East Austin College Preparatory Academy (EAPrep)
Quantitative Data Report and Analysis
School Year 2011-2012

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Executive Summary

This report reviews metrics related to the STEM education program at East Austin College Prep, in order to measure progress toward the goal of increasing STEM interest and motivation.

> Demographics
>
> Attendance
>
> Reasons for participating
>
> STEM self-efficacy
>
> Standardized test scores in STEM-related areas
>
> Demographic characteristics of EAPrep students

The majority of students are from underserved demographic groups:
- 83% are Hispanic, 13% are African American, and 3-4% are White,
- One-third have limited English proficiency (LEP), and
- Approximately 90% qualify for free and reduced lunch.

STEM engagement as measured by daily attendance (Table 2)
- The average attendance rate based on school records was 97.4% for girls and 98% for boys, which indicates very high level of student engagement with EACPA.
  - Because students of middle school age are likely are not responsible for their own transportation, this also indicates a high level of parental engagement and commitment to the school.

STEM motivation:

As measured by pre and post program surveys
Forty three percent of students stated that they viewed their participation in Globaloria as an important part of preparing for their future.

Thirty six percent felt that participating in Globaloria was a good way to improve their skills and knowledge of game design and technology.

As measured by student reported STEM self-efficacy scores
We found moderate change in the students' STEM self-efficacy reports. We also found that the EA Prep students with most experience in Globaloria showed the most growth in self-efficacy for STEM skills.

As measured by Standardized Test scores in STEM and STEM-related areas
Math

Science

Algebra EOC

Writing (7th grade)

EAPrep Globaloria Program Goals

The EAPrep curriculum is designed to support the school's mission to change the future for the underserved students of East Austin by employing a focus on science, technology, engineering, and math (STEM). The curriculum, and particularly the Globaloria Constructionist game design and media literacy class and platform is intended to directly prepare students for college and professional success. The Globaloria class is required meets 60-70 minutes each school day and provides students an opportunity to learn through the collaborative process of developing web-based, educational computer games.

Formative Evaluation Questions

The present report presents STEM-related metrics from the 2011-2012 school year. The participants at the school during the covered time frame included three grades, 6th, 7th and 8th.
This report is organized around the following evaluation questions:

1. What are the demographic characteristics of EAPrep students?
2. Is there evidence of student engagement in the EAPrep curriculum as measured by daily attendance?
3. What levels of interest do students report in Science, Math and Programming? By gender?
4. What motivating factors do game-design students report most frequently?
5. Do students show growth in feelings of STEM self-efficacy in the Globaloria classroom?
6. Is there evidence of increased interest in STEM careers among the student population?
7. How have students performed on the state (standardized) tests, in STEM-related content areas?

What are the demographic characteristics of EAPrep students?

At East Austin College Prep, all students take Globaloria as a required class. During the 2011-12 school year, the school was comprised of 190 students with the following distribution across the middle school grades:

Grade 6	114
Grade 7	108
Grade 8	86

Table 1 Total Student Enrollment for each grade

- The large majority of students are Hispanic (85.4%) or African American (12.1%).
- Twenty four percent are classified as learners of English as a Second Language (ESL) or Limited English Proficiency (this number is lower than the previous years').
- A large majority qualifies for free and reduced lunch.
- Students are almost equally distributed among genders.

Hispanic	85.4%	ESL/LEP	24.0%
African-American	12.1%	SPED	11%
White	2.5%	Male	49%
Economically disadvantaged	90.5%	Female	51%
At Risk	38.7%		

Table 2 Student Demographics for EAPrep Student Population

Is there evidence of student engagement in the EA Prep curriculum as measured by attendance?

Daily attendance patterns from 2011-12 provide evidence that EA Prep students are highly engaged in school.

The following table depicts attendance rates for each grade during 2011-12

EA Prep cohort	2011-12 Attendance Rate
Sixth grade	97.4%
Seventh grade	96.7%
Eighth grade	96.9

Table 3 EA Prep Attendance Rates for 2011-12

- This attendance rate indicates a high level of student engagement, particularly for a disadvantaged student group.
- Student daily attendance is one of the best predictors of student success.
- Middle school student attendance is associated with family support and encouragement.
- Excellent attendance is an important supporting factor of other goals of Globaloria, because declining attendance is an important leading indicator of drop out.

Do students report interest in the STEM subjects?

