APPLIED LEARNING STUDENT QUESTIONNAIRE: *ANALYSIS*

Overall Results
December 2012

Executive Summary

Participants and Methods

In December 2012, 860 students across 6 Race to the Top programs completed the Applied Learning Student Questionnaire (ALSQ). The response rate displayed in Table 1 suggests that 95% of the total number of participating students were successfully surveyed.

Table 1. Survey Response Rates

Program	# of Survey Respondents	Total # of Participating Students	Survey Response Rate
STEM for Life Carroll County	41	42	**98%**
Drew Charter School- Partners of Innovation	281	301	**93%**
Murray County STEM Academy	44	50	**88%**
21st Century STEM Collaboration- Barrow County	396	412	**96%**
STEM Targeted Education Program (STEP) Academy- Moore MS	62	64	**97%**
Tift County Mechatronics Program	36	40	**90%**
Total	**860**	**909**	**95%**

The ALSQ[1] is designed to measure pre and post gains related to student problem solving and communication skills, self-management and engagement.

The ALSQ is a self-report questionnaire that includes 36 items to assess students' attitudes on the following survey constructs:

1. **Intrinsic Motivation**: motivation stemming from goals of mastery, learning and challenge. Example, "It is important for me to learn what is being taught in this program."
2. **Self-management/Self-Regulation:** effortful and persistent behaviors that are used to guide, monitor, and direct the success of one's learning and performance. Example, "I turn all my assignments in on time."
3. **Intent to Persist:** aspirations, plans, and goals to pursue additional education and a career in STEM. Example, "I intend to get a college degree in STEM (Science, Technology, Engineering, and Math)."
4. **Problem Solving:** inquiry-based learning environment that provides higher-order cognitive tasks and real-world applications. Example, "I work out explanations on my own."
5. **Implementation Activities:** hands-on activities designed to increase exposure to STEM topics and real-world applications. Example, "We learn what scientists/technicians/engineers/ mathematicians or other STEM professionals do."

[1] See Appendix A for information related to the construct reliabilities of the ALSQ.

Executive Summary, continued

Results & Discussion

- **ALSQ Survey Constructs**

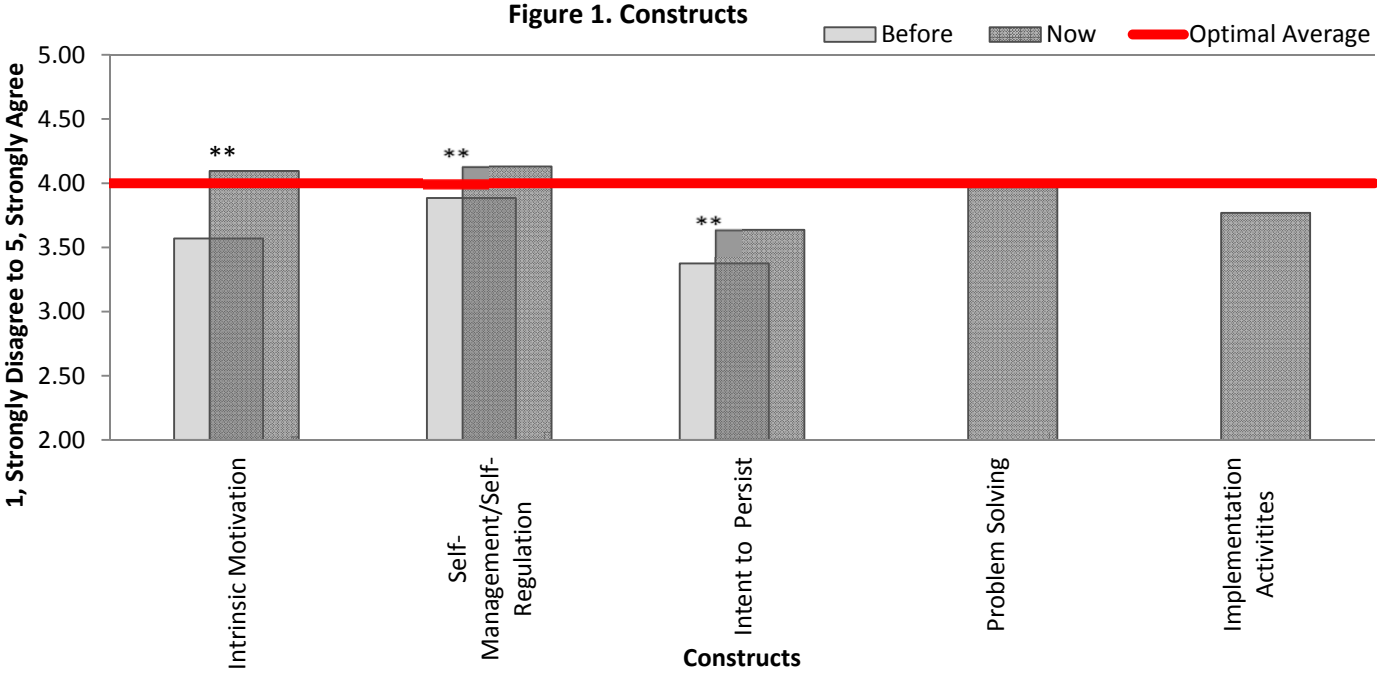
  Table 2 summarizes students' responses to the ALSQ survey constructs across all programs. It is clear that the programs were effective at producing statistically significantly increases in students' intrinsic motivation, self-management/self-regulation skills and intent to persist. The largest student gains observed were in the intrinsic motivation construct. Before the program, less than 55% of students indicated that they derive value and see the importance in learning about STEM; now, more than 76% say that they are intrinsically motivated to tackle STEM-related tasks and projects. Despite these statistically significant gains, it is important to note that the "now" scores across the following 3 constructs did not reach or exceed the optimal average of 4.0 on a 5-point likert scale (1, strongly disagree to 5, strongly agree): Intent to Persist, Problem Solving, and Implementation Activities. See Figure 1. In order to maximize effectiveness, we would expect students' average scores to exceed 4.0. Figure 1 suggests that additional work may be needed in the above mentioned areas.

