APPLIED LEARNING STUDENT QUESTIONNAIRE: *OVERALL ANALYSIS*

Overall Results
2013-2014

Executive Summary

Participants and Methods

In 2013-2014, 2,931 students across 10 Race to the Top programs completed the Applied Learning Student Questionnaire (ALSQ).[1] The response rates displayed in Table 1 suggest that 78% of the total number of participating students were successfully surveyed across all programs. The response rate ranged from 47% to 100%. Although there is no agreed-upon standard for a minimum response rate, Martella, Nelson, Morgan, and Marchand-Martella (2013)[2] suggest that a response rate of 50% is *adequate* for analysis and reporting, 60% is *good*, and 75% or higher is considered *very good*. Overall, the response rate achieved across 10 Race to the Top programs is considered *very good* for reporting and analysis.

Table 1. Survey Response Rates

Program	# of Survey Respondents	Total # of Participating Students[1]	Survey Response Rate
STEM for Life Carroll County	370	480	77%
Drew Charter School- Partners of Innovation	692	841	82%
Murray County STEM Academy	117	150	78%
21st Century STEM Collaboration- Barrow County	780	895	87%
STEM Targeted Education Program (STEP) Academy- Sweetwater MS and Moore MS	247	278	89%
Tift County Mechatronics Program	133	135	99%
21st Century Academy of Environmental Studies – Rockdale County	348	581	60%
Computational Thinking: 21st Century STEM Problem-Solving Skills for Georgia Students	115	246	47%
Real STEM – Georgia Southern	86	131	66%
Morehouse College	43	43	100%
Total	**2,931**	**3,780**	**78%**

Note. [1]Total # of participating students does not count unique students; students may have completed both the Fall and Spring surveys and, thus, be counted twice in the dataset.

[1] The current report assesses students' responses across Fall 2013, Spring 2014, and Summer 2014. Students may have participated in more than one survey; thus, total student figures may not be of unique students.

[2] Martella, R., Nelson, J., Morgan, R., Marchand-Martella, N (2013). *Understanding and Interpreting Education Research*. New York, NY: The Guilford Press.

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Executive Summary, continued

The ALSQ[3] 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 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."

Results & Discussion

- **ALSQ Survey Constructs**
  Table 2 summarizes students' responses to the ALSQ survey constructs across all programs and semesters. In aggregate, students show statistically significant increases in *Intrinsic Motivation*, *Self-Management/Self-Regulation Skills*, and *Intent to Persist*. The largest student gains observed were in the *Intrinsic Motivation* construct. This suggests that the programs were particularly effective at enhancing students' interests to learn and derive value from the material being taught. For example, prior to participating in the programs, only 56% of students said that understanding STEM is important to them compared to 76% after the program. See Appendix A for more information.

  To maximize impact, we would expect students' average scores to exceed 4.00 on a 5-point Likert scale (1, *Strongly Disagree* to 5, *Strongly Agree*). In light of this benchmark, it is important to note that the "now" scores across the following three constructs— *Intent to Persist, Problem Solving,* and *Implementation Activities*— did not reach or exceed the optimal average of 4.00. Figure 1 suggests that additional work may be needed in the above mentioned areas.

[3] See Appendix B for information related to the construct reliabilities of the ALSQ.

