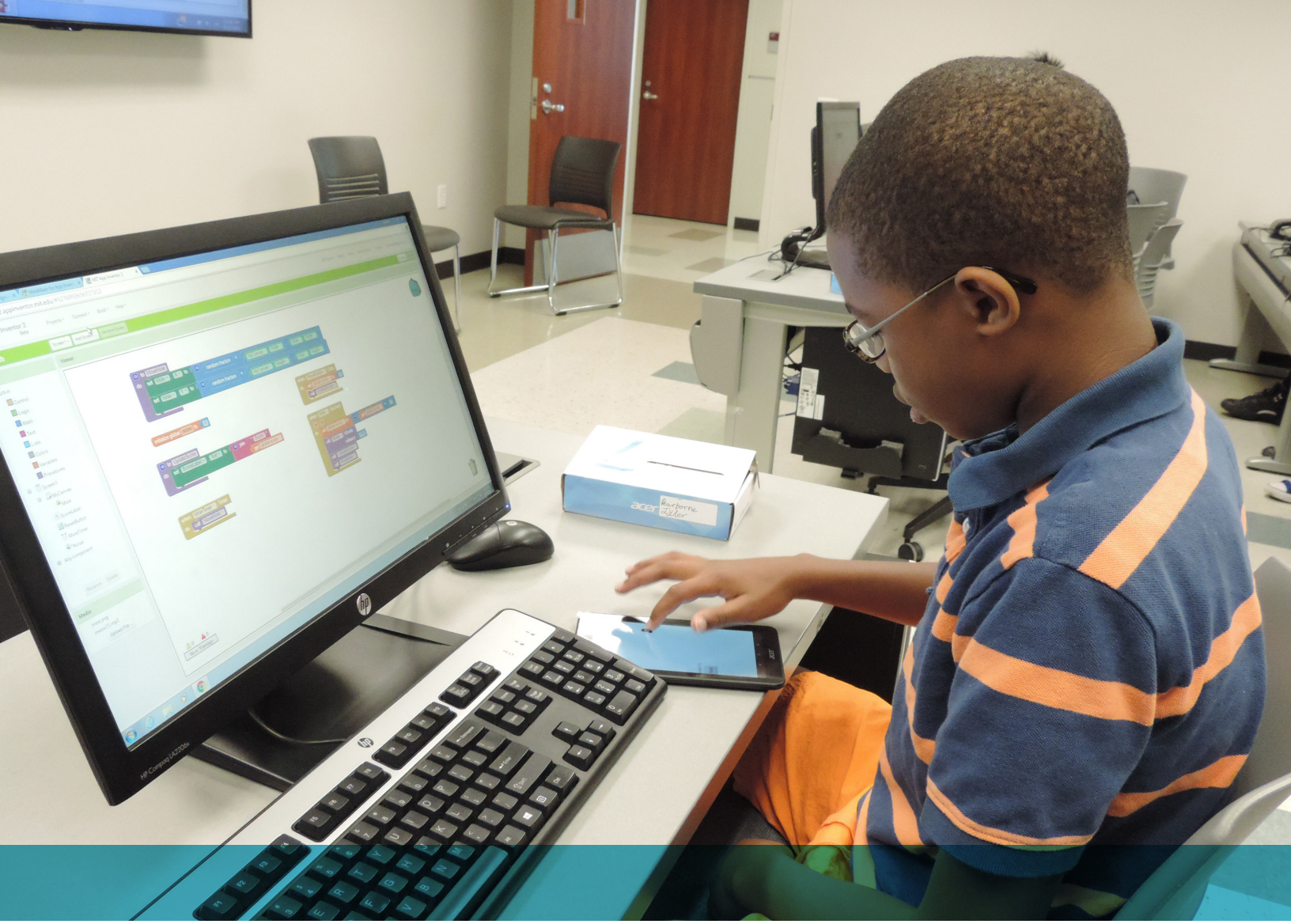

2016 Verizon Innovative Learning Minority Male Program

Summer Program Evaluation Executive Summary

September 2016

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SRI Education

SRI Education's Center for Technology in Learning improves student learning, enhances teaching effectiveness, develops meaningful assessments, and evaluates program impacts in preschool, K–12 schools, community colleges, and informal settings such as museums.

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Executive Summary

SRI International's Center for Technology in Learning, with support from the Verizon Education Foundation, developed this research brief as part of a two year evaluation of the 2016 Verizon Innovative Learning Minority Male Program (VIL MM). The goals of the VIL MM Program are to increase minority, male, middle school students' problem solving skills, technology proficiency, and interest in STEM subjects and careers. This brief summarizes key findings from survey and assessment results collected during the 2016 summer program at twelve minority serving institutions (MSUs) between June and August of 2016 (see Table 1). A description of the highlights, challenges and lessons learned during the summer are also provided. The aim of this research is to understand the experiences of participating minority, middle school male students by giving voice to the perspectives of participating stakeholders (e.g., students, educators, mentors, parents and administrators).

The VIL MM program served approximately 1176 students who participated in one, two, four, or five week summer sessions on university campuses located across the country. Table 1 describes the location of each setting and the number of students who participated in the pre or post assessments administered at each campus, with the exception of one campus (University of District of Columbia) that did not participate in data collection.

Table 1. Program locations, duration of sessions and number of participants.

University Name	Program Length	**Program Participants
Central State University	One 2 week residential session	40
Clark Atlanta University	One 5 week session	38
Delaware State University	One 4 week session	39
Hampton University	Two 2 week sessions	47
Harris Stowe University	Two 2 week sessions	69
*Jackson State University	One 4 week session	72
*Kentucky State University	One 2 week session	91
*Morgan State University	One 4 week session	49
*North Carolina A & T University	Four 1 week sessions	298
Texas Southern State University	Four 1 week sessions	205
***University of District of Columbia	One 4 week session	101
California State University at San Bernardino	Three 1 week sessions	127
	Total:	**1176**

Case study site. ** Number of students who participated in the pre or post survey/assessment. * Did not participate in pre or post survey/assessment.*

Research Questions

The VIL MM program evaluation addressed the following research questions:

R1. To what extent does participation in the VIL MM Program increase students' interest in STEM subjects, STEM careers, and attending college?

R2. To what extent does participation in the VIL MM Program increase students' performance in STEM activities such as 3D modeling and printing, mobile app development, computer programming and coding and problem solving?

R3. What unique elements of the VIL MM Programs at each campus enhanced students' STEM learning experiences?