Table 2. Summary of Results by Constructs

Overall- Constructs										
Constructs		**n**	**Mean[1]**		**Paired Samples t-test**		**1 (Strongly Disagree)**	**2 (Disagree)**	**3 (Neutral)**	**4 (Agree)**	**5 (Strongly Agree)**
Intrinsic Motivation	Before	845	3.57		0.000**		5%	11%	29%	31%	24%
	Now	834	4.10				2%	4%	17%	34%	42%
Self-Management/Self-Regulation	Before	840	3.89		0.000**		21%	12%	25%	25%	17%
	Now	825	4.13				21%	8%	19%	27%	26%
Intent to Persist	Before	841	3.37		0.000**		13%	17%	23%	15%	32%
	Now	828	3.64				10%	13%	20%	17%	40%
Problem Solving	Now	842	3.97		n/a		2%	5%	22%	36%	35%
Implementation activities	Now	838	3.77		n/a		3%	7%	26%	35%	28%

[1] Reference lines are set at 3.5 and 4. Negatively worded statements were reverse coded for mean computations. **p<.01, *p<.05, †p<.10

Figure 1. Constructs



**p<.01, *p<.05, †p<.10; Scale is truncated for visual clarity.

Executive Summary, continued

- **ALSQ Survey Constructs by Program**

Examining the ALSQ results by individual program, it is evident that all programs show statistically significant increases in intrinsic motivation, self-management/self-regulation and intent to persist. Students in the STEM for Life program at Carroll County show the largest increases from before to now on all three of the above mentioned constructs; Murray STEM Academy students show the smallest average increases across all 6 programs. See Table 3.

Table 3. Summary of Results by Constructs per Program

Overall- Constructs per Program													
Constructs		**STEM for Life Carroll County (n=41)**		**Drew Charter (n=281)**		**Murray STEM Academy (n=44)**		**21st Century Barrow County (n=396)**		**STEP Academy Moore MS (n=62)**		**TIFT County Mechatronics (n=36)**	
		Mean	*t-test*	Mean	*t-test*	Mean	*t-test*	Mean	*t-test*	Mean	*t-test*	Mean	*t-test*
Intrinsic Motivation	Before	3.27	*0.000***	3.69	*0.000***	2.95	*0.018**	3.59	*0.000***	3.41	*0.000***	3.83	*0.000***
	Now	4.16		4.12		3.27		4.15		4.06		4.31	
Self-Management/ Self-Regulation	Before	3.42	*0.000***	3.97	*0.000***	3.50	*0.010**	3.93	*0.000***	3.65	*0.000***	4.09	*0.000***
	Now	4.19		4.14		3.61		4.19		4.00		4.30	
Intent to Persist	Before	2.87	*0.000***	3.54	*0.000***	2.98	*0.499*	3.32	*0.000***	3.35	*0.000***	3.74	*0.000***
	Now	3.49		3.74		3.06		3.58		3.69		4.26	
Problem Solving	Now	3.74	*n/a*	4.04	*n/a*	3.35		4.04	*n/a*	3.64	*n/a*	4.16	*n/a*
Implementation activities	Now	3.70		3.76		2.96		3.94		3.43		4.23	