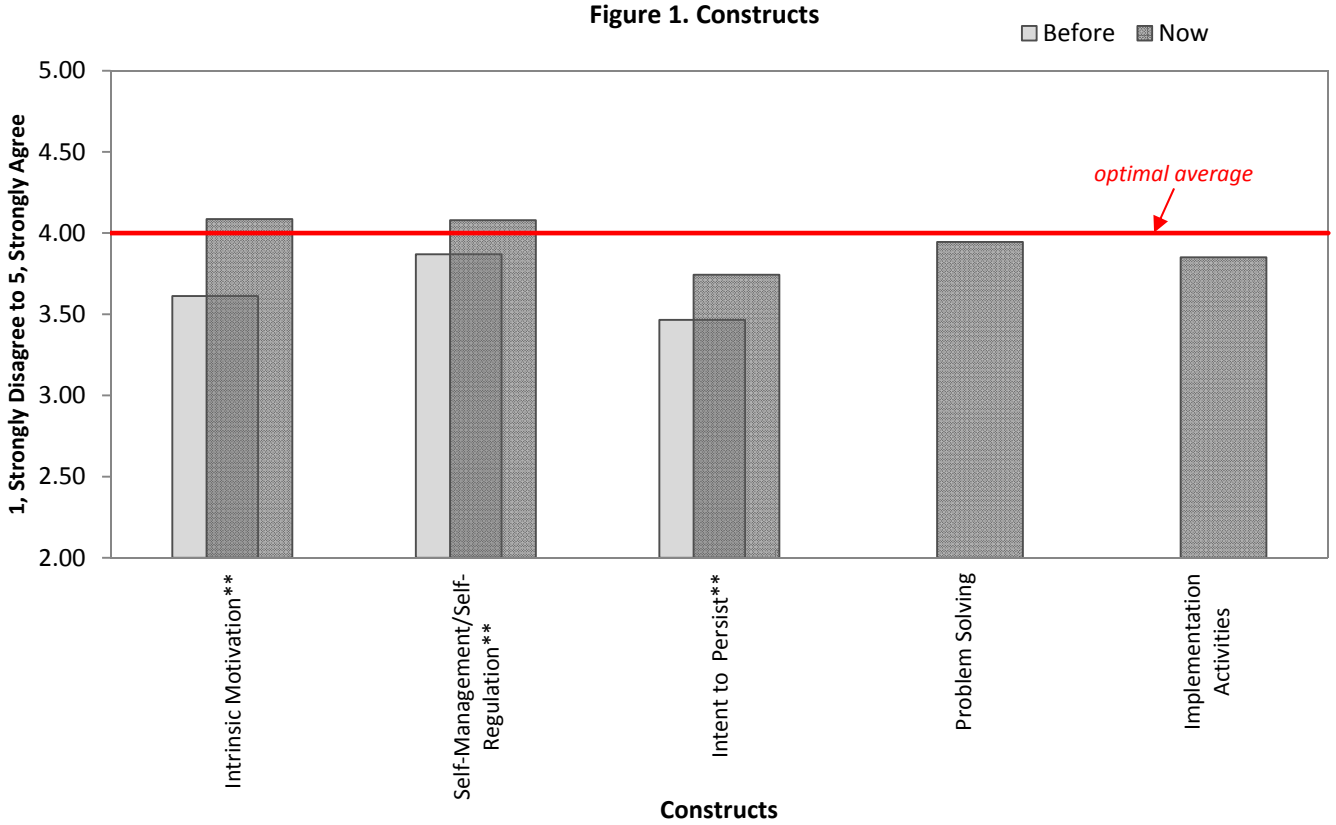
Executive Summary, continued

Table 2. Summary of Results by Constructs

Overall- Constructs				
Constructs		**n**	**Mean[1]**	**Paired Samples t-test[2]**
Intrinsic Motivation	Before	2926	3.61	p<0.001**
	Now	2905	4.09	
Self-Management/Self-Regulation	Before	2923	3.87	p<0.001**
	Now	2908	4.08	
Intent to Persist	Before	2922	3.47	p<0.001**
	Now	2915	3.74	
Problem Solving	Now	2910	3.95	*n/a*
Implementation Activities	Now	2888	3.85	*n/a*

Note. Scale= 1, *Strongly Disagree* to 5, *Strongly Agree*. [1]Reference lines are set at 3.5 and 4. [2]Please note that only students with matched Pre and Post data were assessed for significance. Desired statistically significant changes are highlighted in green and undesired statistically significant changes are highlighted in red. **p<0.001, *p<0.01, †p<0.05. Negatively worded statements were reverse coded for mean computations.