R4. How can the VIL MM Program be refined to support students', teachers, mentors and administrators?

Key Findings

Evaluation findings revealed the following:

- Results from self-reported responses to a student pre-post survey that asked about interest (moderate or very interested) in STEM and Design classes found increases in students' interest in taking future classes in Science (60% to 63%), Mathematics (57% to 64%), and Design (72% to 73%), with a slight decrease in interest in taking classes in Engineering (73% to 72%) and Technology (85% to 81%).
- Pre-post survey results regarding interest in STEM careers indicated that interest in Engineering careers increased from 66% to 72% and interest in Mathematics careers increased from 58% to 59% Interest in Technology careers decreased from 82% to 79%, while interest in Design careers decreased from 70% to 69%. Interest in Science careers did not change (61%).
- Student interest in attending a four year university increased following program participation (91% to 92%).
- Results from self-reported responses to a student pre-post survey that asked about proficiency (moderate or high proficiency) in STEM and Design classes found increases in students' proficiency in Science (75% to 77%), Technology (77% to 81%), Engineering (64% to 72%), Mathematics (73% to 75%), and Design (55% to 71%).
- Results from program-created pre-post assessments indicated increases in student's knowledge on items related to 3D printing, and programming and coding, while performance on items involving problem solving and mobile app development skills had mixed results.
- Students who participated in focus groups reported increased interest in entrepreneurship and business as a result of participating in the VIL MM program activities.
- Mentors reported increased interest in technology and teaching.
- Students reported a variety of unique experiences that enhanced their learning. Examples include motivational presentations from Verizon Vice President Tony Lewis, field trips, and presentations. Field trip locations included the Cleveland Zoo, the Air Force Museum, the NASA Museum, the Connected City Maker Space at the Science Museum in St. Louis and a visit to an simulator used by air traffic controllers.
- Stakeholders (e.g. mentors, students, parents, faculty, and administrators) reported that the program met or exceeded their expectations.
- Parents requested more communication regarding their students' activities.
- Teachers and mentors requested more time to work with the students, additional hands on activities and technology devices (i.e., iPads) for each student.

- Challenges included limited preparation time to stand up the programs at the campuses, transportation costs, and gaps in teachers and mentors understanding of their roles and the expectations for mentors.
- Professional development needs varied among sites. While some campuses provided mentors with professional development in leadership and mentoring, training in how to support instruction in 3D printing and mobile app development was limited at some locations.

Study Design and Limitations

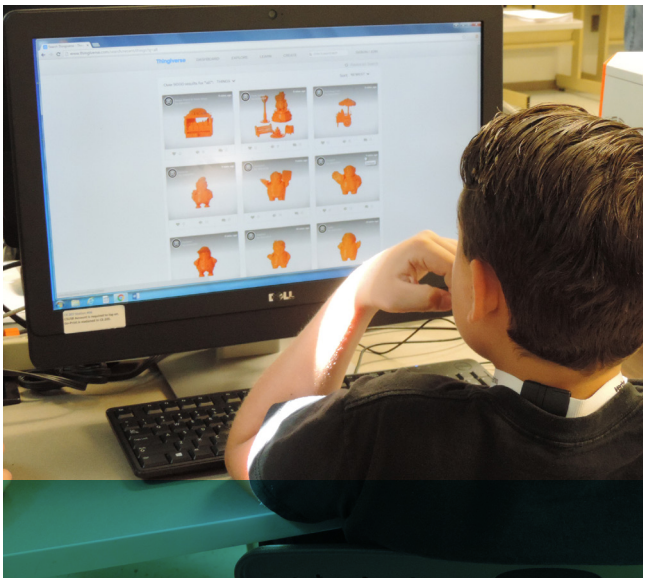
During the summer of 2016 (June 6th – August 5th), SRI researchers collected data through focus groups, observations, surveys and interviews with administrators, students, mentors, parents, teachers and faculty associated with the program. Pre and Post survey and assessment data was collected from approximately 1176 students. Over 50 interviews were conducted with stakeholders.

The findings from this research are only a snapshot in time and depict situations that may have changed by the end of the summer program. For example, in some cases, interviews were conducted with stakeholders who were just learning about the program or had only been involved for a few days, and thus were unable to give detailed information about their perspectives. In addition, due to time constraints, the survey and assessments used to collect data were piloted with only a small group of students, prior to administration in the VIL MM program. A plan exists to conduct psychometric analyses using the assessment data from the 2016 VIL MM Summer program, in order to guide refinements to the items and improve the reliability and validity of the assessments.

Recommendations

Stakeholder recommendations for program improvements included:

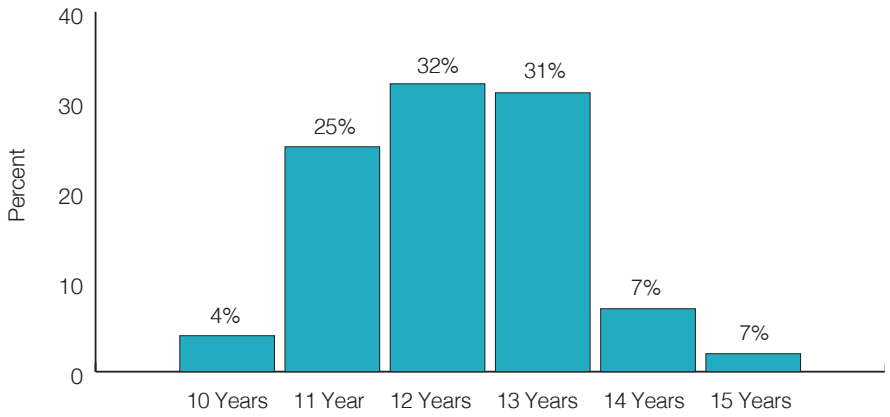
- expanding the program to include longer sessions (from 1 week to four weeks) with the option for a residential component;
- providing more field trips and technology resources, such as iPads to students;
- creating strategies for assessing students' interests and prior knowledge, in order to meet students' needs;
- developing an online repository of lesson plans and shared resources, that includes a forum for mentors and instructors to share best practices;
- increasing communication with parents about their students' activities (e.g., newsletters, emails, or a website where information can be found easily);
- clarifying the roles of mentors so that they can support the program more effectively;
- providing more meal choices at some locations;
- including parents and local teachers in program planning; and
- enhancing campus support would help administrators with implementing the programs.



