

# STEM Greenhouse STEAM PLC Pilot Report: 2017–18

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## Introduction

The Expanded Learning Opportunities (ELO) Network, hosted by Our Community's Children (OCC), is a coalition of more than 60 community stakeholders and out-of-school-time (OST) providers in the Greater Grand Rapids area who work to ensure that children have access to quality programs that prepare them for college, work, and life. The ELO Network's (2018) purpose is "to promote and align community efforts in the provision of quality afterschool programs. This is accomplished through public education and advocacy, professional development and training on best practices, a data-driven system on shared outcomes for children, and continuous collaboration."

During the 2017-18 school year, the ELO Network organized the Science, Technology, Engineering, Arts, and Math Professional Learning Community (STEAM PLC) pilot program. This learning community trains providers on STEAM subjects and careers so that they can incorporate STEAM activities into their own programs. Specifically, the network offers monthly half-day professional development trainings consisting of presentations, free resources, and networking opportunities to stimulate STEAM ideas to implement with youth. The objectives of the STEAM PLC are to increase students' interest and proficiency in STEM subjects, to increase students' interest in STEM careers, and to enhance students' Social Emotional Learning (SEL). Youth in Grades 5-8 were chosen as the target of the intervention, given this age group's cognitive capacity to understand the material and that early exposure to these subjects may favorably shape attitudes.

Eight organizations within the ELO Network participated in the STEAM PLC pilot evaluation:<sup>1</sup> The YMCA, Camp Blodgett, Ferris State University, the Refugee Education Center (REC), Camp Fire West Michigan 4C, STEM Greenhouse, Boy Scouts of America, and the Cook Arts Center. The average number of STEAM hours delivered to youth by providers varied across provider sites, ranging from fewer than twenty minutes per week to three hours per week. Activities for youth also differed among sites. Examples include museum visits, mock DNA crime scene analysis, bridge building, catapult launching, habitat studies, construction of fidget spinners, studies of math in music, and acid rain experiments with sugar cubes.

The Dorothy A. Johnson Center for Philanthropy's Community Research Institute (CRI) at Grand Valley State University collaborated with OCC and its evaluation workgroup to develop and evaluate a pilot program for the STEAM PLC. The purpose of this evaluation is to indicate the strengths of current STEAM-related OST programming for youth in the Grand Rapids area, as well as areas for improvement. This report is best characterized as a formative evaluation — an evaluation of a pilot program meant to create a baseline of data on which to build and refine the STEAM PLC's processes in future years. Specifically, this report provides information on the methodology and results of the overall pilot, as well as outcomes for the principal provider in this evaluation, STEM Greenhouse. STEM Greenhouse can utilize these results as a baseline to inform future STEAM-related processes and programming for youth.

<sup>1</sup>John Ball Park Zoo provided 52 hours of STEM programming to students attending other STEAM programs, and thus is not included in the pilot evaluation.



## Evaluation Questions

This evaluation was designed to answer the following questions:

- ▶ How many unique youth were served by programs in the STEAM PLC, and how many youth participated in multiple STEAM PLC programs?
- ▶ What is the demographic composition of STEAM PLC youth participants? If data are available, what are the descriptive statistics for youth on the following dimensions?
  - Age
  - Race and Ethnicity
  - Gender
  - Disability Status
  - Household Income
  - Household Size
  - School
  - Neighborhood
- ▶ How did selected outcomes differ by student demographic characteristics?
- ▶ How did interest, awareness, and motivation in STEM change over time for youth in the STEAM PLC programs?
- ▶ Were there differences in these outcomes associated with program factors, such as the number of hours per week, or whether the programs primarily focused on STEM (e.g., Camp Blodgett and STEM Greenhouse) or incorporated STEM lessons only as a portion of their programming?
- ▶ How did social emotional development change over time for youth in the STEAM PLC programs?
- ▶ What changes to the evaluation are recommended based on the results of the pilot?
  - How well did the pilot survey instrument capture social emotional growth?
  - How well did the pilot survey instrument capture progress in STEM awareness, interest, and motivation?



## Methodology

### Procedure

Evaluation opt-out forms available in English and Spanish were distributed to parents and collected prior to survey administration to youth (Appendices A and B). Pre- and post-program surveys were made available to fifth through eighth grade ELO STEAM PLC program participants, also in both English and Spanish (Appendices D and E). Providers distributed these surveys in hard copy and/or online format to capture their students' responses before and after participation in the STEAM PLC programs.

To maximize survey participation, providers were asked to administer the pre-program surveys for two weeks of their choosing between October 23, 2017, and November 10, 2017. Similarly, post-program surveys were administered for two weeks, from April 30, 2018, to May 11, 2018. When program dates differed from the typical OST schedule, providers were instructed to submit their alternative administration dates to the evaluators.

While providers were instructed not to give out more than one survey per child during an administration period, in cases when they did, evaluators used data only from the earlier survey. Similarly, when a student filled out a survey at two different OST programs, evaluators used the survey with the earlier administration date in the analysis.

Appendix C provides additional information about the evaluation goals, tools, and data collection procedures distributed to providers, whose feedback was incorporated following one of the monthly STEAM PLC professional development sessions.

### Measures

#### Scales

**Social Emotional Learning (SEL):** The IMAGINE U Student Survey (Ferguson, 2014) comprises 13 questions designed to assess students' perceived emotional growth as well as their agency — the ability and motivation to effect change. The survey measures self-esteem, as well as whether or not one holds a “success mindset,” has fully developed social and emotional skills, and is a good communicator. The survey utilizes a five-point scale from Totally Untrue (1) to Totally True (5).

**Emotional Awareness:** Four questions were created in collaboration with the ELO Evaluation Committee in order to measure emotional awareness, or the frequency with which one can name, express, and manage the emotions one feels, and attempt to understand other people's emotions. The scale consisted of five options: None of the time (1), Some of the time (2), Most of the time (3), All of the time (4), and I don't know (5).

**STEM Attitudes and STEM Career Interest:** Created by Unfried, Faber, Stanhope, & Wiebe (2015), the STEM Attitudes Scale comprises eight math questions, eight science questions, and nine engineering/technology questions on a five-point response scale from Strongly Disagree (1) to Strongly Agree (5). Examples include, “I am sure I could do advanced work in math,” “Knowing science will help me earn a living,” and “I like to imagine creating new products.” The aforementioned authors also created a survey scale comprising 12 STEM Career Interest categories, such as earth science, environmental work, energy, and mathematics, whereby youth read career descriptions and example job titles and indicate their level of interest in each (e.g., Not at all interested [1], Not so interested [2], Interested [3], or Very interested [4]).



**Scale Creation:** Questions were reverse-scored when worded in a “negative” direction, so that questions within a scale could be combined. Reverse scoring means that the numerical scoring scale runs in the opposite direction. For instance, if a participant responded with Strongly Agree (5) for “Math has been my worst subject,” the score was recoded as Strongly Disagree (1) to capture the “positive” direction: interest and self- efficacy in math.<sup>2</sup> The reliability of the STEM Attitudes Scale and STEM Career Interest Scale were good; alpha coefficients = 0.83 or higher. Typically, a coefficient of 0.70 is considered acceptable in social science research; this indicates that the questions measure one construct, and that there is minimal measurement error.