Figure 1. Constructs



**p<0.001, *p<0.01, †p<0.05; Scale is truncated for visual clarity.

Executive Summary, continued

- **ALSQ Survey Constructs by Program**

  Disaggregating the results by program, Table 3 suggests that students show statistically significant increases in *Intrinsic Motivation*, *Self-Management/Self-Regulation Skills*, and *Intent to Persist* across all programs, with the exception of the students in the Murray STEM Academy. Students in the RT3 Computational Thinking program only show a statistically significant increase in *Intrinsic Motivation*. Students in the Mechatronics Program at Tift County show the largest increases from before to now on all three of the abovementioned constructs; RT3 Computational Thinking and Murray STEM Academy students show the smallest average increases across all 10 programs.

Table 3. Summary of Results by Constructs per Program

Overall- Constructs per Program											
Constructs		**STEM for Life Carroll County (n=370)**		**Drew Charter (n=692)**		**Murray STEM Academy (n=117)**		**21st Century Barrow County (n=780)**		**STEP Academy Moore MS Sweetwater MS (n=247)**	
		Mean	*t-test*	Mean	*t-test*	Mean	*t-test*	Mean	*t-test*	Mean	*t-test*
Intrinsic Motivation	Before	3.48	p<0.001**	3.60	p<0.001**	3.22	p=0.059	3.64	p<0.001**	3.52	p<0.001**
	Now	4.06		3.93		3.49		4.18		4.09	
Self-Management/ Self-Regulation	Before	3.73	p<0.001**	3.82	p<0.001**	3.51	p=0.822	4.01	p<0.001**	3.67	p<0.001**
	Now	4.07		3.96		3.57		4.20		3.96	
Intent to Persist	Before	3.36	p<0.001**	3.43	p<0.001**	3.00	p=0.311	3.40	p<0.001**	3.42	p<0.001**
	Now	3.74		3.60		3.15		3.66		3.76	
Problem Solving	Now	3.86	*n/a*	3.85	*n/a*	3.40	*n/a*	4.10	*n/a*	3.78	*n/a*
Implementation Activities	Now	3.79		3.71		3.18		4.07		3.68	

Note. Scale= 1, *Strongly Disagree* to 5, *Strongly Agree*. Negatively worded statements were reverse coded for mean computations. **p<0.001, *p<0.01, †p<0.05

Executive Summary, continued

Continued Table 3. Summary of Results by Constructs per Program

Overall- Constructs per Program											
Constructs		**Tift County Mechatronics (n=133)**		**21st Century Rockdale County (n=347)**		**RT3 Computational Thinking(n=115)**		**Real STEM Georgia Southern (n=86)**		**Morehouse College (n=43)**	
		Mean	*t-test*	Mean	*t-test*	Mean	*t-test*	Mean	*t-test*	Mean	*t-test*
Intrinsic Motivation	Before	3.86	p<0.001**	3.83	p<0.001**	3.60	p=0.039†	3.50	p<0.001**	3.87	p<0.001**
	Now	4.65		4.27		3.75		4.05		4.35	
Self-Management/ Self-Regulation	Before	4.01	p<0.001**	4.04	p<0.001**	3.76	p=0.055	3.89	p=0.001*	3.95	p<0.001**
	Now	4.43		4.23		3.84		4.02		4.32	
Intent to Persist	Before	3.73	p<0.001**	3.78	p<0.001**	3.60	p=0.151	3.39	p<0.001**	4.13	p=0.007*
	Now	4.61		4.00		3.70		3.70		4.44	
Problem Solving	Now	4.55	*n/a*	3.92	*n/a*	3.63	*n/a*	4.22	*n/a*	4.29	*n/a*
Implementation Activities	Now	4.59		3.75		3.55		4.20		4.10	

Note. Scale= 1, *Strongly Disagree* to 5, *Strongly Agree*. Negatively worded statements were reverse coded for mean computations. **p<0.001, *p<0.01, †p<0.05

Executive Summary, continued

In order for programs to maximize their impact on students, 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 seven out of 10 programs met or exceeded the optimal average for intrinsic motivation; three out of 10 programs—Drew Charter, Murray STEM Academy, and RT3 Computational Thinking— fell below the optimal average. In general, programs not reaching or exceeding the red horizontal line may need additional support and attention.

