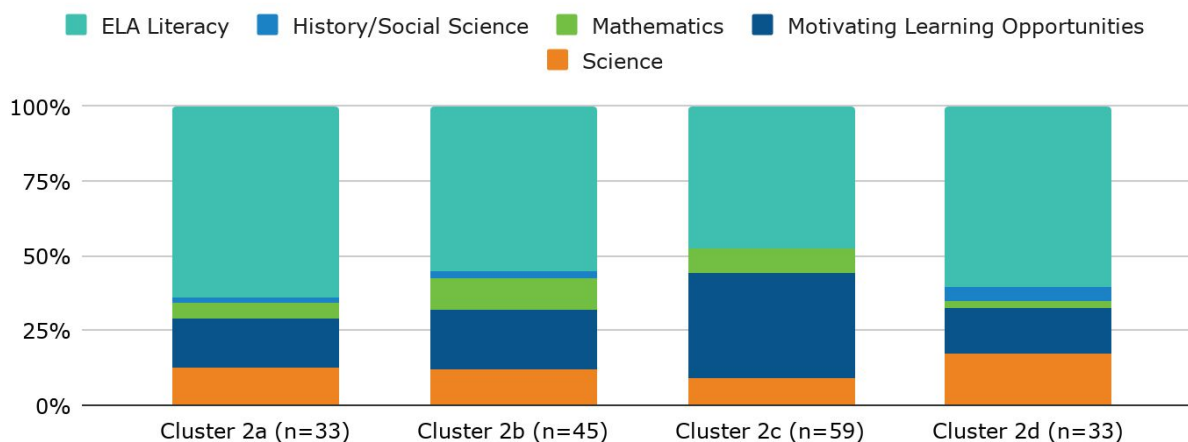
Figure 12: Cluster Composition by Learning Community for Grant Year 2 (2018-19)



Year 2 Clusters: PLO Attributes

In addition to expanding the PLO offerings by type and number, LUSD offered two additional focus areas in Grant Year 2: History/Social Science and Science. Although 59% of the PLOs remained specific to ELA Literacy, the remainder distributed across the focus areas as follows: 5.4% Mathematics, 2.9% History/Social Studies, and 19% Motivating Learning Opportunities. Figure 13 shows the percentage of PLOs by focus area for each cluster.

Figure 13: Cluster Focus Areas for Grant Year 2



Although none of the learning facilitators in Cluster 2c engaged in any professional learning related to History/Social Studies, Clusters 2a and 2b had some participation and Cluster 2d had the most. Interestingly, although Cluster 2a had the highest percentage of PLOs in the ELA Literacy focus area, the most attended PLO by that cluster was specific to science. Similarly, 21 of 33 learning facilitators in Cluster 2d participated in the 30 Minute Science Focus Institute — the most attended PLO in that cluster (see Table 6).

As with Grant Year 1, given the district’s emphasis on ELA Literacy and English Learner Development, it is not surprising that half of the most attended PLOs could be categorized into that focus area. Of note, two different Site-Based Academies also emerged as heavily attended. In Cluster 2b, 10 learning facilitators (who comprised 22.2% of the cluster) from Washington attended the Washington (English Learner Language Acquisition, Akhavan) Academy. This means that 31.25% of the learning facilitators from that community all had the same experience. Similarly, in Cluster 2c, nine learning facilitators from Lincoln engaged in the Lincoln (SOAR Teaching Frames for Literacy and Math) Academy. Although these learning facilitators only represented 17% of the cluster, they comprised 45% of the faculty in that community.