**Scale Increase Categorization:** When measuring change in participants’ scale scores, evaluators established a 15 percent change threshold in order to minimize inaccuracies caused by measurement error (e.g., a participant’s scores of 3.35 and 3.40 are virtually the same, and the difference between the two is not considered a “change” for the purposes of this evaluation).

**Future Intentions:** Participants were given the options of Yes, No, and Not Sure to respond to three separate questions regarding whether in the future, they plan to take advanced classes in mathematics, plan to take advanced classes in science, and plan to go to college.

### Secondary Data

**ELO Network Program Attendance:** Providers submitted program attendance data through the ELO Network website, enabling evaluators to identify students who partook in more than one STEAM PLC program.

**STEM Focus:** For the purposes of this evaluation, “STEM-focused programming” includes only those programs with an established STEM emphasis prior to their inclusion in the STEAM PLC (e.g., Camp Blodgett and STEM Greenhouse).

**School Attendance:** In order to match participants with their school attendance data, GRPS provided evaluators with students’ attendance rates. When used as a predictor, at-risk, moderate, and severe absences were combined into one category to compare against participants with satisfactory attendance.

**Demographic Data:** GRPS provided data on age, grade, race and ethnicity, gender, English Language Learner (ELL) status, school, ZIP Code of residence, and Free and Reduced Lunch (FRL) status, for matching with STEAM PLC survey respondents.

**Academic Scores:** To assess participants’ progress in mathematics, evaluators drew on the Measures of Academic Progress (MAP) math test conducted by GRPS. The MAP’s Conditional Growth Index (CGI) measures students’ academic gains from fall to spring of the school year, taking into account their initial achievement level. It is measured in units of standard deviation with the following guidelines: below-average growth is less than zero, average growth is zero, and exceeded average growth is greater than zero (NWEA, 2018).

Evaluators also acquired GRPS M-STEP science and math scores. Rather than assessing growth over time, these tests are administered only once during the academic year, and measure grade-level proficiency. When used as a predictor, the response options were recoded to Not Proficient and Some Proficiency.

<sup>2</sup> In order to calculate a particular scale’s item mean, the scale needed to reach a 75 percent completion rate among participants.



## Overall STEAM PLC Participants

STEAM PLC programs served over 1,048 unique youth during the academic year; 1,009 (96.3%) participated in a STEAM PLC program during both fall and winter semester, and were subsequently eligible to have completed both the pre- and post-program STEM survey. Only one percent of participants (n=10) were enrolled in multiple STEAM programs.

Four hundred and four participants provided enough data to calculate at least one scale, producing a reasonable response rate of 40 percent. This evaluation focuses on the 348 GRPS students who completed both surveys. In order to best examine predictors of increased interest in STEM, only GRPS students were included in the analysis due to demographic data accessibility. As most (85%) of the survey participants were from GRPS, this is a representative sample of survey participants.

Most participants were in Grade 6 (28.7%, n=100), Grade 7 (37.6%, n=131), or Grade 8 (29.6%, n=103), with only four percent (n=14) in Grade 5. Participants' ages ranged from 10 to 15 years old, with a median/mean age of 13 years old. In terms of physical location, two-thirds of all participants (66.4%, n=231) resided in ZIP Code 49507, followed by 49503 (23.6%, n=82), and then 49504 (3.7%, n=13). In addition, most participants (86.5%, n=301) attended Burton Middle School, followed by Southwest Community Campus (3.4%, n=12). The vast majority of participants were involved in Boy Scouts of America programming (82.2%, n=286).

Regarding other demographic characteristics, slightly more participants identified as male (54.3%, n=189) than female (45.7%, n=159). The majority of participants (73%, n=254) were identified by GRPS as Hispanic (any race), followed by non-Hispanic African-American (21.3%, n=74). The remaining 5.7 percent (n=20) identified as two or more races, white, Asian, or Native American. Of those participants for whom GRPS had data on FRL status (n=344), nearly all (92%, n=320) qualified for FRL, and most were ELL (64.7%, n=225). As illustrated in Table 1, more participants demonstrated a degree of grade proficiency for M-STEP science (46.5%) than M-STEP math (20%). Finally, 74.7 percent of participants were categorized by GRPS as having satisfactory school attendance (see Table 2).

**TABLE 1** M-STEP Academic Achievement

	Math		Science	
	N	%	N	%
Not Proficient	275	79.9%	61	53.5%
Partially Proficient	53	15.4%	47	41.2%
Proficient	10	2.9%	5	4.4%
Advanced Proficient	6	1.7%	1	0.9%
<b>Total</b>	<b>344</b>	<b>100%</b>	<b>114</b>	<b>100%</b>

**TABLE 2** School Attendance

	N	%
Satisfactory	260	74.7%
At-Risk	57	16.4%
Moderate Chronic	26	7.5%
Severe Chronic	5	1.4%
<b>Total</b>	<b>348</b>	<b>100%</b>





## Overall STEAM PLC Results

- ▶ Relative to participants in programs without a strong STEM focus, twice as many participants in STEM-focused programs demonstrated improvement in STEM Attitudes, indicating that regular STEM exposure may have positive effects on young people's interest and expectation of success in these fields.<sup>3</sup>
- ▶ Almost three times as many participants who were not proficient in M-STEP math (versus those with some proficiency) developed more favorable attitudes toward STEM. Similarly, their STEM Career Interest also increased, suggesting that low-performing students may especially benefit from further exposure to STEM programming.
- ▶ Students whom GRPS identified as African-American (non-Hispanic) were almost three times as likely as students of other races and ethnicities to demonstrate improved STEM Attitudes.
- ▶ On average, participants in all varieties of programming began the 2017-18 program year with neutral to slightly positive attitudes toward STEM subjects and maintained those attitudes throughout the program year. Similarly, participants maintained a "fair" interest in STEM careers over the duration of the program.
- ▶ Participants' scores in Social Emotional Learning (SEL) and Emotional Awareness were fairly positive and stable across the program year.
- ▶ Participants' improvement in SEL was related to increases in Emotional Awareness, STEM Attitudes, and STEM Career Interest. That is, participants who reported an increase in SEL were about twice as likely to have improved STEM Attitudes and STEM Career Interest, and 2.5 times as likely to have improved Emotional Awareness. These results indicate that SEL growth and increased personal agency may lead to increased interest in STEM disciplines and the belief that one could be successful in these fields.
- ▶ The STEAM PLC providers served traditionally underserved populations. Nearly all participants (92%) qualified for Free and Reduced Lunch, 73 percent were identified by GRPS as Hispanic (any race), and 65 percent were identified as English Language Learners.

<sup>3</sup>Results were not statistically significant due to the small number of participants (n=23) who received STEM-focused programming.



