Indicators of Student Achievement and Quality Programming

2016-2017

iu13

Service, Support ... Solutions

TABLE OF CONTENTS

INTRODUCTION

Lancaster-Lebanon Intermediate Unit 13 (IU13) is an educational service agency with offices in Lancaster and Lebanon, Pennsylvania, that is committed to providing outstanding programming and professional development designed to improve student achievement. These services are provided through instruction to students in classes taught by IU13 staff and support provided by IU13 consultants that is designed to improve the skills of the educators that work with students.

As part of its ongoing commitment to continuous improvement, IU13 has developed a data collection system that will be used to identify, gather, and reflect on key areas of student learning and the impact of IU13 programming and services. Identified indicators include multiple types of information such as demographic, perceptual, and achievement/student learning data that have been selected to provide the most complete representation of the impact of IU13 services. Information was gathered from those programs that provide direct instruction to students (Early Childhood, Special Education Services, Community Education, and Nonpublic Services) or offer professional development for educators responsible for teaching students in districts or IU-operated classes (Curriculum and Instruction Services). When available, similar data for multiple years will be reported; however, in cases where multiple-year data is not available, single-year data will be reported, with additional data added over time. It should also be noted that in several cases, data represented is from 2015-16. This is true in those programs where data is gathered via an outside source such as state or partner agency data banks.

Indicators were selected by program supervisors based on how well data aligned with three defined criteria. They include:

1) **Representation of the trend of student learning, attainment of desired goals such as graduation, or observable changes in behaviors;**
2) **Representation of the quality of services and/or the satisfaction levels of the recipients of services; and**
3) **Availability of the data in an accessible format at a system level vs. individual student level.**

While the list of data indicators selected by the supervisors to be represented in 2016-17 is extensive, it is not designed to be exhaustive at this point in time. The indicators will continue to be refined, and the reliability, validity, and the depth of data will only increase in future years.

NEW THIS YEAR: In addition to data on IU13's ongoing programs, this year's report includes a section designed to highlight several innovative initiatives – "Promising Practices" – that were implemented during the 2016-17 school year. These pilot or grant-funded programs are based on best practices in the field and are designed to offer fresh takes on educational practices in order to maximize outcomes for students. Data from these programs is included in this report to provide additional insight into IU13's commitment to enhancing the lives of students and educators in Lancaster and Lebanon counties.

TYPES OF DATA

Definitions of the types of data categories to be used by IU13 were designed as per the recommendations of Victoria Bernhardt, Ph.D., well-known for her work in school data analysis. In her book "Data Analysis for Continuous School Improvement" (2013), Dr. Bernhardt suggests using multiple measures of data including the following:

1. **Demographics on a school, student, and staff level:** This includes information such as enrollment, attendance, graduation rates, gender, etc. For the purposes of this report, demographic information will be shared when it is relevant to understanding the trends or outcomes identified.
2. **Perceptions:** This includes values, beliefs, attitudes and observations. Since much of the success of IU13 is related to the value of its services by its users, surveys and other feedback loops were collected and synthesized at a system level.
3. **Student Learning:** Both standardized and formative assessments are included in this category. Measures of student achievement from both IU classes and district classes where teachers received extensive and/or ongoing technical assistance and training were included.
4. **School Processes:** Descriptions of school programs and processes tell us about how we work and its relevance to issues that may be uncovered through data analysis. This type of data was gathered on a very limited basis and is not used in this report; however, it will become more relevant as the other types of data are analyzed and questions arise regarding root causes of identified issues.

By analyzing information from a variety of sources as well as different types of information, it is believed that a more accurate and complete picture of IU13 and its services will be provided. Ultimately, the analysis of the data will be used to answer the following questions:

- **Is IU13 providing quality instruction to the students it serves that result in improved student achievement?**
- **Is the professional development and training offered by IU13 of high quality and effectiveness, resulting in more highly trained educators who will in turn impact student achievement?; and**
- **Has the implementation of IU13's promising practices resulted in improved student outcomes?**

These questions will be considered across programs and age of learners, from early childhood to adulthood.

ANALYSIS OF DATA

Is IU13 providing quality instruction to the students it serves that results in improved student achievement?

Early Childhood Programs

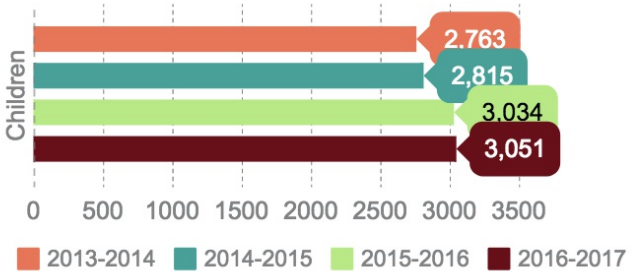
IU13
An Education Service Agency

IU13 provides instruction to eligible students in its Early Childhood and Preschool Early Intervention program, including Early Head Start and Head Start, Pre-K Counts, and Early Intervention services for children identified with special needs.

These programs, serving children from infants to preschool, are designed to strengthen and encourage early literacy, social development, resourcefulness, and self-sufficiency through positive learning experiences.

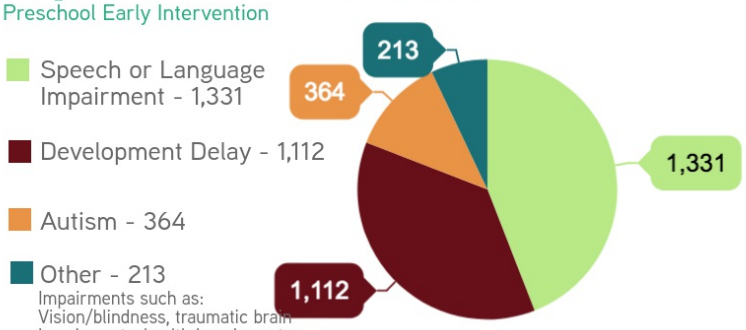
Early Literacy
Social Development
Resourcefulness & Self-sufficiency
Positive Learning Experiences

Growth in Preschool Early Intervention



Top Services Received

Preschool Early Intervention



3,051

Preschool Early Intervention

Children 3-5 years old (pre-kindergarten) served

488

Head Start & PreK Counts

Children 3-5 years old (pre-kindergarten) served

288

Early Head Start

Children birth-3 years served

Data is reflective of 2016-2017 school year.

Early Childhood and Early Intervention Programs

Demographic Information

Early Intervention

IU13 continues to impact a significant number of young children through its Early Intervention program. Data gathered through June 2017 indicates that IU13 has served a total of 3,051 children in the Early Intervention program in 2016-17. **Figure 1** shows the steady increase in the number of children that have received Early Intervention services over the last four years.

Figure 1: Number of Children Served in Early Intervention

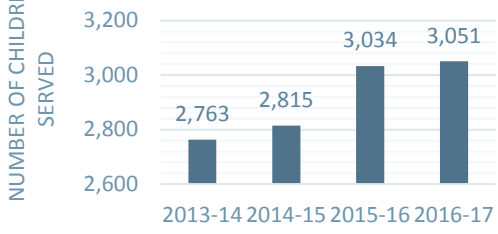
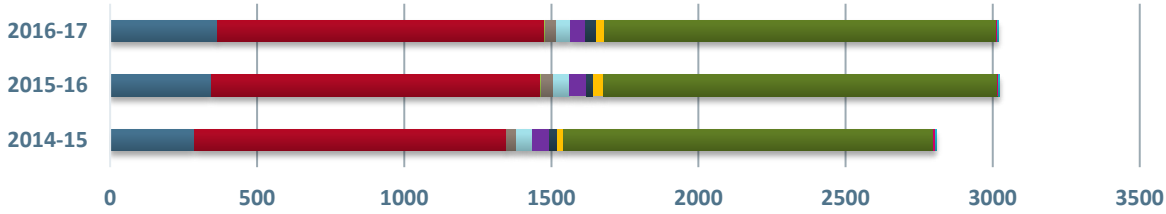


Figure 2 shows the number of children receiving services by their category of eligibility. The three most common eligibility categories continue to be Speech/Language Impairment, Developmental Delay and Autism. This is consistent with previous years' data.

Figure 2: Early Intervention Number of Children Served By Eligibility Category



	2014-15	2015-16	2016-17
Autism	288	343	364
Developmental Delay	1059	1121	1112
Emotional Disturbance	1	4	4
Hearing Impairment/Deaf	35	40	36
Intellectual Disability	52	52	47
Multiple Disabilities	60	59	53
Orthopedic Impairment	23	22	36
Other Health Impairment	23	37	28
Speech or Language Impairment	1258	1338	1331
Traumatic Brain Impairment	8	5	6
Visual Impairment/Blindness	2	3	3

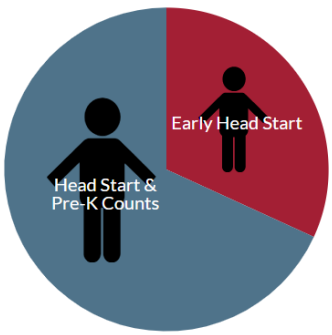
Early Childhood

A total of 952 children were served in the Early Childhood programs during 2016-17. The breakdown by program was as follows:

- Early Head Start (Lebanon home based and Lancaster & Lebanon counties child care partners), 288 children
- Head Start and Pre-K Counts, 488 children

In addition, 335 home visits were completed and 3,673 social work contacts were completed.

2016-17 Children in Early Childhood Programs



While English continues to be the primary language spoken as reported by parents (70% of children), the Early Childhood programs serve students with a wide variety of primary languages including Spanish (27%), and other languages including Arabic, Haitian-Creole, Hindi, Russian, and Cambodian (4%).

Achievement/Student Learning

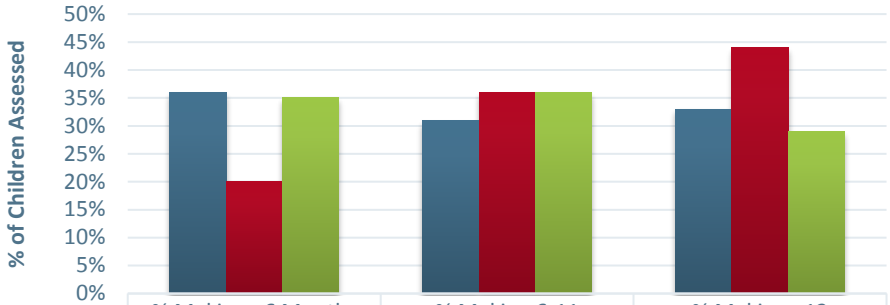
The curriculum and instructional practices provided by IU13 programs to young learners are designed to support the growth of early literacy and math skills, and other key developmental areas including physical, cognitive, language, and social abilities. Assessment of these skills in young children can be challenging since these learners are not developmentally ready for the demands of the types of assessments indicated for older students. Assessment at this level includes a variety of types of assessments and is accomplished over time to provide the most reliable and valid measure of their skill levels (Helm, 2014). IU13 has selected several types of assessments to use in tracking the impact of programming on achievement level. They include the **Peabody Picture Vocabulary Test (PPVT)** and **Teaching Strategies Gold** (See *Appendix A* for additional details on the assessments).

Indicators of Student Learning

Peabody Picture Vocabulary Test (PPVT) Results

The Peabody Picture Vocabulary Test (PPVT) is administered in the fall and spring to all preschool-age children enrolled in IU13 classrooms funded by Head Start and Pre-K Counts. Approximately one-third of the children enrolled in IU13 Head Start or Pre-K Counts classrooms have an identified disability with most of them qualifying for speech/language services and/or a developmental delay. **Figure 3** depicts the growth that children made in their age-equivalent score between the fall and spring PPVT assessments. There were 245 children with matched scores meaning they were enrolled and assessed during the administration of both the fall and spring PPVT assessments. With approximately six months between the administration of the fall and spring assessments, sixty-five percent of children made a gain of six months or more. Twenty-nine percent of matched scores made a gain of more than one year. When comparing growth from fall to spring in 2016-2017 to growth in the 2015-2016 school year, fifteen percent fewer children made a gain of more than one year. An initial analysis of the data suggests that this may be related to an increase in the number of children who identified a language other than English as their primary language. In 2015-16, 25% of children had a primary language other than English; in 2016-2017, 32% of children identified a language other than English as their primary language.

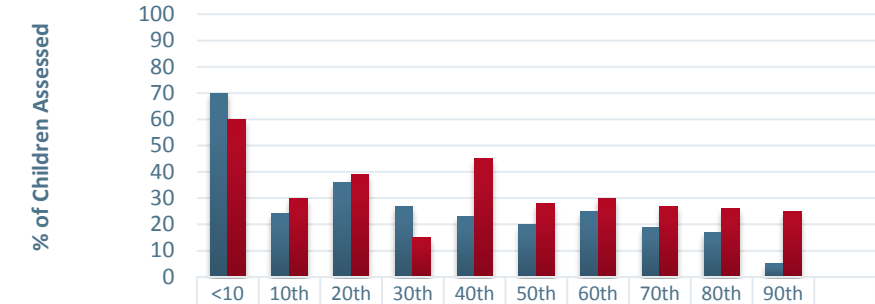
Figure 3: Receptive Language Growth (PPVT)



	% Making <6 Months Gain	% Making 6-11 Months Gain	% Making >12 Months Gain
2014-15	36%	31%	33%
2015-16	20%	36%	44%
2016-17	35%	36%	29%

Figure 4 portrays how the children enrolled in the Lebanon Early Childhood Program scored in receptive language skills using the norm percentile ranking. All children that were administered the PPVT in the fall were included as well as all children that were administered the PPVT in the spring. **Figure 4** reflects all children, not just those children with matched scores.

Figure 4: PPVT Percentile Ranks Early Learners (2016-17)

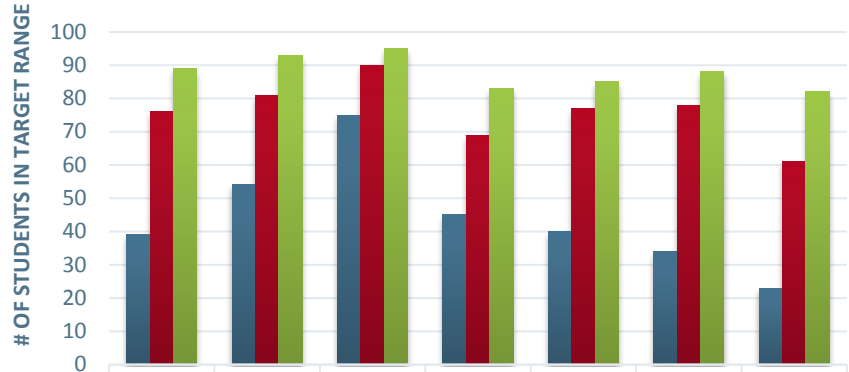


	<10	10th	20th	30th	40th	50th	60th	70th	80th	90th
# students - Fall	70	24	36	27	23	20	25	19	17	5
# students - Spring	60	30	39	15	45	28	30	27	26	25

Teaching Strategies GOLD

The Teaching Strategies GOLD assessment uses multiple data points that include student performance and anecdotal notes from teachers which are then compared to the expected levels of development in key target areas based on the child's age. **Figure 5** indicates the number of children who were evaluated to be within the appropriate target range indicated as per their chronological age. Children were assessed in the fall, winter and spring with the expectation that the number of students performing in the specific skills domain would increase as a result of their preschool experiences. This indeed proved to be the case, with all seven areas showing significant upward trends in skills.

Figure 5: Teaching Strategies GOLD Data (2016-17)

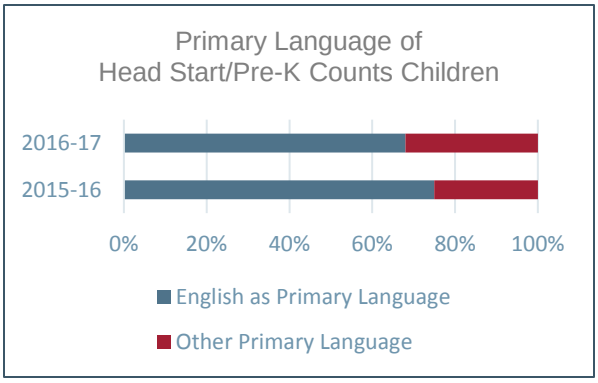


	Social-Emotional	Physical-Gross Motor	Physical - Fine Motor	Language	Cognitive	Literacy	Math
Fall	39	54	75	45	40	34	23
Winter	76	81	90	69	77	78	61
Spring	89	93	95	83	85	88	82

Discussion

Based on a review and examination of the 2016-2017 student data for the Lebanon Early Childhood Program, including the Peabody Picture Vocabulary Test and Teaching Strategies GOLD, it appears children made the greatest gains in the areas of literacy, math, and social-emotional development. This may have been influenced by several specific initiatives that were implemented over the course of the year. The Lebanon Early Childhood Program joined the Pennsylvania Positive Behavior Support Network (PAPBS Network), whose mission is to support schools and their families to create and sustain comprehensive, school-based behavioral health support systems that promote the academic, social, and emotional well-being of all children. As a result, the Lebanon Early Childhood Program received targeted professional development and teacher feedback in the area of social-emotional development. An area of focus, based on the results from the PPVT and

Teaching Strategies GOLD data, continues to be language development. The demographic data indicates an increase in the percentage of children that identify with a primary language other than English. Given that to date all student assessments have been administered in English, consideration should be given to the reliability of data when assessments are not administered in the child's primary language. The Lebanon Early Childhood Program is currently reviewing program policies and procedures with regard to the administration of assessments with children whose primary language is not English. A second discussion point has been focused on using the curriculum to maximize language development. Program supervisors are currently conducting an in-depth review of the curriculum to more effectively use the curriculum to support children's language development, particularly for children whose first language is not English.



Perceptual Data

Parent involvement is critical to the development of early learners and is a key component of the services in the Early Learners program. IU13 collects information on its families' satisfaction with these services through a yearly survey of parents of children participating in the Early Learners classes. Two-hundred and thirty-six parent surveys of the surveys sent were returned (82% return rate). The results were as follows

- I feel **welcomed and respected** by the Head Start staff.
  - Yes - 100%
- The teacher is **interested** in what I have to say.
  - Yes - 100%
- The teacher **keeps me informed** about how my child is doing.
  - Yes - 99%
- Do you feel **heard and valued** when you talked about your child with Head Start staff?
  - Yes - 100%
- If your child has an IEP, were Head Start staff **helpful in getting your child evaluated**?
  - Yes - 53%, No - 1%, NA - 46%
- The teacher and I made **educational goals** for my child.
  - Yes - 97%, NA - 3%
- My child learned how to **share and take turns**.
  - Yes - 99%, NA - 1%
- My child is better at i**dentifying his/her own emotions**.
  - Yes - 97%, No - 2%, NA - 1%
- My family worker helped me to **set goals** and work toward achieving them.
  - Yes - 95%, No - 1%, NA - 4%
- The **home visit** with my family service worker was helpful.
  - Yes - 96%, No - 1%, NA - 3%
- Did you attend the **monthly parent meetings**?
  - Yes - 71%, No - 25%, NA - 4%
- Were the parent **meetings helpful**?
  - Yes - 74%, No - 5%, NA - 21%

PARENT INVOLVEMENT HIGHLIGHTS

Head Start helped me to **prepare my child** for kindergarten.

- Yes - 96%

My child and I had a **good experience** at Head Start.

- Yes - 99%

- Head Start helped me to **prepare my child** for kindergarten.
    - Yes - 96%, NA - 4%
- My child and I had a **good experience** at Head Start.
    - Yes - 99%, NA - 1%

The results of the survey suggest that the participating families feel positively about the program and that the program continues to meet its goal of creating strong connections with the students and their families.

School-Age Programs

IU13
An Education Service Agency

IU13 provides direct instruction and support to students with special needs who require individualized education plans (IEPs) in the Lancaster and Lebanon counties in grades kindergarten through high school.

Classes include:
Emotional Support, Life Skills, Diagnostic Kindergarten, Autistic Support, Basic Occupational Skills (BOS), School-to-Work, Deaf/Hard of Hearing Support, and Multiple Disabilities

Supplemental services to students with IEPs include:
Physical, Occupational, Speech and Language Therapies; Job Training Services; Autism Itinerant Services; and Hearing Impaired/Visually Impaired Itinerant Services

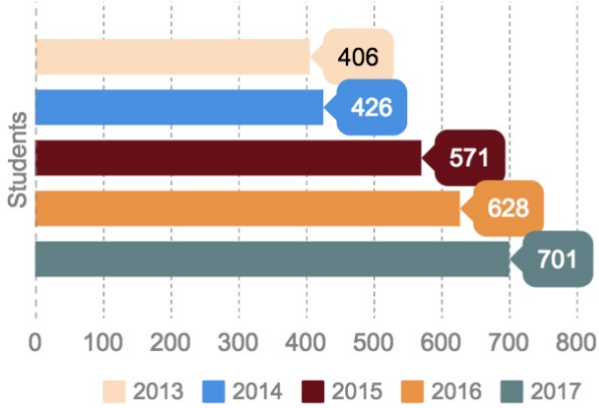
School-Age Students Served by IU13

In School-Age Itinerant Programs - 6,054

In School-Age IU13 Classes - 834

Extended School Year (ESY)

73% Increase in attendance over five years



93
Number of IU13-operated classrooms

Operated in support of area school districts

2,413
Receiving IU13 Job Training Services

Students with IEPs in IU or District Classes

Due Process Hearings

Zero Due Process Hearings occurred during the school year!

Data is reflective of the 2016-2017 school year.