Scale= 1, Strongly Disagree to 5, Strongly Agree. Negatively worded statements were reverse coded for mean computations. **p<.01, *p<.05, †p<.10

In order for programs to maximize their effectiveness, we would expect "now" scores to reach or exceed the optimal average of 4.0. Figures 2 – 6 display "now" scores for each program and construct. For example, Figure 2 indicates that all programs met or exceeded the optimal average for intrinsic motivation, with the exception of Murray STEM Academy. In general, programs not reaching or exceeding the red horizontal line may need additional attention.

Figure 2. Intrinsic Motivation ("Now" Scores)

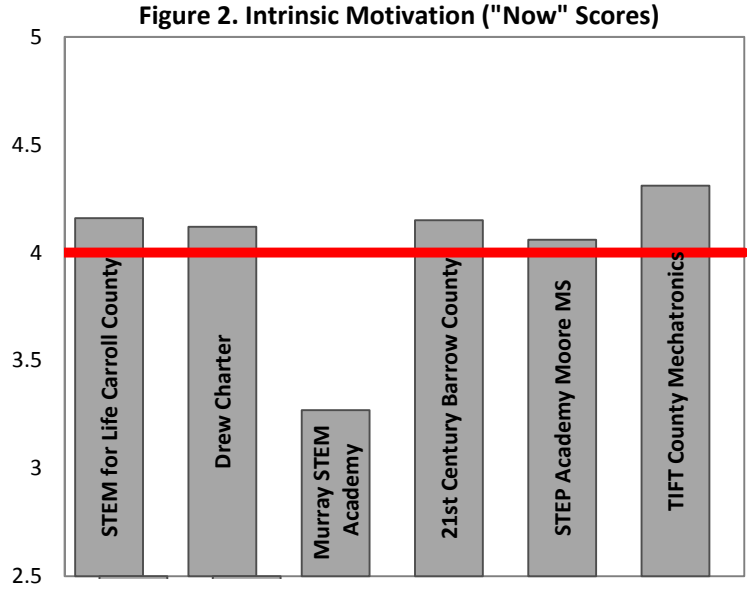
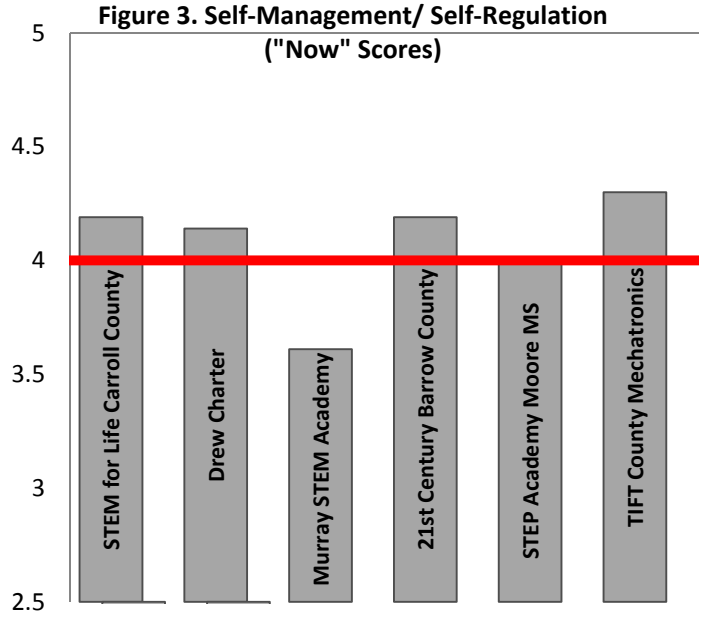
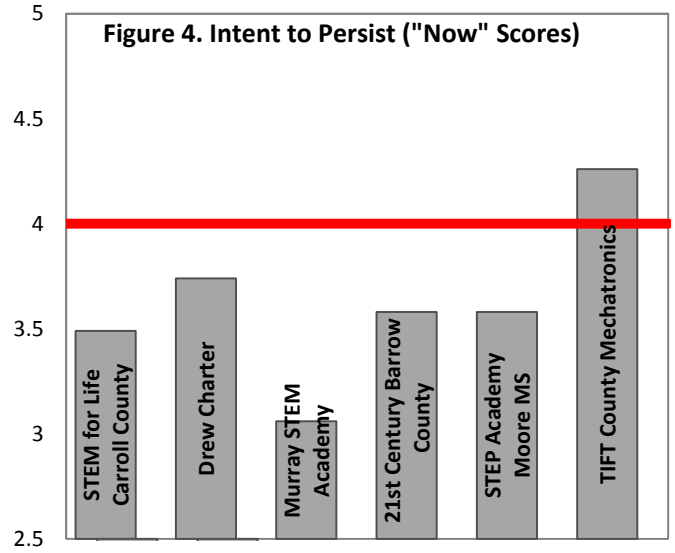
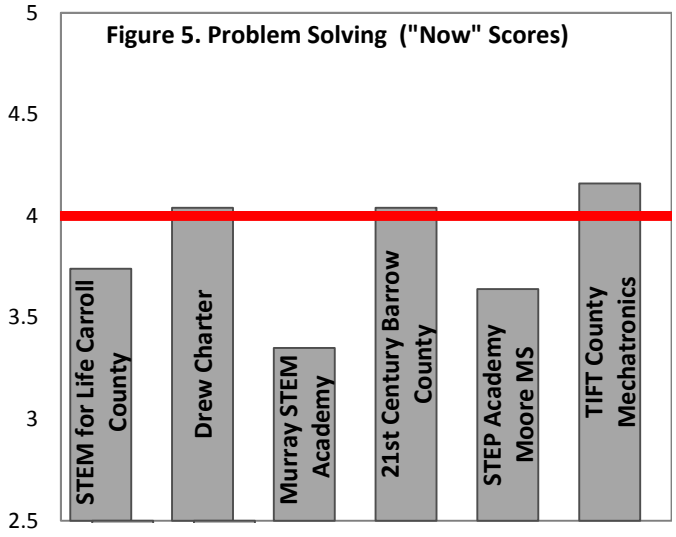