One of the major goals of the Globaloria program at EA Prep is to engage students in STEM subjects. Student interest was high, as reported by students after completing 1, 2 or 3 years of the program. On a post-program survey, students were asked to respond on a scale of 1-5 to denote their interest level in for subject areas including Reading, Graphic Arts, Science, Programming and Math. Sixth graders, or those with one year of experience in the program, reported the highest interest in all STEM subjects. Eighth graders also showed strong interest in Science and programming.
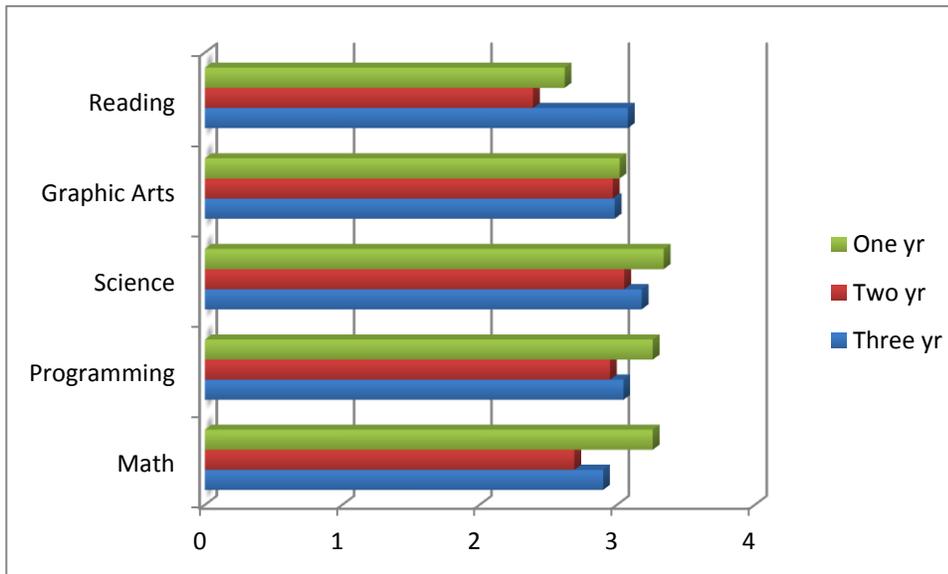

Table 4 Students' interest in STEM subject areas

Note that this data is post-program only. Pre and post data on STEM subject interest will be available for 2012-13.

Do students report interest in STEM career goals?

Nationally, only 33% of eighth graders are interested in STEM majors (US Navy, 2013) for college. EA Prep researchers sought to explore the interest in pursuing STEM majors and careers among the EA Prep Globaloria students. During 2011-12, differences and changes in student STEM interest across the year were documented.

EA Prep students formed and maintained STEM career goals at much higher levels than the national average. This finding was the result of analysis of the career goals listed by students on written surveys. The surveys were given at both the beginning and end of the program. For students with three years of experience in Globaloria, interest in STEM careers remained fairly constant across middle school, with dips occurring between the end of one program year and the beginning of the following year. It should also be noted that some of the change in these levels can be explained by the changes within the cohorts, particularly of students leaving the program from year to year.

STEM Career Goals:	STEM Career goal *Pre	STEM Career goal *Post	Previous Year Pre	Previous Year Post
Cohort A3: Students who began the program in 2009, in Year 3 of Globaloria when surveyed	42%	59%	36%	52%
Cohort B2: Students who began the program in 2010, in year 2 of Globaloria when surveyed	29%	54%	19%	48%
Cohort D1: Students who began the program in 2011, in year 1 of Globaloria when surveyed	37%	68%	n/a	n/a

Table 5 STEM career interests reported by students, by cohort

Female students became interested in STEM careers at a slightly higher rate than boys, and also were less likely to lose interest in STEM careers than males. The group of students with persistent STEM interest, in other words, those who reported STEM interests at both pre and post, was made up of more females than males.

	Male (n = 131)		Female (n = 143)	
KEY	N	Percentage	N	Percentage
Group 0 = STEM interest at pre, non- STEM at post	17	13.0%	8	5.6%
Group 1 = Non-STEM interests at pre and post	46	35.1%	46	32.2%

Group 3 = Non-STEM interests at pre, STEM interest at post	41	31.3%	44	30.8%
Group 4 = STEM interests at pre and post	27	20.6%	45	31.5%

Table 6 Changes in STEM career interest pre to post program

Do students maintain an interest in learning about technology?

The following charts depict responses from Globaloria students regarding motivation for participating and reasons to participate, keeping in mind that the class is a required part of the curriculum in middle school. A majority of students report that they believe that *learning to use technology well* **is an important part of preparing for their future**, and also that **it is exciting to try new ways to use technology for game design.** These very positive feelings about technology may provide some support for the continued interest that students have shown in STEM related careers.

	Very True
Learning to use technology well is an important part of preparing for my future	43.8
Because it's exciting to try new ways to use technology for game design	42.1
I believe that I believe the class will help me use technology effectively	39.5