Summary of Findings

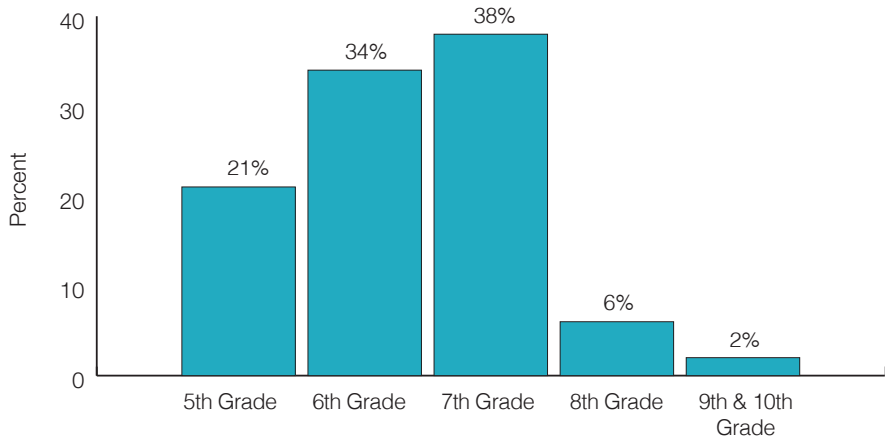
Pre and post student surveys were developed in collaboration with Verizon staff. The survey questions were designed to capture demographic information and target research questions R1 and R2. Results from a pre-post survey question that asked "What is your age?" indicated that most students (63%) were 12 or 13 years of age (see Figure 1).

Figure 1. Describes the ages of the students who responded to the VIL MM summer survey question "What is your age?"



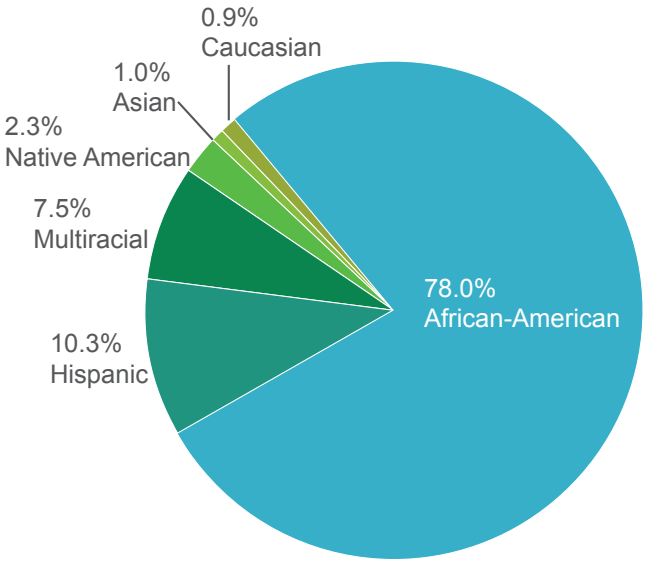
Results from a pre-post survey question that asked "What grade did you just finish?" indicated that most students (72%) had just finished 6th or 7th grade (see Figure 2).

Figure 2. Describes the grades of students who responded to the VIL MM summer survey question "What grade did you just finish?"



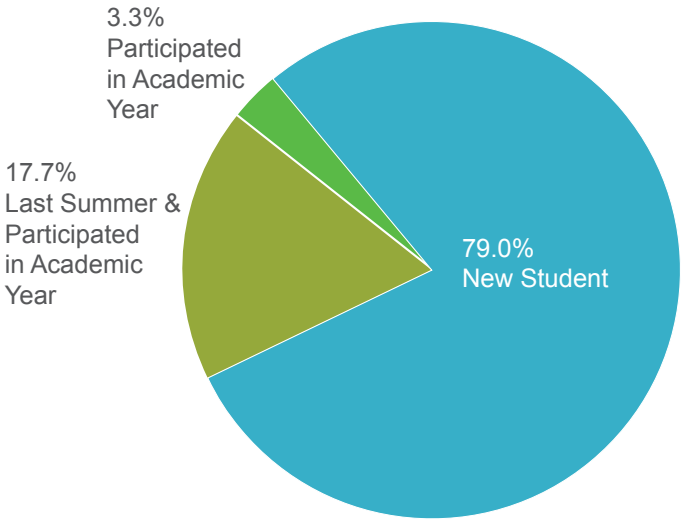
Results from a pre-post survey question that asked “What is your race?” indicated that most students (78%) were African American (see Figure 3).

Figure 3. Describes the race of students who responded to the VIL MM summer survey question “What is your race?”



Results from a pre-post survey question that asked “What is your experience with the VIL MM Program?” indicated that most students (79%) were new students (see Figure 4).

Figure 4. Describes the percentage of new students and those with prior VIL MM experience.



Results from a post survey question that asked students to "Please rate your interest in furthering your education?" indicated that (92%) rated their interest in attending a four year university as moderate or very interested, as compared to 91% on the pre-survey (see Table 2).

Table 2. Describes the responses of students who answered the question "Please rate your interest in furthering your education (at a four year university)."