## Individual Provider Results: STEM Greenhouse

### Participants

STEM Greenhouse served 28 unique youth during the academic year, with an average of three hours of STEM programming per week; nine (32.1%) participated in a STEAM PLC program during both fall and winter semesters, and were subsequently eligible to have completed both the pre- and post-program STEM survey. All nine participants provided enough data to calculate at least one pre-program to post-program scale difference, producing a perfect response rate (100%). While the overall STEAM PLC results only included GRPS students in order to examine predictors of outcomes, the non-GRPS STEM Greenhouse participant (n=1) is included in the STEM Greenhouse provider results, in addition to GRPS students (n=8).

Participants were primarily 11 or 12 years old, with a mean and median age of 12 years old. There was a relatively even gender split between male (55.5%, n=5) and female (44.5%, n=4) participants. Most students were identified as African American; the remainder (n=2) were Hispanic (any race).

Data from GRPS indicate the following: Participants were primarily in Grade 6 (62.5%, n=5), followed by Grade 7 (25%, n=2), and then Grade 5 (12.5%, n=1). All (n=8) participants attended Dickinson Elementary, and resided in ZIP Code 49507. Three-quarters (75%, n=6) of students qualified for FRL, and only one (12.5%) was ELL. As illustrated in Table 3, 50 percent of participants demonstrated a degree of grade level proficiency for M-STEP math. Only one M-STEP science score was received, so it is not reported here to protect participant anonymity. Finally, 100 percent of participants were categorized by GRPS as having satisfactory school attendance.

**TABLE 3**  
STEM Greenhouse M-STEP Math Academic Achievement

	<b>N</b>	<b>%</b>
Not Proficient	4	50%
Partially Proficient	4	50%
Proficient	0	0%
Advanced Proficient	0	0%
<b>Total</b>	<b>8</b>	<b>100%</b>



## Results

Overall, results indicated that participants began the 2017-18 STEAM program year with fairly positive attitudes toward STEM (pre-program score M=3.65) and maintained those attitudes post-program (M=3.75). Simultaneously, almost a quarter (22.2%) of participants had a 15 percent or greater increase in STEM Attitudes whereas no one experienced a 15 percent or greater decrease in STEM Attitudes. Participants indicated having STEM Career Interest at the beginning of their program (M=3.01), and experienced slightly higher interest by the end of the program (M=3.18). The most notable finding is the 13.3 percent increase in SEL that occurred by the end of the program; similarly, Emotional Awareness scores began fairly positive and increased 9.5 percent. The results<sup>4</sup> are illustrated in Table 4.

### Measures of Impact

Table 4 also illustrates potential participant program impact per measure. Specifically, two more students showed improvement on the STEM Attitudes Scale and STEM Career Interest Scale than a decline (two versus zero); three more students had an increase rather than a decline on the SEL Scale; and one more student had an increase than a decline on the Emotional Awareness Scale. Only participants with both pre- and post-program numerical Emotional Awareness responses (rather than “I don’t know”) are illustrated in the table; post-program, three more students went from “I don’t know” to a numerical response, demonstrating more awareness of their emotions over time. Simultaneously, at least a plurality of participants maintained identical or very similar scores over the course of the year on all four outcome measurements.

**TABLE 4** STEAM Greenhouse Pre-Program to Post-Program Scale Results

	STEM Attitudes		STEM Career Interest		Social Emotional Learning		Emotional Awareness	
	N	%	N	%	N	%	N	%
15% or greater decrease in score	0	0%	0	0%	0	0%	1	16.7%
Score maintained (up to a 14.99% change in either direction)	7	77.8%	6	75.0%	6	66.7%	3	50.0%
15% or greater increase in score	2	22.2%	2	25.0%	3	33.3%	2	33.3%
<b>Total</b>	<b>9</b>	<b>100%</b>	<b>8</b>	<b>100%</b>	<b>9</b>	<b>100%</b>	<b>6</b>	<b>100%</b>
	N	Mean <sup>†</sup>	N	Mean <sup>**</sup>	N	Mean <sup>***</sup>	N	Mean <sup>****</sup>
Pre-Program Score	9	3.65	8	3.01	9	3.46	6	2.63
Post-Program Score	9	3.75	8	3.18	9	3.92	6	2.88

**Note:** The measures have overlapping participants, so adding column numbers together for those who decreased, increased, or maintained their scores would misrepresent the data.

<sup>†</sup> Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5)

<sup>\*\*</sup> Not at all interested (1), Not so interested (2), Interested (3), Very interested (4)

<sup>\*\*\*</sup> Totally Untrue (1), Mostly Untrue (2), Somewhat True (3), Mostly True (4), Totally True (5)

<sup>\*\*\*\*</sup> None of the time (1), Some of the time (2), Most of the time (3), All of the time (4); “I don’t know” was excluded.

<sup>4</sup>Results were produced from paired samples t-tests with small sample sizes, and were not statistically significant, meaning there were not reliable pre- to post-program differences.



## Future Plans

The examination of pre- to post-program differences in participants' future plans for taking advanced classes in math and science, and attending college, are additional ways to examine program impact. Pre- to post-program percentage comparisons should be interpreted with caution given that with small sample sizes, small frequency changes can produce large percentage changes. Two thirds of participants who filled out both the pre- and post-program question about college attendance, indicated they plan to attend college. By the end of the program, this percentage increased to 88.9 percent.

**TABLE 5** STEM Greenhouse Pre-Program to Post-Program College Results

Response Option	Pre-Program Frequency	Pre-Program %	Post-Program Frequency	Post-Program %
Yes	6	66.7%	8	88.9%
No	0	0%	0	0%
Not Sure	3	33.3%	1	11.1%
<b>Total</b>	<b>9</b>	<b>100%</b>	<b>9</b>	<b>100%</b>

Two-thirds of participants reported initial intention to take advanced math classes (Table 6) and advanced science classes (Table 7). At the end of the program, the percentages remained the same (66.7%) for both courses. Simultaneously, one person per question shifted from not planning to take an advanced course on the subject, to being unsure.

**TABLE 6** STEM Greenhouse Pre-Program to Post-Program Advanced Math Results

Response Option	Pre-Program Frequency	Pre-Program %	Post-Program Frequency	Post-Program %
Yes	6	66.7%	6	66.7%
No	2	22.2%	1	11.1%
Not Sure	1	11.1%	2	22.2%
<b>Total</b>	<b>9</b>	<b>100%</b>	<b>9</b>	<b>100%</b>

**TABLE 7** STEM Greenhouse Pre-Program to Post-Program Advanced Science Results

Response Option	Pre-Program Frequency	Pre-Program %	Post-Program Frequency	Post-Program %
Yes	6	66.7%	6	66.7%
No	1	11.1%	0	0%
Not Sure	2	22.2%	3	33.3%
<b>Total</b>	<b>9</b>	<b>100%</b>	<b>9</b>	<b>100%</b>



## Conclusion and Recommendations

Overall, the results of this pilot are promising. Prior research has shown that STEM interest might not evolve until a firmer sense of purpose is developed in adolescence (Phillips & Miller 2014); thus current exposure may not demonstrate an impact until years later. Further, there were large percentages of ELL and economically disadvantaged students who may not have had enough previous exposure to STEAM content to substantially increase interest during a relatively brief pilot evaluation period. The pilot also did not include a control group, so it is possible that the pilot was successful in preventing students from having *decreased* interest in outcomes over time.