Table 6: Most Attended PLOs per Cluster and Focus Area for Grant Year 2

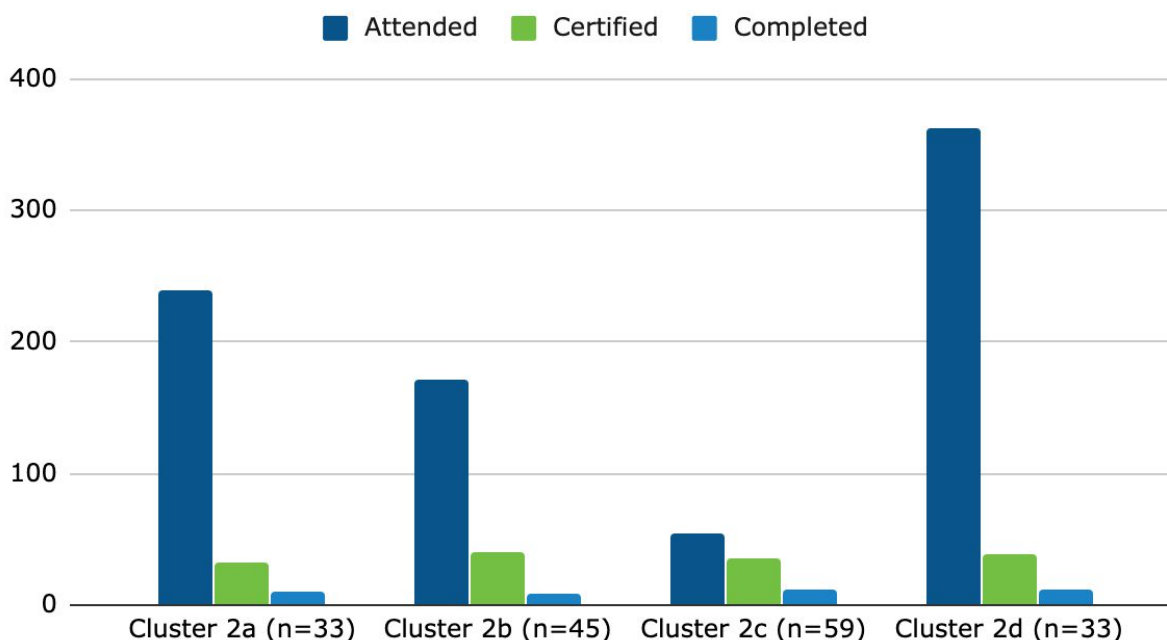
	Total # of Distinct PLOs	3 Most Attended PLOs per Cluster	PLO Focus Area
Cluster 2a (n=33)	83*	GY 2 - Hands-On Science with STEMScopes (n=15)	Science
		GY 2 - Guided Reading: Getting Fired Up (n=12)	ELA Literacy
		GY 2 - Guided Reading: Digging Deeper into Transitional and Fluent Levels (n=11)	ELA Literacy
Cluster 2b (n=45)	61	GY 2 - Washington (English Learner Language Acquisition, Akhavan) (n=10)	ELA Literacy
		GY 2 - Project Based Learning 101 (n=9)	Motivating Learning Opportunities
		GY 2 - Guided Reading: Classroom Literacy Activities: Session 2 (n=7)	ELA Literacy
Cluster 2c (n=59)	94**	GY 2 - Blended Learning (n=11)	Motivating Learning Opportunities
		GY 2 - Lincoln (SOAR Teaching Frames for Literacy and Math) (n=9)	Mathematics
		GY 2 - Project Based Learning 101 (n=9)	Motivating Learning Opportunities
Cluster 2d (n=33)	64	GY 2 - 30 Minute Science (n=21)	Science
		GY 2 - Content Literacy for Nonfiction (n=15)	ELA Literacy
		GY 2 - Guided Reading- Word Work (n=15)	ELA Literacy

* Within the 83 distinct PLOs, learning facilitators completed 26 different Master's Courses that were not categorized by focus area.

** Learning facilitators completed 59 different Master's Courses within these 94 distinct PLOs that were not categorized by focus area.

In addition to examining the focus area and specific PLOs within each cluster, we also analyzed the level of participation as shown in Figure 14. Neither Master's Courses nor TIE Courses were included in this analysis as participation was not measured in the same manner. With one exception (the three-day Customized Learning Focus Institute which had an optional certification), learning facilitators could only certify or complete Learning Academies, Micro Credentials, Site-Based Academies.