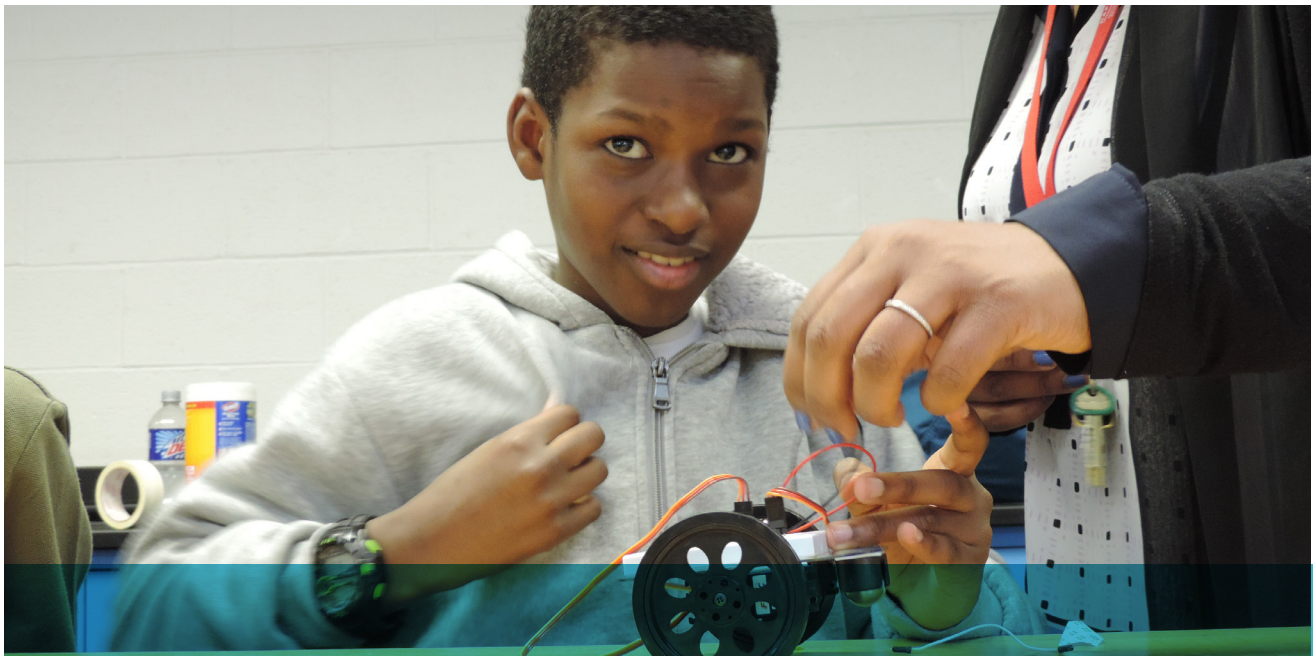
Pre-test Results on Students' Interest in Attending a 4 Year University	Post Test Results on Students' Interest in Attending a 4 Year University					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested (N = 15) (2%)	6 40%	1 7%	1 7%	3 20%	4 27%	15 100%
Low Interest (N = 8) (1%)	1 12.5%	6 75%	1 12.5%	0 0%	0 0%	8 100%
Some Interest (N = 50) (6%)	2 4%	6 12%	14 28%	15 30%	13 26%	50 100%
Moderate Interest (N = 93) (12%)	2 2%	1 1%	10 11%	36 39%	44 47%	93 100%
Very Interested (N = 635) (79%)	1 .16%	0 0%	14 2%	23 4%	597 94%	635 100%
Total N = 801 on Pre Test	12 1.5%	14 2%	40 5%	77 10%	658 82%	801 100%

Interest in STEM Courses

As part of a pre-post program survey, students were asked to rate their interest in taking classes in science, technology, engineering, mathematics, and design. Post-survey results indicated that, after participating in the program, 63% of students who responded to the question "Please rate your interest in taking classes in science in the future" rated their interest in taking science classes as moderate or very interested, as compared to 60% on the pre-survey (see Table 3).

Table 3. Depicts changes in responses to the pre-post survey question "Please rate your interest in taking science classes in the future."

Pre-test Results on Students' Interest in Science Classes	Post Test Results on Students' Interest in Taking Science Classes in the Future					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested	21	16	6	3	5	51
(N = 51) (6%)	41%	31%	12%	6%	10%	100%
Low Interest	16	30	17	4	5	72
(N = 72) (9%)	22%	42%	24%	6%	7%	100%
Some Interest	8	20	105	58	17	208
(N = 208) (25%)	4%	10%	50%	28%	8%	100%
Moderate Interest	1	3	41	112	69	226
(N=226) (28%)	.44%	1%	18%	50%	31%	100%
Very Interested	2	1	13	29	214	259
(N=259) (32%)	.77%	.39%	5%	11%	83%	100%
Total N = 816 on	48	70	182	206	310	816
Pre Test	6%	9%	22%	25%	38%	100%



Post-survey results indicated that, after participating in the program, 81% of students who responded to the question "Please rate your interest in taking classes in technology classes in the future" rated their interest in taking technology classes as moderate of very interested, as compared to 85% on the pre-survey (see Table 4).

Table 4. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in taking technology classes in the future."

Pre-test Results on Students' Interest in Technology Classes	Post Test Results on Students' Interest in Taking Technology Classes in the Future					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested (N = 8) (1%)	3 37.5%	0 0%	1 12.5%	1 12.5%	3 37.5%	8 100%
Low Interest (N = 26) (3%)	5 19%	9 35%	10 38%	1 4%	1 4%	26 100%
Some Interest (N = 208) (11%)	3 3.4%	17 19%	38 43%	19 21%	12 13%	89 100%
Moderate Interest (N = 226) (26%)	5 .2%	5 2%	44 121	95 45%	60 29%	209 100%
Very Interested (N = 259) (59%)	6 1%	1 .2%	13 3%	68 14%	396 82%	484 100%
Total N = 816 on Pre Test	22 3%	32 4%	106 13%	184 23%	472 58%	816 100%

Post-survey results indicated that, after participating in the program, 72% of students who responded to the question "Please rate your interest in taking classes in engineering classes in the future" rated their interest in taking engineering classes as moderate or very interested, as compared to 73% on the pre-survey (see Table 5).

Table 5. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in taking engineering classes in the future."

Pre-test Results on Students' Interest in Engineering Classes	Post Test Results on Students' Interest in Taking Engineering Classes in the Future					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested (N = 25) (3%)	15 60%	5 20%	2 8%	1 4%	2 8%	25 100%
Low Interest (N = 48) (6%)	10 21%	18 37.5%	13 27%	4 8%	3 6%	48 100%
Some Interest (N = 151) (19/%)	12 8%	20 13%	65 43%	32 21%	22 15%	151 100%
Moderate Interest (N = 207) (26%)	0 0%	6 3%	37 18%	84 41%	80 39%	207 100%
Very Interested (N = 378) (47%)	2 .53%	3 .79%	19 5%	38 10%	316 84%	378 100%
Total N = 809 on Pre Test	39 5%	52 6%	136 17%	159 20%	423 52%	809 100%

Post-survey results indicated that, after participating in the program, 64% of students who responded to the question "Please rate your interest in taking classes in mathematics in the future" rated their interest in taking mathematics classes as moderate of very interested, as compared to 57% on the pre-survey (see Table 6).

Table 6. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in taking mathematics classes in the future."