Figure 2. Intrinsic Motivation ("Now" Scores)

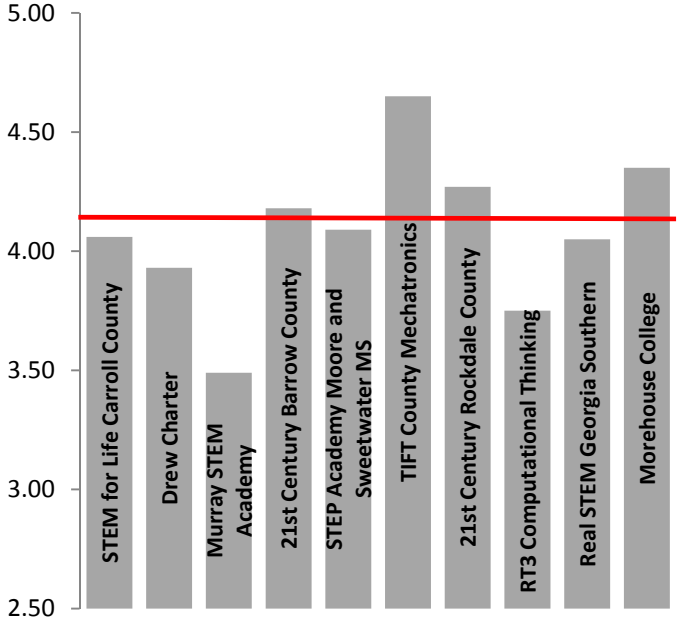


Figure 3. Self-Management/Self-Regulation ("Now" Scores)

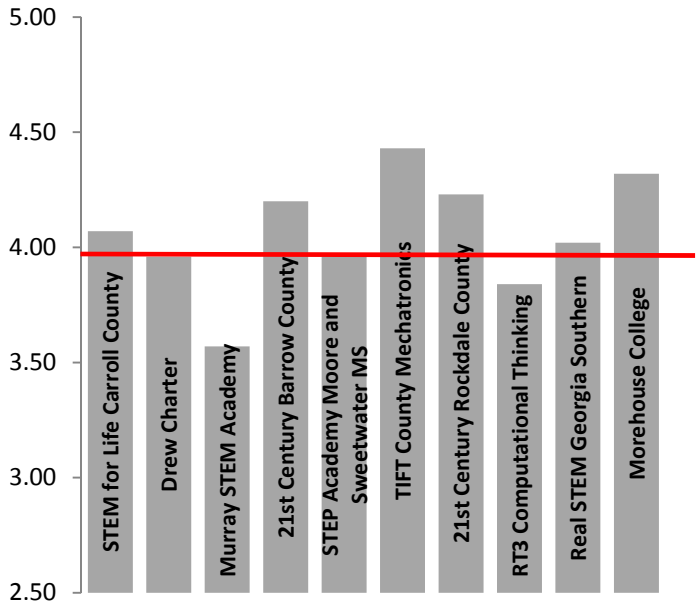


Figure 4. Intent to Persist ("Now" Scores)