Figure 14: Participation by Cluster For Grant Year 2



Interestingly, Cluster 2b had the most number of learning facilitators who attained certification. When looking more closely at participation by focus area (see [Appendix Table A4](#) for details), we realize that 29 of these certifications can be attributed to participation in an ELA Literacy PLO. Approximately half as many learning facilitators certified in a PLO within the Motivating Learning Opportunities focus area. Cluster 2c had the most certifications, which makes sense given the number of learning facilitators who participated in the Blended Learning Academy and Project Based Learning 101 Micro Credential. Across clusters, very few certified in a Science PLO, and certification was not offered for the Mathematics PLOs.

Year 2: Performance Based Compensation Strategies (PBCS)

The district doubled its investment in professional learning during Grant Year 2 as compared to Grant Year 1, offering substantially more PLOs and serving a greater population of learning facilitators. Once again, to analyze the total Performance Based Compensation Strategies (PBCS), we calculated both the amount provided directly to learning facilitators as either a daily stipend or a certification award, and the total district investment in supplies, program support, and consultancy fees. Unlike in the first year when the district heavily invested in program support and fees, 67.32% of the total performance based compensation funds allocated for Grant Year 2 was used to compensate learning facilitators.

Figure 15: Heat Map of Investment by Cluster for Grant Year 2

	Relative Investment	Description
Cluster 2a (n=33)	Significant	23% more than the Minimum investment in this grant year
Cluster 2b (n=45)	Moderate	13% more than the Minimum investment in this grant year
Cluster 2c (n=59)	Minimum	The Minimum amount invested in Grant Year 2 was 1.5 times greater than that invested in Grant Year 1 and almost twice as much as Grant Year 3.
Cluster 2d (n=33)	Maximum	Over 1.5 times as much as the Minimum investment made in this grant year

Unlike during Grant Year 1, the amount invested in each cluster more closely correlated to the level of participation. The district made the most financial investment in Clusters 2a and 2d, both of which completed the most PLOs. Although Cluster 2c had the largest sample size, because they completed substantially fewer PLOs, they represent the minimal investment.

Grant Year 3 (2019-20) School Year

During the third year, 164 of 206 learning facilitators completed at least one PLO for a participation rate of approximately 80%. It is important to remember that COVID-19 school closure impacted the last year of the TSL Grant, preventing some professional learning opportunities from either running or being completed. As explained previously, and illustrated by Figure 16, each cluster consisted of varying combinations of PLOs and participation rates. This section further describes the attributes of these clusters beyond the structure of the professional learning.

Figure 16: Heat Map of PLO Types by Cluster for Grant Year 3

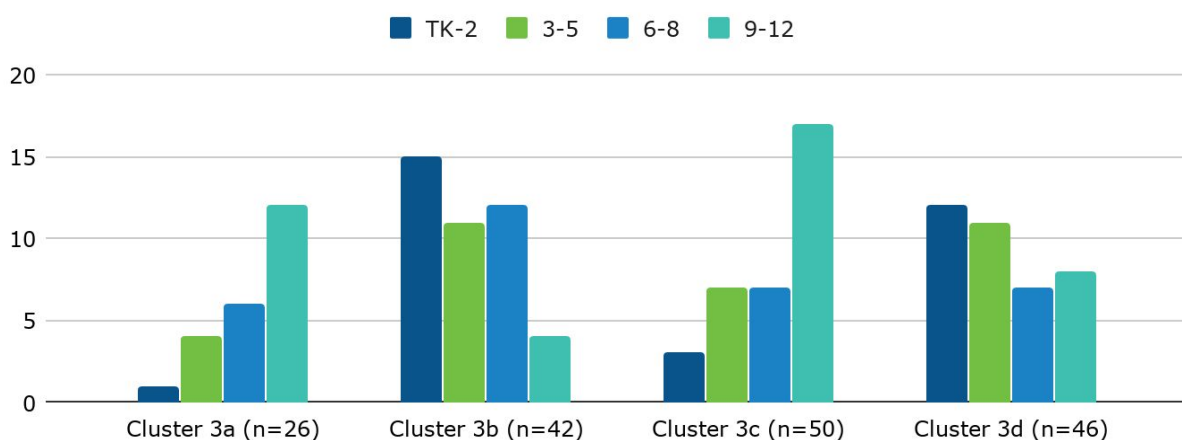
	Focus Institutes	Learning Academies	Micro Credentials	Site-Based Learning Academies	Master's Courses	TIE Courses
Cluster 3a (n=26)	6.23	1.27	1.00	0.85	8.46	0.04
Cluster 3b (n=42)	18.29	1.69	1.52	1.29	0.83	0.02
Cluster 3c (n=50)	2.86	0.58	0.48	0.76	0.96	0.73
Cluster 3d (n=46)	9.41	1.24	1.15	0.89	0.04	0.23