Pre-test Results on Students' Interest in Mathematics Classes	Post Test Results on Students' Interest in Taking Mathematics Classes in the Future					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested (N = 80) (10%)	45 56%	15 19%	8 10%	4 5%	8 10%	80 100%
Low Interest (N = 93) (11.5%)	13 14%	44 47%	24 26%	8 9%	4 4%	93 100%
Some Interest (N = 171) (21%)	8 5%	18 11%	64 37%	63 37%	18 11%	171 100%
Moderate Interest (N = 205)(25%)	2 1%	4 2%	36 18%	108 53%	55 27%	205 100%
Very Interested (N = 258) (32%)	1 .39%	2 .78%	5 2%	43 17%	207 80%	258 100%
Total N = 807 on Pre Test	69 9%	83 10%	137 17%	226 28%	292 36%	807 100%

Post-survey results indicated that, after participating in the program, 73% of students who responded to the question "Please rate your interest in taking classes in design in the future" rated their interest in taking design classes as moderate or very interested, as compared to 72% on the pre-survey (see Table 7).

Table 7. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in taking design classes in the future."

Pre-test Results on Students' Interest in Design Classes	Post Test Results on Students' Interest in Taking Design Classes in the Future					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested (N = 46) (6%)	22 48%	6 13%	6 13%	4 9%	8 17%	46 100%
Low Interest (N = 62) (8%)	11 18%	19 31%	15 24%	13 21%	4 6%	62 100%
Some Interest (N = 120) (15%)	5 4%	12 10%	52 43%	28 23%	23 19%	120 100%
Moderate Interest (N = 183) (23%)	6 3%	9 5%	26 14%	87 48%	55 30%	183 100%
Very Interested (N = 393) (49%)	5 1%	2 .50%	23 6%	55 14%	308 78%	393 100%
Total N = 804 on Pre Test	49 6%	48 6%	122 15%	187 23%	398 50%	804 100%

Interest in STEM Careers

Students were asked to rate their interest in careers in science, technology, engineering, mathematics, and design. Post-test results indicated that 61% of student who responded to this question after participating in the program rated their interest in science careers as moderate or very interested, as compared to the same results (61%) on the pre-survey (see Table 8).

Table 8. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in the following careers: Science."

Pre-test Results on Students' Interest in Science Careers	Post Test Results on Students' Interest in Science Careers					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested (N = 70) (9%)	37 53%	15 26%	18 9%	6 4%	3 9%	70 100%
Low Interest (N = 84) (10%)	18 21%	33 39%	24 29%	7 8%	2 2%	84 100%
Some Interest (N = 162) (20%)	9 6%	29 18%	67 41%	40 25%	17 10%	162 100%
Moderate Interest (N = 258) (32%)	2 1%	8 3%	57 22%	125 48%	66 26%	258 100%
Very Interested (N = 233) (29%)	3 1%	2 1%	8 3%	32 14%	188 81%	233 100%
Total N = 807 on Pre Test	69 9%	90 11%	162 20%	207 26%	279 35%	807 100%

Post-test results indicated that 79% of students who responded to this question after participating in the program rated their interest in technology careers as moderate or very interested, as compared to 82% on the pre-survey (see Table 9).

Table 9. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in the following careers: Technology."

Pre-test Results on Students' Interest in Technology Careers	Post Test Results on Students' Interest in Technology Careers					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested (N = 22) (3%)	7 32%	1 5%	6 27%	2 9%	6 27%	22 100%
Low Interest (N = 41) (5%)	4 10%	13 32%	15 37%	8 20%	1 2%	41 100%
Some Interest (N = 82) (10%)	6 7%	8 10%	32 39%	27 33%	9 11%	82 100%
Moderate Interest (N = 212) (26%)	5 2%	9 4%	42 20%	89 42%	67 32%	212 100%
Very Interested (N = 454) (56%)	6 1%	3 1%	20 4%	65 14%	360 79%	454 100%
Total N = 811 on Pre Test	28 3%	34 4%	115 14%	191 24%	443 55%	811 100%

Post-test results indicated that 72% of students who responded to this question after participating in the program rated their interest in engineering careers as moderate or very interested, as compared to 76% on the pre-survey (see Table 10).

Table 10. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in the following careers: Engineering."

Pre-test Results on Students' Interest in Engineering Careers	Post Test Results on Students' Interest in Engineering Careers					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested	24	4	3	1	4	36
(N = 36) (4%)	67%	11%	8%	3%	11%	100%
Low Interest	10	20	15	6	6	57
(N = 57) (7%)	18%	35%	26%	11%	11%	100%
Some Interest	6	16	45	22	18	107
(N = 107) (13%)	6%	15%	42%	21%	17%	100%
Moderate Interest	0	13	47	77	62	199
(N = 199) (25%)	0%	7%	24%	39%	32%	100%
Very Interested	3	4	15	43	343	408
(N = 408) (51%)	1%	1%	4%	11%	84%	100%
Total	43	57	125	149	443	807
N = 807 on Pre Test	5%	7%	15%	18%	54%	100%

Post-test results indicated that 59% of students who responded to this question after participating in the program rated their interest in mathematics careers as moderate or very interested, as compared to 58% on the pre-survey (see Table 11).

Table 11. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in the following careers: Mathematics."

Pre-test Results on Students' Interest in Mathematics Careers	Post Test Results on Students' Interest in Mathematics Careers					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested	60	22	5	4	9	100
(N = 100) (12%)	60%	22%	5%	4%	9%	100%
Low Interest	11	42	19	10	4	86
(N = 86) (11%)	13%	49%	22%	12%	5%	100%
Some Interest	6	28	67	42	14	157
(N = 157) (19%)	4%	18%	43%	27%	9%	100%
Moderate Interest	1	10	38	117	56	222
(N = 222) (28%)	.45%	5%	17%	53%	25%	100%
Very Interested	3	1	13	39	185	241
(N = 241) (30%)	1%	.41%	5%	16%	77%	100%
Total	81	103	142	212	268	806
N = 806 on Pre Test	10%	13%	17%	26%	33%	100%

Post-test results indicated that 69% of students who responded to this question after participating in the program rated their interest in design careers as moderate or very interested, as compared to 70% on the pre-survey (see Table 12).

Table 12. Depicts changes in responses on a pre-post survey question that asked "Please rate your interest in the following careers: Design."