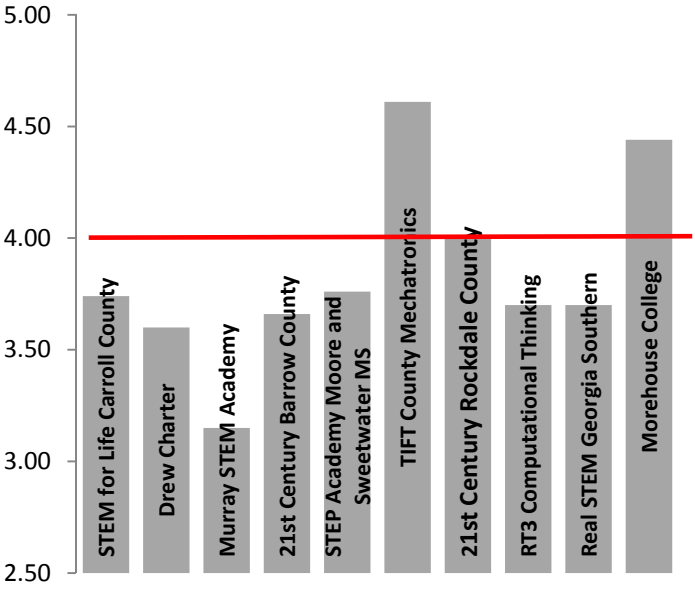
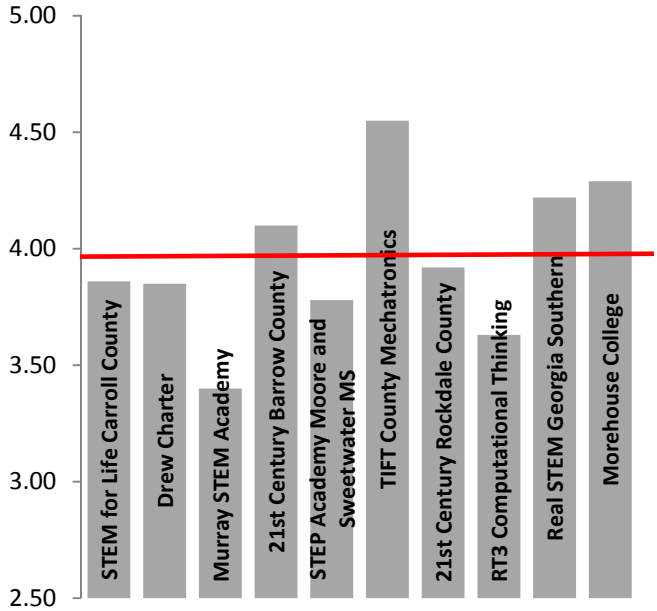


Figure 5. Problem Solving ("Now" Scores)



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

Figure 6. Implementation Activities ("Now" Scores)

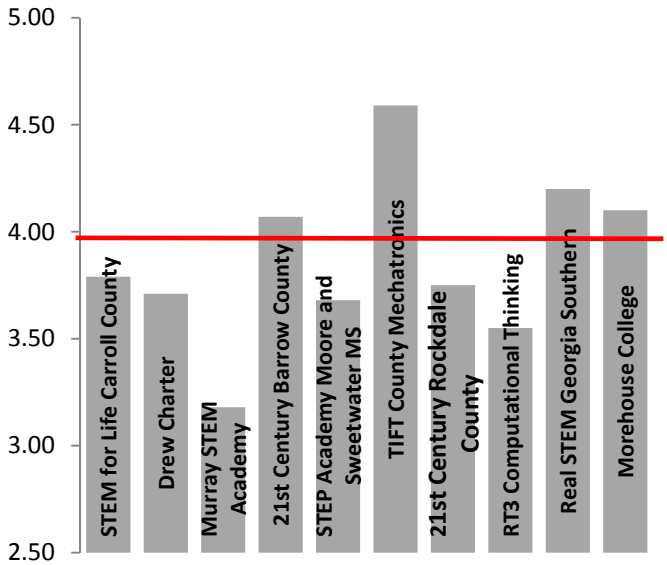
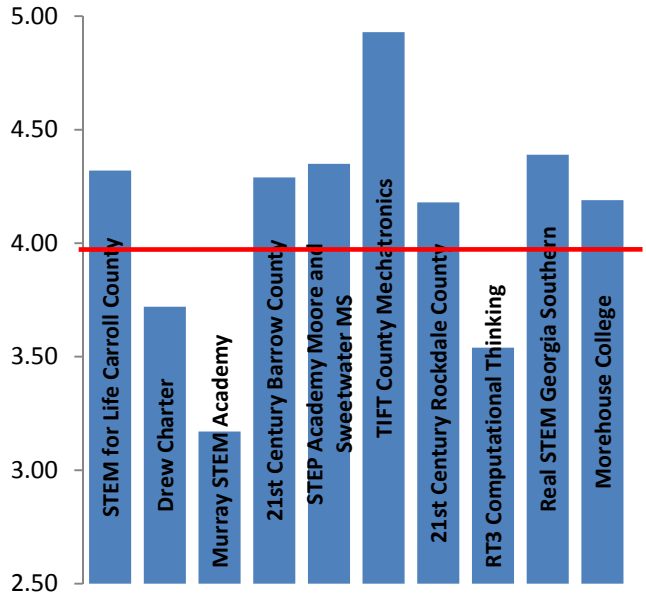