Despite STEM Greenhouse's small sample size (although perfect response rate), the program demonstrated strong pilot results. First, keeping in mind that STEM Greenhouse's data were included within the STEAM PLC overall results, STEM Greenhouse had higher pre-program means on STEM Attitudes and STEM Career Interest relative to the overall pilot, demonstrating that from the beginning of the program year, their participants reported more favorable attitudes towards STEM. Second, albeit not statistically significant, STEM Greenhouse achieved gains from pre- to post- program on all four outcome scales, whereas the means of the STEAM PLC youth remained consistent.<sup>5</sup> Moreover, 30 percent more STEM Greenhouse participants demonstrated a degree of grade level proficiency for M-STEP math in the spring.

While intention to take advanced math and science courses remained the same pre- to post-program, there was not much room for growth since the majority (66.7%) indicated initial intention; by comparison, half as many participants in the overall pilot indicated advanced math and science course intention, and percentages on all three intention questions decreased slightly pre- to post-program. Further, all STEM Greenhouse GRPS students had satisfactory school attendance — 25.3 percent higher than youth in the STEAM PLC. It is possible that regular school attendance, and perhaps program attendance, had a positive impact on participants' math interest and ability. Finally, intention to attend college increased a notable 22.2 percent from pre- to post-program for STEM Greenhouse participants.

Some of STEM Greenhouse's positive findings, relative to the overall pilot, may be because the youth served by STEM Greenhouse had a higher rate of native English speakers and/or may have been more familiar with the concepts presented during the programming. However, rates of economic disadvantage, as measured by FRL status, were similar, and youth were exposed to more hours of STEM programming per week than in most other STEAM PLC programs. The data show that STEM Greenhouse youth did indeed have more positive gains than the overall sample. Comparison of math MAP CGI scores, which measure expected growth across the academic year and account for initial proficiency, indicate that on average, STEM Greenhouse students exceeded average growth ( $M=0.69$ ,  $n=8$ ), whereas the rest of the sample, on average, had below-average growth ( $M=-0.22$ ,  $n=319$ ). This relationship was statistically significant.

<sup>5</sup> Compared to the data represented in Table 4, the overall pilot's means, by comparison, were: STEM Attitudes (pre-program  $M=3.27$ , post-program  $M=3.23$ ), STEM Career Interest ( $M=2.45$ ,  $M=2.42$ ), SEL ( $M=3.51$ ,  $M=3.50$ ), and Emotional Awareness ( $M=2.82$ ,  $M=2.82$ ).



The freedom with which providers had to determine the dosage of STEAM content and shape their programming to accommodate pre-planned activities, likely contributed to pilot evaluation buy-in and served as a useful starting point for the STEAM PLC Initiative. Going forward, provider implementation of some of the following suggestions may lead to increased standardization across STEAM PLC providers, and further outcome improvement:

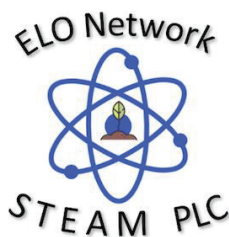
- ▶ Deliver more hours of STEAM-focused programming per week.
- ▶ Concentrate on one or two aspects of STEAM throughout the program year, such as science and math, to provide more interest and familiarity with particular subjects. Similarly, providers could emphasize a few select careers, such as those in earth science or computer science, with programming tailored around them.
- ▶ Consider including careers that cross over with humanities or social science. For instance, psychology is also science-oriented, especially at the doctoral level. See <https://www.btaa.org/docs/default-source/diversity/nsf-approved-fields-of-study.pdf?sfvrsn=2>
- ▶ To foster increased interest in STEM, combine art programming with other elements of STEM, such as making music through computer programming (Land, 2013; Madden et al., 2013; Moyer, Klopfer, & Ernst, 2018).
- ▶ Further exchange resources with other providers about administered STEAM activities — both organizationally and those discovered through articles — that appear to have enhanced students' interest. Incorporate effective activities within one's own program.
- ▶ In addition to a periodic formal evaluation, providers might consider administering more frequent, brief surveys of participants' knowledge on particular session topics (e.g., a 1-7 Likert-type Scale) before and after the activity. Alternatively, providers could inquire whether students' knowledge increased following the presentation (Yes/No/Don't know) and if they became more interested in the topic (Yes/No/Don't know, or Likert Scale). This evaluation method might also better capture responses by English Language Learners.
- ▶ Increased accuracy with which participants' names and dates of birth are submitted, will in turn increase the number of successful matches of pre- and post-program surveys and GRPS data, strengthening the confidence of findings.

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# APPENDIX A

## Opt-Out Form: English



### **5<sup>th</sup> – 8<sup>th</sup> Grade Afterschool Programs Information Sheet and Opt-out Form for STEAM PLC Program Evaluation Surveys**

Some afterschool programs in the Greater Grand Rapids area are taking part in trainings about Science, Technology, Engineering, Art, and Math. This is part of a Professional Learning Community organized by the ELO Network called the “STEAM PLC.” These trainings help afterschool providers learn ways to support youth learning about STEAM subjects and careers, and support students’ personal growth.

#### **WHAT IS THE PURPOSE OF THIS PROGRAM EVALUATION?**

The ELO Network wants to see if the STEAM trainings impact 5<sup>th</sup>-8<sup>th</sup> grade students in afterschool programs that are a part of the STEAM PLC. Youth will be asked to fill out a survey at the beginning and end of each program. The goal of the survey is to measure students’ learning and growth in these areas:

- Self-confidence and motivation
- Interest in math, science, and related careers
- Personal development

#### **WHERE AND WHEN WILL THE PROGRAM EVALUATION TAKE PLACE?**

Surveys will be completed by students at the program sites. Afterschool programs will ask students to complete a survey at the beginning and end of their 2017-2018 programs.

#### **HOW WILL MY CHILD’S SURVEY ANSWERS STAY PRIVATE?**

The Community Research Institute (CRI) at the Dorothy A. Johnson Center for Philanthropy at Grand Valley State University is working with the ELO Network and STEAM PLC programs to collect, record, and analyze the information these youth surveys. Any reports that CRI creates for the ELO Network or the participating programs will contain summarized information only, and students’ names will never be included in any of these reports. CRI will keep all survey information confidential. The information from the surveys will always be kept in secured places, such as CRI’s secured database and secured network folders.

#### **DOES MY CHILD HAVE TO PARTICIPATE IN THE PROGRAM EVALUATION OR SURVEY?**

Participation in the program evaluation and survey are optional. However, by allowing us to include your child’s survey answers in the evaluation study, you will be helping the ELO Network learn more about the effectiveness of the STEAM PLC trainings, and how afterschool programs can improve in the future. All students will be asked to take the surveys, but students may stop filling out a survey at any time with no negative consequences.



**WHAT DO I DO IF I HAVE QUESTIONS?**

If you have questions, please contact the Community Research Institute:

- Jamie DeLeeuw, Research Scholar, [deleejam@gvsu.edu](mailto:deleejam@gvsu.edu), or 616.331.7085
- Rachel Borashko, Research Fellow, [borashra@gvsu.edu](mailto:borashra@gvsu.edu), or 616.331.9034

**WHAT DO I NEED TO DO WITH THIS FORM?**

This form has provided information about the survey and program evaluation that afterschool programs are doing as part of the STEAM PLC. If you would like to see a copy of the survey, please request a copy from your afterschool provider.