School-Age Programs

Demographic Information

IU13 currently operates 93 classes in both Lancaster and Lebanon counties, including students in the following settings:

- Autistic Support
- Diagnostic Kindergarten
- Emotional Support
- Hearing Impaired Support
- Life Skills Support
- Multiple Disabilities Support
- School to Work/BOS

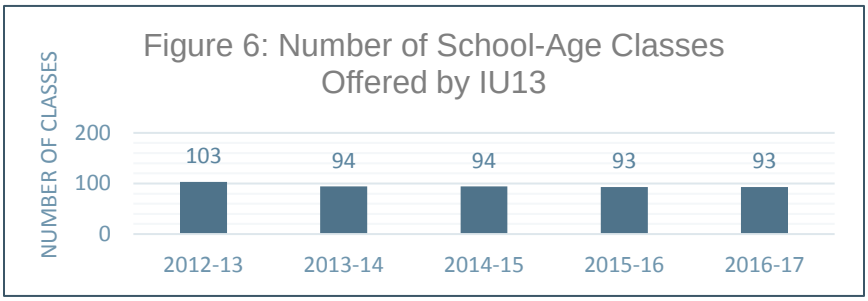


Figure 6 shows the number of classes operated by IU13 over the last five years, with the number of classrooms remaining relatively stable over the last four years.

The number of students in school-age IU13 classes has also remained fairly stable as shown in **Figure 7**, consistently measuring over the 830 students mark.

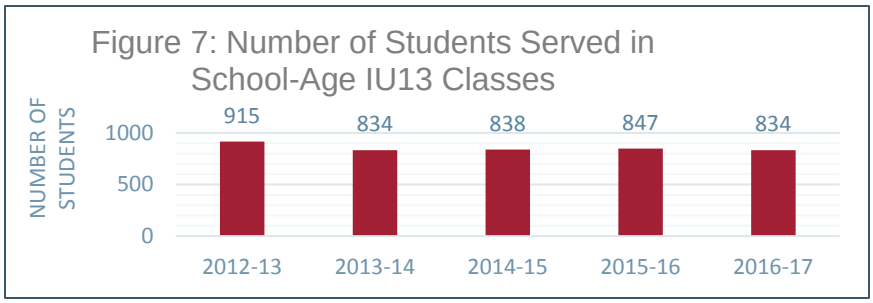
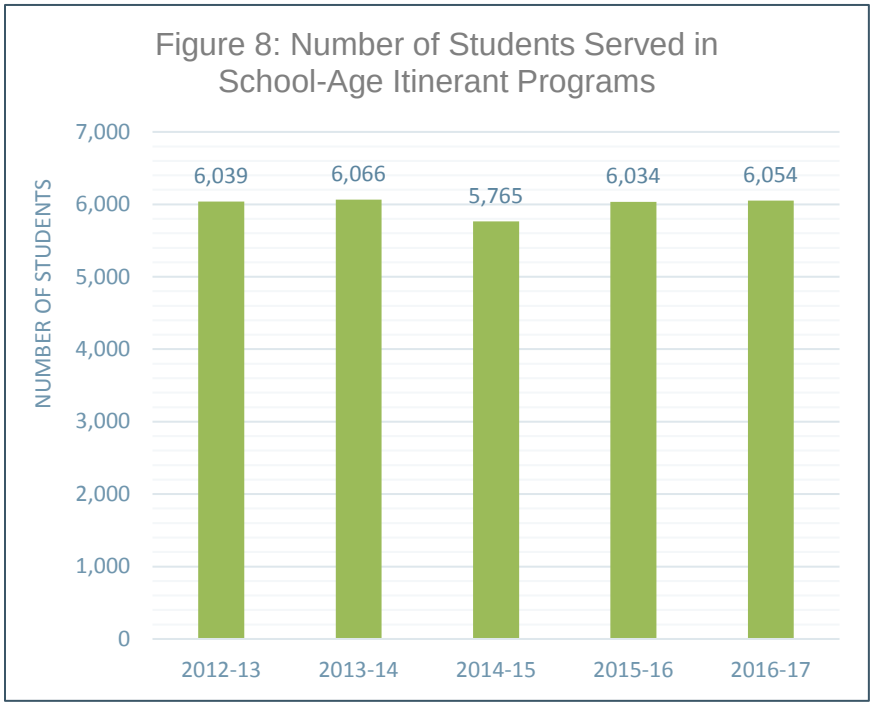


Figure 8 shows the demand for school-age itinerant services over the past 5 years. IU13 provides services to students in the following itinerant programs:

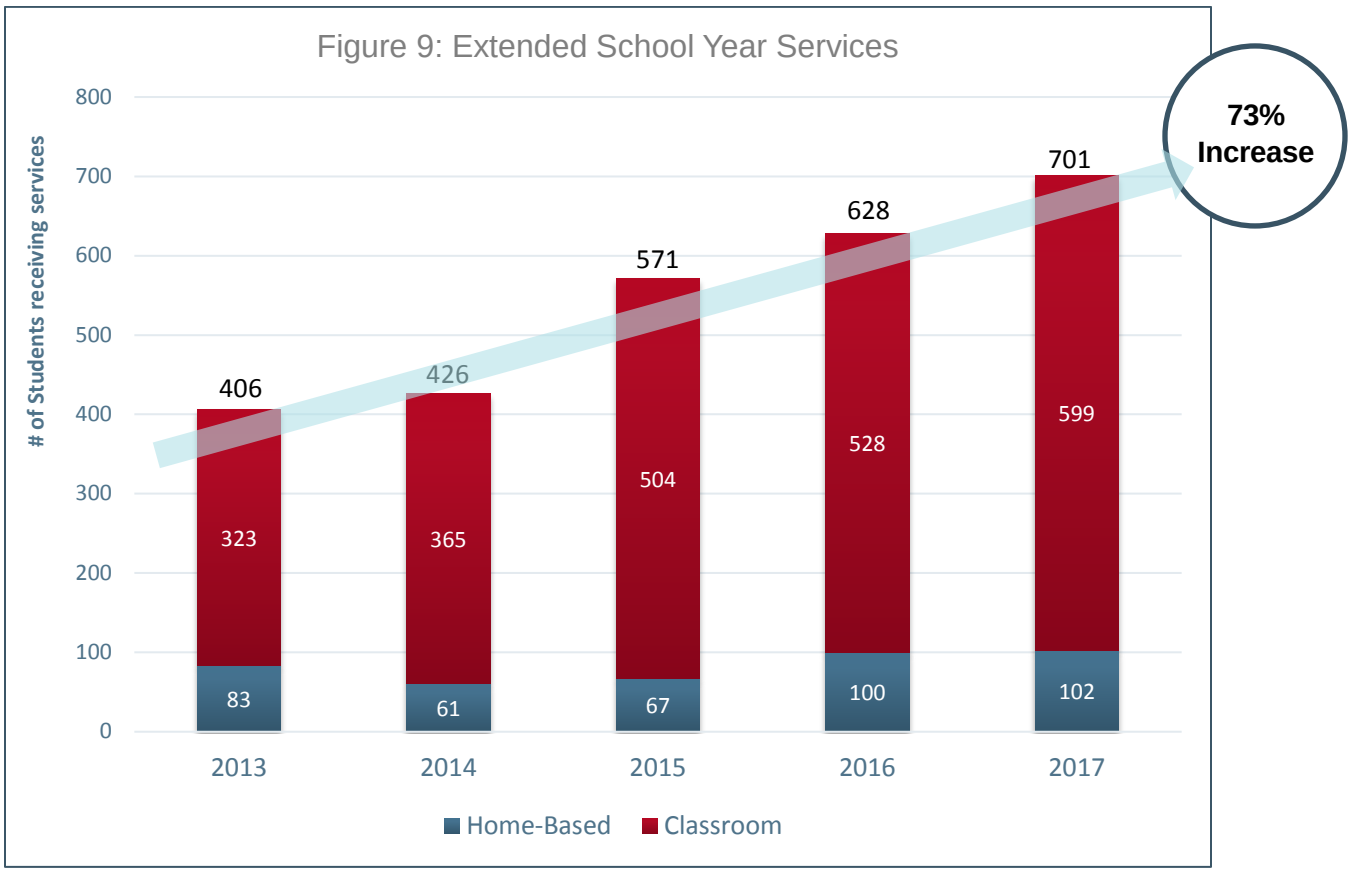
- Autistic Support
- Blind/Visually Impaired
- Deaf/Hard of Hearing Support
- Job Training
- Learning Support at Lancaster County CTC
- Occupational Therapy
- Physical Therapy
- Speech/Language Therapy



*Numbers represent total number of services provided. Students receiving more than one service are counted more than once.

In addition, IU13 itinerant therapists completed 183 occupational therapy and physical therapy evaluations and 18 feeding team evaluations during 2016-17. Eight hundred and thirty-eight (838) students received occupational therapy, 468 students received physical therapy and 1350 students received school-age speech and language services. IU13 also provided 78 classes of adapted physical education.

Extended school year services (ESY) play an important part in the maintenance of the skills of a child with special needs. Because of this, IU13 provides extended school year services to students in local school districts to maximize the learning gains of eligible students. **Figure 9** shows the increasing demand for these services with the number of students participating in the program increasing by 73% over the last five years.



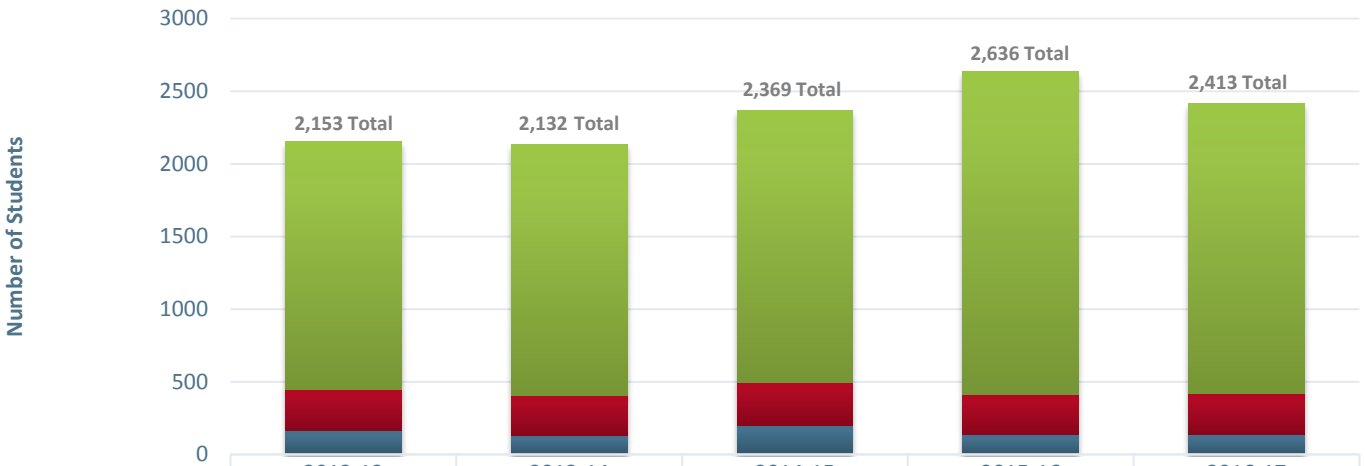
Due Process Hearings

One of the important indicators of a quality special education program is the number of due process hearings that have occurred during the school year. Due process hearings take place when parents and school districts are unable to resolve differences over a student's individual education program. These events are expensive, time-intensive, and can erode the partnership between families and schools; therefore, tracking the number of due process hearings is an important indicator of how parent-school partnerships are proceeding. IU13 was involved in no due process hearings in 2016-17. As a result, IU13 staff has been able to stay focused on positive relationships with parents and the program has avoided the costs associated with multiple hearings.

Job Placement of Students

IU13 provides transition services to students with disabilities in both district and IU-operated classes. Job trainers work closely with IEP teams and community partners to provide students with needed experiences and support as they apply classroom skills to the workplace environment through job placements, work readiness instruction, and internship experiences. Though the number of students served declined slightly during the past school year, these services continue to be highly in demand as shown in **Figure 10**.

Figure 10: Job Training Services for Students with IEPs in District and IU13 Classes



	2012-13	2013-14	2014-15	2015-16	2016-17
Work Readiness	1,708	1,726	1,875	2,225	1,995
Job Placements	282	274	292	277	282
Unpaid Internships	163	132	202	134	136

IU13 also runs several School-to-Work programs designed to provide students with intensive job preparation with sites at the Burle Business Park, Project SEARCH at Lancaster General Hospital and the Lebanon Veterans Administration Hospital, and Willow Valley Communities. Forty-seven (47) students participated in these programs, with 36 of them gaining full-time or part-time employment.

Achievement/Student Learning

The instruction provided to students served in IU13 classes is determined by a team of educators, parents, and designated educational partners resulting in an individualized education plan (IEP). Each IEP includes achievement levels, progress monitoring targets and exit criteria. Because of the varied nature of IEPs, it is difficult to use an aggregate individual analysis as a method of broad program evaluation. State assessments are not tracked by IU13 classes and instead are reported to school districts. In addition, many of the students served by IU13 have IEP goals which include social and emotional, communication, and daily living skills goals. Because of this, IU13 special education program supervisors have established common data indicators that will be gathered on a yearly basis to track the quality and success rate of IU13 services. These identified indicators included:

- Number of recommendations to have students return to a Less Restrictive Environment (LRE): IU13's goal is to

transition students back to their home district or to a LRE as they improve academically and behaviorally, as well as to prevent the need for students to require a more restrictive setting due to a decline in their IEP progress. Though yearly data may vary based on individual student needs, this information will continue to be tracked in future reports to allow for possible trend analysis.

- Progress on designated assessments aligned to select program goals: Assessments used included the **Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP),** the **NOCTI**, and the **Diagnostic Kindergarten Early Reading and Math Criterion Referenced Assessments.** (See *Appendix A* for further information on assessments.)

Indicators of Student Learning

Number of recommendations to return to a less restrictive environment (LRE):

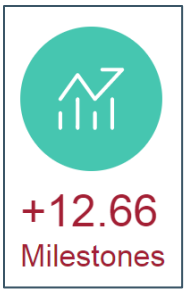
During 2016-17, 67 students were recommended by the IEP team to return to a less restrictive environment. IU13 consistently returns between 7 to 10 percent of its students to a less restrictive environment each year. **Table 1** shows the baseline data detailed by program assignments:

Table 1: Number of Recommendations to Return to a Less Restrictive Environment

	Number of Students Returning to Less Restrictive Environment (LRE)					
	2014-15		2015-16		2016-17	
Program	Total Students Served	Return To LRE	Total Students Served	Return To LRE	Total Students Served	Return To LRE
Community School Southeast/West	132	15	164	32	144	26
Diagnostic Kindergarten	21	12	20	3	12	11
Emotional Support (Lancaster Co.)	71	4	85	0	85	5
Life Skills (Lancaster Co.)	61	0	49	6	54	0
Catholic Charities	23	4	27	1	28	7
Deaf/Hard of Hearing	34	2	29	0	32	0
MEC Emotional Support (Now Valley Road)	39	3	49	4	68	5
MEC Autistic Support (Now Valley Road)	17	1	20	1	20	1
Fairland	45	3	51	3	52	2
Autistic Support (School Based)	113	9	132	18	117	9
Lebanon County Emotional Support, Life Skills Support, and Multiple Disabilities Support	97	4	92	1	100	0
Lancaster Multiple Disabilities Support	76	0	76	0	67	0
TOTAL	**729**	**57 (7.8%)**	**785**	**69 (8.8%)**	**772**	**67 (8.7%)**

VB-MAPP Achievement Data:

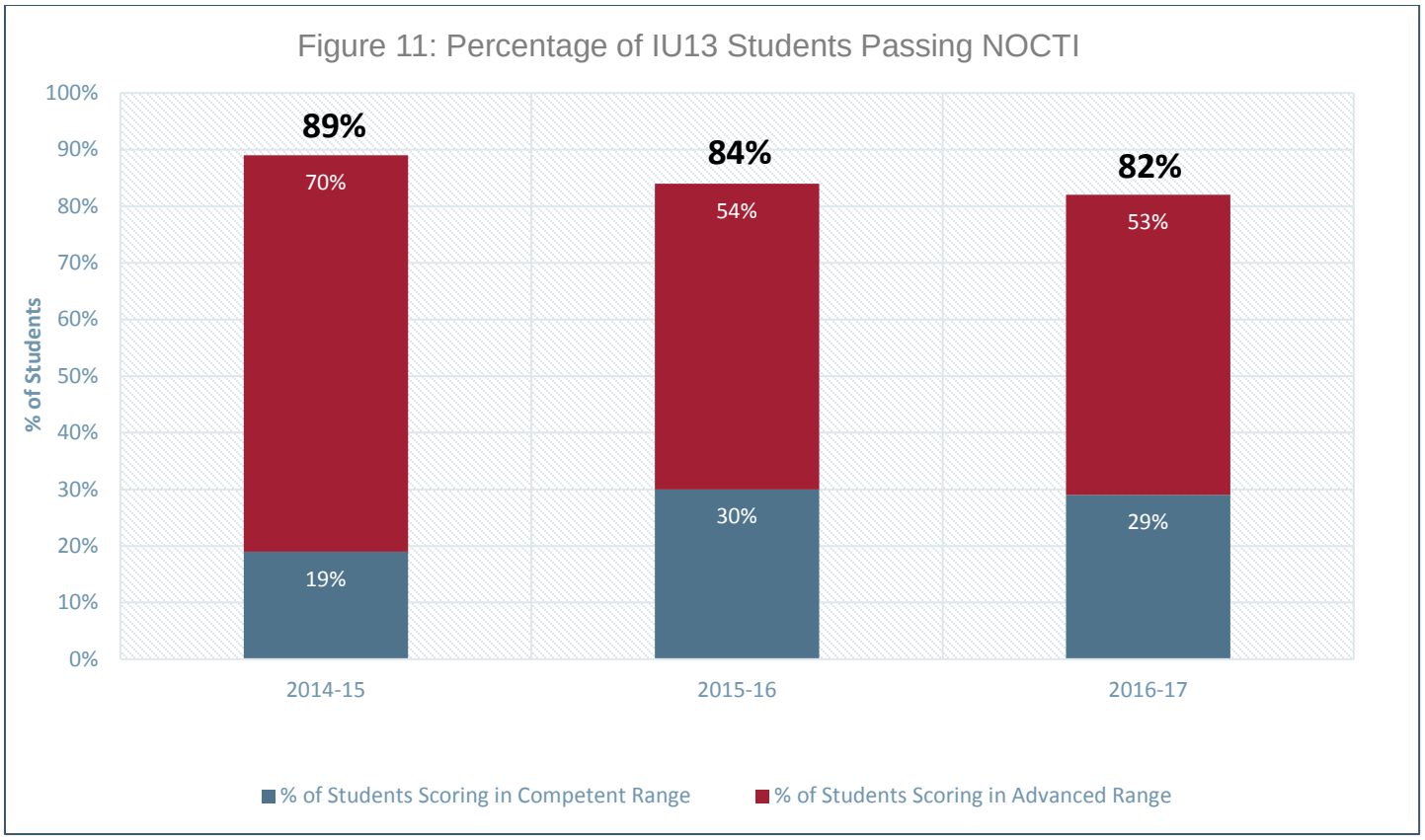
IU13 provides direct instruction to students with autism in partnership with the Lancaster and Lebanon school districts. Eighty-one (81) students in 14 IU13 autistic support classes were assessed at the beginning and end of the year using the VB-MAPP. Students gained an average of 12.66 milestones during 2016-17 as a result of their instruction in IU13 classrooms.



NOCTI Achievement Data:

IU13 provides direct instruction and support to students with IEPs enrolled in the Lancaster County Career and Technology Center (LCCTC) programs. The service also includes ongoing consultation with the LCCTC educators and administrators. Students participating at the Lancaster County CTC were given the NOCTI at the completion of their program as a measure of their skill accumulation. The NOCTI assessments are designed to assess students' skills in comparison to real-life job-specific skill expectations.