Figure 7. Program Ratings



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 4.00. On a 5-point Likert scale where 1 signifies *Very Poor* and 5 signifies *Excellent*, the average score was a 4.11. See Table 12 for more information. Looking at Figure 7, above, we see that seven out of 10 programs were rated highly by students (i.e., above the optimal average). However, Drew Charter, Murray County STEM Academy, and RT3 Computational Thinking may need additional assistance in improving student enjoyment.

- **Areas for Further Improvement**
  Across all programs, further enhancing problem solving, implementation activities, and students' intentions to persist 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, 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 educational and career opportunities in STEM fields. Moreover, providing targeted support to the three programs—Drew Charter, Murray STEM Academy, and RT3 Computational Thinking— that did not reach the optimal average across most survey constructs may be needed to strengthen the overall efficacy of the Race to the Top grant(s) in Georgia.

Appendix A. Item Tables

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	2926		3.30	p<0.001**		7%	14%	37%	27%	16%
	Now	2905		3.83			4%	5%	25%	37%	29%
2. It is important to me to learn what is being taught in this program.	Before	2918		3.86	p<0.001**		3%	6%	25%	36%	31%
	Now	2892		4.28			2%	2%	13%	34%	50%
3. I like what I am learning in this program.	Before	2909		3.58	p<0.001**		4%	8%	34%	34%	20%
	Now	2885		4.06			3%	3%	19%	35%	40%
4. I think I will be able to use what I learn in this program in other classes.	Before	2899		3.59	p<0.001**		4%	10%	30%	34%	22%
	Now	2883		4.11			3%	3%	17%	35%	42%
5. Even when I do poorly on a test, I try to learn from my mistakes.	Before	2916		3.94	p<0.001**		4%	5%	20%	35%	35%
	Now	2894		4.35			2%	2%	10%	32%	54%
6. I think that what I am learning in this program is useful for me to know.	Before	2899		3.67	p<0.001**		4%	7%	31%	33%	25%
	Now	2875		4.13			3%	3%	16%	33%	45%
7. I think that what we are learning in this program is interesting.	Before	2895		3.45	p<0.001**		6%	11%	35%	29%	19%
	Now	2888		3.95			3%	6%	20%	33%	37%
8. Understanding STEM (Science, Technology, Engineering, and Math) is important to me.	Before	2915		3.62	p<0.001**		6%	8%	30%	30%	26%
	Now	2900		4.10			3%	3%	17%	32%	44%
9. I enjoy STEM (Science, Technology, Engineering, and Math) in general.	Before	2910		3.50	p<0.001**		7%	10%	33%	27%	23%
	Now	2894		3.95			4%	5%	21%	30%	39%

Note. [1] Reference lines are set at 3.5 and 4. [2]Please note that only students with matched Pre and Post data were assessed for significance. Desired statistically significant changes are highlighted in green and undesired statistically significant changes are highlighted in red. **p<0.001, *p<0.01, †p<0.05. Highest percentages are highlighted in gray.