**If you agree that your child’s answers to the survey can be included in the program evaluation, then you do not need to do anything else.**

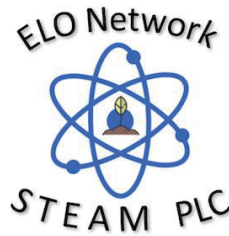
If you do NOT want your child’s answers to the survey to be included in the program evaluation, you must fill in the information and your signature, and return this form to your child’s afterschool program.

**By signing the form below, I am not allowing my child’s survey responses to be used for the purposes of the program evaluation described on this form.**

_____	_____
Organization or program your child attends	Name of the site your child attends (if applicable)
_____	_____
Child’s name (please print)	Child’s date of birth (MONTH/DAY/YEAR)
_____	_____
Parent/Legal guardian signature	Date (MONTH/DAY/YEAR)

# APPENDIX B

## Opt-Out Form: Spanish



### **Programas Extraescolares, 5º - 8º Grado Hoja de Información y Formulario de Exclusión Voluntaria para Encuestas de Evaluaciones de Programas de STEAM PLC**

Algunos programas extraescolares en Grand Rapids y la área conurbana están participando en entrenamientos sobre Ciencia, Tecnología, Ingeniería, Arte, y Matemáticas. Esto es parte de una Comunidad Profesional de Aprendizaje organizada por el ELO Network llamada el "STEAM PLC" (por sus siglas en inglés). Estos entrenamientos ayudan a los proveedores de programas extraescolares a aprender maneras de apoyar a jóvenes que están aprendiendo sobre las temas y carreras de STEAM, y apoyar el crecimiento personal de los estudiantes.

#### **¿CUÁL ES EL PROPÓSITO DE ESTA EVALUACIÓN DE PROGRAMA?**

El ELO Network quiere ver si los entrenamientos de STEAM impactan a estudiantes de 5º - 8º grado en programas extraescolares que son parte del STEAM PLC. Se pedirán a los jóvenes a completar una encuesta al principio y al final de cada programa. El objetivo de la encuesta es evaluar el aprendizaje y el crecimiento en estas áreas:

- La confianza en sí mismo y la motivación
- El interés en matemáticas, ciencia y carreras relacionadas
- El desarrollo personal

#### **¿DÓNDE Y CUÁNDO TENDRÁ LUGAR LA EVALUACIÓN DE PROGRAMA?**

Las encuestas serán completadas por los estudiantes en los sitios de los programas. Programas extraescolares pedirán a los estudiantes a completar una encuesta al principio y al final de sus programas de 2017-2018.

#### **¿CÓMO QUEDAN PRIVADAS LAS RESPUESTAS DE MI HIJA/O DE LAS ENCUESTAS?**

El Community Research Institute (CRI) del Dorothy A. Johnson Center for Philanthropy en Grand Valley State University está trabajando con el ELO Network y los programas de STEAM PLC para juntar, anotar y analizar la información de estas encuestas de jóvenes. Cualquiera informes que crea CRI para el ELO Network o los programas participantes contendrán solamente información resumida, y los nombres de los estudiantes nunca serán incluidos en ningún de estos informes. CRI guardará confidencial toda la información de las encuestas. La información de las encuestas siempre será guardada en lugares seguros, como la base de datos asegurada de CRI y carpetas de red aseguradas.

**¿TIENE QUE PARTICIPAR MI HIJA/O EN LA EVALUACIÓN DE PROGRAMA O LA ENCUESTA?**

La participación en la evaluación de programa y la encuesta es opcional. Sin embargo, permitiéndonos incluir las respuestas de su hijo a la encuesta en el estudio de evaluación ayudará al ELO Network a aprender más sobre la efectividad de los entrenamientos de STEAM PLC, y cómo los programas extraescolares pueden mejorar en el futuro. A todos los estudiantes se pedirán a tomar las encuestas, pero los estudiantes pueden parar una encuesta a cualquier tiempo sin consecuencias negativas.

**¿QUÉ HAGO SI TENGO PREGUNTAS?**

Si tiene preguntas, favor de contactar al Community Research Institute:

- Jamie DeLeeuw, Research Scholar, [deleejam@gvsu.edu](mailto:deleejam@gvsu.edu), o 616.331.7085
- Rachel Borashko, Research Fellow, [borashra@gvsu.edu](mailto:borashra@gvsu.edu), o 616.331.9034

**¿QUÉ NECESITO HACER CON ESTE FORMULARIO?**

Esta forma ha proveído información sobre la encuesta y la evaluación de programa que hacen los programas extraescolares como parte del STEAM PLC. Si le gustaría ver una copia de la encuesta, favor de pedir una copia de su proveedor extraescolar.

**Si accede que las respuestas de su hija/o a la encuesta pueden ser incluidas en la evaluación de programa, no necesita hacer nada más.**

Si NO quiere que las respuestas de su hija/o a la encuesta sean incluidas en la evaluación de programa, debe completar la información, firmar este formulario y devolverlo al programa extraescolar de su hija/o.

**Por firmar el formulario debajo, no permito las respuestas de mi hija/o a la encuesta a ser usadas por los propósitos de la evaluación de programa descrito en este formulario.**

_____	_____
Organización o programa que asiste a su hija/o	Nombre del sitio que asiste a su hija/o (si aplicable)
_____	_____
Nombre del hija/o	Fecha de nacimiento del hija/o (MES/DÍA/AÑO)
_____	_____
Firma de padre/madre/guardián legal	Fecha (MES/DÍA/AÑO)

# APPENDIX C

## Evaluation Goals, Tools, and Data Collection Procedures



### Evaluation Goals, Tools, and Data Collection Procedures: 2017-18

1. The goal of this evaluation is to measure the impact of STEAM PLC activities on kids in STEAM PLC programs, specifically these outcomes:
  - a. Interest in STEM subjects
  - b. Motivation/understanding of value of STEM in society
  - c. Knowledge of/interest in STEM careers
  - d. Social emotional skills/growth
2. The ELO Network and the Community Research Institute (CRI) at the Dorothy A. Johnson Center for Philanthropy have put together a survey that fully captures the outcomes listed above. This is the survey that the ELO Network is requesting you administer to the students in your program.
3. These data collection procedures were designed to ensure that the data are as useful as possible to the ELO Network and STEAM PLC providers.
  - a. **SURVEY ADMINISTRATION PLANNING.** Fill out the form provided to you today, so we know when your program begins and ends, and when you plan on administering the surveys. Also record these anticipated dates for your personal usage.
  - b. **OPT-OUT FORMS.** Distribute information sheets/opt-out forms to parents of all 5<sup>th</sup> through 8<sup>th</sup> grade students in your program. PDF opt-out forms will be sent to providers via email on October 19<sup>th</sup>. You will be collecting surveys from **ALL 5<sup>th</sup> through 8<sup>th</sup> grade students** in your programs. Children whose parents have opted out can still take the surveys, but their survey answers will be excluded from the data analysis and reports.
  - c. **PRE-SURVEYS.** Administer pre-surveys to **ALL 5<sup>th</sup> through 8<sup>th</sup> grade students** during a two-week window at the start of your program. Please do not give the survey to students in other grades. In addition to the hard copy provided today, the pre-survey will be provided to you via email (PDF and web link) by October 23<sup>rd</sup>.
    - i. Choose two weeks within Oct. 23 – Nov. 10 to administer pre-survey
      1. Programs with unique start dates can discuss modifications with CRI, who will also be aware through the Survey Administration Planning form collected today.
      2. Paper and online administration options. Online administration allows for more efficiency in collecting, analyzing, and disseminating provider-level data.
        - a. Online survey: [https://qvsu.co1.qualtrics.com/jfe/form/SV\\_3wScFfGmlx2JmYt](https://qvsu.co1.qualtrics.com/jfe/form/SV_3wScFfGmlx2JmYt)