Year 3 Clusters: Learning Facilitator and Community Attributes

To begin, we examined the content level ranges of the learning facilitators in each cluster. During this last year of the grant, more learning facilitators from the high school completed PLOs (n=43). Interestingly, as illustrated by Figure 17, the majority grouped into Cluster 3C which had the largest sample size and the lowest average participation rate.

The distribution of learning facilitators by content level range helps to understand two other underlying trends. First, Cluster 3a had both the highest average participation rate in Master's Courses and included the highest percentage of high school learning facilitators. Second, Clusters 3b and 3d both had similar sample sizes and percentages of TK-8 learning facilitators as well as relatively high rates of participation in Focus Institutes and Learning Academies. Since the Grant Year 3 clusters are cumulative, this illustrates how learning facilitators in the primary grades generally participated in more professional learning.

Figure 17: Cluster Composition by Content Level for Grant Year 3

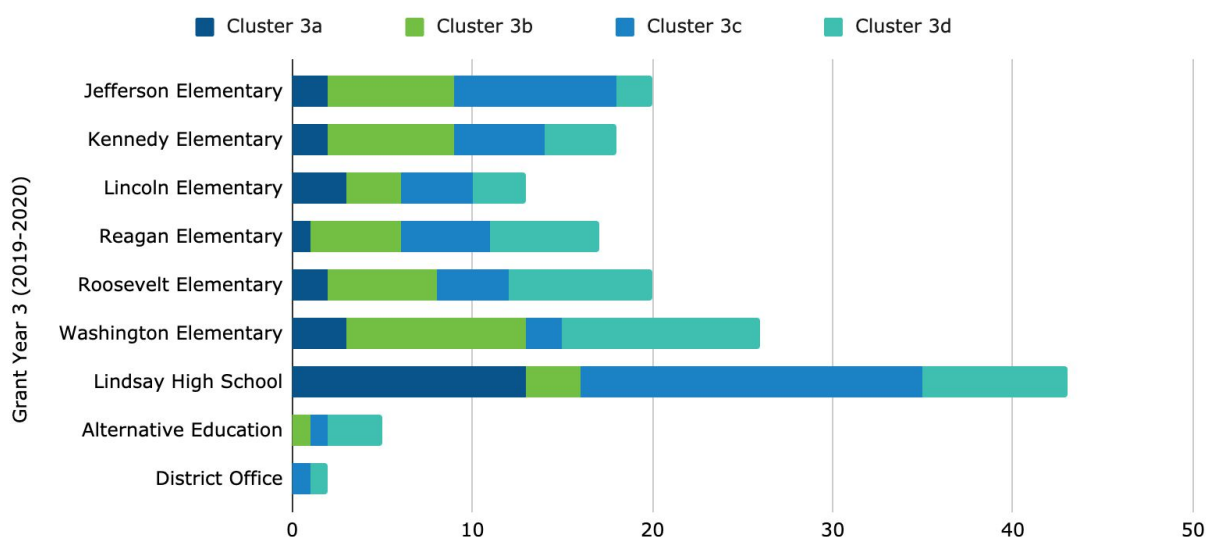


When looking more closely at the participation by learning community, additional trends emerged (see [Appendix Table A5](#) for specifics). Although Figure 18 compares the number of learning facilitators per learning community assigned to each cluster, it is also important to consider how these counts compare to the percentage of participation within and across each separate learning community.