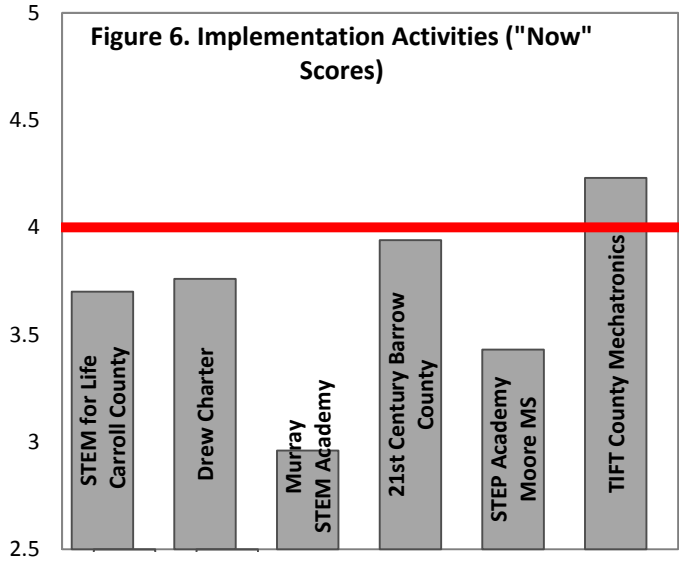
Figure 3. Self-Management/ Self-Regulation ("Now" Scores)