- b. If you need hard copies and lack the organizational resources for printing, CRI can provide assistance.
  - 3. Surveys are available in both English and Spanish. The first online question asks for survey language preference.
- ii. Administer pre-surveys every day possible during those two weeks to include as many 5<sup>th</sup> through 8<sup>th</sup> graders as possible. (**Note: each child should only complete the pre-survey once** across all after-school programs they might participate in. If multiple organizations submit surveys for the same child, the first survey will be used).
- iii. To help us maintain consistency across programs in the way the surveys are administered and how students understand the questions, please adhere to the following guidelines:
  - 1. Students should complete the entire survey at one time. Please **do not** have students complete one part one day and another part another day.
  - 2. Provide students with your organization and program name that is inquired on the top of both the hard copy and electronic surveys. Or better yet, fill in this information for them.
  - 3. Do not read the survey to the students, and do not provide your interpretation of the meaning of questions to the students.
  - 4. If students ask questions about the survey, please do not interpret the question or answers for them. **Instead, tell them that it is okay not to know everything, and they should just do their best and skip questions if they need to.**
- iv. Place the surveys and opt out forms in the envelope provided that has your organization's information, keep it in a secure location, and hand in (sealed) to Erica Curry Van Ee at the STEAM PLC event on November 15th at GVSU's Kirkhof Center. Please make other arrangements if you have non-traditional program dates.

**\*\*\*Opt-out forms and pre-surveys DUE November 15, 2017 to CRI.**

- d. **POST-SURVEYS.** Administer post-surveys for **all 5<sup>th</sup> through 8<sup>th</sup> grade students** during a two-week window at the end of the program. Please do not give the survey to students in other grades. Retaining kids between pre-survey and post-survey is very important for the results of this evaluation.
  - i. Administer the survey during the first two weeks of May (April 30<sup>th</sup> through May 11), or earlier if your program ends sooner.
    - 1. Programs with unique program lengths can discuss modifications with Jamie, who will also be aware through the Survey Administration Planning form.
    - 2. Paper and online administration options. Online administration allows for more efficiency in collecting, analyzing, and disseminating provider-level data.
      - a. Online survey: <https://tinyurl.com/y9yhsnre>
      - b. If you need hard copies and lack the organizational resources for printing, CRI can provide assistance.
    - 3. Surveys are available in both English and Spanish. The first online question asks for survey language preference.
  - ii. Administer surveys on every day of the two week window in order to reach as many kids who took the pre-survey as possible and to maximize the number of matched pre-post survey pairs (**Note: each child should only complete the post-survey once** across all

after-school programs they might participate in. If multiple organizations submit surveys for the same child, the first survey taken will be used).

- iii. To help us maintain consistency across programs, please adhere to the following guidelines:
1. Students should complete the entire survey at one time. Please **do not** have students complete one part one day and another part another day.
  2. Provide students with your organization and program name that is inquired on the top of both the hard copy and electronic surveys. Or better yet, fill in this information for them.
  3. Do not read the survey to the students, and do not provide your interpretation of the meaning of questions to the students.
  4. If students ask questions about the survey, please do not interpret the question or answers for them. **Instead, tell them that it is okay not to know everything, and they should just do their best and skip questions if they need to.**

***\*\*\*Post-surveys will be due to CRI on May 18<sup>th</sup>. Please bring your completed surveys to the STEAM PLC event on the 18th!***

#### **CONTACT INFORMATION**

If you have any questions regarding the survey or evaluation, please contact the CRI research team:

- Jamie DeLeeuw, Ph.D., Research Scholar, [deleejam@gvsu.edu](mailto:deleejam@gvsu.edu), 616-331-7085

# APPENDIX D

## STEAM PLC Survey: English



First Name: \_\_\_\_\_

Last Name: \_\_\_\_\_

Birth Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
Month Day Year

Organization: \_\_\_\_\_

Site (if applicable): \_\_\_\_\_

Program: \_\_\_\_\_

TODAY'S DATE: \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
Month Day Year

### 5<sup>th</sup> – 8<sup>th</sup> Grade Survey

**Instructions. PLEASE READ.**

Before you begin, please be sure to write your first and last name on EVERY page. There are lists of statements and questions on the following pages. For each one, please fill in the ONE box that best describes your answer.

Even though some items are very similar, please answer each item. This is not timed; work fast, but carefully. There are no “right” or “wrong” answers! The only correct responses are those that are true *for you*. **This is not a test.** Every question is voluntary. This means you do not have to answer anything you do not want to answer.

What describes you, as you are right now?	Totally Untrue	Mostly Untrue	Somewhat True	Mostly True	Totally True
1. I think people like me can change the world.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I am the type of person who keeps trying even when I feel like giving up.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I am the type of person who believes I can get smarter.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I try to help people, even if I don't know them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I am the type of person who plans what I'll do each week.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I am the type of person who focuses on the quality of my work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I am the type of person who does the right thing, even if others disagree.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I feel comfortable talking to grownups that I don't know.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. When I talk to grownups, I make sure to speak in complete sentences.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I am a good person.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I am a happy person.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Other people like me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. On the whole, I am satisfied with myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	None of the time	Some of the time	Most of the time	All of the time	I don't know
14. I can name the emotions that I'm feeling.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. I can express the emotions that I'm feeling.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I can manage the emotions that I'm feeling.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I try to understand other people's emotions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
18. Math has been my worst subject.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I would consider choosing a career that uses math.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Math is hard for me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I am the type of student to do well in math.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I can handle most subjects well, but I cannot do a good job with math.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. I am sure I could do advanced work in math.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. I can get good grades in math.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. I am good at math.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
26. I am sure of myself when I do science.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. I would consider a career in science.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. I expect to use science when I get out of school.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Knowing science will help me earn a living	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. I will need science for my future work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. I know I can do well in science.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Science will be important to me in my life's work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. I can handle most subjects well, but I cannot do a good job with science.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. I am sure I could do advanced work in science.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**PLEASE READ** this paragraph before you answer the next questions. **Engineers** use math, science, and creativity to research and solve problems that improve everyone's life and to invent new products. There are many different types of engineering, such as chemical, electrical, computer, mechanical, civil, environmental, and biomedical. Engineers design and improve things like bridges, cars, fabrics, foods, and virtual reality amusement parks. **Technologists** implement the designs that engineers develop; they build, test, and maintain products and processes.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
35. I like to imagine creating new products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. If I learn engineering, then I can improve things that people use every day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. I am good at building and fixing things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. I am interested in what makes machines work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Designing products or structures will be important for my future work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. I am curious about how electronics work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. I would like to use creativity and innovation in my future work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Knowing how to use math and science together will allow me to invent useful things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. I believe I can be successful in a career in engineering.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_

**PLEASE READ.** Here are descriptions of subject areas that involve math, science, engineering and/or technology, and lists of jobs connected to each subject area. As you read the list below, you will know how interested you are in the subjects and the jobs. Fill in the circle that relates to how interested you are. There are no “right” or “wrong” answers. The only correct responses are those that *are true for you*.