Pre-test Results on Students' Interest in Design Careers	Post Test Results on Students' Interest in Design Careers					
	Not Interested	Low Interest	Some Interest	Moderate Interest	Very Interested	Total
Not Interested	27	11	5	7	9	59
(N = 59) (7%)	46%	19%	8%	12%	15%	100%
Low Interest	16	17	14	9	7	63
(N = 63) (8%)	25%	27%	22%	14%	11%	100%
Some Interest	6	21	40	28	20	115
(N = 115) (14%)	5%	18%	35%	24%	17%	100%
Moderate Interest	6	12	39	93	52	202
(N = 202) (25%)	3%	6%	19%	46%	26%	100%
Very Interested	6	3	27	58	270	364
(N = 364) (45%)	2%	1%	7%	16%	74%	100%
Total	61	64	125	195	358	803
N = 803 on Pre Test	8%	8%	16%	24%	45%	100%

STEM Proficiency

Students were asked to rate their performance in science, technology, engineering, mathematics, and design. Posttest results indicated that 77% of students who responded to this question after participating in the program rated their proficiency in science as moderate or high, as compared to 75% on the pre-survey (see Table 13).

Table 13. Depicts changes in responses on a pre-post survey question that asked "Please rate your performance in Science."

Pre-test Results on Students' Proficiency in Science	Post Test Results on Students' Proficiency in Science					
	No Proficiency	Low Proficiency	Some Proficiency	Moderate Proficiency	High Proficiency	Total
Not Proficiency (N =179) (2%)	8 47%	1 6%	2 12%	1 6%	5 29%	17 100%
Low Proficiency (N = 32) (4%)	4 13%	12 38%	15 47%	0 0%	1 3%	32 100%
Some Proficiency (N = 155) (19%)	9 6%	12 8%	65 42%	57 37%	12 8%	155 100%
Moderate Proficiency (N = 316) (39%)	4 1%	4 1%	44 14%	171 54%	93 29%	316 100%
High Proficiency (N = 294) (36%)	4 1%	1 .34%	5 2%	52 18%	232 79%	294 100%
Total N = 814 on Pre Test	29 4%	30 4%	131 16%	281 35%	343 42%	814 100%

Post-test results indicated that 81% of students who responded to the question "Please rate your performance in technology" after participating in the program rated their proficiency in technology as moderate or high, as compared to 77% on the pre-survey (see Table 14).

Table 14. Depicts changes in responses on a pre-post survey question that asked "Please rate your performance in Technology."

Pre-test Results on Students' Proficiency in Technology	Post Test Results on Students' Proficiency in Technology					
	No Proficiency	Low Proficiency	Some Proficiency	Moderate Proficiency	High Proficiency	Total
Not Proficiency (N = 21) (3%)	12 57%	1 5%	4 19%	1 5%	3 14%	21 100%
Low Proficiency (N = 27) (3%)	1 4%	9 33%	10 37%	3 11%	4 15%	27 100%
Some Proficiency (N = 134) (16%)	3 2%	11 8%	43 32%	53 40%	24 18%	134 100%
Moderate Proficiency (N = 289) (35%)	6 2%	3 1%	34 12%	142 49%	104 36%	289 100%
High Proficiency (N = 345) (42%)	4 1%	2 1%	7 2%	65 19%	267 77%	345 100%
Total N = 816 on Pre Test	26 3%	26 3%	98 12%	264 32%	402 49%	816 100%

Post-test results indicated that 72% of students who responded to the question "Please rate your performance in engineering" after participating in the program rated their proficiency in engineering as moderate or high, as compared to 64% on the pre-survey (see Table 15).

Table 15. Depicts changes in responses on a pre-post survey question that asked "Please rate your performance in Engineering."

Pre-test Results on Students' Proficiency in Engineering	Post Test Results on Students' Proficiency in Engineering					
	No Proficiency	Low Proficiency	Some Proficiency	Moderate Proficiency	High Proficiency	Total
Not Proficiency	30	5	8	11	3	57
(N = 57) (7%)	53%	9%	14%	19%	5%	100%
Low Proficiency	3	18	17	12	10	60
(N = 60) (7%)	5%	30%	28%	20%	17%	100%
Some Proficiency	7	20	67	59	23	176
(N = 176) (22%)	4%	11%	38%	34%	13%	100%
Moderate Proficiency	4	3	28	118	90	243
(N = 243) (30%)	2%	1%	12%	49%	37%	100%
High Proficiency	2	1	8	46	215	272
(N = 272) (34%)	1%	1%	3%	17%	79%	100%
Total	46	47	128	246	341	808
N = 808 on Pre Test	6%	6%	16%	30%	42%	100%

Post-test results indicated that 75% of students who responded to the question "Please rate your performance in mathematics" after participating in the program rated their proficiency in mathematics as moderate or high, as compared to 73% on the pre-survey (see Table 16).

Table 16. Depicts changes in responses on a pre-post survey question that asked "Please rate your performance in Mathematics."

Pre-test Results on Students' Proficiency in Mathematics	Post Test Results on Students' Proficiency in Mathematics					
	No Proficiency	Low Proficiency	Some Proficiency	Moderate Proficiency	High Proficiency	Total
Not Proficiency	7	7	3	0	6	23
(N = 23) (3%)	30%	30%	13%	0%	26%	100%
Low Proficiency	7	21	22	4	2	56
(N = 56) (7%)	13%	38%	39%	7%	4%	100%
Some Proficiency	3	15	47	62	16	143
(N = 143) (18%)	2%	10%	33%	43%	11%	100%
Moderate Proficiency	3	8	42	127	67	247
(N = 247) (31%)	1%	3%	17%	51%	27%	100%
High Proficiency	3	1	10	41	281	336
(N = 336) (42%)	1%	1%	3%	12%	84%	100%
Total	23	52	124	234	372	805
N = 805 on Pre Test	3%	6%	15%	29%	46%	100%

Post-test results indicated that 71% of students who responded to the question "Please rate your performance in design" after participating in the program rated their proficiency in design as moderate or high, as compared to 65% on the pre-survey (see Table 17).

Table 17. Depicts changes in responses on a pre-post survey question that asked "Please rate your performance in Design."

Pre-test Results on Students' Proficiency in Design	Post Test Results on Students' Proficiency in Design					
	No Proficiency	Low Proficiency	Some Proficiency	Moderate Proficiency	High Proficiency	Total
Not Proficiency	27	8	8	10	10	63
(N = 63) (8%)	43%	13%	13%	16%	16%	100%
Low Proficiency	7	24	24	12	8	75
(N = 75) (9%)	9%	32%	32%	16%	11%	100%
Some Proficiency	6	13	51	51	25	146
(N = 146) (18%)	4%	9%	35%	35%	17%	100%
Moderate Proficiency	2	3	44	114	83	246
(N = 246) (31%)	1%	1%	18%	46%	34%	100%
High Proficiency	4	2	12	48	208	274
(N = 274) (34%)	1%	1%	4%	18%	76%	100%
Total	46	50	139	235	334	804
N = 804 on Pre Test	6%	6%	17%	29%	42%	100%

Assessment Results

Pre and post assessments of program content were developed and piloted prior to the 2016 VIL MM Summer Program. The assessments included twenty multiple choice items and twelve anchor items. The anchor items were the same items on both the pre and post-tests and were used to determine improvements in students' knowledge of four domains: 3 D modeling and printing (four items), problem solving and the engineering design process (2 items), mobile app development (2 items), and coding and programming (4 items).