Figure 11 shows the results for the most recent skill ratings of IU13 students in the program:



Though the percentage of students passing the NOCTI decreased slightly in 2016-17, IU13 students still demonstrated a high success rate on the NOCTI exam, suggesting that their accumulation of job-specific skills will serve them well in their selected occupation. Breakdown by the CTC sites is shown in **Table 2**:

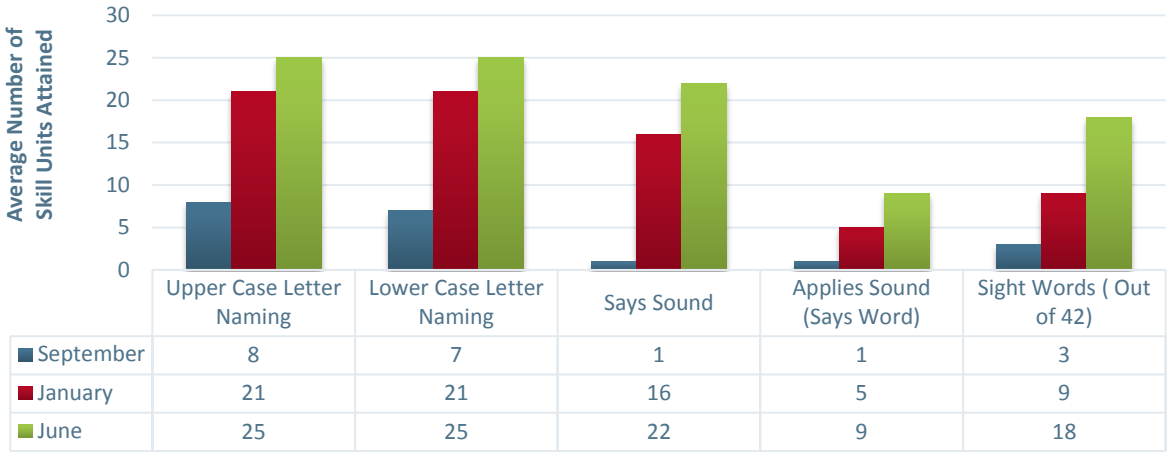
Table 2: NOCTI Scores for IU13 Students at the Lancaster County CTC 2016-17

Lancaster County CTC Campus	Total # Taking NOCTI	# Passing NOCTI	# Scoring in the Competent Range	# Scoring in the Advanced Range
Mount Joy	78	63 (80%)	21 (14%)	42 (66%)
Brownstown	69	59 (86%)	18 (17%)	41 (69%)
Willow Street	69	55 (80%)	24 (44%)	31 (56%)
All Students	**216**	**177 (82%)**	**63 (30%)**	**114 (53%)**

Early Reading and Math Achievement Data

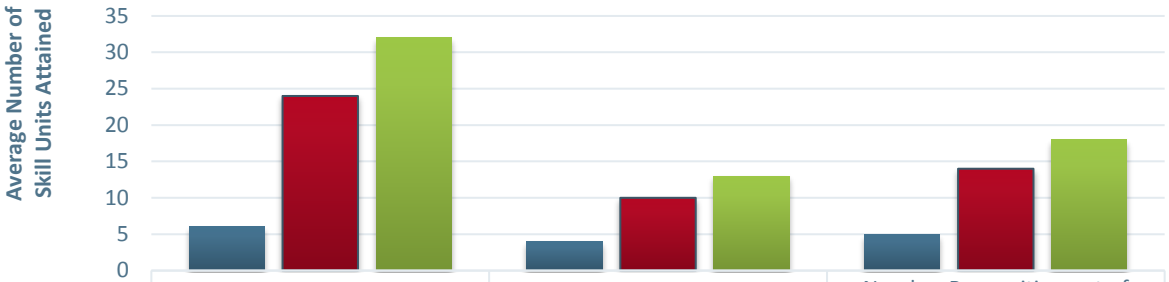
The Diagnostic Kindergarten program helps educators and parents determine the nature of a young child's learning disabilities. This program provides a developmentally appropriate environment that fosters intellectual, social, and emotional growth. The emphasis in the program is on concept formation, language development, and the development of auditory, visual, and motor skills. Students enrolled in the program were assessed in September 2016, January 2017, and May 2017, using criterion-referenced tests of early literacy and math skills developed by the program (**Figures 12 & 13**). These figures show the average number of skill units attained by students as measured by the Early Literacy and Early Math program assessments.

Figure 12:
Early Literacy Skills - Diagnostic Kindergarten (2016-17)



	Upper Case Letter Naming	Lower Case Letter Naming	Says Sound	Applies Sound (Says Word)	Sight Words (Out of 42)
September	8	7	1	1	3
January	21	21	16	5	9
June	25	25	22	9	18

Figure 13:
Early Math Skills - Diagnostic Kindergarten (2016-17)



	Rote Count	Count Sets Up to 18	Number Recognition out of 41
September	6	4	5
January	24	10	14
June	32	13	18

Throughout the course of the school year, the number of students in the program that were able to reach expected benchmarks increased, significantly reflecting the accumulation of skills by students in the program.

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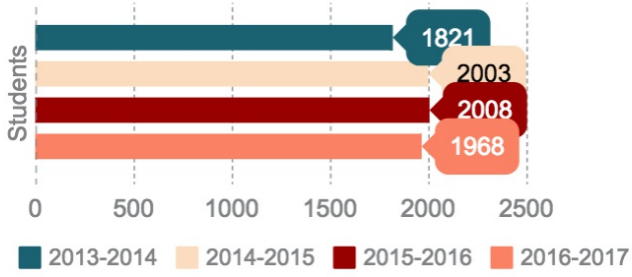
Community Education

IU13 offers High School Equivalency (HSE) and English as a Second Language Services (ESL) to adult learners in Lancaster and Lebanon counties. These classes provide adults with the necessary skills to pass the HSE examination and with the language and employability skills needed to prepare students to succeed in their community and the workplace.

Parents can also participate in family literacy classes which are designed to benefit whole families.

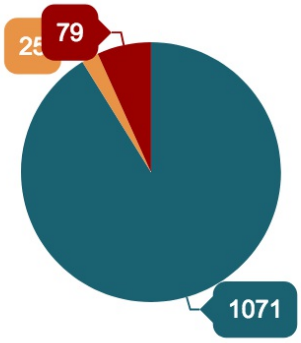
Note: Adult education data is released to IU13 on a one-year delay to ensure data quality. Information included in this report reflects the most recent data available to the program (2015-16) and also represents data from IU13's partnering agency, the Literacy Council of Lancaster-Lebanon.

Adult Education Total Enrollment



Enrollment by Program

- Federal/State Adult Education - 1,071 students
- English Language Civics - 25 students
- Family Literacy - 79 families



85%

"My teacher helps me meet my goals."

Student Satisfaction Survey

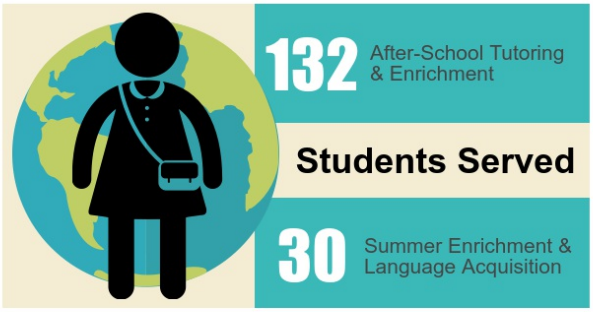
90%

"My teacher encourages me to learn."

Student Satisfaction Survey

Refugee Center & Community School

Opened in 2015 to provide educational, health, social, and emotional support services to families resettling in Lancaster County.



Data is reflective of the 2015-2016 school year.

Community Education

In addition to services to early learners and K-12 students, IU13 offers High School Equivalency (HSE) and English as a Second Language services (ESL) to adult learners in Lancaster and Lebanon counties. These classes provide adults with the necessary skills to pass the HSE examination and with the language and employability skills needed to prepare students to succeed in their community and the workplace. Parents can also participate in family literacy classes which are designed to benefit whole families. Additionally, Community Education staff serve refugee families through the Refugee Center and Community School in Lancaster City.

Community Education | iu13

Services include:

- High School Equivalency
- English as a Second Language
- Family Literacy
- Refugee Services

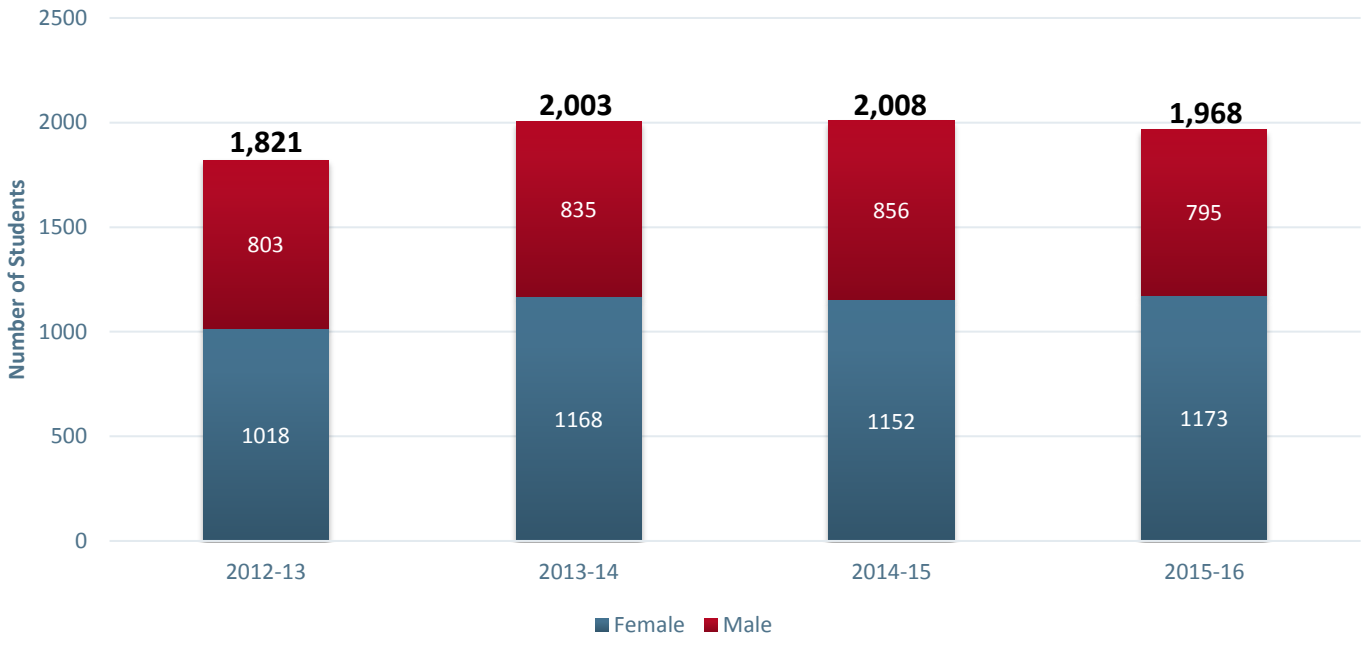
Adult education data is released to IU13 on a one-year delay to ensure data quality. Information included in this report reflects the most recent data available to the program (2015-16) and also represents data from IU13's partnering agency, the Literacy Council of Lancaster-Lebanon.

Demographic Information

Adult Education

Overall enrollment in IU13's Adult Education programs remained steady in 2015-16, with more females than males enrolling in programs and the majority of students in their twenties and thirties.

Figure 14: Enrollment in Adult Education Programs



Each year, IU13 is contracted to serve a targeted number of students to meet the requirements of the designated state and federal funding streams. **Table 3** shows the number of students enrolled in each type of contract offered by Adult Education services as well as the percentage of students enrolled compared to contracted numbers. This is important information to track as funding is frequently tied to meeting contracted enrollment numbers.

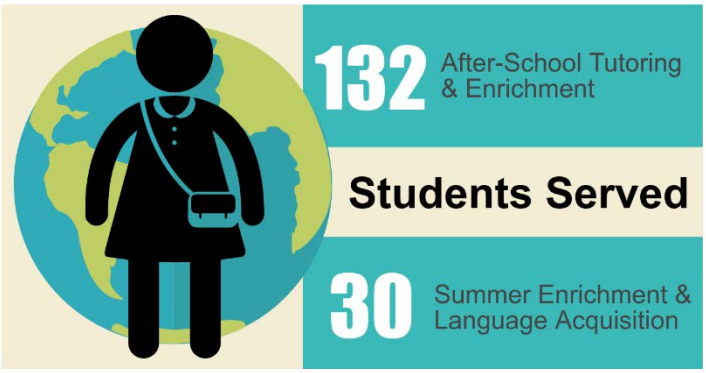
Table 3: Adult Education Enrollment Data and Completion Rates

Contract Type	2013-14 Contract Goal	2013-14 Actual Enrollment	2013-14 % of Contracted Number	2014-15 Contract Goal	2014-15 Actual Enrollment	2014-15 % of Contracted Number	2015-16 Contract Goal	2015-16 Actual Enrollment	2015-16 % of Contracted Number
Federal/State Adult Education	1,082 Students	1,117 Students	103% of Goal	1,082 Students	1,081 Students	100% of Goal	1,002 Students	1,071 Students	107% of Goal
English Language Civics	53 Students	51 Students	96% of Goal	60 Students	40 Students	67% of Goal	47 Students	25 Students	53% of Goal
Family Literacy	87 Students	91 Students	105% of Goal	87 Families	73 Families	84% of Goal	87 Families	79 Families	91% of Goal

Analysis of the data shows that in 2015-16, while numbers for federal and state adult education classes exceeded the contract goal, the English Language Civics and Family Literacy programs did not serve the contracted number of students. These areas continue to be areas of potential growth for the program.

Refugee Center & Community School at Reynolds Middle School

The Refugee Center and Community School at Reynolds Middle School (RCCSR) opened its doors at the School District of Lancaster (SDOL) in 2015, to provide educational, health, and social and emotional support services to Lancaster families. IU13 is the lead agency at the Center which represents a broad partnership among community agencies, leveraging resources to provide integrated services for the refugee and immigrant population in Lancaster City. As part of its mission, in addition to services such as meal provision, parent workshops and cultural navigation services, the Refugee Center provides support to students to accelerate their academic growth. In 2016-17, the RCCSR served 132 students with after school tutoring and enrichment activities and 30 students with summer enrichment and language acquisition activities.



Achievement/Student Learning

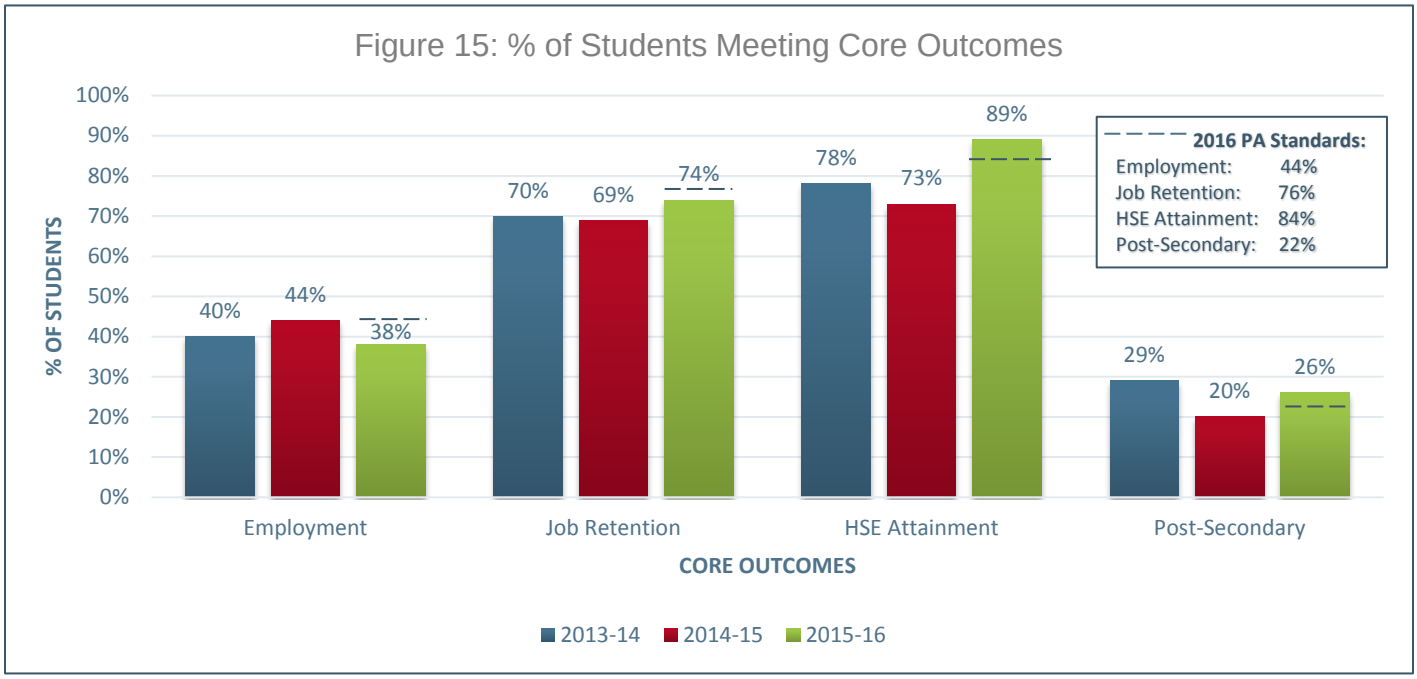
The Pennsylvania Division of Adult Education requires IU13 to track the progress of its students in multiple ways. These indicators include learning gains made by students, as well as employment, HSE attainment, job retention, and transition to post-secondary.

The most current data on IU13 programs shows mixed results for these indicators. As represented in **Table 4,** the educational functional levels (EFL) gains of IU13 students show improved learning gains in English Language Civics and Family Literacy from the prior year, both in overall levels and in comparison to other state agencies providing similar services. Students counted under the Federal/State Adult Education contract showed learning gains up one percent from the prior year; however, when compared to other agencies across the state, IU13's position dropped from the prior year, from 13th to 16th out of 54 agencies.

Table 4: Adult Education Learning Gains

Contract	2014-15 Learning Gains	2014-15 Comparison to Other State Agencies	2015-16 Learning Gains	2015-16 Comparison to Other State Agencies
Federal/State Adult Education	48%	13th/55	49%	16th/54
English Language Civics	28%	16th/16	56%	5th/16
Family Literacy	47%	11th/21	53%	8th/20

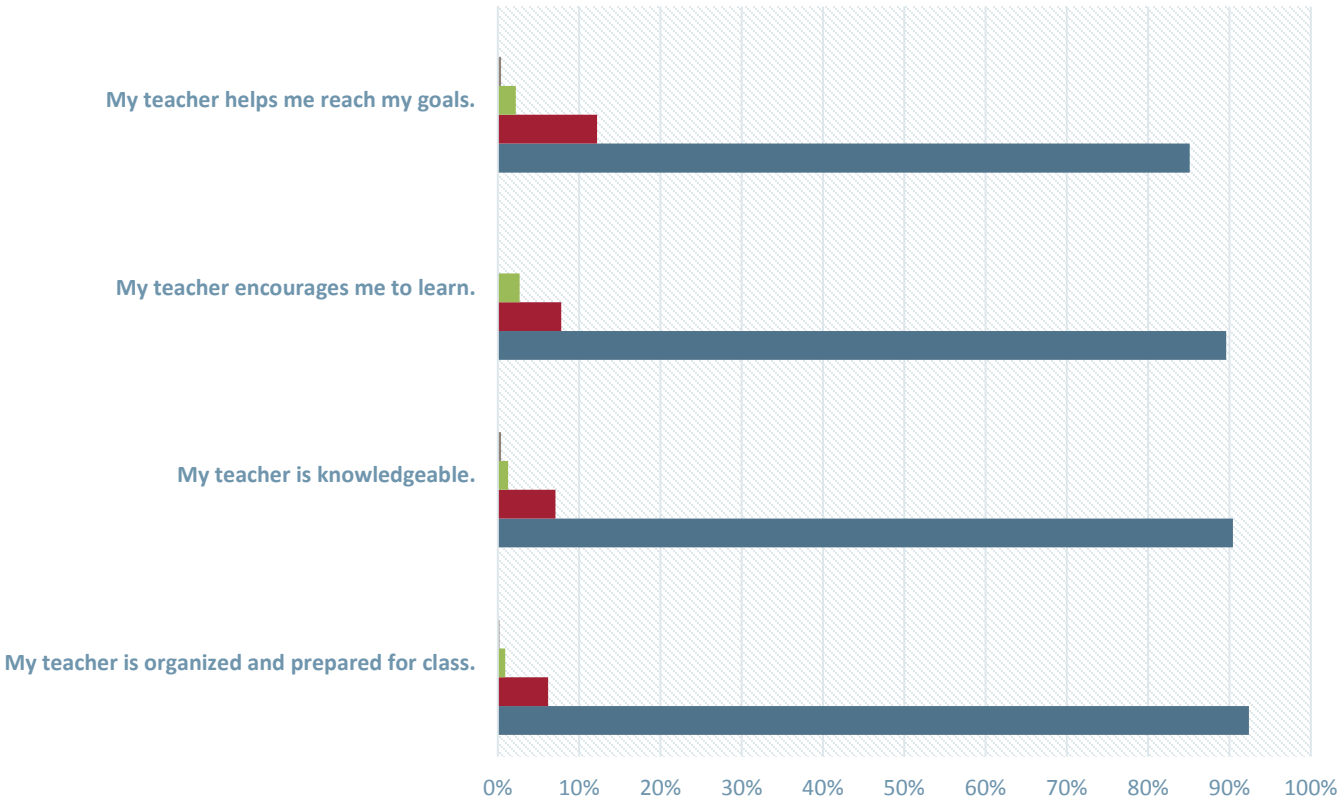
Figure 15 represents the percentage of students meeting the core outcomes requirements for Pennsylvania adult education programs. IU13 exceeded the Pennsylvania (PA) standard for HSE attainment and post-secondary outcomes, reversing a prior downward trend, but fell below the PA Standard in employment and job retention.



Perceptual Data

The Community Education program annually asks students to complete surveys regarding their satisfaction with the services they received. Four hundred and fifty responses were analyzed. As shown in **Figure 16**, the students indicated a high level of satisfaction with their teachers.

Figure 16: Student Survey - Adult Education



	My teacher is organized and prepared for class.	My teacher is knowledgeable.	My teacher encourages me to learn.	My teacher helps me reach my goals.
Never	0%	0%	0%	0%
Rarely	0%	0%	0%	0%
Sometimes	1%	1%	3%	2%
Usually	6%	7%	8%	12%
Always	92%	90%	90%	85%

*Percentages may not add up to 100% because of rounding.

Discussion

An analysis of this most recent data in Community Education revealed several trends in the indicators that are worth further discussion. Student surveys showed that participating students continue to value their instruction and believe that their teachers care about them. In addition, enrollment numbers remained strong for the primary federal/state adult education contracts which impacts future funding from the state.

The Community Education Program Improvement Team continues to look for ways to better improve the program's outcomes. Recommendations to improve practices include more detailed tracking of enrollment and learning gains data to improve accuracy, adjustments to class schedules for improved access, and ongoing alignment of curriculum and instruction with best practices.