	Not at all interested	Not so interested	Interested	Very interested
44. <b>Physics:</b> is the study of basic laws governing the motion, energy, structure, and interactions of matter. This can include studying the nature of the universe. ( <i>aviation engineer, alternative energy technician, lab technician, physicist, astronomer</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. <b>Environmental work:</b> involves learning about physical and biological processes that govern nature and working to improve the environment. This includes finding and designing solutions to problems like pollution, reusing waste and recycling. ( <i>pollution control analyst, environmental engineer or scientist, erosion control specialist, energy systems engineer and maintenance technician</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. <b>Biology and Zoology:</b> involve the study of living organisms (such as plants and animals) and the processes of life. This includes working with farm animals and in areas like nutrition and breeding. ( <i>biological technician, biological scientist, plant breeder, crop lab technician, animal scientist, geneticist, zoologist</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. <b>Veterinary Work:</b> involves the science of preventing or treating disease in animals. ( <i>veterinary assistant, veterinarian, livestock producer, animal caretaker</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. <b>Mathematics:</b> is the science of numbers and their operations. It involves computation, algorithms and theory used to solve problems and summarize data. ( <i>accountant, applied mathematician, economist, financial analyst, mathematician, statistician, market researcher, stock market analyst</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. <b>Medicine:</b> involves maintaining health and preventing and treating disease. ( <i>physician’s assistant, nurse, doctor, nutritionist, emergency medical technician, physical therapist, dentist</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. <b>Earth Science:</b> is the study of earth, including the air, land, and ocean. ( <i>geologist, weather forecaster, archaeologist, geoscientist</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. <b>Computer Science:</b> consists of the development and testing of computer systems, designing new programs, and helping others to use computers. ( <i>computer support specialist, computer programmer, computer and network technician, gaming designer, computer software engineer, information technology specialist</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. <b>Medical Science:</b> involves researching human disease and working to find new solutions to human health problems. ( <i>clinical laboratory technologist, medical scientist, biomedical engineer, epidemiologist, pharmacologist</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. <b>Chemistry:</b> uses math and experiments to search for new chemicals, and to study the structure of matter and how it behaves. ( <i>chemical technician, chemist, chemical engineer</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_

	Not at all interested	Not so interested	Interested	Very interested
54. <b>Energy:</b> involves the study and generation of power, such as heat or electricity. ( <i>electrician, electrical engineer, heating, ventilation, and air conditioning (HVAC) technician, nuclear engineer, systems engineer, alternative energy systems installer or technician</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. <b>Engineering:</b> involves designing, testing, and manufacturing new products (like machines, bridges, buildings, and electronics) through the use of math, science, and computers. ( <i>civil, industrial, agricultural, or mechanical engineers, welder, auto-mechanic, engineering technician, construction manager</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No	Not Sure
56. In the future, do you plan to take advanced classes in mathematics?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. In the future, do you plan to take advanced classes in science?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Do you plan to go to college?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

***Thank you so much for taking this survey!***

**Citations**

Ferguson, Ronald F. (2015). "IMAGINE U Student Survey for Middle and High School (Pre & Post)." Developed for the Imagine U Program, Grand Rapids, MI.

Friday Institute for Educational Innovation (2012). Middle/High School Student Attitudes toward STEM Survey. Raleigh, NC: Melinda Faber, Alana Unfried, Eric Wiebe, Jeni Corn, LaTricia Townsend, and Tracey Collins.

# APPENDIX E

## STEAM PLC Survey: Spanish



Primer nombre: \_\_\_\_\_

Apellido: \_\_\_\_\_

Nacimiento: \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
                    Mes                      Día                      Año

Organización: \_\_\_\_\_

Sitio (si es aplicable): \_\_\_\_\_

Programa: \_\_\_\_\_

FECHA DE HOY: \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
                                    Mes                      Día                      Año

### Encuesta para 5<sup>o</sup> – 8<sup>o</sup> grado

**Instrucciones. POR FAVOR LEA.**

Antes de comenzar, por favor asegúrese de escribir su nombre y apellido en CADA hoja. Hay listas de afirmaciones y preguntas en las siguientes páginas. Para cada una, por favor llene UNA caja que mejor describa su respuesta.

Aunque algunos elementos son similares, por favor responda cada uno. Esto no está sujeto a tiempo. Trabaje rápido, pero con cuidado. ¡No hay respuestas “correctas” o “incorrecta”! Las únicas respuestas correctas son las que sean verdadera *para usted*. **Esto no es un examen.** Cada pregunta es voluntaria. Esto significa que no tiene que responder si usted no quiere hacerlo.

¿Qué lo describe a usted, como está en este momento?	Totalmente falso	Mayormente falso	Algo cierto	Mayormente cierto	Totalmente cierto
1. Creo que gente como yo puede cambiar el mundo.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Soy el tipo de persona que sigue intentando aun cuando me siento a punto de tirar la toalla.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Soy el tipo de persona que cree que puedo llegar a ser más inteligente.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Trato de ayudar gente aun cuando no las conozca.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Soy el tipo de persona que planea lo que voy a hacer cada semana.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Soy el tipo de persona que se enfoca en la calidad de mi trabajo.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Soy el tipo de persona que hace lo correcto, aunque otros no estén en desacuerdo.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Me siento confiada hablando con mayores que no conozco.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Cuando hablo con mayores, me aseguro de hablar en frases completas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Soy una buena persona.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Soy una persona feliz.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. La gente gusta de mí.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. En general, como persona estoy satisfecha conmigo misma.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Nombre: \_\_\_\_\_ Apellido: \_\_\_\_\_