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	2923		3.60	p<0.001**		3%	11%	31%	31%	23%
	Now	2900		3.88			2%	6%	25%	35%	31%
11. I miss class often. (n)	Before	2902		1.68	p=0.253		63%	19%	11%	5%	3%
	Now	2895		1.66			66%	16%	8%	6%	4%
12. I am often late for class. (n)	Before	2875		1.73	p=0.982		59%	21%	12%	5%	3%
	Now	2868		1.73			61%	19%	10%	6%	4%
13. I set aside time to do my homework and study.	Before	2913		3.37	p<0.001**		7%	11%	34%	30%	16%
	Now	2898		3.72			5%	6%	28%	34%	27%
14. When I say I'm going to do something, I do it.	Before	2918		3.75	p<0.001**		3%	6%	31%	35%	26%
	Now	2908		4.04			2%	3%	22%	36%	37%
15. I am a hard worker.	Before	2908		3.98	p<0.001**		2%	4%	22%	35%	36%
	Now	2895		4.24			2%	2%	15%	32%	49%
16. I finish whatever I begin.	Before	2901		3.78	p<0.001**		2%	6%	30%	33%	28%
	Now	2908		4.07			2%	3%	21%	36%	38%

Note. [1] Reference lines are set at 3.5 and 4. [2]Please note that only students with matched Pre and Post data were assessed for significance. Desired statistically significant changes are highlighted in green and undesired statistically significant changes are highlighted in red. **p<0.001, *p<0.01, †p<0.05; (n) negatively worded statement. Highest percentages are highlighted in gray.

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	2922		3.13	p<0.001**		15%	17%	29%	19%	20%
	Now	2915		3.48			12%	12%	25%	21%	31%
18. I intend to get a college degree in STEM (Science, Technology, Engineering, and Math).	Before	2914		3.26	p<0.001**		12%	15%	30%	21%	22%
	Now	2908		3.57			9%	11%	25%	22%	32%
19. I can see myself working in STEM (Science, Technology, Engineering, and Math).	Before	2913		3.16	p<0.001**		14%	16%	30%	20%	20%
	Now	2906		3.48			11%	12%	24%	23%	30%
20. Someday, I would like to have a career in STEM (Science, Technology, Engineering, and Math).	Before	2915		3.14	p<0.001**		15%	15%	30%	20%	20%
	Now	2887		3.46			11%	12%	25%	22%	30%
21. I intend to graduate from high school.	Before	2910		4.64	p<0.001**		2%	1%	7%	9%	80%
	Now	2907		4.73			2%	1%	5%	7%	85%

Note. [1] Reference lines are set at 3.5 and 4. [2]Please note that only students with matched Pre and Post data were assessed for significance. Desired statistically significant changes are highlighted in green and undesired statistically significant changes are highlighted in red. **p<0.001, *p<0.01, †p<0.05. Highest percentages are highlighted in gray.

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.	2878	4.08	Good ☺		3%	3%	17%	35%	41%
23. In this program, my teacher(s) lets us choose our own topics or projects to investigate.	2844	3.48	Action !		7%	10%	33%	27%	23%
24. In this program, I work out explanations on my own.	2910	3.76	Attention ✓		2%	4%	32%	42%	21%
25. In this program, I have opportunities to explain my ideas.	2898	3.88	Attention ✓		3%	5%	23%	41%	28%
26. In this program, we plan and do our own projects and/or experiments.	2895	3.73	Attention ✓		4%	8%	27%	34%	27%
27. In this program, we work on real-world problems.	2903	3.93	Attention ✓		3%	4%	23%	36%	34%
28. In this program, we have class discussions.	2897	4.15	Good ☺		2%	3%	16%	35%	44%
29. In this program, we investigate to see if our ideas are right.	2887	4.02	Good ☺		2%	3%	20%	39%	35%
30. In this program, we need to be able to think and ask questions.	2894	4.22	Good ☺		2%	2%	15%	36%	46%
31. In this program, we are expected to understand and explain ideas.	2901	4.20	Good ☺		2%	2%	15%	38%	44%

Note. [1] Reference lines are set at 3.5 and 4. Assessment: Good=Above 4.0; Attention=Below 4.0; Action=Below 3.5. Highest percentages are highlighted in gray.