- **Cluster 3a** - Lindsay High School represents almost half of the sample in this cluster, yet only 21.3% of the learning facilitators from that community.
- **Cluster 3b** - Learning facilitators from Washington, Jefferson, and Kennedy represent over half of this cluster and between 20-30% of their respective communities.

- **Cluster 3c** - Over 30% of the learning facilitators in the high school fell into Cluster 3C, accounting for 38% of the sample. Learning facilitators from Jefferson comprised the second largest group in the cluster and represented 35% of that learning community.
- **Cluster 3d** - The cluster consisted of a relatively high percentage of learning facilitators from Washington and Roosevelt, representing a substantial proportion of their faculties. Of note, this cluster also includes three of the five learning facilitators from Alternative Education.

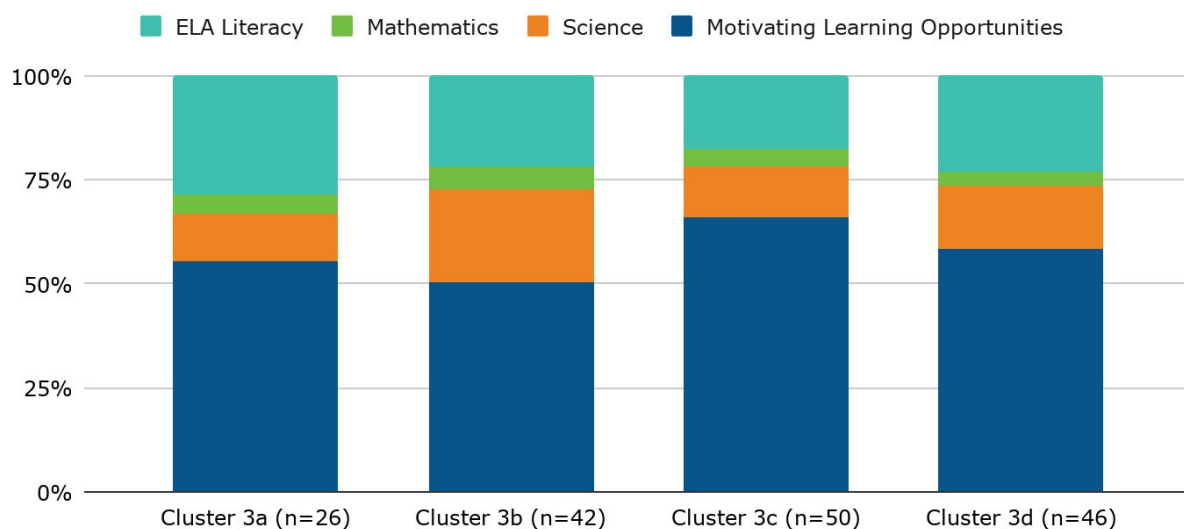
Figure 18: Cluster Composition by Learning Community for Grant Year 3 (2019-20)



Year 3 Clusters: PLO Attributes

Unlike the previous years, more learning facilitators participated in professional learning associated with the Motivating Learning Opportunities focus area rather than ELA Literacy. Cluster 3c included the highest percentage of PLOs associated with Motivating Learning Opportunities, although it is also important to remember that this cluster had breadth over depth, meaning that a larger number of learning facilitators completed a wide array of PLOs but with a relatively low average participation rate. On the contrary, learning facilitators in Cluster 3b had greater depth of participation based on the number of completed PLOs and yet also maintained breadth in terms of the distribution across focus areas.

Figure 19: Cluster Focus Areas for Grant Year 3



When looking at the individual PLOs with the highest participation rates in each cluster (Table 7), it is also important to note that Grant Year 3 had the least consistency across clusters. The *Literature Groups* Learning Academy was the only repeat in Clusters 3a and 3d. Although funded during Grant Year 2, learning facilitators did not participate in *Literature Groups* until the fall of 2019. As such, it is included in year three because of how it will be incorporated into future analyses of learner growth.