Table 7 Reasons for participating in Globaloria mentioned most often by students
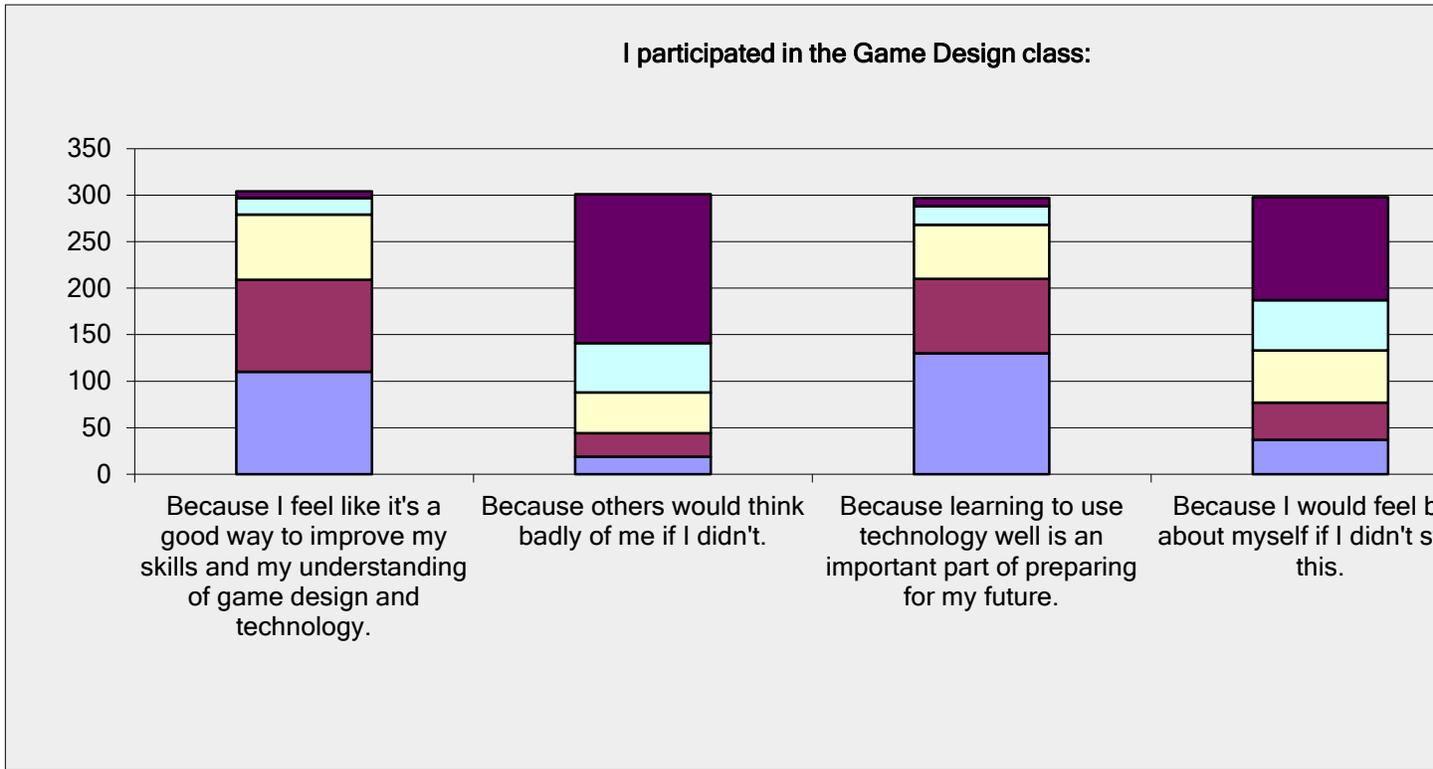
I participated in the Game Design class:

- Because I feel like it's a good way to improve my skills and my understanding of game design and technology.
- Because others would think badly of me if I didn't.
- Because learning to use technology well is an important part of preparing for my future.
- Because I would feel b[...] about myself if I didn't s[...] this.

Table 8 Students' reasons for participating in Globaloria

I plan to continue strengthening my technology and game design skills:

- Because it's exciting to try new ways to use technology for game design.
- Because I would feel proud if I continued to improve at technology and game design.
- Because it's a challenge to really understand how to design and program games.
- Because it's interest[...] use technology to id[...] how to best design [...] program games[...]
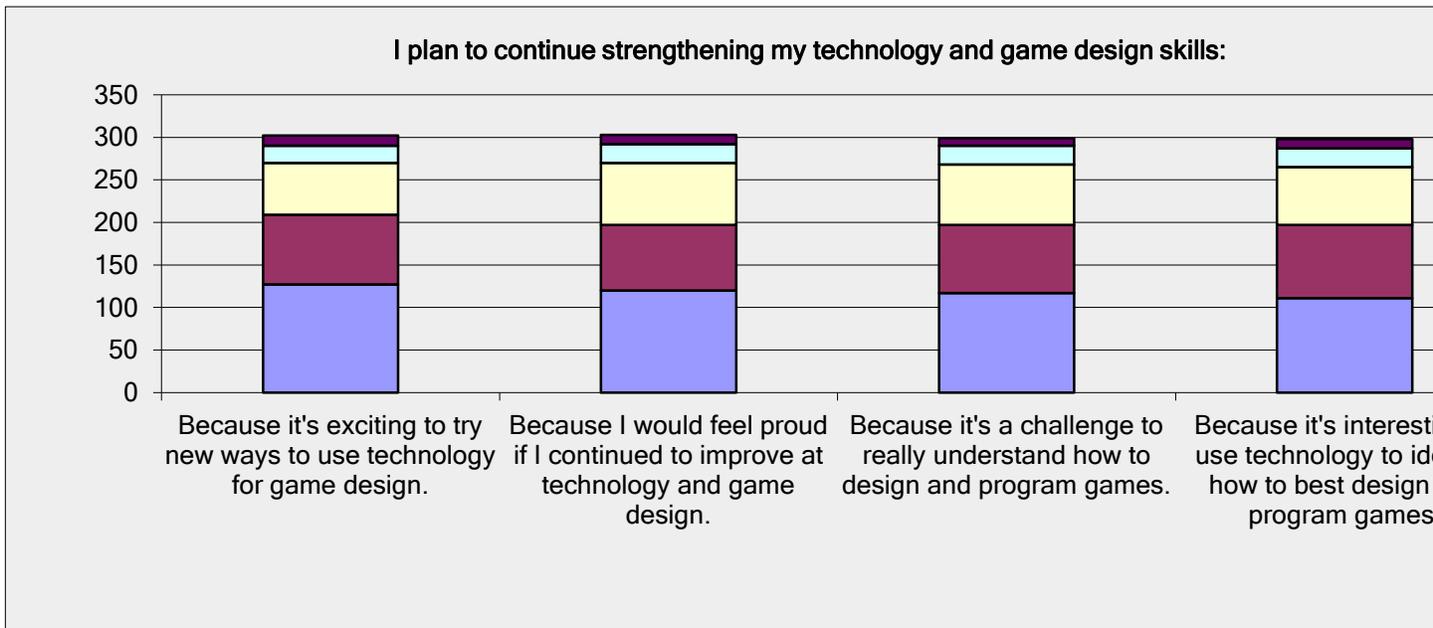
Table 9 Students' reasons for participating in Globaloria, continued

Self-efficacy with STEM Skills and Globaloria

Researchers have been documenting changes in student feelings of STEM self-efficacy during the students' participation in Globaloria. Students are asked to reflect on and then rate their feelings of self-efficacy regarding STEM skills. During 2011-12, students gave ratings on a scale from 1-100.

This data is depicted in years of experience cohort groups. The cohorts are A3: eighth grade students in year three of the program, B2: seventh grade students in year two of the program, and D1: sixth grade students in year one of the program. The means for each of these three groups and 2 additional smaller groups are indicated below.
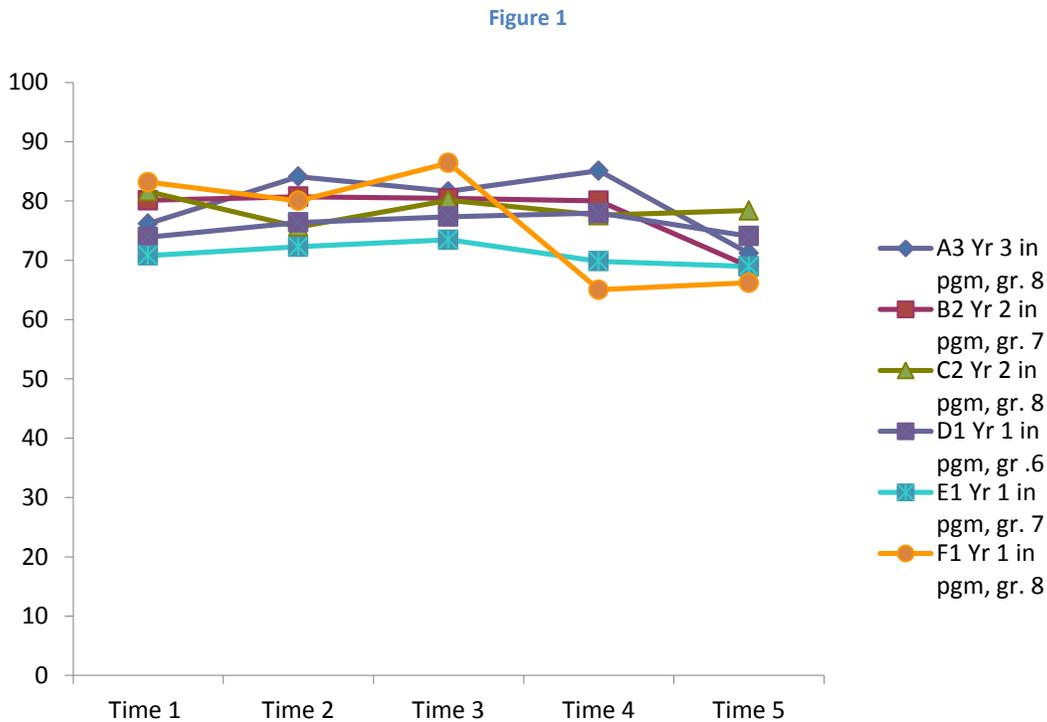
Figure 1

Table 10 Globaloria self-efficacy means at 5 time points throughout the year.