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.	2868		3.85	Attention ✓		4%	5%	23%	35%	32%
33. In this program, my teacher(s) shows us how new information relates to what we have already learned.	2829		4.09	Good ☺		3%	3%	17%	38%	40%
34. In this program, we learn what scientists/ technicians/ engineers/ mathematicians or other STEM professionals do.	2887		3.78	Attention ✓		4%	7%	24%	35%	29%
35. In this program, we do our work in groups.	2888		3.82	Attention ✓		2%	4%	30%	36%	27%
36. In this program, we interact with scientists/ technicians/ engineers/ mathematicians or other STEM professionals.	2881		3.71	Attention ✓		5%	8%	25%	33%	28%

Note. [1] Reference lines are set at 3.5 and 4. Assessment: Good=Above 4.0; Attention=Below 4.0; Action=Below 3.5. Highest percentages are highlighted in gray.

Table 9. Educational Plans

What is the highest level of education you plan to achieve?	Before		Now		*Change*[1]	
	n	%	n	%	*n*	*%*
High School	423	15%	218	8%	-205	-7%
2-year college	348	12%	251	9%	-97	-3%
4-year college	808	29%	592	21%	-216	-8%
Graduate School	615	22%	724	26%	+109	+4%
Professional School	593	21%	988	36%	+395	+14%
Total	**2788**	**100%**	**2773**	**100%**		
Average[2]	**3.01**		**3.37**		**p<0.001** (*significant*)**[3]	

Note. [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]Only students with matched Pre and Post data were assessed for significance. Paired samples t-test, p-value: **p<0.001, *p<0.01, †p<0.05

Table 10. Demographics

Gender	n	%
Female	1352	47%
Male	1523	53%
Total	**2875**	**100%**

Ethnicity	n	%
Asian	105	4%
Black	1168	41%
Hispanic	223	8%
Native American	29	1%
White	1048	36%
Multiracial	215	7%
Other	91	3%
Total	**2879**	**100%**

Grade	n	%
6th	562	19%
7th	628	22%
8th	525	18%
9th	236	8%
10th	209	7%
11th	301	10%
12th	394	14%
Other	31	1%
Total	**2886**	**100%**

Table 11. Participation

How long have you participated in this program?		n	%
Dosage	0 semesters	80	3%
	1 semester	1051	37%
	2 semesters	745	26%
	3 semesters	145	5%
	4 or more semesters	439	15%
	Summer Only	49	2%
	Don't Know	367	13%
	Total	**2876**	**100%**

Did you participate in this program during the summer?		n	%
Summer Participation	No	2044	71%
	Yes	533	19%
	Don't Know	294	10%
	Total	**2872**	**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)
	2874		4.11	Good ☺		3%	2%	17%	36%	42%

Note. [1] Reference lines are set at 3.5 and 4. Assessment: Good=Above 4.0; Attention=Below 4.0; Action=Below 3.5. Highest percentage is highlighted in gray.

Appendix B. Construct Reliabilities

Construct Reliabilities				
Constructs		**n**	**Cronbach's alpha**	***Reliability Interpretation***
Intrinsic Motivation (9-items)	Before	4502	.877	*Very Good*
	Now	4428	.896	*Very Good*
Self-Management/Self-Regulation (7-items)	Before	4588	.603	*Somewhat Low*
	Now	4535	.625	*Somewhat Low*
Intent to Persist (5-items)	Before	4638	.870	*Very Good*
	Now	4587	.883	*Very Good*
Problem Solving (10-items)	Now	4543	.884	*Very Good*
Implementation Activities (5-items)	Now	4614	.809	*Very Good*

Note. Construct reliabilities were computed based on December 2012 – July 2014 data.

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 very good measurement reliability with the exception of Self-Management/Self-Regulation.

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. .65 is considered acceptable.
.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.