Figures 5-8 illustrate the results from the pre and post assessment anchor items in four domains.

Figure 5. Results for assessment items related to knowledge of 3D modeling and printing.

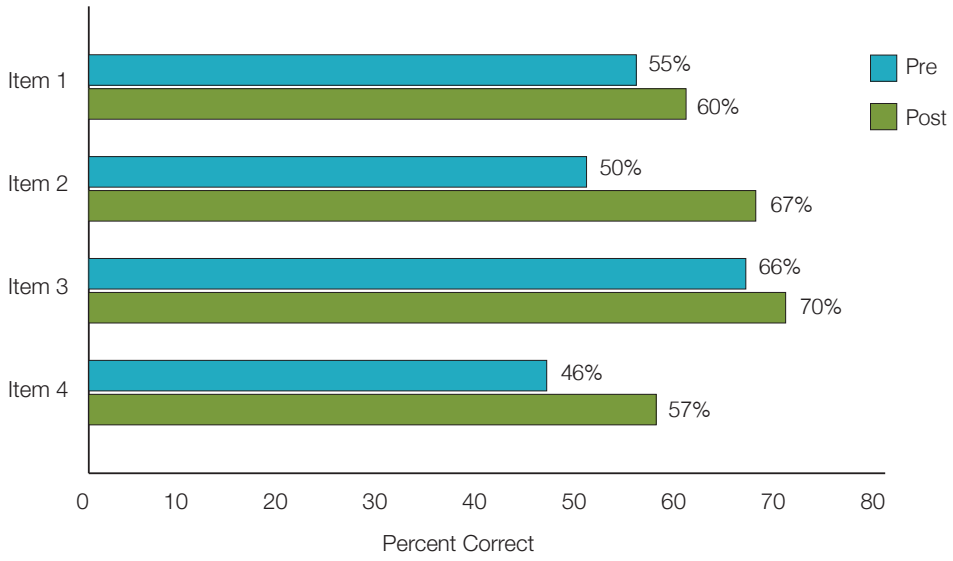


Figure 6. Results for assessment items related to problem solving and engineering.

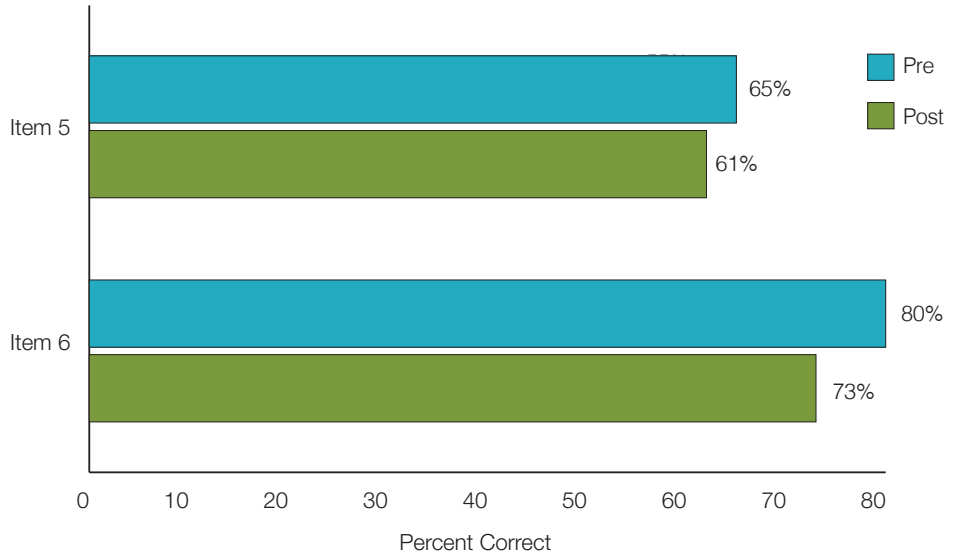


Figure 7. Results for assessment items related to mobile app development.

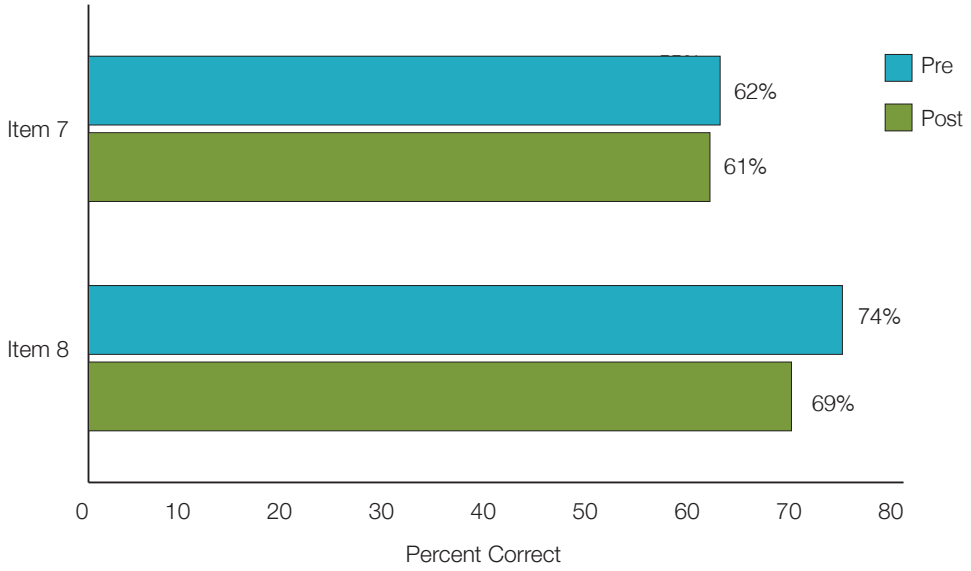
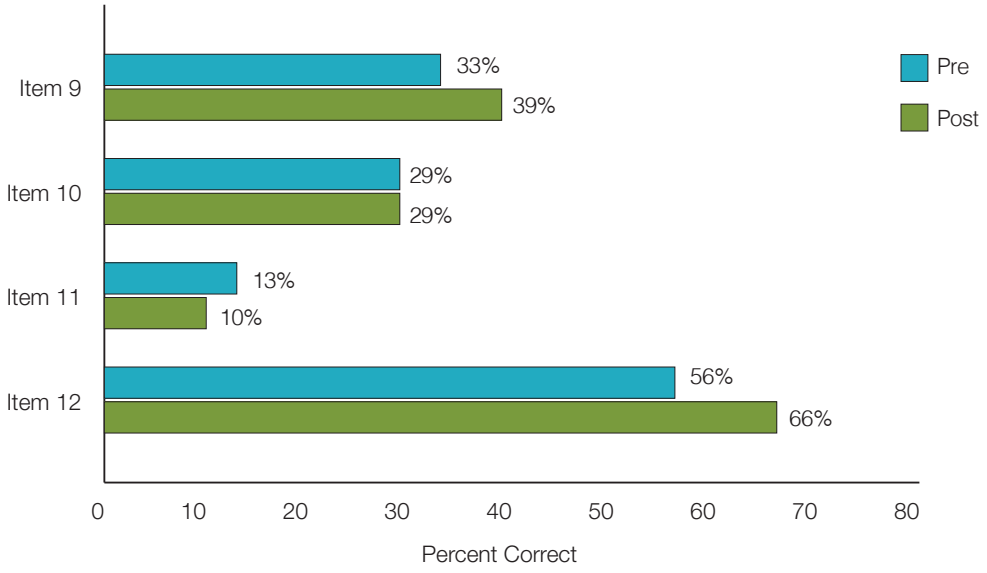