Nonpublic School Services

IU13
An Education Service Agency

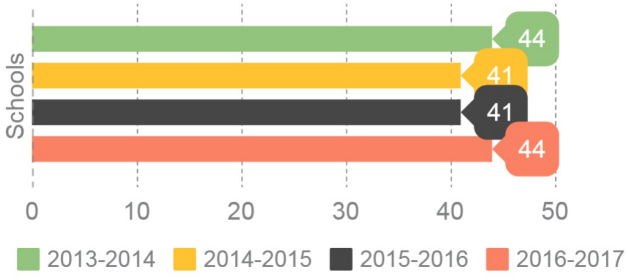
IU13 provides remedial and support services to eligible Lancaster and Lebanon county students who attend nonpublic schools through the use of Act 89 state funds and Title I federal funds.

Title I
Title I services are provided on behalf of local school districts.

Act 89
Act 89 regulations require that intermediate units provide equitable services to students attending nonpublic schools.

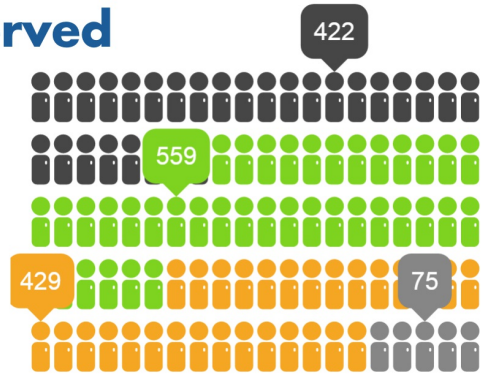
Additional Services
IU13 reading and math specialists, speech and language therapists, school counselors and psychologists work directly with identified students to improve their academic and social/emotional needs.

Act 89 Schools Served



Students Served

- Remedial Math Services - 422
- Remedial Reading Services - 559
- Speech and Language - 429
- Psychological Referrals - 75

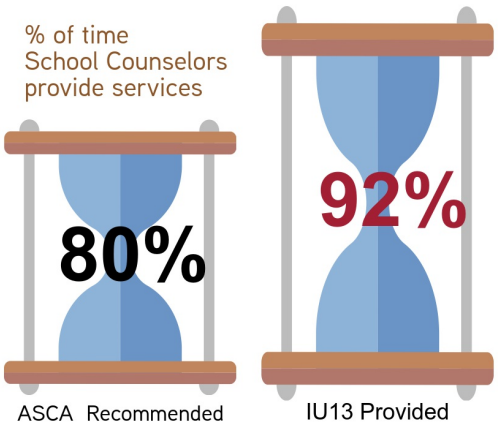


Some students receive multiple services.

School Counseling Services

22
Number of Nonpublic Schools using IU13 School Counseling Services

5,557
Number of times students received services by the IU13 Nonpublic School Counselors

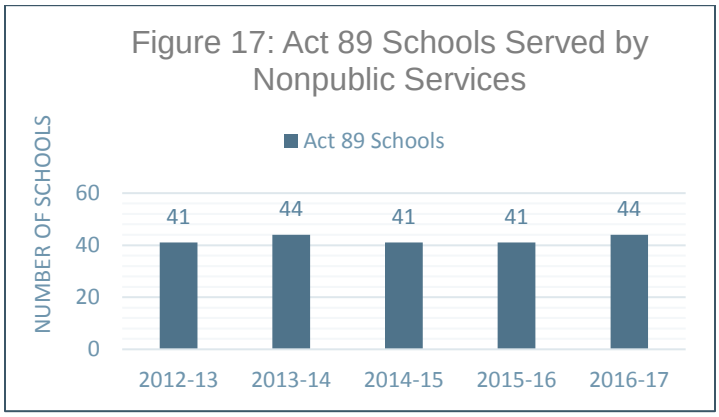


Data is reflective of the 2016-2017 school year.

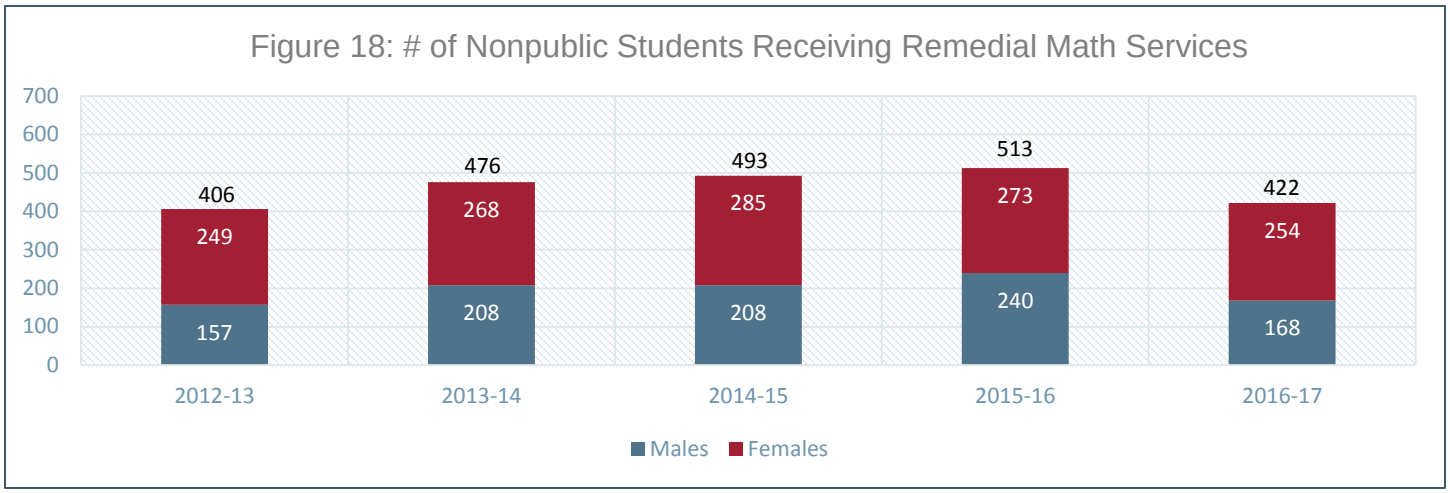
Nonpublic Services

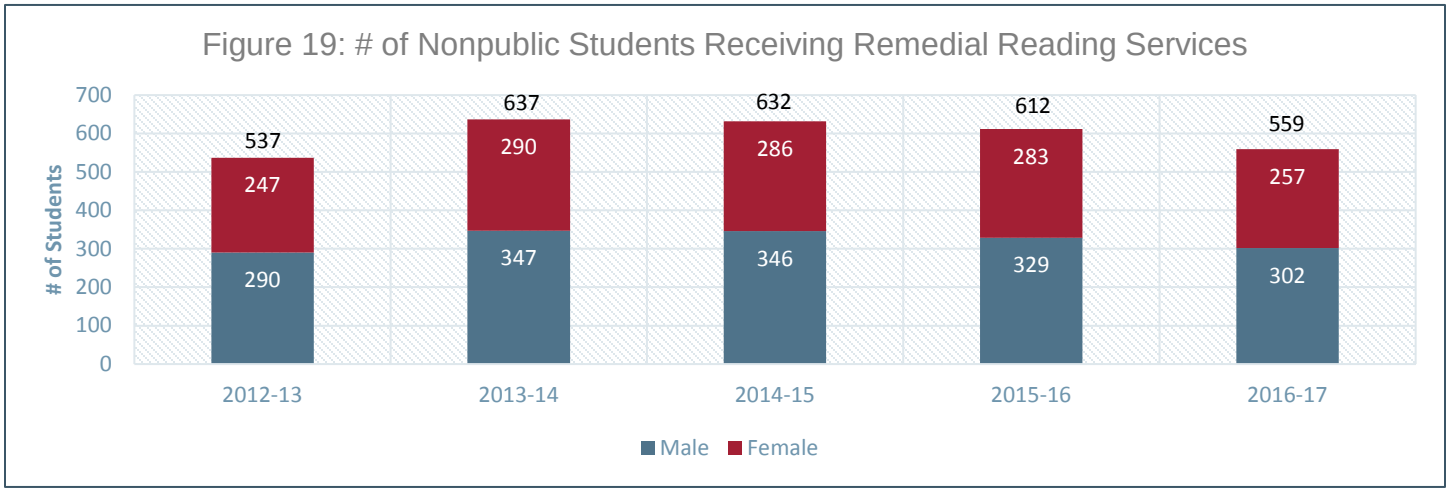
Demographic Information

IU13 has consistently provided services to students in more than 40 nonpublic schools. **Figure 17** shows the trend in the number of schools served over the past five years.

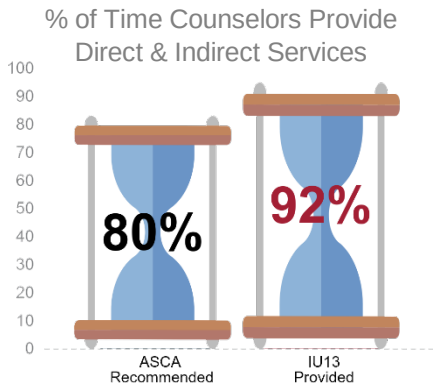


A breakdown of the number of students receiving reading and math remedial services is detailed below in **Figure 18** (remedial math services) and **Figure 19** (remedial reading services):

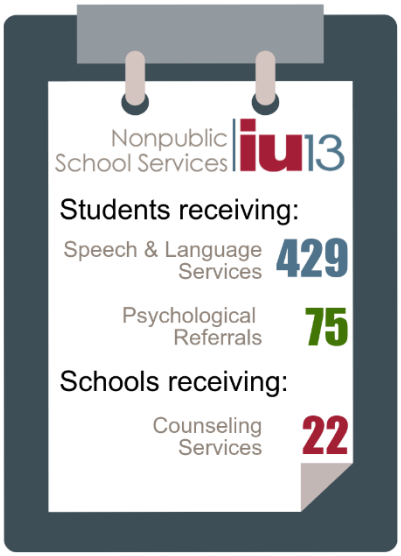




In addition, 429 students received speech and language services and 75 psychological referrals were conducted. IU13 also provides counseling services to students in 22 nonpublic schools in Lancaster and Lebanon counties. **Figure 20** shows the number of students served by IU13 counselors over the past three years:

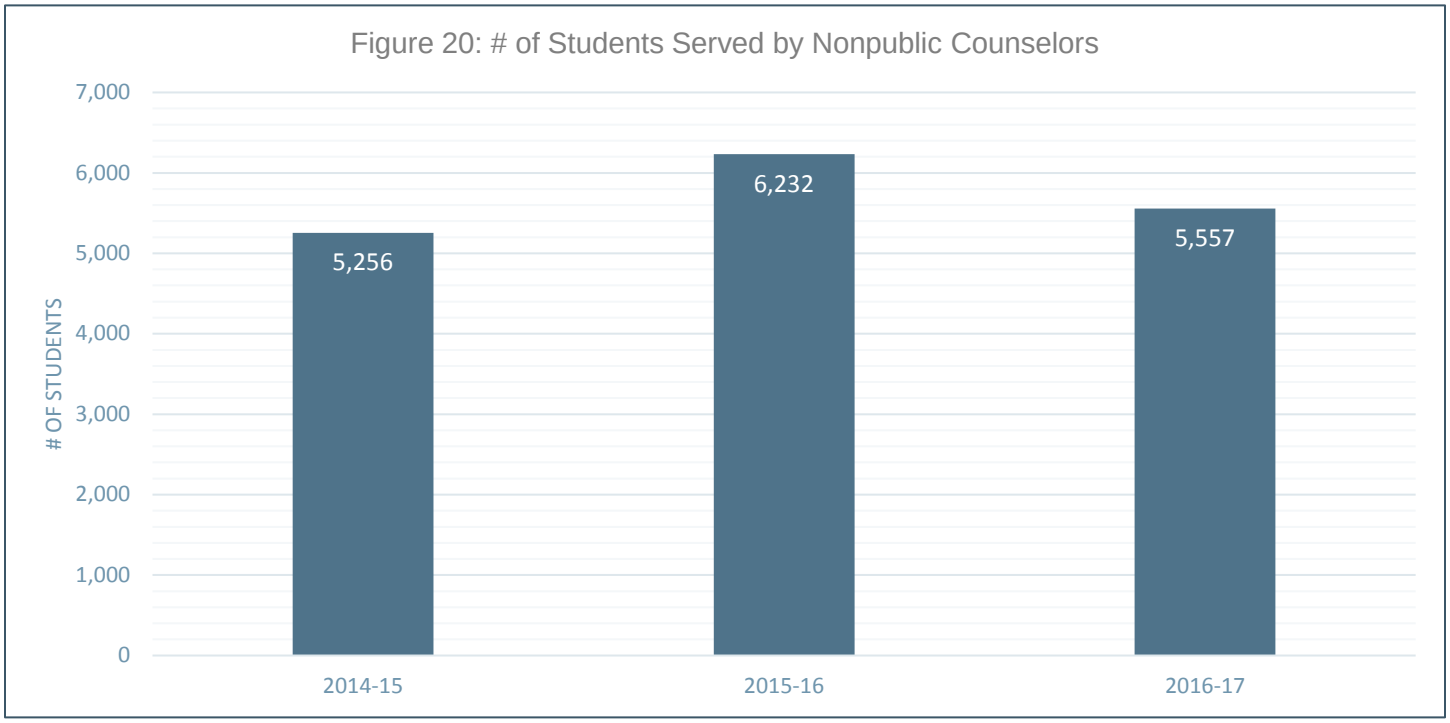


The American School Counselor Association recommends that school counselors spend at least 80% of their time providing direct and indirect services to students. The nonpublic school counselors consistently exceeded these recommendations, with 92% of their time spent providing direct and indirect services to students in 2016-17. This number represents the strong commitment IU13 has made to maximize the availability of services to schools and students.



Achievement/Student Learning

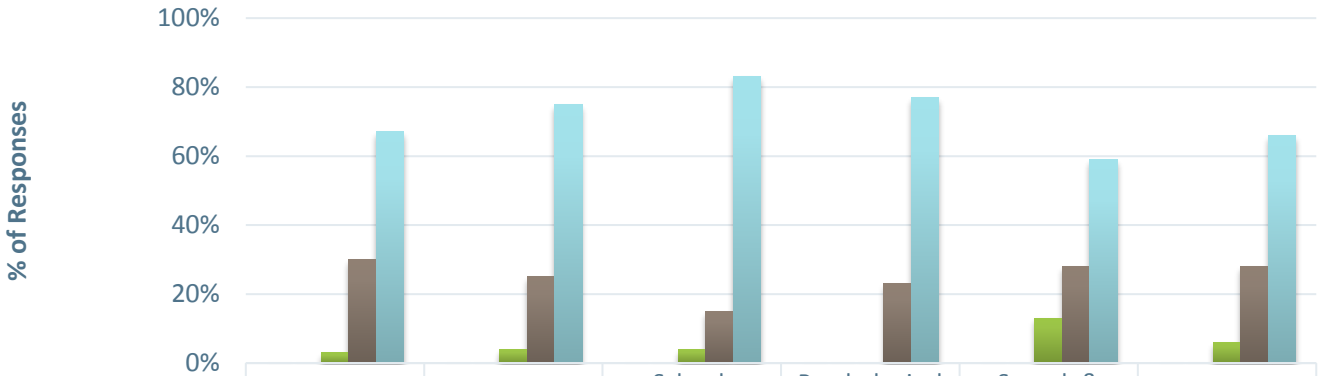
Nonpublic reading and math specialists work directly with students who are identified as having below grade-level skills in reading and math. The services consist of pullout small group sessions designed to remediate key skills in these areas. As a result of these interventions, 32% of the identified students participating in the services were able to reach performance levels which placed them in the instructional range of their grade-level classroom, and therefore were exited from the IU's remedial services.



Perceptual Data

Nonpublic administrators were surveyed regarding their satisfaction with Nonpublic Act 89 and related services. The results of the survey are indicated below in **Figure 21**:

Figure 21: Satisfaction Ratings - Nonpublic Services



	Reading	Math	School Counseling	Psychological Services	Speech & Language	Office Staff
1 - Poor	0%	0%	0%	0%	0%	0%
2 - Below Average	0%	0%	0%	0%	0%	0%
3 - Average	3%	4%	4%	0%	13%	6%
4 - Above Average	30%	25%	15%	23%	28%	28%
5 - Excellent	67%	75%	83%	77%	59%	66%

*Percentages may not add up to 100% because of rounding.

Overall, ratings on the surveys show a consistent rating of satisfaction with services by the nonpublic administrators, suggesting that the staff is meeting the designated needs of the schools and their students. Any rating of a "3" or lower is followed up with a personal phone call to the nonpublic administrators to discuss ways to improve services.

Curriculum & Instruction Services

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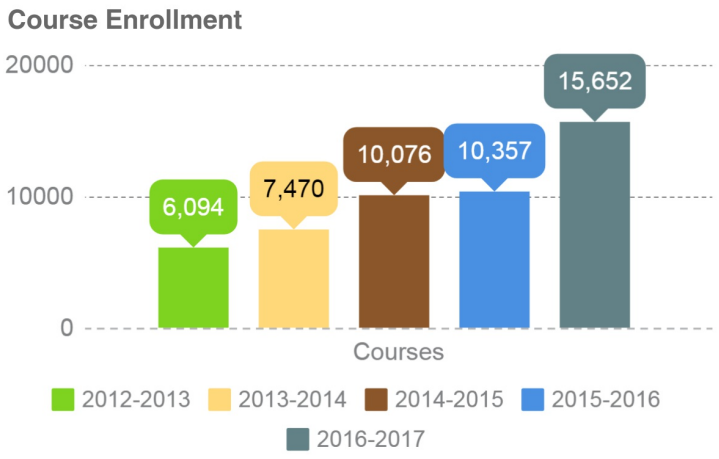
IU13 Curriculum & Instruction (C&I) services are designed primarily to improve the skills of district and IU13 teachers and administrators as they interact and instruct their students.

Content Areas:
Literacy
STEM
Instructional Technology
Gifted Services

Services:
Workshops
Instructional coaching
Technical assistance
Curriculum, Instructional, and Assessment audits

Lancaster-Lebanon Virtual Solutions (LLVS)

LLVS provides districts and students with a high-quality, cost-effective online learning solution. LLVS currently serves students from 16 public and nonpublic school districts.



94% Completion

94% of students complete at least 90% of courses

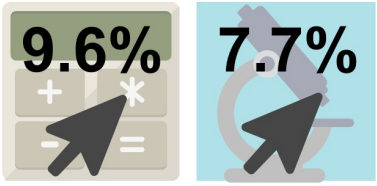
Partnerships to Understand and Lead STEM Education (PULSE)

PULSE, a Math Science Partnership grant, was launched by IU13 in 2013. The 3-year program was an action-research study designed to measure the impact of targeted professional development for educators as it relates to student achievement in math and science.

3 Years
38 Schools
163 Teachers
15,000+ Students

Teacher Outcomes

Teacher Content Knowledge (TCK) increased an average of 9.6% in math and 7.7% in science



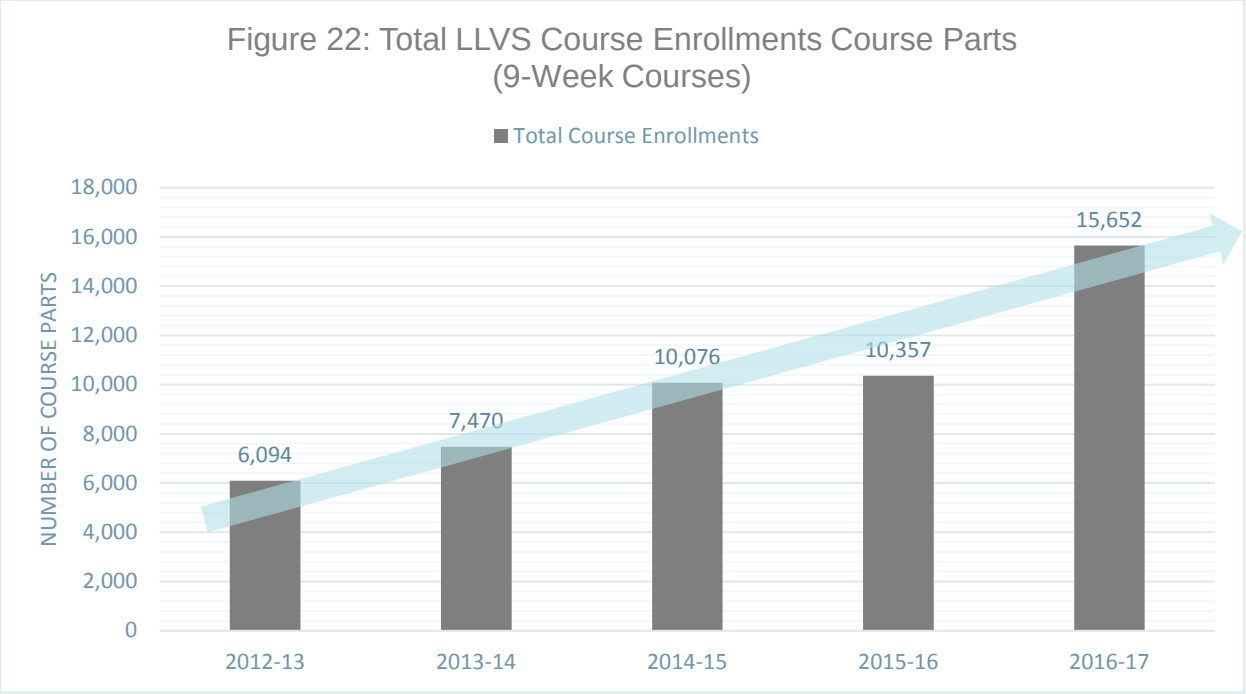
Data is reflective of the 2016-2017 school year.