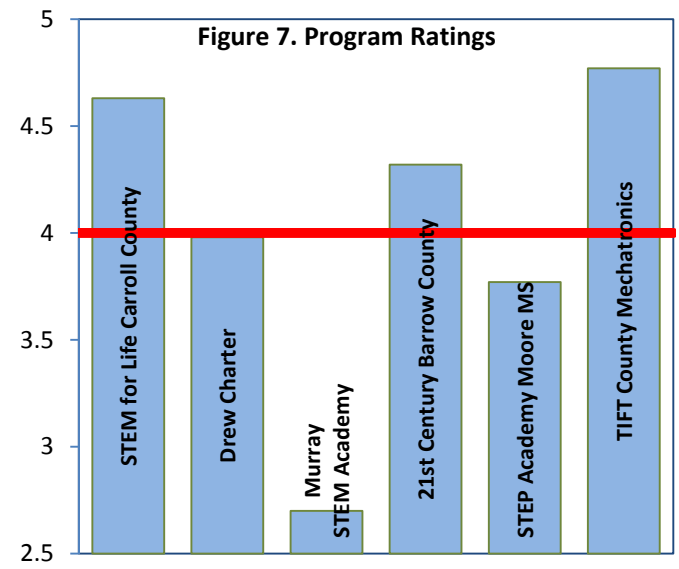


Scale= 1, Strongly Disagree to 5, Strongly Agree. Scale was truncated for visual clarity









Scale= 1, Strongly Disagree to 5, Strongly Agree. Scale was truncated for visual clarity; Program Rating Scale= 1, Very Poor to 5, Excellent.

- **Program Rating**
  Collapsing across all programs, students' ratings exceeded the optimal average of 4.0. On a 5-point likert scale where 1 signifies *very poor* and 5 signifies *excellent*, the average score was a 4.12. Looking at Figure 7, above, we see that 4 out of 6 programs were rated highly. However, Murray County STEM Academy and the STEP Academy at Moore Middle School may need additional assistance in improving student enjoyment.

- **Areas for Further Improvement**
  Across all programs, further enhancing problem solving skills may be warranted. Specifically, students' ratings suggest that the inquiry-based learning environment may be improved by allowing students more opportunity to choose their own topics or projects, work out explanations on their own, and plan and conduct their own projects. Likewise, encouraging programs to provide activities that foster interaction with STEM professionals may increase student exposure to real-world applications and careers. Such implementation activities may strengthen students' intentions and motivations to pursue additional education in STEM fields.

Table 4. Intrinsic Motivation

Intrinsic Motivation		n	Mean[1]		Paired Samples t-test		1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
1. I prefer class work that is challenging so I can learn new things.	Before	845		3.07	0.000**		10%	17%	38%	24%	10%
	Now	834		3.68			4%	8%	26%	39%	23%
2. It is important to me to learn what is being taught in this program.	Before	844		3.85	0.000**		2%	5%	27%	38%	28%
	Now	832		4.31			1%	1%	12%	37%	49%
3. I like what I am learning in this program.	Before	834		3.55	0.000**		5%	11%	32%	30%	23%
	Now	828		4.12			3%	4%	17%	33%	44%
4. I think I will be able to use what I learn in this program in other classes.	Before	831		3.57	0.000**		5%	11%	29%	33%	22%
	Now	828		4.10			2%	5%	17%	33%	43%
5. Even when I do poorly on a test, I try to learn from my mistakes.	Before	841		4.00	0.000**		2%	7%	18%	35%	38%
	Now	831		4.44			1%	1%	9%	32%	58%
6. I think that what I am learning in this program is useful for me to know.	Before	833		3.70	0.000**		3%	9%	25%	37%	24%
	Now	826		4.21			1%	3%	15%	35%	46%
7. I think that what we are learning in this program is interesting.	Before	831		3.47	0.000**		7%	13%	31%	26%	24%
	Now	825		4.01			3%	5%	19%	31%	41%
8. Understanding STEM (Science, Technology, Engineering, and Math) is important to me.	Before	840		3.60	0.000**		5%	9%	31%	30%	25%
	Now	831		4.13			2%	4%	18%	32%	44%
9. I enjoy STEM (Science, Technology, Engineering, and Math) in general.	Before	834		3.32	0.000**		9%	13%	31%	28%	18%
	Now	828		3.85			5%	6%	22%	34%	33%