We found that the EA Prep students with most experience in Globaloria showed the most growth in self-efficacy for STEM skills.

Is there evidence of academic progress in STEM subjects according to state assessment scores?

To examine academic performance in STEM subjects, we looked at state standardized test scores (STAAR) in math for all students. Please see chart below for percent passing the math tests at Satisfactory or Advanced levels on the sixth, seventh and eighth grade STAAR Math test.
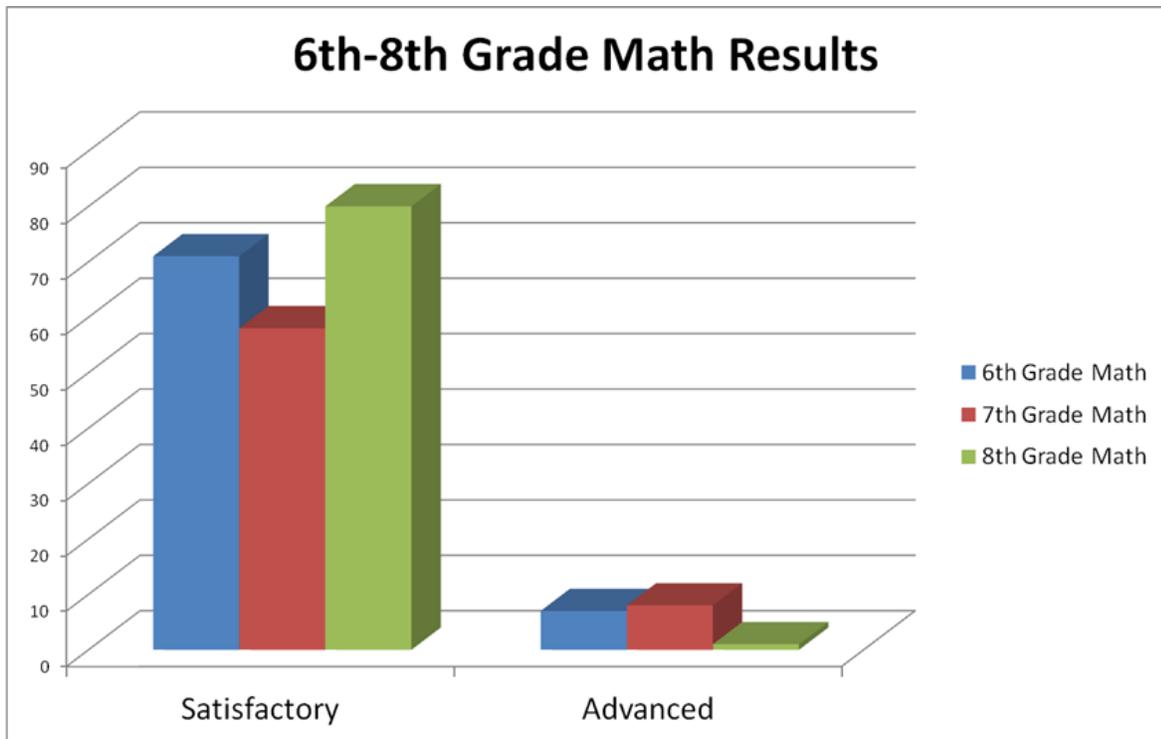
Table 11 STAAR Math scores for 6th through 8th grades