Curriculum and Instruction

Demographics

Over the past several years, the Curriculum and Instruction (C&I) staff has offered numerous marketplace services to IU13 districts. These services are available to schools on a fee-for-service basis; thus allowing educators to choose those offerings which best meet their particular needs. All 22 districts, plus the two Career and Technology Centers, purchased services from the C&I program during the 2016-17 school year. School District of Lancaster was the largest purchaser of C&I services, with Manheim Central, Cornwall-Lebanon, Elizabethtown Area, and Hempfield rounding out the list of top five purchasers.

The Curriculum and Instruction program also includes the cyber program, Lancaster-Lebanon Virtual Solutions (LLVS), which provides districts with access to an extensive portfolio of online courses, along with technical assistance and computer support. LLVS has maintained a consistent number of districts participating in the program over its five-year history, with 16 public and nonpublic school districts participating during 2016-17. The number of actual course enrollments over the past five years has steadily increased, showing the increasing popularity of online learning, as shown in **Figure 22**:



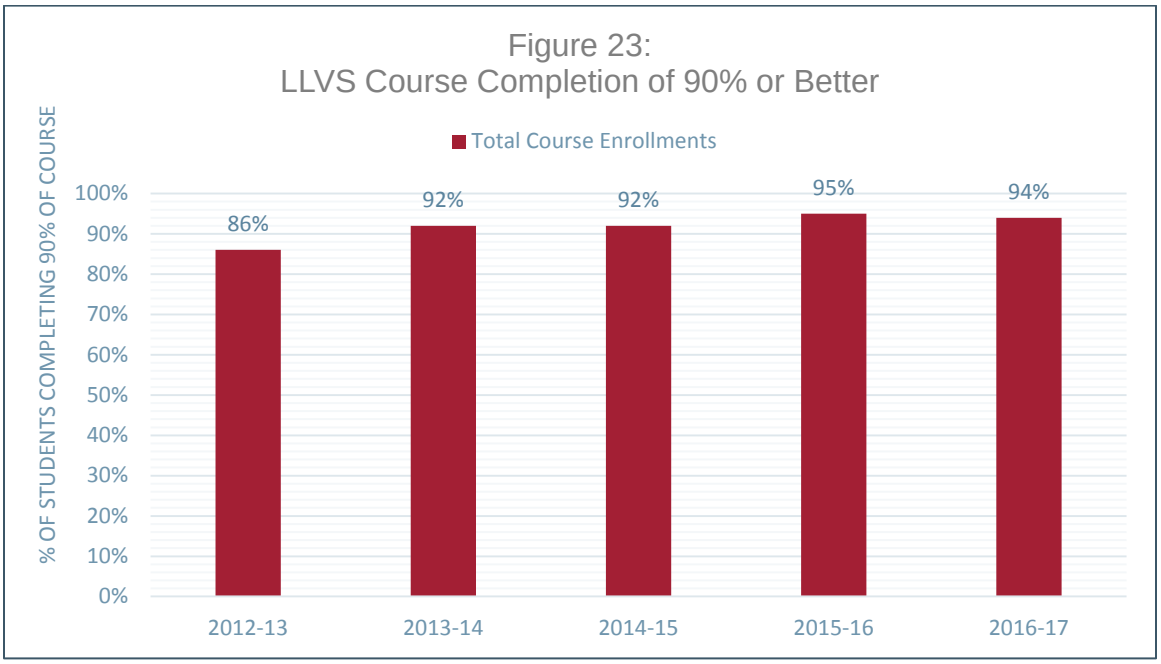
Achievement/Student Learning

Lancaster-Lebanon Virtual Solutions (LLVS)

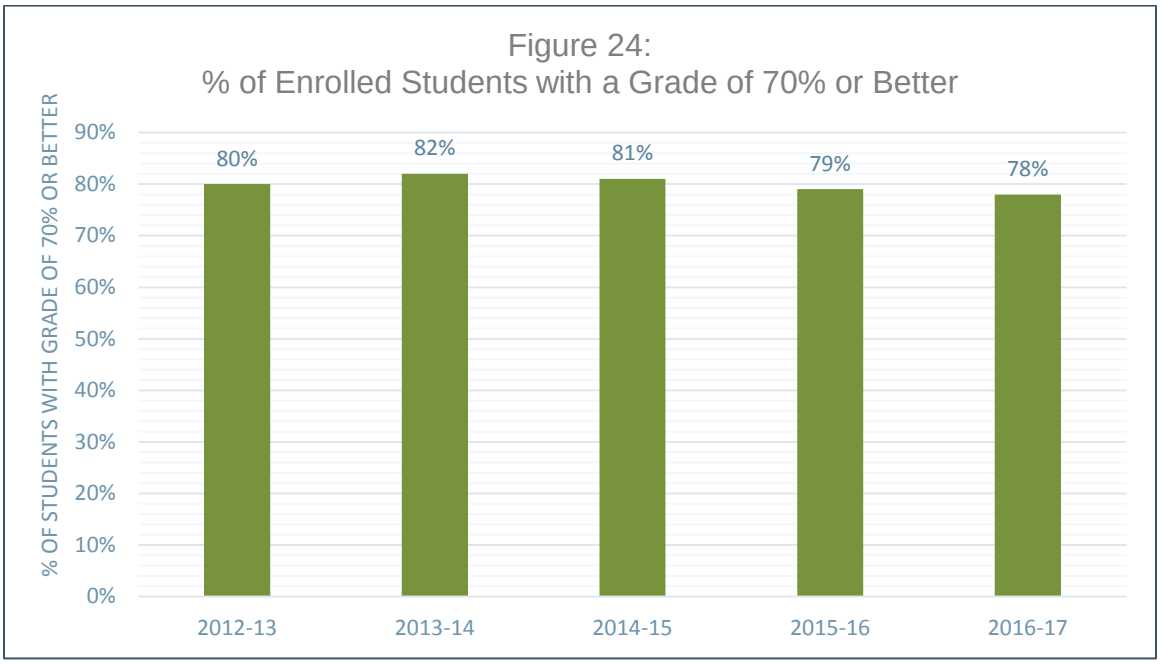
Students who participate in LLVS courses are provided instruction by teachers employed by the online content provider. LLVS, therefore, is not directly responsible for the learning gains of its enrolled students. Instead, LLVS provides districts and students with services that are designed to maximize learning opportunities. These services include, but are not limited to, support to district mentors who interact with students to make sure they are being successful in an online environment, help desk assistance to students should they encounter any technical difficulties, and a job-alike group designed to provide

a forum for networking and professional development. It is believed that all of these services will result in better outcomes for students, both in the course completion rate and passing grades.

Data from LLVS support this belief. Course completion is an important component of online learning. Without proper support, students can easily become frustrated with this more independent method of learning. LLVS students have maintained a high level of course completion over the years as shown in **Figure 23**:



Over three-quarters of the students enrolled in LLVS classes received a 70% or better for their final grade, though the trend shows a slight downward trend over the past 3 years as shown in **Figure 24**:



This could be related to a much wider use of online courses with students which will require school districts to increase their supports to students and monitoring of course status. The LLVS staff will be reviewing the supports offered to students to ensure that they are receiving the attention they need to successfully manage the course expectations.

Professional Development and Consultation Services

IU13 consultants rarely provide direct instruction to students. Their task instead is to influence student achievement by training educators on best practices and assisting them in the implementation of these practices at the classroom, building, and district level. As a result, the selection and analysis of the designated data have been designed to answer the second analysis question:

Is the professional development and training offered by IU13 of high quality and effectiveness, resulting in more highly trained educators who will in turn, impact student achievement?

The C&I team strives to provide expert services to increase their impact on IU13 teachers and students. One measure of this quality is demonstrated by the results of their Math Science Partnership grant**,** the **Partnership to Understand and Lead STEM Education (PULSE).** The IU13 MSP grant program is an action-research study designed to measure the impact of targeted professional development for educators on student achievement in math and science. By increasing the content knowledge and pedagogical skills of participating teachers, it is hypothesized that student achievement in the targeted concepts and standards should increase. Developed in partnership with local colleges, school districts, and community agencies, each MSP program is a three-year project, funded by the U.S. Department of Education and administered by the PA Department of Education. Secondary math, science, and technology-education teachers participate in a summer 80-hour STEM Institute designed to deepen content knowledge and pedagogy. During the subsequent school year, participating teachers work as building-based professional learning communities, receive instructional coaching from one of the IU13 STEM consultants, and participate in three days of professional development. Information shared in this data report is drawn from the data analysis done of years 1 through 3 of the grant, i.e. 2013-16.

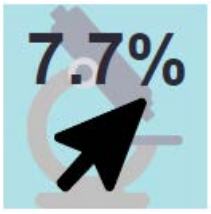
Assessments used as part of the research design for the MSP grant include:

- **Reformed Teaching Observation Protocol (RTOP);**
- **Keystone Exams;**
- **Pennsylvania System of School Assessments (PSSAs);**
- **Classroom Diagnostic Tools (CDTs);**
- **Pennsylvania Value-Added Assessment System (PVAAS)**; and the
- **Danielson Domains**

For a description of each assessment, see *Appendix A*.

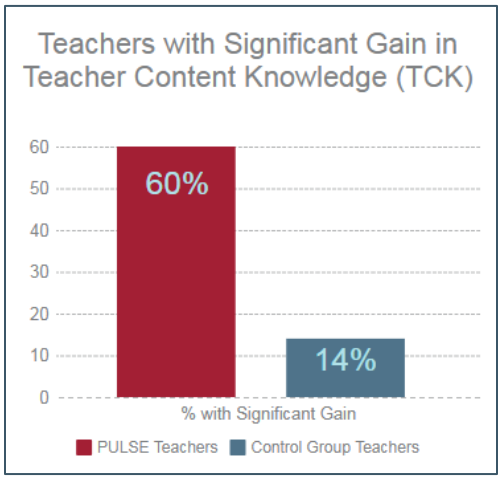
Participants:
Over the three years of the grant, 163 teachers from 38 public and nonpublic middle and high schools completed PULSE. PULSE's primary audience was secondary math and science teachers, but technology/engineering education and agriculture teachers were also welcome to the group. Collectively, the PULSE participants taught over 15,000 students.

Teacher Outcomes:



As part of the PULSE Summer STEM Institute, all teachers took a pretest and posttest on either math or science topics, designed to measure gains in teacher content knowledge (TCK) resulting from their Institute participation. TCK was one of three grant-required measurements. In all three years, on both the math and the science test, teachers showed statistically significant gains in TCK between the start and end of the Institute, with an average gain of 9.6 percentage points in math and 7.7 points in science.

Another group of teachers, the "control group," also took the TCK tests each year, although they did not participate in the summer STEM Institutes. The purpose of the control group (CG) was to help the PULSE staff, faculty, and evaluators know that any TCK gains shown by the PULSE participants could be attributed to their attendance at the summer STEM institute, and not random chance. In Year 1, the math control group teachers showed a gain between pretest and post-test scores similar to that of Institute participants. Because the math CG teachers showed increases in their scores despite not attending the Summer Institute, PULSE faculty and evaluators reviewed the Summer 2013 math TCK test and found some misalignment between the test and the Institute content, meaning that several tested topics were addressed either insufficiently, or not at all, and thus the gains in math shown by the Institute attendees may have been due to "luck," guessing, or other factors. Steps were therefore taken to better align the math TCK test with the Institute in 2014. In Years 2 and 3, the science and math CG teachers showed no gain or only a small gain between pretest and posttest.



Across all three project years, 161 teachers completed either the math or science full PULSE professional development program. Of those, a total of 97 teachers (60%) had a significant gain in TCK between pretest and posttest, whereas only 18 of the 133 math and science CG teachers (14%) had a statistically significant gain in TCK between pretest and posttest. Additionally, the TCK gains made by teachers who participated in PULSE were significantly larger than the gains made by the CG teachers.

After the Summer Institute, teachers could work with an IU13 STEM Consultant to apply newly learned content and pedagogical knowledge in their classroom. All PULSE participants participated in at least one coaching session. Changes in instructional practices were then measured through classroom observations using the RTOP and the Danielson Domains #1 (Planning and Preparation) and #3 (Classroom Instruction). Significant gains in instructional practices were seen in all three project years.

Student Outcomes

The analysis of student results is more limited due to the lack of consistent assessments across grades and subjects, thus limiting the consistency and number of student results available at each grade and content area. Results of Math and Science PSSAs were varied significantly across years, making it difficult to reach any reliable conclusions. Assessments targeted to measuring growth, however, showed more positive patterns. PVAAS data suggested that PULSE had a positive impact on student achievement in math, particularly for students in 9th and 10th grades and on student achievement in science for students in Grades 8 through 10. A more detailed analysis of both teacher and student outcomes can be found in Appendix B which contains the comprehensive **Community Report for PULSE**.

Perceptual Data

Feedback from PULSE participants showed overall positive associations with the project. Specific teacher comments included:

- *Although it will take a great deal of preparation, there are meaningful ways to integrate math, science and technology. I have learned some meaningful science in the area of agriculture, and how these real world problems can be incorporated into some exciting mathematical applications. – Math teacher*
- *The best part was the atmosphere…I have not been in such a high concentration of (learning) energy since college. – High school math teacher*

- *The most valuable part for me was deepening my knowledge of subjects…The more I know, the better I am able to draw connections to my own teaching content, regardless if it directly applies or not. – High school science teacher*
- *I will be actively seeking out the input and assistance of the algebra teachers when I am planning my units…If I can use the same language that they do, I can avoid having to "re-teach" algebra. – High school science teacher*

Teacher feedback suggests that local educators see the value in the skills they gathered through their PULSE training and are taking these skills back to their classroom.

Promising Practices

IU13 is committed to delivering exemplary service to its community. As part of this commitment, IU13 staff are constantly seeking ways to build "promising practices" to increase student outcomes.

Promising Practices Exemplars:

- Project MAX (Maximizing Access and Learning)
- Integrated Technology in ECSES Classrooms
- Improved Reentry Education (IRE)

PROMISING PRACTICES

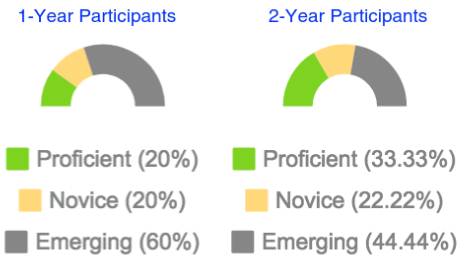
Project MAX

PROJECT MAX

Project MAX focuses on building the capacity of Pennsylvania schools and intermediate units (IU) to provide students with complex instructional needs with maximum access to and learning of grade level, general education curriculum and Pennsylvania standards.

-www.pattan.net

PASA Performance (Reading)



The results suggest that these practices are beneficial to students and should continue to be explored.

Integrated Technology in ECSES Classroom

INTEGRATED TECHNOLOGY IN SPECIAL EDUCATION

The technology use was designed to increase student engagement, thus decreasing disruptive episodes. It was also believed that increased student engagement would improve attendance rates since students would more likely want to participate in more appealing assignments.

70 Students

5 Autistic Support Classrooms

Emotional Support Classrooms **6**

Improved Reentry Education (IRE)

IMPROVED REENTRY EDUCATION (IRE)

IU13 was recently awarded a grant to expand reentry services to incarcerated individuals and those returning to the community who wish to pursue education and career opportunities.

High School Equivalency

Adult Basic Education

English as a Second Language

154 Participants

Data is reflective of the 2016-2017 school year.

Promising Practices

IU13 prides itself on its commitment to its students and delivering exemplary services to its community. As part of this commitment, IU13 staff is constantly seeking ways to build on emerging best practices to increase student outcomes. This is achieved through piloting new instructional practices or working with state, community and business partners. For the purposes of this report, the results of these initiatives will be examined in light of the following analysis question:

Has the implementation of IU13's promising practices resulted in improved student outcomes?

Three initiatives will be reviewed. They include:

- **Project MAX** (Maximizing Access and Learning)
- **Integrated Technology in ECSES Classrooms**
- **Improved Reentry Education (IRE)**

Project MAX

Project MAX focuses on building the capacity of Pennsylvania schools and intermediate units (IU) to provide students with instruction based on the Pennsylvania Standards. IU13 staff involved in Project MAX participated in formalized teaming processes designed to support systems change, including monthly professional development; coaching; data-driven decision making; and standards-aligned instruction. Student progress was measured by performance on the Pennsylvania Alternative System of Assessment (PASA). **Figure 25** shows the outcomes for students participating in the program.

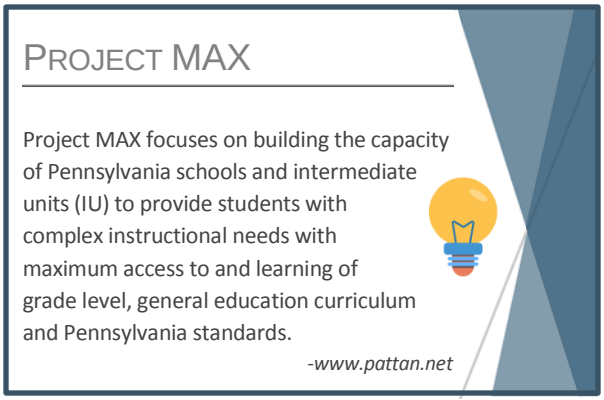
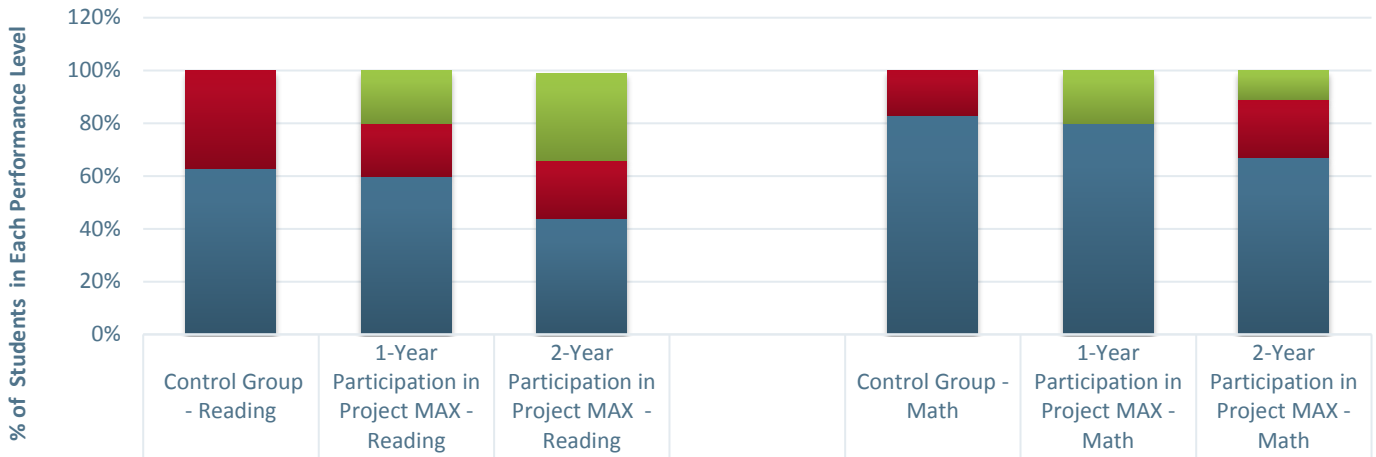


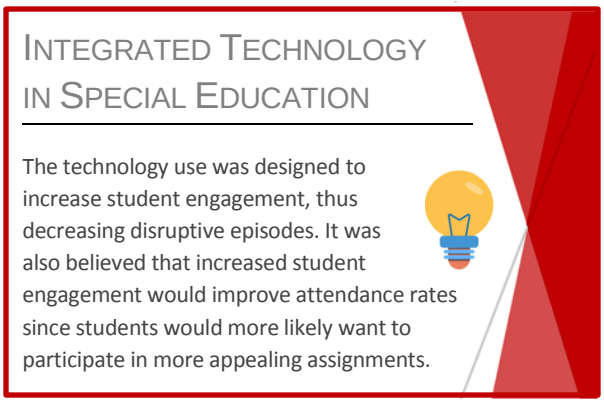
Figure 25: Project MAX - PASA Performance



	Control Group - Reading	1-Year Participation in Project MAX - Reading	2-Year Participation in Project MAX - Reading		Control Group - Math	1-Year Participation in Project MAX - Math	2-Year Participation in Project MAX - Math
Proficient	0%	20%	33%		0%	20%	11%
Novice	37%	20%	22%		17%	0%	22%
Emerging	63%	60%	44%		83%	80%	67%

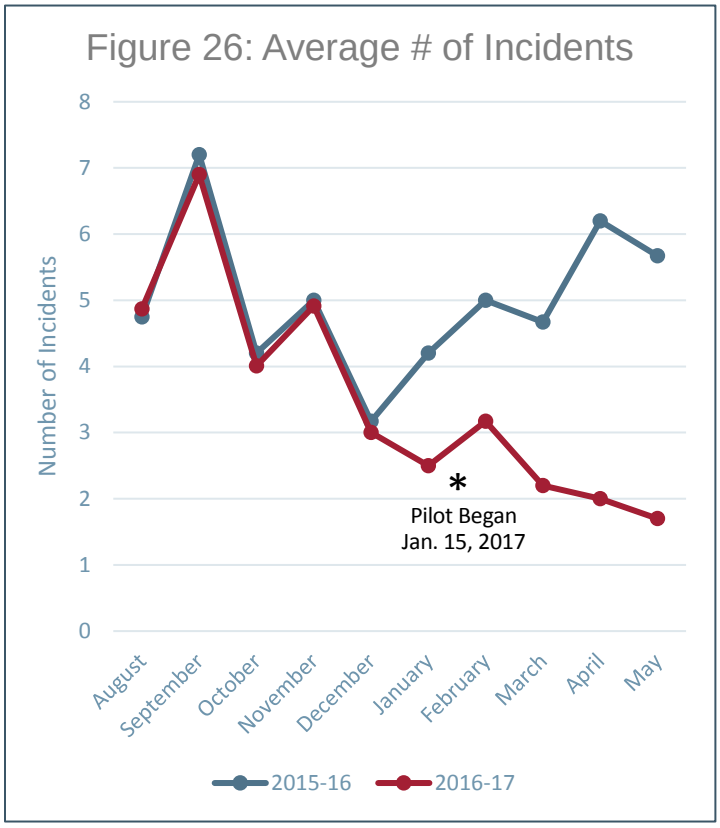
Students who participated in Project MAX for two years were significantly more likely to be proficient on the PASA than those students who had not received the intensive resources provided by the project (33% vs. 0%- Reading, 11% vs. 0% - Math). Students with only one year of participation were also significantly more likely to be proficient on than the PASA (20% vs. 0% - Reading, 20% vs. 0% - Math). These results strongly suggest that these practices are beneficial to students and should continue to be explored as promising practices.