[1] Reference lines are set at 3.5 and 4. **p<.01, *p<.05, †p<.10

Table 5. Self-Regulation/Self-Motivation

Self-Regulation/Self-Motivation		n	Mean[1]		Paired Samples t-test		1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
10. I turn all my assignments in on time.	Before	840		3.51	0.000**		4%	13%	33%	31%	20%
	Now	818		3.91			1%	6%	25%	38%	30%
11. I miss class often. (n)	Before	835		1.56	0.640		66%	20%	9%	4%	2%
	Now	817		1.54			71%	15%	7%	4%	3%
12. I am often late for class. (n)	Before	828		1.57	0.045*		65%	21%	9%	4%	1%
	Now	814		1.52			69%	18%	8%	3%	2%
13. I set aside time to do my homework and study.	Before	838		3.34	0.000**		6%	15%	34%	30%	15%
	Now	825		3.72			4%	7%	29%	32%	27%
14. When I say I'm going to do something, I do it.	Before	840		3.79	0.000**		2%	5%	31%	37%	25%
	Now	823		4.05			1%	3%	21%	39%	36%
15. I am a hard worker.	Before	836		4.00	0.000**		1%	4%	24%	36%	35%
	Now	823		4.30			0%	1%	15%	34%	49%
16. I finish whatever I begin.	Before	837		3.69	0.000**		2%	8%	35%	32%	24%
	Now	822		4.01			0%	3%	25%	37%	34%

[1] Reference lines are set at 3.5 and 4. **p<.01, *p<.05, †p<.10; (n) negatively worded statement

Table 6. Intent to Persist

Intent to Persist		n	Mean[1]		Paired Samples t-test		1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
17. I am considering a career in STEM (Science, Technology, Engineering, and Math).	Before	841		3.00	0.000**		16%	21%	29%	17%	18%
	Now	827		3.32			13%	17%	23%	21%	27%
18. I intend to get a college degree in STEM (Science, Technology, Engineering, and Math).	Before	839		3.17	0.000**		11%	20%	29%	18%	21%
	Now	826		3.47			10%	14%	27%	18%	31%
19. I can see myself working in STEM (Science, Technology, Engineering, and Math).	Before	836		2.99	0.000**		17%	19%	28%	19%	17%
	Now	825		3.31			13%	16%	24%	22%	25%
20. Someday, I would like to have a career in STEM (Science, Technology, Engineering, and Math).	Before	833		2.92	0.000**		19%	21%	27%	17%	17%
	Now	819		3.23			15%	16%	25%	18%	26%
21. I intend to graduate from high school	Before	835		4.79	0.002**		1%	1%	4%	6%	88%
	Now	828		4.85			1%	1%	2%	4%	92%

[1] Reference lines are set at 3.5 and 4. **p<.01, *p<.05, †p<.10

Table 7. Problem Solving, Now Only

Problem Solving	n	Mean	Assessment		1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
22. In this program, my teacher(s) tells me how to improve my work.	838	4.18	Good ☺		2%	3%	14%	40%	42%
23. In this program, my teacher(s) lets us choose our own topics or projects to investigate.	838	3.44	Action !		7%	11%	32%	32%	18%
24. In this program, I work out explanations on my own.	841	3.65	Attention ✓		1%	5%	36%	41%	16%
25. In this program, I have opportunities to explain my ideas.	842	3.87	Attention ✓		2%	6%	25%	38%	29%
26. In this program, we plan and do our own projects and/or experiments.	842	3.76	Attention ✓		3%	8%	27%	33%	29%
27. In this program, we work on real-world problems.	840	3.90	Attention ✓		3%	7%	22%	34%	34%
28. In this program, we have class discussions.	836	4.27	Good ☺		2%	3%	13%	32%	51%
29. In this program, we investigate to see if our ideas are right.	838	4.05	Good ☺		1%	3%	22%	36%	37%
30. In this program, we need to be able to think and ask questions.	834	4.35	Good ☺		1%	2%	13%	32%	53%
31. In this program, we are expected to understand and explain ideas.	837	4.23	Good ☺		1%	2%	16%	37%	45%

[1] Reference lines are set at 3.5 and 4. Assessment: Good=Above 4.0; Attention=Below 4.0; Action=Below 3.5.

Table 8. Implementation Activities, Now Only

Implementation Activities	n	Mean		Assessment		1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
32. In this program, my teacher(s) takes notice of students' ideas.	834		3.93	Attention ✓		3%	5%	22%	39%	32%
33. In this program, my teacher(s) shows us how new information relates to what we have already learned.	828		4.18	Good ☺		1%	3%	15%	37%	43%
34. In this program, we learn what scientists/ technicians/ engineers/ mathematicians or other STEM professionals do.	838		3.58	Attention ✓		4%	10%	30%	35%	21%
35. In this program, we do our work in groups.	837		3.71	Attention ✓		2%	7%	33%	35%	23%
36. In this program, we interact with scientists/ technicians/ engineers/ mathematicians or other STEM professionals.	835		3.45	Action !		8%	12%	30%	28%	22%

[1] Reference lines are set at 3.5 and 4. Assessment: Good=Above 4.0; Attention=Below 4.0; Action=Below 3.5.