	Nunca	Algunas veces	La mayoría de las veces	Siempre	No sé
14. Puedo nombrar las emociones que siento.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Puedo expresar las emociones que siento.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Puedo manejar las emociones que siento.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Trato de entender las emociones de otros.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Fuerte desacuerdo	Desacuerdo	Ni de acuerdo ni en desacuerdo	De acuerdo	Fuertemente de acuerdo
18. Matemática ha sido el peor tema.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Consideraría escoger una carrera que utilice matemática.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Matemática es duro para mí.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Soy el tipo de estudiante al que le va bien en Matemática.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Puedo manejar la mayoría de los temas bien, pero no puedo hacer un buen trabajo en Matemática.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Estoy segura de que puedo tomar Matemática avanzada.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Puedo sacar buenas notas en Matemática.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Me va bien en Matemática.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Fuerte desacuerdo	Desacuerdo	Ni de acuerdo ni en desacuerdo	De acuerdo	Fuertemente de acuerdo
26. Tengo seguridad en mí cuando estudio Ciencias.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Consideraría escoger una carrera que utilice Ciencias.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Espero utilizar las ciencias cuando salga de estudiar.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Saber Ciencias me ayudará a ganarme la vida.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Voy a necesitar Ciencias para mi futuro trabajo.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Sé que me puede ir bien en Ciencias.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Ciencias va a ser importante para mí en mi vida de trabajo.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Puedo manejar la mayoría de los temas bien, pero no puedo hacer un buen trabajo en Ciencias.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Tengo la seguridad de que puedo estudiar Ciencias avanzadas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**POR FAVOR LEA** este párrafo antes de contestar las siguientes preguntas. **Los ingenieros** utilizan matemáticas, ciencias y creatividad para investigar y resolver problemas que mejoren la calidad de vida de todos y para inventar nuevos productos. Hay muchos tipos diferentes de ingeniería, como química, eléctrica, computacional, mecánica, civil, ecológica y biomédica. Los ingenieros diseñan y mejoran cosas como puentes, carros, textiles, comidas y parques de entretenimiento de realidad virtual. **Los tecnólogos** implementan el diseño que los ingenieros desarrollan; construyen, prueban y mantienen productos y procesos.

Nombre: \_\_\_\_\_ Apellido: \_\_\_\_\_

	Fuerte desacuerdo	Desacuerdo	Ni de acuerdo ni en desacuerdo	De acuerdo	Fuertemente de acuerdo
35. Me gusta imaginarme creando nuevos productos.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Si aprendo ingeniería, puedo mejorar cosas que la gente usa todos los días.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Soy bueno(a) construyendo y arreglando cosas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Me interesa saber qué es lo que hace trabajar las máquinas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Diseñar productos o estructuras va a ser importante para mi futuro trabajo.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Tengo curiosidad sobre cómo funcionan las cosas electrónicas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Me gustaría utilizar creatividad e innovación en futuro trabajo.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Saber cómo usar Matemáticas y Ciencias juntas me permitirá inventar cosas útiles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Creo que puedo tener éxito en una carrera en ingeniería.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**POR FAVOR LEA.** Aquí hay unas descripciones áreas académicas que envuelven matemática, ciencias, ingeniería y/o tecnología, y lista trabajos conectados con cada área de estudio. Al leer la siguiente lista, usted sabrá qué tan interesado está en los temas y los trabajos. Llene en el círculo que se relacione con cuanto interés tienen usted. No hay respuestas “correctas” o “incorrectas”. La única respuesta correcta es la que *es verdad para usted*.

	Ningún interés	Sin interés	Interesado(a)	Muy interesado(a)
44. <b>Física:</b> es el estudio de las leyes básicas que gobiernan el movimiento, la energía, la estructura e interacción con la materia. Esto puede incluir estudio de la naturaleza del universo. ( <i>ingeniería de aviación, técnico de energía alternativa, técnico de laboratorio, físico, astrónomo</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. <b>Trabajo de Ecología:</b> involucra aprendizaje sobre los procesos físicos y biológicos que gobiernan la naturaleza y funcionamiento para mejorar el ambiente. Esto incluye encontrar y diseñar soluciones a problemas como contaminación, reuso de desechos y reciclaje. ( <i>analista de control de contaminación, ingeniero ambiental o científico, especialista de control de erosión, ingeniero de sistemas de energía y técnico de mantenimiento</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. <b>Biología y Zoología:</b> involucran el estudio de organismos vivos (como plantas y animales) y procesos de vida. Esto incluye trabajo de apareamiento de animales en fincas y en áreas de nutrición. ( <i>técnico de biología, científico de biología, reproductor de crías, técnico de laboratorio y semillas, científico de animales, genetista, zólogo</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Nombre: \_\_\_\_\_ Apellido: \_\_\_\_\_

	Ningún interés	Sin interés	Interesado(a)	Muy interesado(a)
47. <b>Trabajo Veterinario:</b> involucra ciencias de prevención o tratamiento de enfermedades en animales. ( <i>asistente veterinario, veterinario, productor de ganado, cuidado de animales</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. <b>Matemáticas:</b> es la ciencia de los números y sus operaciones. Envuelve la computación, algoritmos y teoría usada en resolución de problemas y resumen de datos. ( <i>Contador, matemática aplicada, ecónomo, analista financiero, matemático, estadista, investigador de mercado, analista de la bolsa de valores</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. <b>Medicina:</b> involucra mantener y prevenir la salud y tratamiento de enfermedades. ( <i>asistente médico, enfermera, médico, nutricionista, técnico de emergencia médica, terapeuta físico, dentista</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. <b>Ciencia Terrestre:</b> es el estudio de la tierra, incluye el aire, el suelo y el océano. ( <i>geólogo, meteorólogo, arqueólogo, geocientífico</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. <b>Ciencias de cómputo:</b> consiste en el desarrollo y prueba de sistemas de computadoras, diseño de nuevos programas y ayudar a otros a usar computadoras. ( <i>especialista de apoyo de computadora, programador de computador, técnico de computador y redes, diseño de juegos, ingeniero de software, tecnólogo especialista de información</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. <b>Ciencias médicas:</b> involucran investigación de enfermedades humanas y trabajo para encontrar nuevas soluciones a problemas de salud humana. ( <i>tecnólogo clínico de laboratorio, científico médico, ingeniero biomédico, epidemiólogo, farmacólogo</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. <b>Química:</b> usa matemática y experimentos para investigar nuevos químicos, y estudia la estructura de la materia y cómo se comporta. ( <i>técnico químico, químico, ingeniero químico</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. <b>Energía:</b> involucra el estudio y generación de energía, como calor o electricidad. ( <i>electricista, ingeniero eléctrico, técnico de calor, ventilación y aire acondicionado (HVAC), ingeniero nuclear, ingeniero de sistemas, instalador o técnico de sistemas de energía alternativa</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. <b>Ingeniería:</b> involucra el diseño, prueba y fabricación de nuevos productos (como máquinas, puentes, edificios y aparatos electrónicos) mediante el uso de la matemática, las ciencias y computadores. ( <i>ingeniería civil, industrial, agrícola, o ingeniería mecánica, soldador, mecánico automovilista, técnico de ingeniería, jefe de construcción</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sí	No	No es seguro	
56. ¿En el futuro, planea usted tomar clases avanzadas de Matemáticas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
57. ¿En el futuro, planea usted tomar clases avanzadas de Ciencias?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
58. ¿Planea usted ir a la universidad?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

***¡Gracias por participar en esta encuesta!***

**Referencias**

Ferguson, Ronald F. (2015). "IMAGINE U Student Survey for Middle and High School (Pre & Post)." Developed for the Imagine U Program, Grand Rapids, MI.

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