EAPrep math results compared to district & state

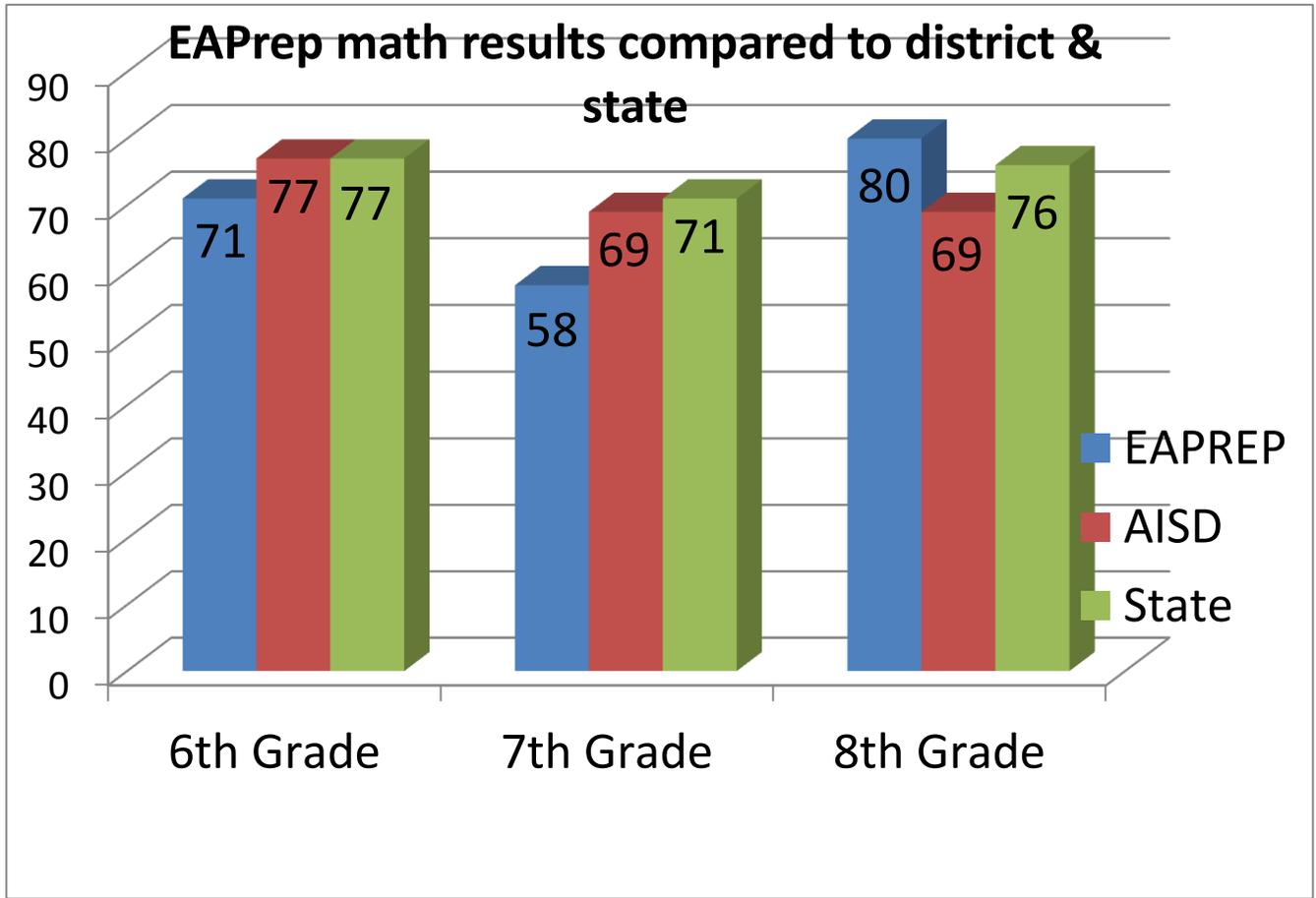| Grade	EAPREP	AISD	State
6th Grade	71	77	77
7th Grade	58	69	71
8th Grade	80	69	76

Table 12 EA Prep STAAR math scores compared to district and state averages

We found that eighth graders at EA Prep performed better than the state and Austin ISD ('district') averages in Math, while sixth and seventh graders at EA Prep performed slightly lower than the state and district averages in Math.

The above analysis of test scores revealed that 8th graders—third year Globaloria students—did better than the state average in Math and better than the average for the Austin Independent School District (AISD), while 6th and 7th grades scores were lower than both state and Austin district averages. Future research will examine whether test performance of students with more time in the Globaloria program continues to correlate with improved performance on standardized assessments.

Science STAAR

The STAAR Science test is given only in 8th grade. Since a large majority of EA Prep students receive free meals, we use will use students who receive free meals statewide as a comparison group. While the EA Prep students' results are lower than the state average they are slightly better than the average for Economically Disadvantaged students who receive free meals.
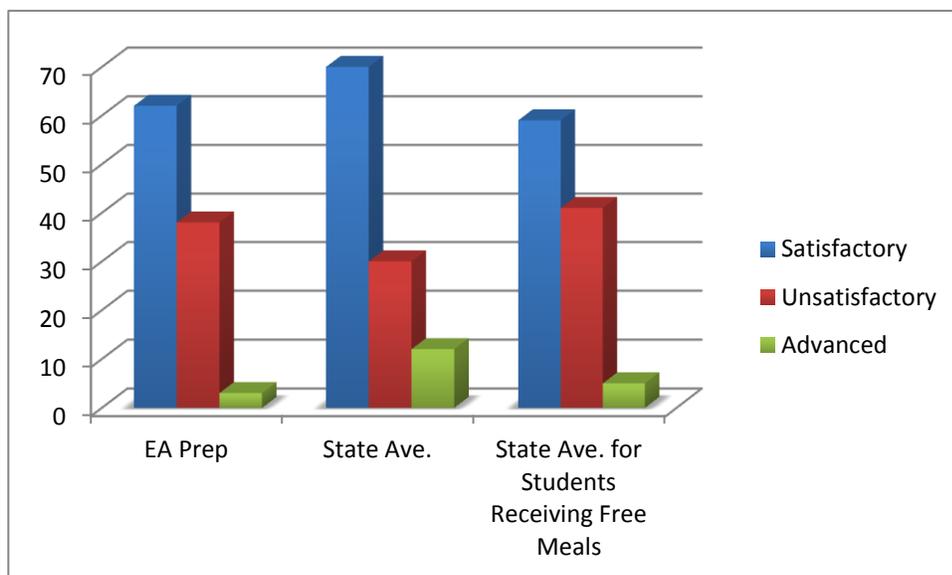