Table 9. Educational Plans

What is the highest level of education you plan to achieve?	Before		Now		*Change*[1]	
	n	%	n	%	*n*	*%*
High School	104	13%	69	9%	-35	-4.16%
2-year college	103	13%	61	8%	-42	-5.04%
4-year college	250	31%	168	21%	-82	-9.72%
Graduate School	180	22%	226	28%	+46	+6.20%
Professional School	174	21%	272	34%	+98	+12.72%
Total	811	100%	796	100%		
Average[2]	**3.05**		**3.38**		**0.000** (*significant*)**[3]	

[1] Change from Before to Now. Increases are highlighted in green; decreases are highlighted in red.
[2] To compute averages, the following codes were applied: High School (1), 2-year college (2), 4-year college (3), Graduate School (4), Professional School (4). [3] Paired samples t-test, p-value: **p<.01, *p<.05, †p<.10

Table 10. Demographics

Gender	n	%
Female	436	52%
Male	406	48%
Total	**842**	**100%**

Ethnicity	n	%
Asian	31	4%
Black	316	38%
Hispanic	69	8%
Native American	4	0%
White	337	40%
Multiracial	64	8%
Other	19	2%
Total	**840**	**100%**

Grade	n	%
6th	178	21%
7th	240	28%
8th	220	26%
9th	47	6%
10th	47	6%
11th	27	3%
12th	86	10%
Other	0	0%
Total	**845**	**100%**

Table 11. Participation

How long have you participated in this program?		n	%
Dosage	0 semesters	34	4%
	1 semester	515	62%
	2 semesters	67	8%
	3 semesters	16	2%
	4 or more semesters	84	10%
	Summer Only	2	0%
	Don't Know	114	14%
	Total	**832**	**100%**

Did you participate in this program during the summer?		n	%
Summer Participation	No	720	86%
	Yes	41	5%
	Don't Know	73	9%
	Total	**834**	**100%**

Table 12. Program Rating

Program Rating: How would you rate this program?	n	Mean[1]	Assessment		Very Poor (1)	Poor (2)	Average (3)	Good (4)	Excellent (5)
	836	4.12	Good ☺		3%	3%	17%	35%	42%

[1] Reference lines are set at 3.5 and 4. Assessment: Good=Above 4.0; Attention=Below 4.0; Action=Below 3.5.

Appendix A. Construct Reliabilities

Construct Reliabilities				
Constructs		**n**	**Cronbach's alpha**	***Reliability Interpretation***
Intrinsic Motivation (9-items)	Before	801	.853	*Very good*
	Now	782	.863	*Very good*
Self-Management/Self-Regulation (7-items)	Before	807	.729	*Good*
	Now	784	.708	*Good*
Intent to Persist (5-items)	Before	828	.861	*Very good*
	Now	817	.877	*Very good*
Problem Solving (10-items)	Now	816	.848	*Very good*
Implementation Activities (5-items)	Now	821	.756	*Good*

Cronbach's Alpha Reliability Key: Cronbach's alpha is a measure of the internal consistency of items in a construct. This statistic ranges from 0 to 1.00; the higher the value the better. An alpha of .80 or higher is considered to have achieved very good measurement reliability; an alpha of .65 is considered acceptable (Field, 2009). The table above suggests that all constructs achieved good to very good measurement reliability.

Reliability	Interpretation
.90 and above	Excellent reliability; at the level of the best measures
.80 - .90	Very good
.70 - .80	Good; in the range of most. There are probably a few items which could be improved.
.60 - .70	Somewhat low. This measure needs to be supplemented by other measures (e.g., more surveys) to determine outcomes. There are probably some items which could be improved.
.50 - .60	Suggests need for revision of measure, unless it is quite short (ten or fewer items). The test definitely needs to be supplemented by other measures (e.g., more tests).
.50 or below	Questionable reliability. This measure should not contribute heavily to the outcomes and needs revision.

From: J. C. Nunnally, Psychometric Theory. New York: McGraw-Hill, 1967, pp. 172-235.

Reference:

Field, A. (2009). *Discovering Statistics Using SPSS, 3rd Edition*. Thousand Oaks, CA: Sage Publications.