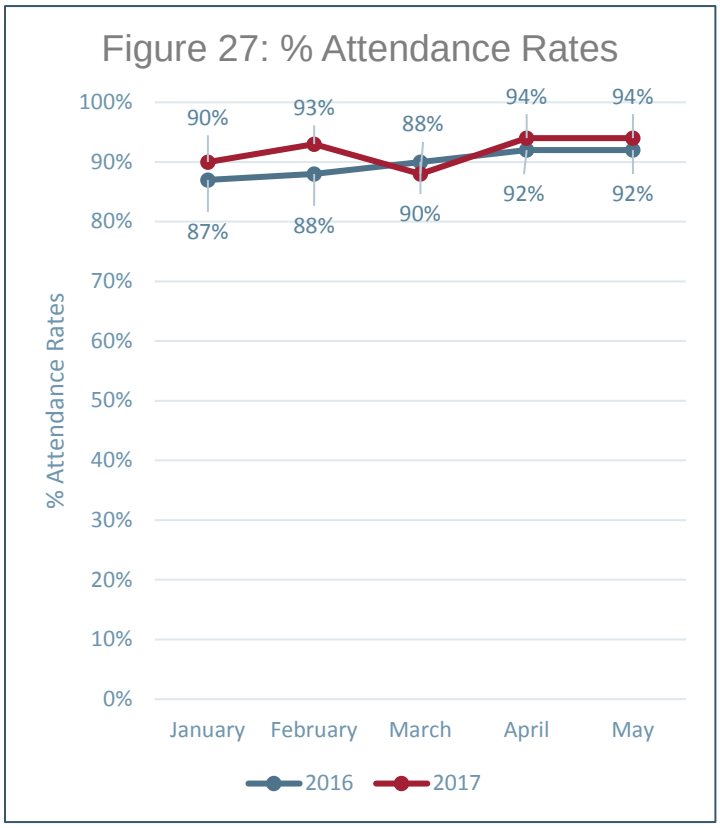
Integrated Technology in ECSES Classrooms



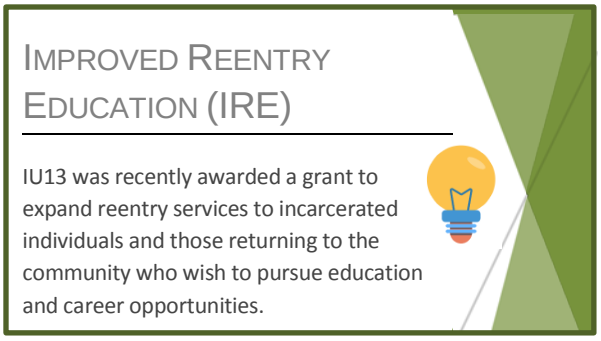
Beginning in January 2017, eleven elementary classrooms (5 Autistic Support and 6 Emotional Support classrooms) were targeted to participate in an integrated technology initiative designed to increase the availability and use of technology in classroom instruction. Approximately 70 students in kindergarten through middle school were given iPads or Chromebooks to use in the classroom to complete both independent tasks and teacher directed/whole group assignments. The technology use was designed to increase student engagement, thus decreasing disruptive episodes. It was also believed that increased student engagement would improve attendance rates since students would more likely want to participate in more appealing assignments. Data gathered in these areas support these hypotheses.

Figure 26 shows that there were fewer incidents when compared to last year and a decreasing trend of incidents during the 2017 school year. The data also suggests that there is some impact on school attendance as shown in **Figure 27**. Both of these trends should be monitored to see if they continue as the initiative continues.

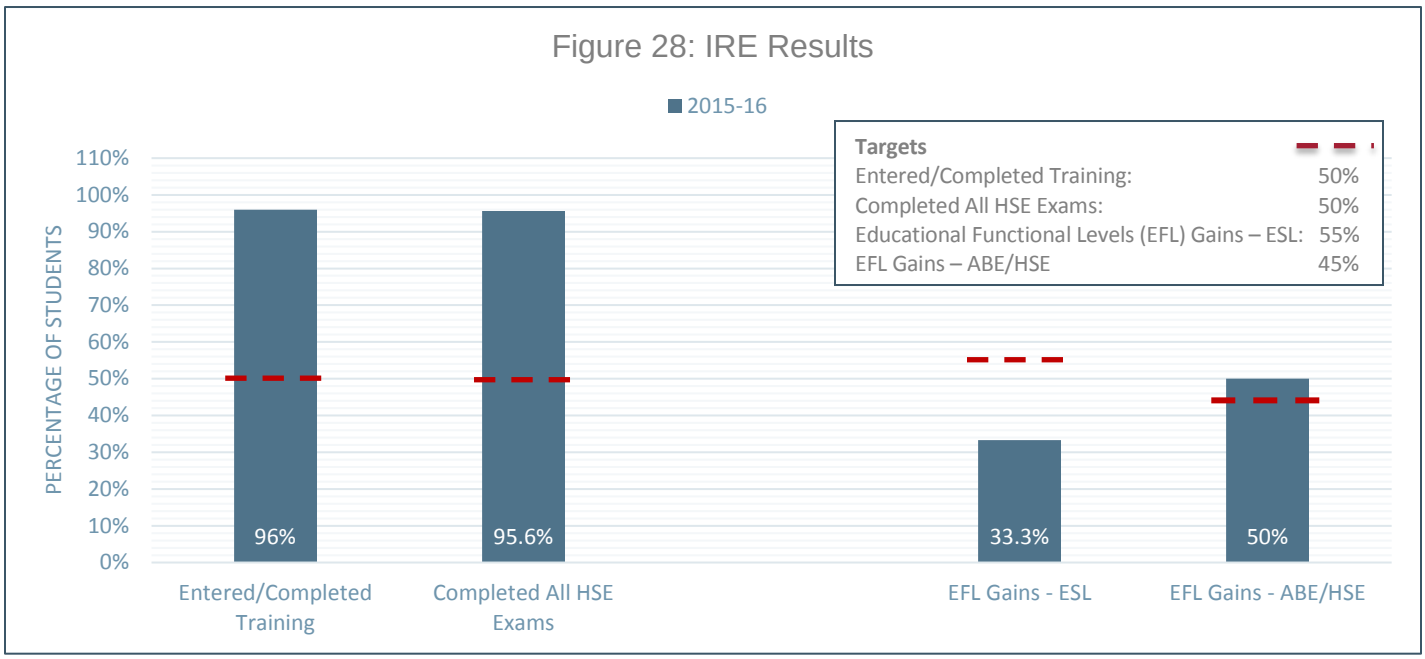




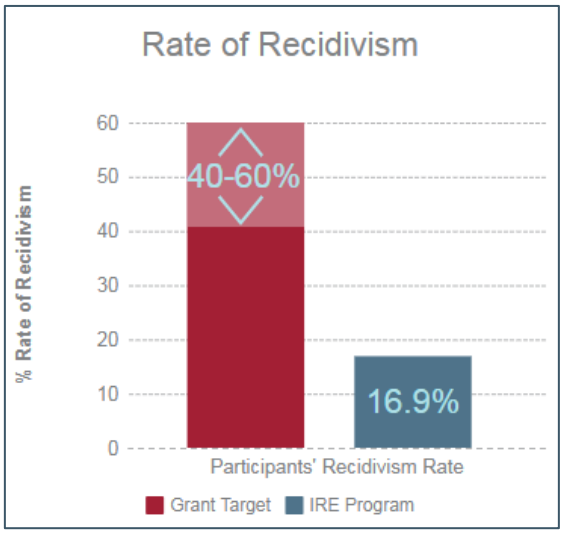
Improved Reentry Education (IRE)



IU13 was recently awarded a grant to expand reentry services to incarcerated individuals and those returning to the community who wish to pursue education and career opportunities. Along with its partner agencies, IU13 provided academic assessment, career planning, Adult Basic Education (ABE) and high school equivalency preparation (HSE) classes, English as a Second Language (ESL) classes, job search and job skills training, post-secondary exploration, tutoring and other support services. The program exceeded the target enrollment (95 participants) by serving 154 participants in Lancaster and Lebanon prisons and the community. The program's additional targets and outcomes are shown in **Figure 28:**



Additionally, the rate of recidivism for individuals in the program was only 16.9%, significantly below the 40-60% target of the grant. Given the positive outcomes of the program, it is strongly suggested that this initiative is having a positive impact on the participants and it should continue to be considered a promising practice.



SUMMARY AND CONCLUSIONS

The results gathered in this data report suggest that Lancaster-Lebanon IU13 services and supports have had a significant impact on the lives of learners in Lancaster and Lebanon counties. The evidence reported here demonstrates the numerous ways that IU13 has produced successful outcomes for students served directly by IU13 programs. In addition, data was shared that suggests that the professional development trainings offered to local teachers and administrators have resulted in more highly skilled educators who use their training to impact student achievement in their classrooms. Finally, IU13 continues to develop innovative programs that are having a positive impact on their participants.

IU13 will continue to implement its data collection system to gather and reflect upon the quality of services it offers. Through this ongoing analysis of critical indicators of program quality, IU13 believes it can more thoroughly fulfill its strategic priority to improve student achievement.

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FIGURE AND TABLE REFERENCES

APPENDIX A

Assessments

Reading, English Language Arts and Mathematics

Classroom Diagnostic Tools (CDTs) – These formative assessments are used voluntarily within public schools, and aligned to the content of the PSSA and Keystone Exams. Numeric scores are categorized into achievement bands that can help teachers monitor student progress and identify gaps in understanding for given content. More information on the CDTs can be found on the PDE SAS portal at http://pdesas.org/.

Diagnostic Kindergarten Early Reading and Math Criterion Referenced Assessments – The Diagnostic Kindergarten program has developed a series of criterion referenced assessments to use with students in the program. These assessments are designed to measure the accumulation of key kindergarten skills in math and reading, and are used to monitor student progress in conjunction with other classroom assessments.

Keystone Exams – These end-of-course assessments are required for Pennsylvania students completing Algebra I and Biology coursework. More information on the Keystone Exams can be found at the PDE SAS portal at http://pdesas.org/.

Pennsylvania Alternate System of Assessment (PASA) – The PASA is a statewide alternate assessment designed for students with the most significant cognitive disabilities. Specifically, it is intended for those who are unable to participate meaningfully in the Pennsylvania System of School Assessments (PSSA) even with accommodations. The PASA is an individually administered test given each spring to students by their teacher or another certified Test Administrator who knows the student well. Skills are measured in reading, mathematics, and science. More information on the PASA can be found at http://www.education.pa.gov/K-12/Assessment%20and%20Accountability/Pages/PASA.aspx#tab-1.

Pennsylvania System of School Assessments (PSSAs) – The Pennsylvania state assessments assess student proficiency levels in reading and math in Grades 3-8 and in science Grades 4 and 8. More information on the PSSA exams can be found at the PDE SAS portal at http://pdesas.org/.

Pennsylvania Value-Added Assessment System (PVAAS) – This analysis of achievement data measures student growth, in certain tested areas. More information on PVAAS can be found at https://pvaas.sas.com.

Student Outcomes

NOCTI – The NOCTI assessments are designed to measure technical skills at the occupation level (i.e., Accounting, Carpentry, and Pre-Engineering). The assessments measure aspects of occupational competence such as factual and theoretical knowledge and target students who have completed secondary and post-secondary programs. These assessments were used with students attending the Lancaster County Career and Technology Centers (CTCs).

Peabody Picture Vocabulary Test (PPVT) – The PPVT is an optional assessment that is administered by a trained assessment team to increase inter-rater reliability. It is given as a pre-test (within the first 45 days of school) and as a post-test. Only the matched scores of those three and four year old children who took the assessment in the fall and again in the spring are used for reporting results. It is used to measure the growth in receptive language skills in young children, a key area of focus in early learning classrooms.

Teaching Strategies Gold – Teaching Strategies Gold is an authentic assessment based on anecdotal notes, and student performance and evidence. This is a required assessment for the PA Pre-K Counts Grant managed by IU13. The assessment is based on 38 research-based objectives that include predictors of school success and are aligned with the Common Core

State Standards, state early learning guidelines, and the Early Childhood Child Development and Early Learning Framework. The objectives are organized into 10 areas of development and learning including broad developmental areas, content areas, and English language acquisition. These assessment areas are Social-Emotional, Physical, Language, Cognitive, Literacy, Mathematics, Social Studies, Science and Technology, and the Arts.

The Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) – Based on B.F. Skinner's analysis of verbal behavior, established developmental milestones and research from the field of behavior analysis, the assessment contains 170 measurable learning and language milestones that are sequenced and balanced across three developmental levels. The skills assessed include mand, tact, echoic, intradermal, listener, motor imitation, and independent play, social and social play, visual perceptual and matching-to-sample, linguistic structure, group and classroom skills, and early academics (Sundburg, 2008). This assessment was used in the Autistic Support program and is aligned to the desired outcomes of the program.

Instructional Practices

Reformed Teaching Observation Protocol (RTOP) – RTOP is an observation tool designed to measure changes in classroom instruction in math or science.

Danielson Domains – Domains 1 and 3 are two of the areas of teaching effectiveness from Charlotte Danielson's Framework for Teaching that are included in the Pennsylvania Department of Education's Classroom Teacher Rating Tool. Domain #1 examines aspects of planning and preparation; Domain #3 examines aspects of classroom instruction.

APPENDIX B

PULSE

Partnership to Understand and Lead STEM Education

COMMUNITY REPORT

Years 1 through 3: 2013-16

TABLE OF CONTENTS

PULSE is funded by a federal / U.S. Department of Education Math-Science Partnership Grant. PULSE provides high-quality professional development to secondary science, math, and technology education teachers to deepen teachers' knowledge of STEM content and pedagogy in order to increase teacher effectiveness, which will ultimately increase student achievement in math and science.

WHAT IS PULSE?

PULSE brought together local secondary schools in partnership with IU13 and other agencies (*see page 2*). The collaborative work engaged IU staff, university faculty, and agency and industry professionals in all aspects of the project. The partnership was governed by an advisory board comprised of representatives from all partners, which met regularly throughout each year to plan, monitor, and refine the program. Collaboration among grant partners enabled the joint development of professional learning experiences aimed at deepening content and pedagogical knowledge in alignment with the National Board for Professional Teaching Standards (NBPTS), Standards for Professional Learning (SPL) developed by Learning Forward (formerly NSDC), the PA Core Standards for Math, the PA Standards for Science, Technology, and Engineering, and the College and Career Readiness Standards.

Each year, teams from eligible schools were assigned to the Intervention Group (IG) or Control Group (CG). By the end of the 2015-16 school year, 163 math and science teachers from 21 districts, seven nonpublic schools, and one charter school across the IU13 and IU 15 regions schools had participated in PULSE. Demographically, participating schools ranged from the most economically disadvantaged to the wealthiest, from urban to rural, and included schools of cultural, ethnic, and linguistic diversity, all collaborating through PULSE to improve science and math teaching, learning, and achievement.

The project design was based upon a comprehensive needs assessment, conducted between November 2012 and February 2013, which included data from PSSA, School Improvement, Title I, PVAAS, and a Professional Development Inventory. Participating schools had a clear need to improve student achievement in math and science, with proficiency rates below 75% and as low as 33.8% in math and 14.4% in science. The needs assessment indicated many teachers lacked significant depth of understanding of math and science content integral to PA standards and assessments. Additionally, teachers lacked adequate professional development in math, science, and STEM pedagogy that research indicates has a positive effect on student achievement. As a result, teachers lacked the content knowledge (TCK) and pedagogical knowledge (PCK) to deeply engage students in complex math and science learning. Based on research and the needs of participants, several goals and objectives were identified. *(These are listed on page 12 of this document.)*

Each year, the professional development program began with an 80-hour summer institute held at IU13, the campuses of the PULSE Institute of Higher Education (IHE) partners, and various local STEM industry locations offering opportunities for hands-on investigations and field studies. During the school year, grant partners continued to support the learning of participating teachers through three days of PD, as well as coaching and school-based professional learning communities (PLCs). In a report prepared for the USDE on Math Science Partnerships, Abt Associates (2012) indicates four key features of effective PD including: "substantial number of hours (~50), intensive follow-up experiences, facilitative of professional collaboration, and science or mathematics content focused with active learning opportunities to transfer into teaching practices and curriculum." PULSE is designed to incorporate these features.

The intended results of PULSE were based upon the Theory of Action that professional development (PD) increases teacher content knowledge (TCK) and pedagogical content knowledge (PCK), which increases teacher effectiveness through increased opportunities for student learning, ultimately increasing student achievement.

YEAR 1 (2013-14) GRANT AWARD: $537,829 *(Federal Fiscal Year 2012-13)*
YEAR 2 (2014-15) GRANT AWARD: $486,735 *(Federal Fiscal Year 2013-14)*
YEAR 3 (2015-16) GRANT AWARD: $512,289 *(Federal Fiscal Year 2014-15)*

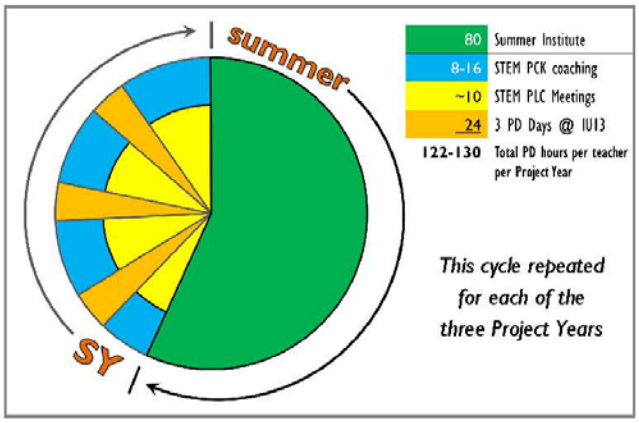
PULSE FISCAL AGENT: Lancaster-Lebanon Intermediate Unit 13

OTHER PULSE PARTNERS:

- Millersville University of Pennsylvania
- Lebanon Valley College
- Lancaster County Conservation District
- Lancaster County Workforce Development Board
- Elizabethtown College Science in Motion
- By the Numbers: Data Analysis & Statistical Solutions
- Capital Area IU 15

SUMMARY OF PULSE:

PULSE provided high-quality professional development to secondary science, math, and technology education teachers to deepen teachers' knowledge of STEM content and pedagogy in order to increase teacher effectiveness, with an ultimate goal of increasing student achievement in math and science.



A PULSE project year included over 120 hours of professional development, including an 80-hour Summer STEM Institute, three 8-hour "pull in days" during the subsequent school year, plus approximately 20 hours of work in a building-based Professional Learning Community (PLC) and additional, individual content and pedagogy coaching as requested.

PULSE aligned with IU13's strategic goal of increasing student achievement in Lancaster and Lebanon Counties.

NUMBER OF FUNDED STAFF IN 2015-16: 2.78 FTEs: STEM Consultant (1.5 FTE), Project Coordinator (0.25 FTE), Program Assistant (0.91 FTE), Project Director (0.12 FTE)

BREAKDOWN OF PARTICIPATION:

	YEAR 1: 2013-14	YEAR 2: 2014-15	YEAR 3: 2015-16
• Number of public districts served:	9	6	11
• Number of nonpublic schools served:	1	1	4
• Number of charter schools served:	0	1	0
• Number of adult educators served:	52	44	67
• Number of school-aged students served:	approx. 5,200	3,922	6,154

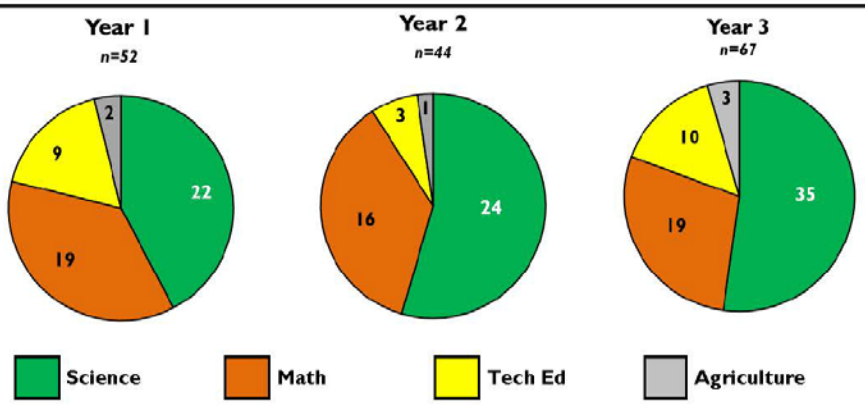
2

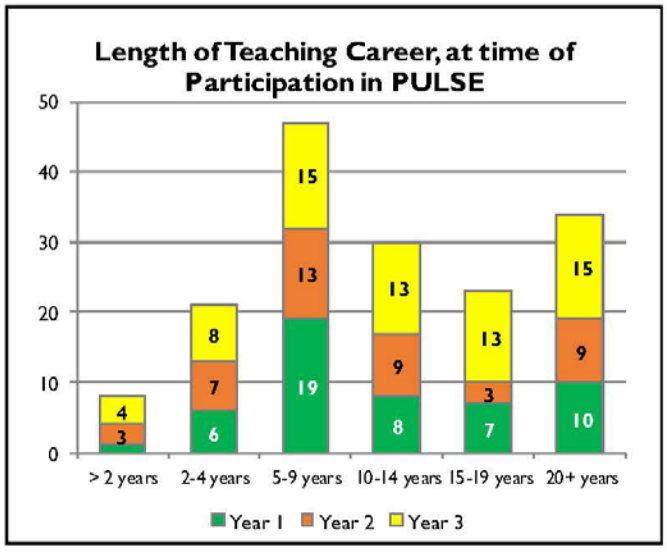
OVER 3 YEARS, 163 TEACHERS COMPLETED PULSE.