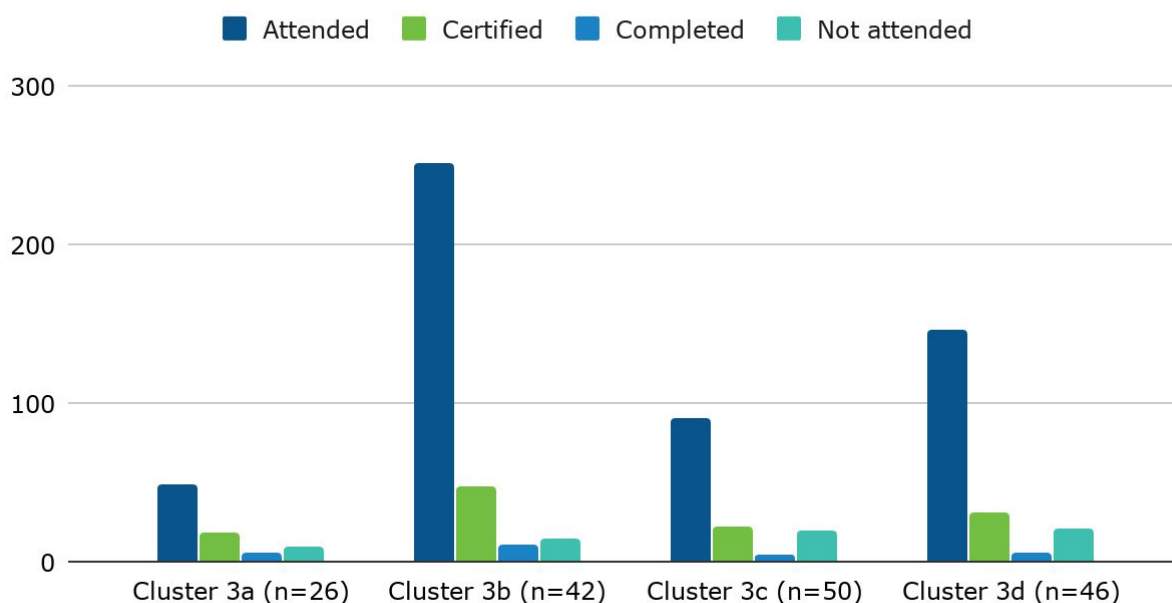
Table 7: Most Attended PLOs per Cluster and Focus Area in Grant Year 3

	Total # of Distinct PLOs	3 Most Attended PLOs per Cluster	PLO Focus Area
Cluster 3a (n=26)	64*	GY 2 - Literature Groups (n=7)	ELA Literacy
		Socratic Seminars (n=7)	Motivating Learning Opportunity
		Getting Things Done- November 16th (n=5)	Motivating Learning Opportunity
Cluster 3b (n=42)	40	Motivate Learners: Environmental Science in the San Joaquin Valley (n=26)	Science
		eSpark ELA Literature (n=18)	ELA Literacy
		Lifelong Learning Session #3 (n=17)	Motivating Learning Opportunity
Cluster 3c (n=50)	43	Empower for LFs- Core Functions of Learner 3.0 (n=12)	Motivating Learning Opportunity
		Empower for LFs- Curriculum & Playlists (n=11)	Motivating Learning Opportunity
		Lifelong Learning Session #2 (n=11)	Motivating Learning Opportunity
Cluster 3d (n=46)	40	Getting Things Done- November 16th (n=18)	Motivating Learning Opportunity
		Supporting the Needs of All Learners (n=14)	Motivating Learning Opportunity
		GY 2 - Literature Groups (n=13)	ELA Literacy

* Within the 64 distinct PLOs in Cluster 3a, learning facilitators completed 32 different Master's Courses that were not categorized by focus area.