Table 13: EA Prep STAAR scores for 8th grade science, compared to state and state free meal averages

Algebra End of Course Exam

A group of twenty-five 8th grade students at EA Prep took the Algebra end of course (EOC) standardized exam. One hundred percent passed at the 'phase-in' standard set by the state. Note that the phase-in standard is a result of the test being new with passing rates are still being determined. Ten of the twenty-five students passed at the Recommended level, and two at the Advanced level.
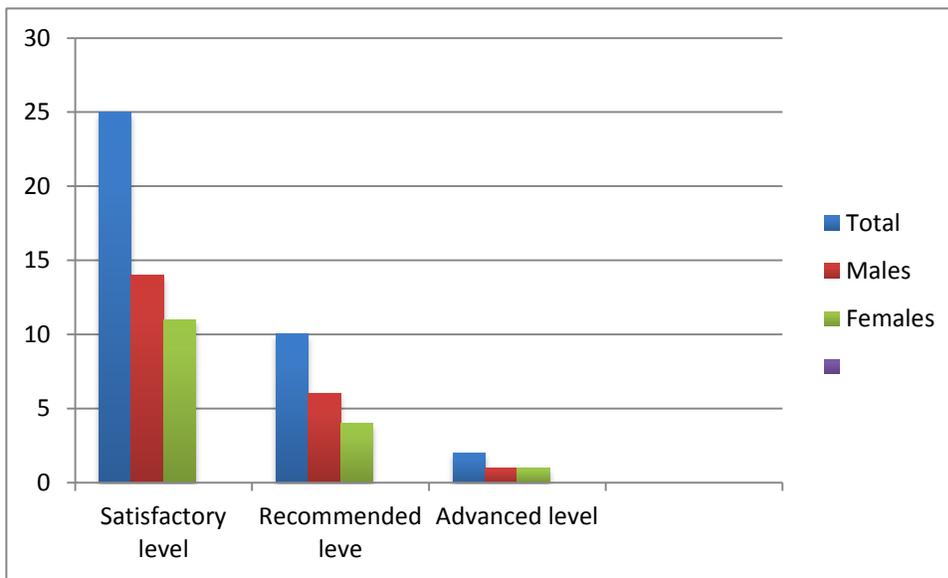
Table 14 Algebra STAAR end of course exam performance

Writing

Writing is part of the Globaloria program in several substantial ways: Design documentation on the wiki, blogging, and writing content for the game. For this reason, we include a description of students' performance on the STAAR writing assessment, which is given in 7th grade only. Since a large majority of EA Prep students receive free meals, we compared their results with students who receive free meals statewide. While the school's results are lower than the state average they are similar to the statewide average among Economically Disadvantaged students who receive free meals.

STAAR Writing, 7th grade	Satisfactory	Unsatisfactory	Advanced
EA Prep students	60	40	2
State Average	71	29	7
State Average for students who receive free meals	61	39	2

EAPrep students scored similarly to the state average for students who receive free meals. One interesting finding was that students performed better on the Expository Composition assessment. This finding differs from the average performance in both the state general population and in state-wide students receiving free meals.

The Expository Composition assessment task involves writing that is:

- Informational Organization
- Logical (but still engaging)
- Facts and Examples Support Thesis

- Tone is Informative
- Language is Clear and Unambiguous
- Clear Controlling Idea or Thesis

Future research will track whether Globaloria students as a whole continue to perform differently than state averages on Expository Composition. Please see the appendix for details about EA Prep student average performance on Expository and Narrative writing tests, comparing them to state general population averages.

Conclusion

This report looked at indicators of STEM engagement, interest and achievement at EA Prep. Students with more experience in the program tend to have higher STEM skill self-efficacy, and EA Prep students in general are much more likely to be interested in a STEM career than national averages. Overall, we find that the students at EA Prep are more engaged and efficacious in STEM learning than their peers.

Appendix

Writing Assessment Results

Personal Narrative Composition (7th): EAPrep(A) and State Ave. (B)
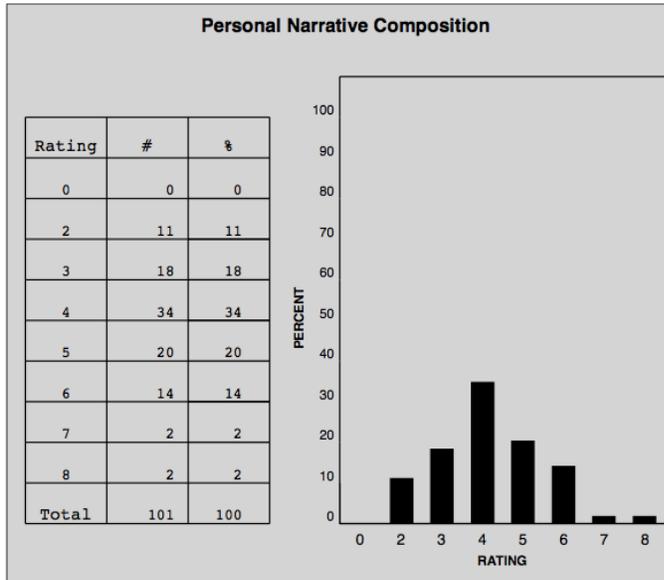
Personal Narrative Composition