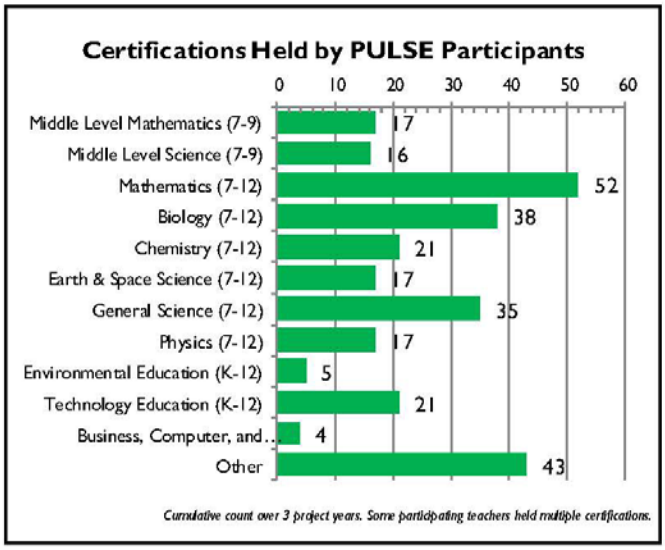
PARTICIPATING SCHOOLS INCLUDED:

- Cedar Crest HS (Cornwall-Lebanon SD)
- Cocalico HS
- Columbia Jr-Sr HS
- Crossroads MS (West Shore SD)
- Dauphin County Technical School
- Donegal HS
- ELCO HS
- Elizabethtown Area HS
- Ephrata Area HS & MS
- Garden Spot HS & MS (ELANCO SD)
- Halifax Area HS & MS
- Hempfield HS
- La Academia Partnership Charter School
- Lancaster Catholic HS
- Lancaster Mennonite School
- Lebanon Catholic School
- Lebanon HS
- Manheim Christian Day School
- Manheim Township HS & MS
- Marshall Math-Science Academy (Harrisburg SD)
- McCaskey HS (SDOL)
- Milton Hershey School
- Northern Lebanon HS
- Our Mother of Perpetual Help School
- Palmyra Area HS
- Penn Manor HS
- Pequea Valley HS
- Red Land HS (West Shore SD)
- Reynolds MS (SDOL)
- Rowland MS (Harrisburg SD)
- SciTech HS (Harrisburg SD)
- Warwick MS
- West Perry HS
- Wheatland MS (SDOL)

PULSE's primary audience was secondary math and science teachers, but technology / engineering education and agriculture teachers were also welcome to participate. Here are the numbers of participants, by discipline, in each year of the project:







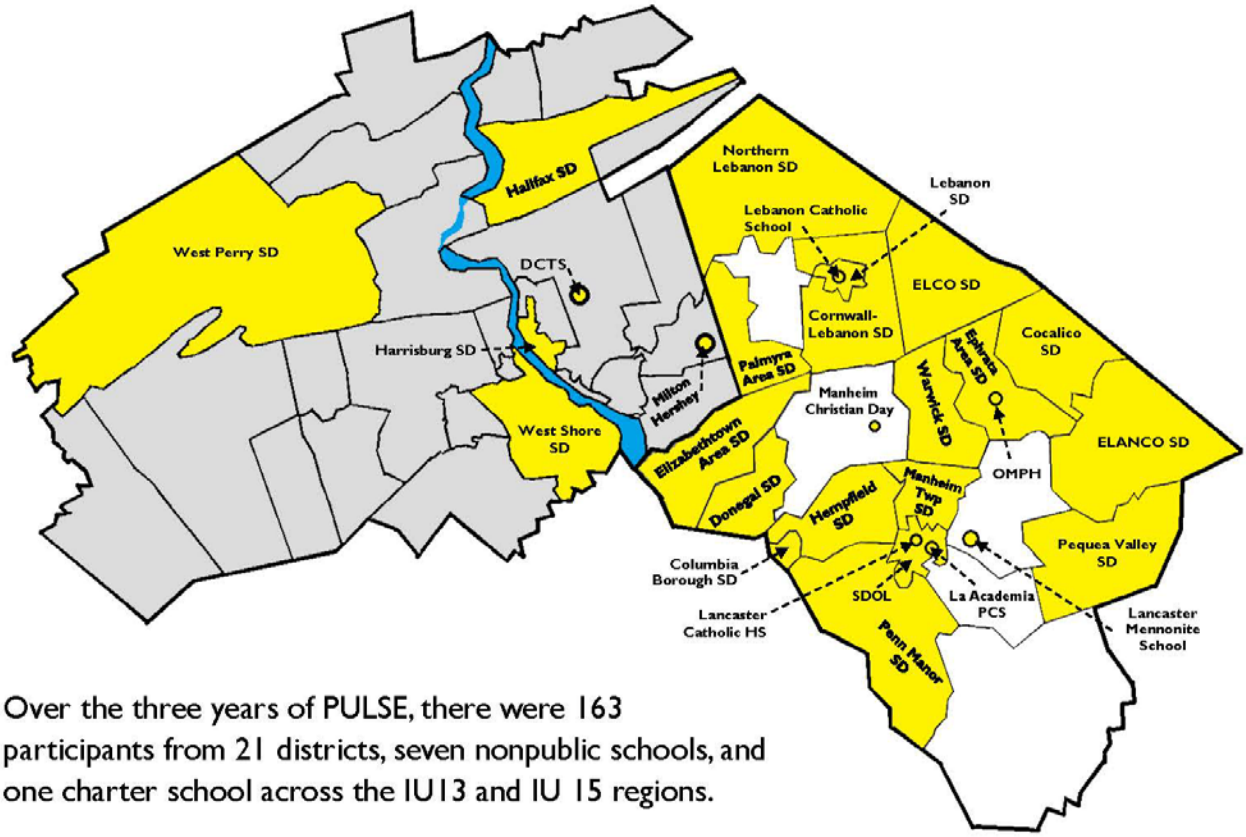
Collectively, the PULSE participants taught over

15,000 students!

23.9% of students in middle school
76.1% of students in high school

5,542 students directly impacted in math
9,734 students directly impacted in science

PULSE PARTICIPANTS, BY SCHOOL



Over the three years of PULSE, there were 163 participants from 21 districts, seven nonpublic schools, and one charter school across the IU13 and IU 15 regions.

DISTRICT/SCHOOL	MATH	SCIENCE	TECH ED	3-YEAR TOTAL
Cedar Crest HS	1	6		7
Cocalico HS	2	1	1	4
Columbia Jr-Sr HS	1	2	1	4
Dauphin County Technical School	2	2		4
Donegal HS	2	3	1	6
ELCO HS		3		3
Elizabethtown HS	1	4	4	9
Ephrata Area HS	1	1	1	3
Ephrata Area MS	1			1
Garden Spot HS	1			1
Garden Spot MS	1	1		2
Halifax Area HS	3	3	1	7
Halifax Area MS	1	3	1	5
Marshall Math-Sci Acad (Harrisburg SD)		2	1	3
Rowland MS (Harrisburg SD)		1		1
SciTech HS (Harrisburg SD)	1	1	1	3
Hempfield HS	2			2
La Academia PCS	2	2		4
Lancaster Catholic HS	1	1		2

DISTRICT/SCHOOL	MATH	SCIENCE	TECH ED	3-YEAR TOTAL
Lancaster Mennonite Schools	4	3	1	8
Lebanon Catholic School	2	2	1	5
Lebanon HS	2	3	1	6
Manheim Christian Day School	1			1
Manheim Township HS	2	7	1	10
Manheim Township MS		5		5
Milton Hershey School	1	3		5
Northern Lebanon HS	2	4		6
Our Mother of Perpetual Help		1		1
Palmyra Area HS	1	6	2	9
Penn Manor HS	2	2	1	5
Pequea Valley HS		1	1	2
McCaskey HS (SDOL)	7	2		9
Reynolds MS (SDOL)	3	1		4
Wheatland MS (SDOL)	1	3		4
Warwick MS	1	2		3
Crossroads MS (West Shore SD)	1	2		3
Red Land HS (West Shore SD)	1			1
West Perry HS	2	3	1	6

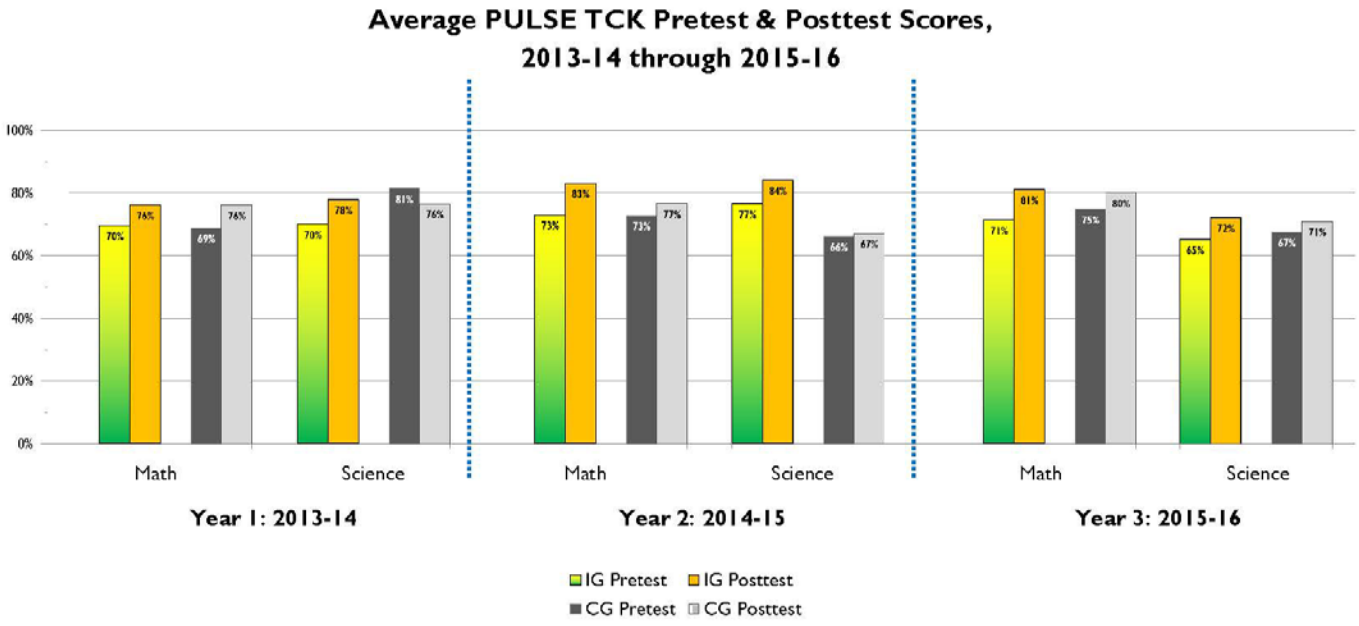
FINDINGS: TEACHER CONTENT KNOWLEDGE

As part of the PULSE Summer STEM Institute, all teachers took a pretest and posttest on either math or science topics, designed to measure gains in teacher content knowledge (TCK) resulting from their Institute participation. *(TCK was one of three grant-required measurements.)* In all three years, on both the math and the science test, teachers showed statistically significant gains in TCK between the start and end of the Institute, with an average gains of 9.6 percentage points in math and 7.7 points in science.

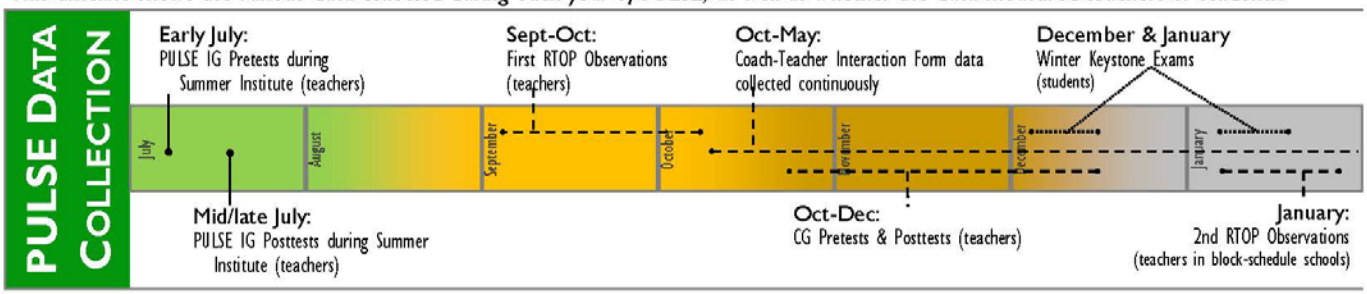
Another group of teachers, the "control group," also took the TCK tests each year, although they did not participate in the summer STEM Institutes. The purpose of the control group (CG) was to help the PULSE staff, faculty, and evaluators know that any TCK gains shown by the PULSE participants could be attributed to their attendance at the summer STEM institute, and not random chance. In Year 1, the math control group teachers showed a gain between pretest and posttest scores similar to that of Institute participants. Because the math CG teachers showed increases in their scores despite not attending the Summer Institute, PULSE faculty and evaluators reviewed the Summer 2013 math TCK test and found some misalignment between the test and the Institute content, meaning that several tested topics were addressed either insufficiently, or not at all, and thus the gains in math shown by the Institute attendees may have been due to "luck," guessing, or other factors. Steps were therefore taken to better align the math TCK test with the Institute in 2014. In Years 2 and 3, the science and math CG teachers showed no gain or only a small gain between pretest and posttest.

Across all three project years, 161 teachers completed either the math or science full PULSE professional development program. Of those, a total of 97 teachers (60%) had a significant gain in TCK between pretest and posttest, whereas only 18 of the 133 math and science CG teachers (14%) had a statistically significant gain in TCK between pretest and posttest. Additionally, the TCK gains made by teachers who participated in PULSE were significantly larger than the gains made by the CG teachers.

The charts below show the average TCK test scores in each project year, for both the PULSE participants and the CG teachers.



This timeline shows the various data collected during each year of PULSE, as well as whether the data measured teachers or students.



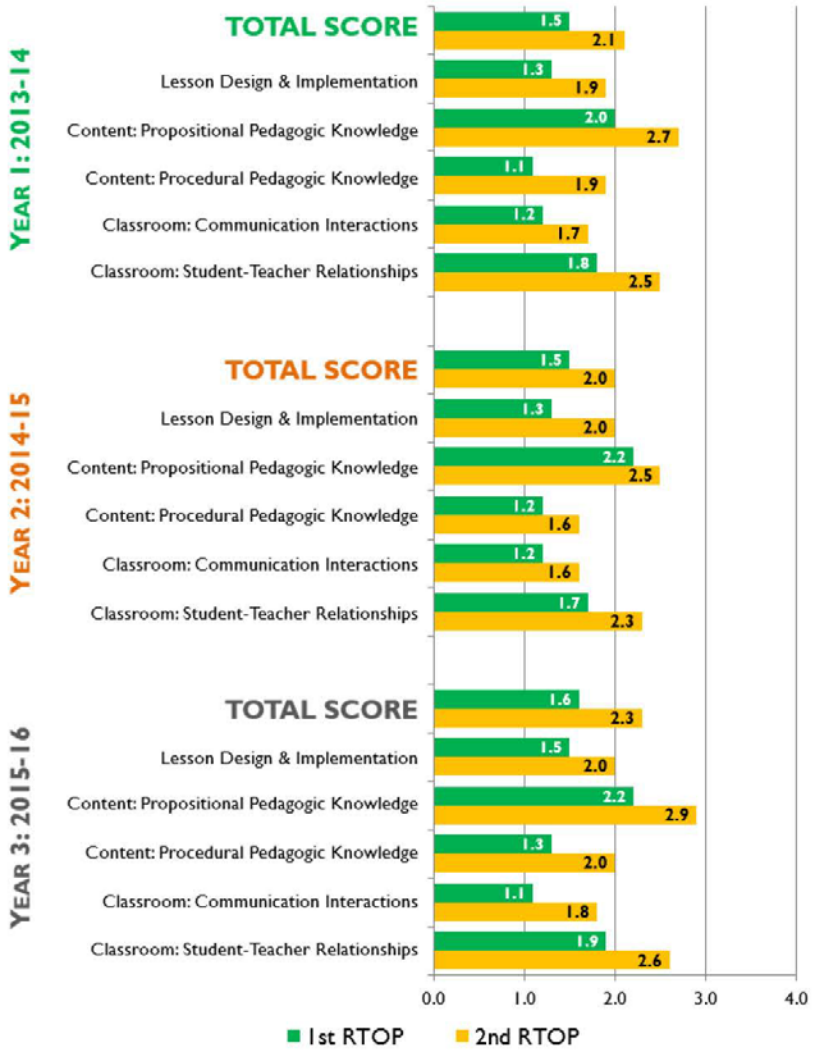
FINDINGS: RTOP OBSERVATIONS

The RTOP (Reformed Teaching Observation Protocol) form is a measure of a teacher's classroom practice. The RTOP contains statements that reflect different aspects of classroom practice; scores range from 0 to 4, with '0' indicating that the behavior described in the RTOP statement "never occurred" and '4' indicating that the RTOP statement was "very descriptive" of the teacher's behavior.

Each PULSE participant was observed twice per project year using the RTOP form. Increases in RTOP scores, from the first to the second observation, would indicate an improvement in observed teaching practice that could be attributable to participation in PULSE.

During the 2013-14 school year, an average of 7 months passed between the first and second observations; during 2014-15, an average of 6.8 months passed between the two observations; and in 2015-16, an average of 6.1 months passed between the two observations.

The average scores for the first and second RTOP observations, for all project years, are shown at right for math and science teachers, combined. Gains are statistically significant in all aspects of teaching practice in all three project years.

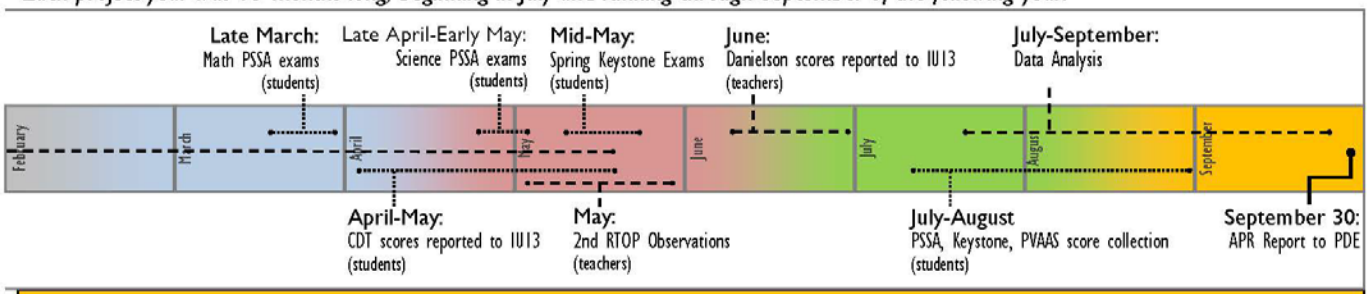


FINDINGS: DANIELSON ANALYSIS

DANIELSON DATA	YEAR 1: 2013-14	YEAR 2: 2014-15	YEAR 3: 2015-16
Domain 1 *Planning & Preparation*	2.2	2.4	2.4
Domain 3 Classroom Instruction	2.1	2.3	2.4

In addition to the RTOP, teaching practice was measured using the Danielson Domains #1 and #3 from PDE's Classroom Teacher Rating Tool. Domain #1 examines aspects of planning and preparation; Domain #3 examines aspects of Classroom Instruction. Scores on the Danielson Domains range from 0 to 3, with '0' indicating unsatisfactory; '1' indicating basic; '2' indicating proficient; and '3' indicating distinguished. Teachers' average scores were similar in all project years.

Each project year was 15 months long, beginning in July and running through September of the following year.