Beyond looking at the focus area and content of the professional learning within each cluster, we also examined the level of participation (Figure 16). Learning facilitators had the opportunity to either *Attend*, *Certify*, or *Complete* different offerings. In Grant Year 3, some participants also might have been coded as *Not Attended*. This designates that an individual registered for a PLO but did not attend. We made the decision to keep these individuals in the dataset because registering signified intent to learn. Master's Courses were not included in this analysis.

Figure 20: Participation by Cluster For Grant Year 3



It is important to remember that participation levels correspond to the structure of the PLO. Learning facilitators would only receive a *Completed* or *Certified* designation for Learning Academies, Site-Based Learning Academies, and Micro Credentials. As such, it is not surprising that learning facilitators *Attended* PLOs at a higher rate.

When looking at the participation levels by focus area (see [Appendix Table A6](#) for details), more learning facilitators became certified in Motivating Learning opportunities. Given the depth of participation in Clusters 3b and 3d, they also had substantially more learning facilitators who either completed or certified. Ten learning facilitators from each of those clusters earned a certification in ELA Literacy. Cluster 3b then had 33 certifications in Motivating Learning Opportunities as compared to the 20 in 3d and 19 in 3c.

Year 3: Performance Based Compensation Strategies (PBCS)

Compared to the other years of the TSL Grant, LUSD invested less during Grant Year 3. However, when looking at the amount spent directly on learning facilitators as either a daily stipend or a certification fee, the district invested a higher percentage of their expenditures. Of the total amount of performance based compensation funds invested during this last year, 81.22% of the total cost went directly to learning facilitators. Comparatively, 67.32% of the total cost was used to compensate learning facilitators during Grant Year 2, and only 46.23% in Grant Year 1.

Figure 21: Heat Map of Investment by Cluster

	Relative Investment	Description
Cluster 3a (n=26)	Moderate	Only 6% more than Minimum investment in this grant year
Cluster 3b (n=42)	Maximum	Over twice as much as the Minimum investment made in this grant year
Cluster 3c (n=50)	Minimum	21% less than the Minimum investment made in Grant Year 1
Cluster 3d (n=46)	Significant	25% more than the Minimum investment in this grant year

As expected, the clusters with the highest participation rates (Clusters 3b and 3d) also had the highest relative investment. More of the learning facilitators in these clusters received additional compensation for earning certifications, and they completed a greater number of individual PLOs.

Summary of Observations and Descriptions

While the cluster analysis defined each cluster based on its sample size and average rate of participation by PLO type, the descriptive analysis associated with research question 1b offered greater insights. As discussed previously, trends naturally occurred within the clusters. The descriptive analysis of learning facilitator, community, and PLO attributes then offered a more nuanced understanding of these initial findings.

- **Master's Courses generally clustered together** such as with Clusters 1a, 2a, and 3a. These clusters also consisted of large percentages of secondary education learning facilitators.
- **Clusters with the largest sample sizes also had the lowest average participation rates**, implying that learning facilitators in these groups completed a minimal amount of professional learning. Lindsay High School comprised a large percentage of these clusters.
- **Because LUSD offered more Focus Institutes, participation in that PLO type was typically higher** than the others. This could be in part because these PLOs required a smaller time commitment. As such, these clusters also had higher percentages of TK-2 learning facilitators.
- **Those clusters that had the highest average participation rate (i.e., Clusters 1c, 2b, and 3d) across PLO types also had lower sample sizes**, implying that fewer learning facilitators engaged in both breadth and depth with their professional learning.

Additionally, TK-5 learning facilitators comprised a majority of these clusters — particularly those from Washington and Roosevelt Elementary.

Next Steps

This module represents the first of four analyses. The next two modules will use these clusters to examine the effects of combinations of professional learning on K-8 and then 9-12 learner growth. The final module will examine the various cluster characteristics to determine which professional learning characteristics, site-based conditions, or learning facilitator attributes might have contributed to learner growth.