Figure 8. Results for assessment items related to coding and programming.

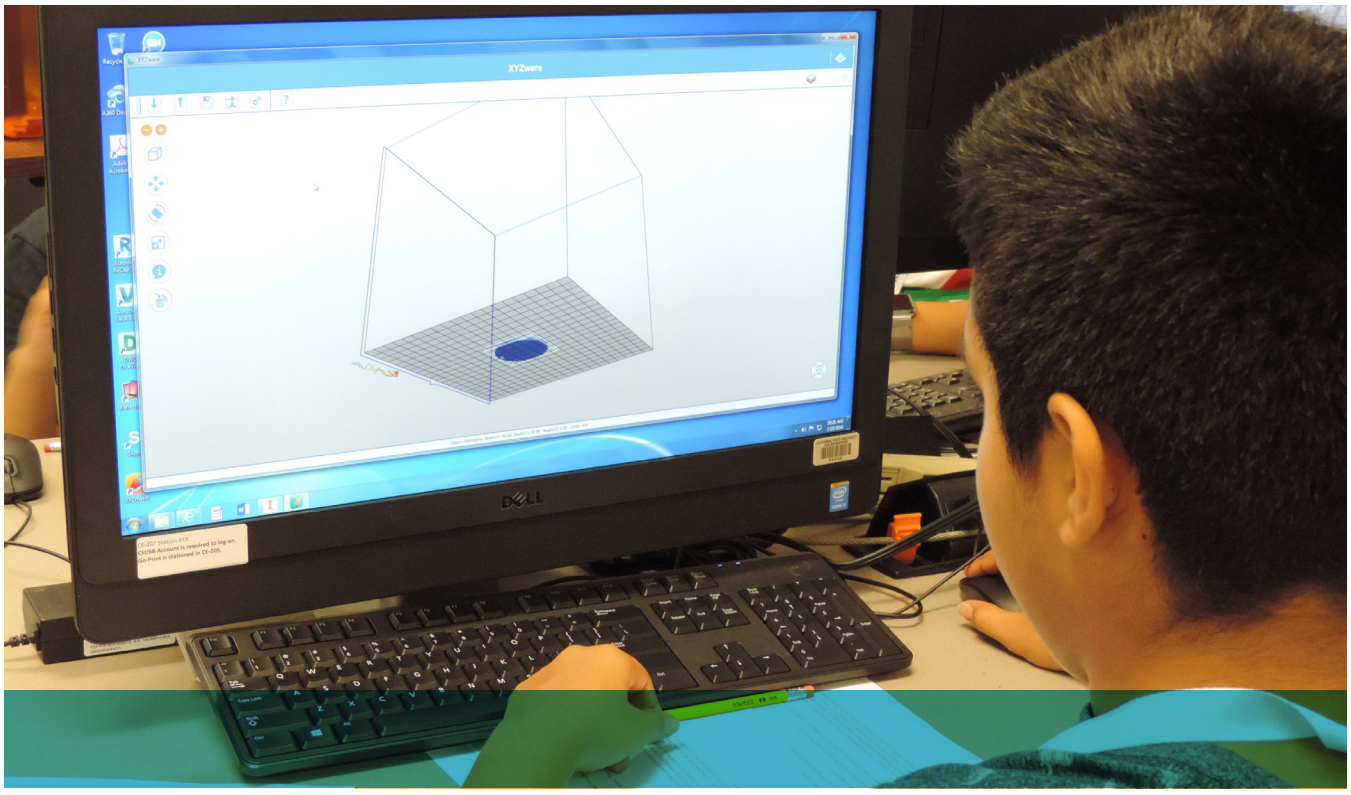


Conclusions

The 2016 VIL MM Program provided over 1176 minority male students in twelve communities with the opportunity to experience advanced training in STEM courses, while exposing them to mentors, university faculty and community resources such as museums and maker spaces. Implementation of each program included professional development, field trips and guest speakers.

Results from pre and post student surveys indicate increases in proficiency in science, technology, engineering, mathematics and design, as well increased interest in attending a four year university. Interest in taking classes in science, mathematics and design also increased, while interest in engineering and technology classes slightly descreased. These findings are aligned with the goals of the VIL MM program and show evidence of promise for continuing support for program activities.

Focus groups and interviews revealed that while stakeholders reported the program met or exceed expectations, there is a need to coordinate training for mentors and faculty, so that the mentors can more efficiently and effectively support instruction. For example, few programs provided mentors with lesson plans prior to placing them in classrooms, which made it difficult for them to know what was expected of the students and themselves. Mentors commented that while many had experience in working with the target population, some did not have a technology background. Mentor training that includes online tutorials and the dissemination of lesson plans prior to class time is recommended. Providing clear expectations for mentors and faculty would also benefit students, as some faculty mentioned that the mentors could have been more effective if they had more awareness of their roles.



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