FINDINGS: COACH-TEACHER INTERACTION FORMS

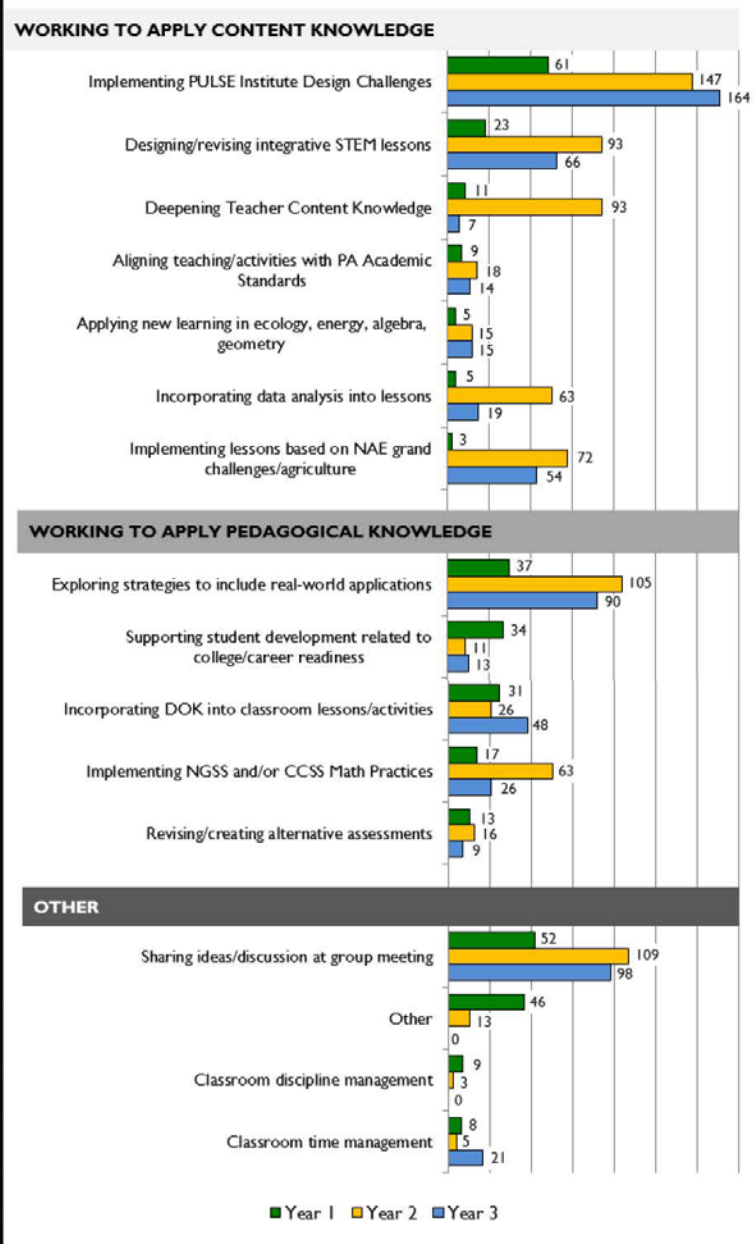
After the Summer Institute, teachers could work with an IU13 STEM Consultant to apply Institute-gained content and pedagogical knowledge in their classrooms. To record the nature and content of coaching and other interactions between PULSE participants and IU13 STEM Consultants, PULSE staff and evaluators developed the Coach-Teacher Interaction form, or CTI, which provided context for RTOP analysis and helped PULSE staff and evaluators track participants' progress in STEM teaching and implementation.

In all project years, coaching occurred mostly in 30- or 60-minute sessions. In Years 2 and 3, there was a greater emphasis on teachers working as Professional Learning Communities (PLCs), with guidance from IU13 STEM Consultants, to implement projects they designed during the Summer Institute; the data collected on CTI forms reflects this shift in emphasis. *(See page 10 for a description of some of the design challenge projects.)* Other common focal areas included designing/revising integrative STEM lessons, implementing lessons based on NAE Grand Challenges and/or agriculture, and exploring strategies to include real-world applications of math and/or science content.

All PULSE participants in all years discussed the application of content knowledge and pedagogical content knowledge from the Summer Institute to classroom instruction in at least one coaching session. The chart at right shows various focus areas and the number of coaching sessions recorded for each focus area, by year. A coaching session could have multiple focus areas.

CTI FORM DATA	YEAR 1: 2013-14	YEAR 2: 2014-15	YEAR 3 2015-16
# coaching sessions recorded	127	163	175
# hours recorded	109	164	118
# participating teachers	52	44	67
Average # hours per teacher	2.1	3.7	1.8

Focus of Coaching (# of sessions)



STUDENT OUTCOMES

PULSE used a variety of assessments to measure the project's impact on students. The MSP grant required analysis of student proficiency levels as measured by the PSSA and Keystone Exams, but because at the secondary level those exams are only given in certain grades and courses, typically scores are available for only a fraction of students taught by PULSE teachers. Therefore, PULSE supplemented PSSA/Keystone data with Classroom Diagnostic Tools (CDT) assessments and Pennsylvania Value-Added Assessment System (PVAAS) information. The combination of these three metrics provided a more comprehensive picture of the project's impact on student achievement and growth. However, despite using multiple metrics to measure impact on students, it was still the case that many students went "unanalyzed" in the project because the measurement tools available did not measure all math and science subjects in all grades, nor did they measure achievement in technical and engineering education classes.

FINDINGS: STUDENT PROFICIENCY LEVELS

The Math PSSA is administered annually to students in grades 3 through 8. The Science PSSA is administered annually to students in grades 4 and 8. The Algebra 1 and Biology Keystone Exams (KE) are end-of-course assessments, administered to students in a variety of grades (although mostly in grades 9 and 10). Both types of exams return numeric scores, which fall into ranges labeled "Advanced," "Proficient," "Basic," and "Below Basic." Math-Science Partnerships are required to report annually on the number of students who score "Basic" or below and who score "Proficient" or above on applicable standardized tests. The number of math and science students with scores available are shown below, per project year, along with the combined totals of "Basic + Below Basic" and "Proficient + Advanced" for each group.

Relatively small sample sizes each year limited the PULSE evaluators from conducting extensive analysis of student achievement, as measured by the PSSA and Keystone Exams. However, when feasible, student data was analyzed by grade level and compared to scores on earlier tests. Those subanalyses indicated that:

		2014	2015	2016
MATH	Approx. # of students taught by PULSE teachers	2400	1500	1600
	# of students with math PSSA or Algebra 1 KE scores	406	623	409
	% of students scoring Basic or Below Basic	60%	87%	54%
	% of students scoring Proficient or Advanced	40%	13%	46%
SCIENCE	Approx. # of students taught by PULSE teachers	2800	2400	4500
	# of students with science PSSA or Biology KE scores	524	704	1121
	% of students scoring Basic or Below Basic	31%	64%	31%
	% of students scoring Proficient or Advanced	69%	36%	69%

- In Year 1 (2013-14), math students generally had a higher proficiency score on their baseline/prior math test than they did on the 2014 PSSA/KE. This result occurred for students in all grades for which there were baseline data. Overall, 70% of students of math IG teachers were rated as proficient or advanced on the baseline Math PSSA, but this percentage declined to 42% in 2014.
- In Year 2 (2014-15), there was a statistically significant increase in the percentage of math students who were Proficient between baseline and the 2015 Algebra 1 KE.
- In Year 3 (2015-16), students of math IG teachers with baseline Math PSSA data were significantly more likely to be proficient or advanced on the 2016 state math assessment than they were in 2015: 48% were proficient or advanced in 2016, compared to 31% one year earlier. This difference represents a 17 percentage point gain, and the gains were seen most frequently among 8th and 9th graders.
- In all three project years, science students tended to be less proficient on their current-year PSSA/Keystone Exams than they were on their prior tests.

These items are simply observational data; it was beyond the scope of the PULSE evaluation plan to determine the cause of any changes between students' "baseline" and "current year" proficiency scores.

STUDENT OUTCOMES

FINDINGS: PVAAS DATA ANALYSIS

PVAAS data measures student growth in certain tested areas, and one aspect of PVAAS data shows a projection of how likely it is that a student will score proficient or advanced on a given PSSA or Keystone exam. PULSE compared students' math and science PVAAS projections with their actual PSSA/KE scores. If a student scored higher than projected, the teacher's participation in PULSE could be a contributing factor.

The table below compares students' proficiency projections and actual scores, separated by Math and Science, grade level, and project year. With the exception of science in 2014-15 and 2015-16, students' actual proficiency levels exceeded predicted levels by a significant amount (particularly in 9th, 10th, and 11th grades). Year-to-year and 3-year-cumulative analysis of projected versus actual proficiency levels suggest that PULSE had a positive impact on student achievement in math, particularly for students in 9th and 10th grades, and on student achievement in science, particularly for students in 8th through 10th grades.

PVAAS data will be used to measure student outcomes in PULSE 2.0 in the 2016-17 and 2017-18 school years, to see if this pattern persists.

MATH							SCIENCE						
	Y1		Y2		Y3			Y1		Y2		Y3	
OVERALL	% Proj	% Actual	% Proj	% Actual	% Proj	% Actual	OVERALL	% Proj	% Actual	% Proj	% Actual	% Proj	% Actual
	40%	43%	18%	24%	40%	46%		49%	69%	37%	38%	69%	69%
Grade level							*Grade Level*						
Gr 7	n/a	n/a	n/a	n/a	48%	52%	Gr 7	n/a	n/a	n/a	n/a	n/a	n/a
Gr 8	64%	46%	n/a	n/a	36%	42%	Gr 8	n/a	n/a	49%	50%	69%	72%
Gr 9	41%	48%	24%	30%	46%	54%	Gr 9	48%	57%	n/a	n/a	91%	89%
Gr 10	12%	29%	0%	4%	33%	42%	Gr 10	50%	77%	28%	29%	62%	54%
Gr 11	n/a	n/a	7%	21%	19%	19%	Gr 11	n/a	n/a	7%	7%	22%	11%
Gr 12	n/a	n/a	7%	7%	n/a	n/a	Gr 12	n/a	n/a	26%	6%	n/a	n/a

FINDINGS: CLASSROOM DIAGNOSTIC TOOLS (CDTS)

Classroom Diagnostic Tools (CDTs) are used voluntarily within public schools, and align to the content of the PSSA and KE (*including Keystones that were developed but never implemented, such as Chemistry and Algebra II*). CDTs return numeric scores that are categorized into colored achievement bands and can be used to help teachers monitor student progress and identify gaps in student understanding for given content.

MATH												
	Algebra I			Gr 6			Gr 7			Gr 8		
Achievement	Y1 %	Y2 %	Y3%	Y1 %	Y2 %	Y3%	Y1 %	Y2 %	Y3%	Y1 %	Y2 %	Y3%
Lowest	60%	70%	56%	n/a	48%	n/a	n/a	55%	n/a	n/a	67%	n/a
Middle	35%	30%	43%	n/a	45%	n/a	n/a	36%	n/a	n/a	31%	n/a
Highest	5%	0%	1%	n/a	6%	n/a	n/a	8%	n/a	n/a	2%	n/a
SCIENCE												
	Biology			Chemistry			Gr 7			Gr 8		
Achievement	Y1 %	Y2 %	Y3%	Y1 %	Y2 %	Y3%	Y1 %	Y2 %	Y3%	Y1 %	Y2 %	Y3%
Lowest	38%	19%	25%	38%	97%	n/a	68%	36%	n/a	n/a	40%	n/a
Middle	56%	60%	60%	60%	3%	n/a	31%	51%	n/a	n/a	53%	n/a
Highest	6%	21%	15%	2%	0%	n/a	1%	13%	n/a	n/a	7%	n/a

Because the CDTs are used voluntarily, and because different schools and teachers participated in PULSE each year, the CDT data available varied greatly from year to year, particularly for the middle school grades. The table above shows, by year and exam, how the CDT data that was available breaks down by achievement band. In general, the CDT achievement percentages tended to correlate with the PSSA/KE scores that were returned, but year-to-year and 3-year-cumulative analysis was impossible because of the inconsistent data available.

EXAMPLES OF INTERDISCIPLINARY STEM PROJECTS

During the PULSE Summer Institute, teachers worked together as school-based STEM teams to develop a plan for an integrative STEM project that would provide engaging instruction to middle school or high school students on a topic addressed during the two-week institute. Each project had to integrate content from at least two STEM disciplines, align to applicable PA Academic Standards, and focus on a real-world problem, question, or goal that is relevant and engaging to students. As part of the school-year professional development, IU13 STEM Consultants provided support to school STEM teams in implementing the projects. Below are examples of some of the projects developed and implemented during the three years of PULSE.

Nine high school teachers from all STEM disciplines designed related, but individual, activities and experiments to be conducted through the school year, centered around a hypothetical farm. All information gathered was provided to students in a Digital Media Design class for incorporation into a website documenting the schoolwide STEM project. Upon completion of all the individual parts of the project, students read, interpreted, and discussed the results of all of the associated labs and activities. Students wrote final reflections wherein they selected an option for eco-friendly farming practices and defended their decision by supporting it with facts and real data. This team presented the project to the entire faculty and to the school board, and the project continued into subsequent years.

Middle school math and science teachers designed a "solar picnic" project for their students, wherein students designed, tested, and refined solar cookers, costed out the food, designed a website to invite parents and teachers, etc. Involved principles of algebra, 2D & 3D geometry, solar energy, data analysis, modeling, estimation, and experimental design.

High-school math, science, and tech-ed teachers designed an interdisciplinary project focused on rebuilding the light pole at the high school stadium. The flagpole was successfully erected by the end of the school year. Involved principles of algebra, 2D and 3D geometry, energy, modeling, estimation, and experimental design.

Four teachers designed and built a greenhouse on the school campus for use in cross-departmental activities and lessons around agriculture, geometry, and plant science. Involved principles of algebra, 2D & 3D geometry, clean water, chemistry, energy, data analysis, modeling, estimation, and experimental design.

Eight math, science, and tech-ed teachers designed a feasibility study and design challenge for their students, centered on installing solar panels on a newly-constructed school building. Project was completed fully as a joint effort between various courses, and the plan was presented to the entire student body at the end of the school year. Involved principles of 2D & 3D geometry, solar energy, energy transfer, economics, data analysis, modeling, estimation, and experimental design.

Three teachers started an STEM Club at the high school, which grew to over 60 student members by the end of the school year. As part of this project, new STEM-based classes were designed for implementation in the following school year, and current math, science, and tech-ed classes developed new field trips and tie-ins to after-school, STEM club competitions. Involved principles of chemistry, life science, energy, data analysis, modeling, estimation, and experimental design.

Teachers from three districts collaboratively created lesson plans focused on topics of land use/management practices, using the science of forestry. Students collected real-world data, quantitatively measured the "value" of various trees in terms of lumber yield, CO_2 reclamation, and financial worth, and evaluated whether or not it was more financially, economically, and/or ecologically feasible to cut or keep trees on a selected tract of land. Involved principles of 2D & 3D geometry, energy capture & transfer, water and air quality, data analysis, estimation, and experimental design.

Three high school teachers designed an interdisciplinary water-quality project that included water testing and monitoring around their urban school campus, plus designing prototypes of water filtration systems. During the school year, the project also expanded to encompass an "environmental racism" aspect, with the help of a social studies/ELA teacher (who did not participate in PULSE). Involved principles of earth science, clean water, GIS mapping, chemistry, mathematics, modeling, and experimental design.

Seven math and science teachers guided their students to design and create a pollinator garden on the high school campus. Plants were planted by the end of the school year and garden was maintained by students over the summer as a summer enrichment activity. Involved principles of algebra, 3D geometry, life science, earth science, modeling, estimation, and experimental design.

Three middle school science teachers designed a new storm-water project to add to their building's science curriculum, in which students "map their watershed" and consider changes that could be made to a school's grounds to make their school property more eco-friendly. Project "went viral" within the project, and was adopted by other PULSE participants from other schools.

Six high school teachers designed a series of cross-departmental lessons and activities around building and testing an anaerobic manure digester that generated energy by converting solid biomass waste into methane and heat. Students collaboratively designed and built prototype digesters, and tested them for efficiency and cost-effectiveness. Involved principles of algebra, 2D and 3D geometry, the nitrogen cycle, clean water, chemistry, energy, data analysis, modeling, estimation, and experimental design.

Six high school math and science teachers designed a feasibility study and design challenge around placing a wind turbine on/near school grounds. The project and study were completed as a collective effort across multiple classrooms, STEM departments, and grade levels. Involved principles of 2D & 3D geometry, physics and engineering, earth science, data analysis, modeling, estimation, and experimental design.

Six high school teachers designed a project in which students investigated watersheds and how human activity impacts water quality. Students collected biotic and abiotic data to analyze conditions at different points along the Quittapahilla Creek and how the conditions change over time, analyzing potential sources of point source pollution of the creek and searching for statistically significant changes over time or by location. Students also considered reengineered surfaces and technology use to attempt to control/decrease the runoff that occurred in the area of the creek. Involved principles of 2D & 3D geometry, water quality, data analysis, modeling, estimation, and experimental design.

TEACHER TESTIMONIALS

I think the field trips were most valuable to me. I learned a lot about the research facilities, etc. that are close to home (ex. I had no idea that SEARAC existed, let alone what they did.)

— Science Teacher, Crossroads MS

I will be actively seeking out the input and assistance of the algebra teachers when I am planning my units. I have developed an appreciation for how much of what they do applies directly to my class. If I can use the same language that they do, I can avoid having to "re-teach" algebra.

—Science teacher, Northern Lebanon HS

The most valuable part of this institute for me was to have the opportunity to work closely with the other subject areas of science and math. This type of collaboration never occurs as we are all in separate departments.

— Engineering teacher, Palmyra HS

After the Institute, one big thing I plan to work on is allowing more time for students to collaborate and come up with their own ideas. Too many times I jump in and do not allow the students to struggle. Also, instead of introducing a topic, showing all of the steps, and then having students practice the problems, I would rather do an intro activity to have students draw their own conclusions.

— Math teacher, Lebanon HS

Thanks for all of your efforts and thanks for allowing me to be a part of a quality Summer Institute. The relationships that I have made with colleagues outside of my district, as well as time to collaborate with these individuals for 2 weeks are extremely valuable and are a positive by-product of this type of professional institute.

—Science teacher, ELCO HS

I plan to use the CER with labs as I find it is more realistic and easier for students to follow, I am hoping to have at least one project based lesson for each unit I do by the end of 2015 if not before. I know the students will learn better and more this way.

—Science teacher, Garden Spot MS

The most valuable part for me was deepening my knowledge of subjects such as fracking, renewable energy sources, and agriculture. The more I know, the better I am able to draw connections to my own teaching content, regardless of if it directly applies or not.

—Science teacher, Donegal HS

Working with my colleagues and having time to talk through project planning while being "infused" with content throughout the course of the two-weeks made the experience rich and increases the likelihood that we will follow through on the activities we have planned.

—Science Teacher, Marshall Math-Science MS

I will collaborate with my math colleague to strengthen math and science connections.

—Science teacher, Wheatland MS

Although it will take a great deal of preparation, there are meaningful ways to integrate math, science and technology. I have learned some meaningful science in the area of agriculture, and how these real world problems can be incorporated into some exciting mathematical applications.

—Math teacher, Lebanon Catholic School

The most valuable part was the opportunity to discuss STEM programming ideas and pedagogy with colleagues from other school districts. It was very interesting to hear about how they see STEM education and their challenges and successes with implementing it in their classroom. Hearing their feedback and discussion in many of the sessions challenged me to question and change some of what I do to better my students' learning.

—Math teacher, Milton Hershey School

The best part was the atmosphere. This was a group of science and math teachers who were here by choice to improve their teaching. I have not been in such a high concentration of [learning] energy since college. Every question was analyzed and extended to view all of the possible applications.

—Science teacher, Northern Lebanon HS

11

PULSE
Partnership to Understand and Lead STEM Education

PROJECT GOALS AND OBJECTIVES

Based upon extensive research and the PULSE comprehensive needs assessment (conducted November 2012-February 2013), the following project goals and objectives were identified:

GOALS

1. Deepen teacher content knowledge (TCK) in math.
2. Deepen TCK in science.
3. Expand teacher STEM pedagogical content knowledge (PCK) in math.
4. Equip teachers to transfer content and PCK to classroom practice in math.
5. Expand teacher STEM PCK science.
6. Equip teachers to transfer content and PCK to classroom practice in science.
7. Increase student achievement and growth on state math assessments.
8. Increase student achievement and growth on state science assessments.

OBJECTIVES

1. Deepen TCK of concepts aligned to math standards.
2. Deepen TCK of math concepts integral to PSSA/KE Assessment Anchors.
3. Deepen TCK of concepts aligned to science standards.
4. Deepen TCK of science concepts integral to PSSA/KE Assessment Anchors.
5. Expand math teacher STEM PCK of PA Core Math Practices.
6. Expand math teacher STEM PCK through integrative STEM approaches.
7. Equip math teachers with strategies for and understanding of how to transfer their content and pedagogical content to classroom practice in math.
8. Expand science teacher STEM PCK of NGSS Science and Engineering Practices.
9. Expand science teacher STEM PCK through integrative STEM approaches.
10. Equip science teachers with strategies for and understanding of how to transfer their content and pedagogical content to classroom practice in science.
11. Increase student achievement and growth in math through teacher use of effective STEM instruction aligned to standards and integral math Assessment Anchors.
12. Increase student achievement and growth in science through teacher use of effective STEM instruction aligned to standards and integral science Assessment Anchors.

PULSE operated for three project years, officially concluding at the end of the 2015-16 school year. MSP funding was renewed in the Spring of 2016, and the project will continue as "PULSE 2.0" for the 2016-17 and 2017-18 school years.

An Annual Performance Report was submitted to the Pennsylvania Department of Education each September, and a final, cumulative analysis of the project was submitted to PDE on September 30, 2016.

The complete PULSE Annual Performance Reports for 2013-14, 2014-15, and 2015-16 were produced jointly by the IU13 STEM Team and By the Numbers: Data Analysis & Statistical Solutions, and were submitted to the Pennsylvania Department of Education on September 30, 2014, September 30, 2015, and September 30, 2016, respectively. If you have questions or would like more information, including details on our statistical and reporting methods, please contact Amanda Paveglio, MSP Grant Coordinator, at 717-606-1666 or amanda_paveglio@iu13.org.

Lancaster-Lebanon Intermediate Unit 13 (IU13) is an education service agency dedicated to delivering irresistible services to school districts and communities across the state. IU13 is a leader in recognizing the needs of schools and implementing programs to meet those needs, with a core compelling purpose of improving student learning.

IU13 serves the 22 public school districts in Lancaster and Lebanon counties, as well as students in nonpublic schools, preschoolers, and adult learners throughout Pennsylvania.

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