Appendix: Tables

Table A1: Cluster Participation by Learning Community

	Cluster 1a n=23	Cluster 1b n=53	Cluster 1c n=25	Cluster 1d n=28	Total
Jefferson Elementary	3	3	4	3	13
Kennedy Elementary	1	4	3	5	13
Lincoln Elementary	3	3	3	3	12
Reagan Elementary	1	5	1	4	11
Roosevelt Elementary	2	7	2	6	17
Washington Elementary	4	15	5	3	27
Lindsay High School	8	13	5	4	30
Alternative Education	0	2	2	0	4
District Office	1	1	0	0	2

Table A2: Participation by Focus Area in Grant Year 1

	ELA Literacy	Mathematics	Motivating Learning Opportunities
Cluster 1a	31	4	22
Attended	22	4	11
Certified	7	---	10
Completed	2	---	1
Cluster 1b	71	21	43
Attended	45	21	18
Certified	15	---	17
Completed	11	---	8
Cluster 1c	43	10	55
Attended	26	10	41
Certified	11	---	12
Completed	6	---	2
Cluster 1d	37	9	12
Attended	9	9	9
Certified	15	---	3
Completed	13	---	---

Table A3: Cluster Participation by Learning Community

	Cluster 2a n=33	Cluster 2b n=45	Cluster 2c n=59	Cluster 3d n=33	Total
Jefferson Elementary	6	4	4	4	18
Kennedy Elementary	5	2	8	6	21
Lincoln Elementary	4	5	9	2	20
Reagan Elementary	3	5	3	3	14
Roosevelt Elementary	4	7	6	5	22
Washington Elementary	5	10	7	10	32
Lindsay High School	6	7	20	2	35
Alternative Education	0	3	0	0	3
District Office	0	2	2	1	5

Table A4: Participation by Focus Area in Grant Year 2

	ELA Literacy	History/Social Science	Mathematics	Motivating Learning Opportunities	Science
Cluster 2a	180	6	14	47*	35
Attended	157	6	14	31	31
Certified	21	---	---	8	3
Completed	2	---	---	7	1
Cluster 2b	126	5	25	45*	27
Attended	96	5	24	21	25
Certified	29	---	---	10	2
Completed	1	---	1	7	---
Cluster 2c	53	0	9	39*	10
Attended	35	---	6	4	10
Certified	17	---	---	16	---
Completed	1	---	3	10	---
Cluster 2d	251	19	8	65	70
Attended	221	19	8	49*	66
Certified	28	---	---	8	2
Completed	2	---	---	7	2

* Learning facilitators also completed multiple TIE courses which could be categorized as Motivating Learning Opportunities. However, levels of participation were not calculated for those online courses.

Table A5: Cluster Participation by Learning Community

	Cluster 3a n=26	Cluster 3b n=42	Cluster 3c n=50	Cluster 3d n=46	Total
Jefferson Elementary	2	7	9	2	20
Kennedy Elementary	2	7	5	4	18
Lincoln Elementary	3	3	4	3	13
Reagan Elementary	1	5	5	6	17
Roosevelt Elementary	2	6	4	8	20
Washington Elementary	3	10	2	11	26
Lindsay High School	13	3	19	8	43
Alternative Education	0	1	1	3	5
District Office	0	0	1	1	2

Table A6: Participation by Focus Area in Grant Year 3

	ELA Literacy	Mathematics	Motivating Learning Opportunities	Science
Cluster 3a	23	4	45	9
Attended	14	2	25	8
Certified	3	2	13	---
Completed	5	---	---	---
Not Attended	---	---	7	1
Cluster 3b	70	17	162	72
Attended	49	12	123	67
Certified	10	5	33	---
Completed	7	---	---	---
Not Attended	4	---	6	5
Cluster 3c	24	6	91*	17
Attended	15	2	61	13
Certified	4	3	19	---
Completed	---	---	---	---
Not Attended	5	1	10	4
Cluster 3d	48	7	121*	31
Attended	30	4	88	24
Certified	10	1	20	---
Completed	6	---	---	---
Not Attended	2	2	10	7

* Learning facilitators also completed multiple TIE courses which could be categorized as Motivating Learning Opportunities. However, levels of participation were not calculated for those online courses.



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