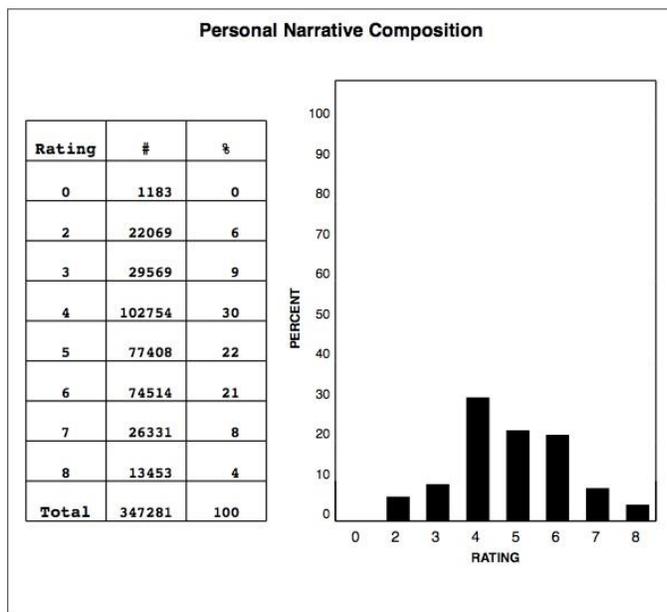| Rating	#	%
0	0	0
2	11	11
3	18	18
4	34	34
5	20	20
6	14	14
7	2	2
8	2	2
Total	101	100

Table 14 A. EAPrep Personal Narrative Composition Results

Personal Narrative Composition

Rating	#	%
0	1183	0
2	22069	6
3	29569	9
4	102754	30
5	77408	22
6	74514	21
7	26331	8
8	13453	4
Total	347281	100

Table 15 B. Personal Narrative Composition Results State Average

Expository Composition

Rating	#	%
0	1	1
2	6	6
3	4	4
4	29	29
5	17	17
6	23	23
7	15	15
8	6	6
Total	101	100
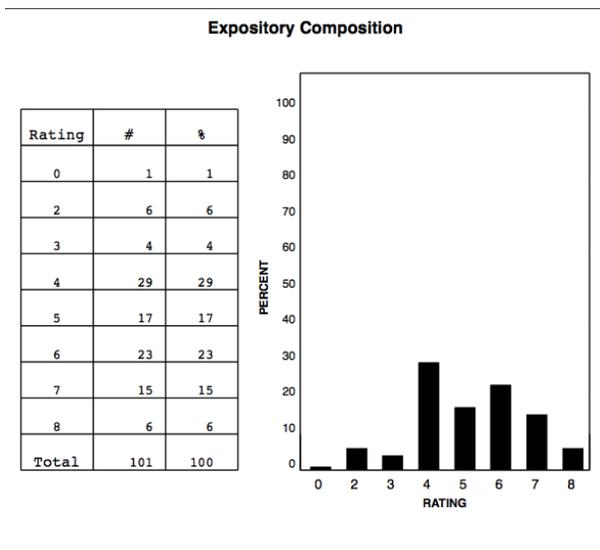
Table 16 A. EAPrep Expository Composition STAAR results

Expository Composition

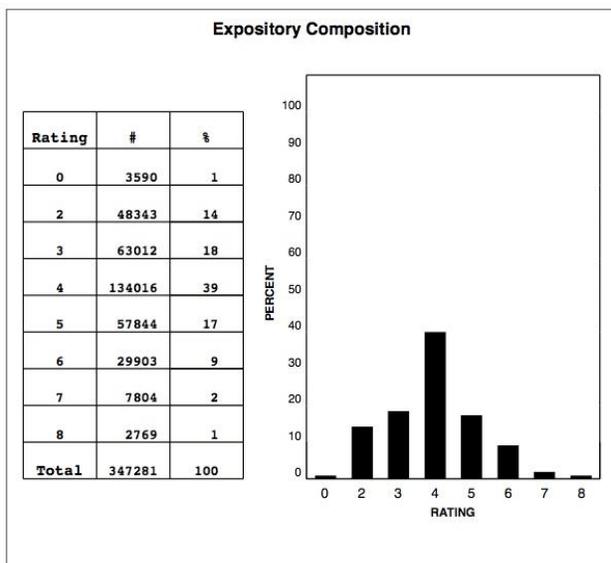| Rating	#	%
0	3590	1
2	48343	14
3	63012	18
4	134016	39
5	57844	17
6	29903	9
7	7804	2
8	2769	1
Total	347281	100

Table 17 B. State Average Expository Composition STAAR results