



NASEF Internal Report: NASEF Parents

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NASEF

The North America Scholastic Esports Federation (NASEF) is a non-profit esports program for middle and high school students. What makes NASEF unique is its *enriched esports* model. NASEF uses student interest in esports as a context and means for learning, school affiliation, and social-emotional skills. The NASEF program accomplishes this through school-affiliated extracurricular clubs rather than just isolated competitive teams, engaging students not only in competitive play but also in esports-related intellectual and professional activities from shoutcasting to logo design, from expository writing to data analysis, from club leadership to team collaboration. The research detailed herein is part of the program's assessment and evaluation, funded by the Samueli Foundation to ensure that the program continues to make good on its stated mission and goals.

Study Goals & Design

In order to assess the impact of NASEF, we conducted a survey across participating students and non-participating students within six schools. The surveys consisted of the PEAR instrument (The PEAR Institute: Partnerships in Education and Resilience, 2018) supplemented by additional items designed in-house to assess school affiliation, social skills, self-regulation, and mastery orientation. Together the survey measured 19 variables across five main topics:

1. **STEM Attitudes & (Career) Knowledge** (in blue), including STEM Engagement, STEM Career Interest, STEM Activity Participation, STEM Career Knowledge, and STEM Identity;
2. **School Affiliation** (in green), including School Value, School Engagement, Sense of Belonging, and Effort in School;
3. **Social Skills & Relationships** (in red), including Cooperation, Communication, Relationships with Peers, and Relationships Adults;
4. **Self-Regulation** (in purple), including Emotional Regulation, Self-Management, Grit, and Perservance; and
5. **21st Century Skills** (in orange), including Critical Thinking and Mastery Orientation.

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The survey was a retrospective posttest assessment with all items framed to measure students' own assessment of change on each variable as a result of the 2018-2019 program. Example items are the following:

This survey uses the term **Program**. For the purpose of this survey, Program is defined as:

- <NASEF Members> your time spent in your high school's esports club
- <Non-Members> your time spent at your high school

This survey will ask you to tell us how you feel TODAY compared to the BEGINNING of the program. We call this reflection. Before responding, think back to the start of your program then think about right now.

Thinking about how you feel **Today** compared to the **Beginning** of the program:

	Much Less Now	Less	About the Same	More
I find the things I learn in class interesting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use ideas from school in my daily life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Responses to all survey items were on a Likert 5-point scale with 1 marked "Much Less Now," 3 marked "About the Same" and 5 marked "Much More Now." Thus, 3 is the spiritual zero of the scale. Students completed both surveys online for a total of roughly 20 minutes on average, with little to no mortality (participant drop off from beginning to end of the survey). Our overall sample size, however, was only half of the sample size sought.

Data Sample

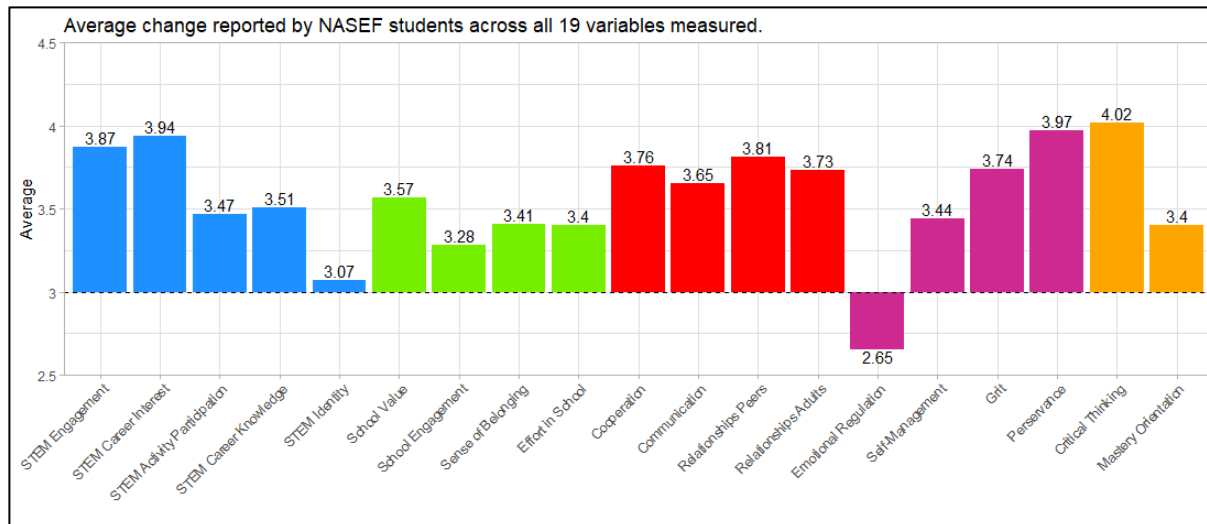
Our target sample was 300 students total comprised of 150 NASEF students and 150 non-NASEF students for a power of 90. Here, "power" is the ability to detect differences due to the program. A power of 80 or higher is typically acceptable for detecting medium size program effects. In fact, however, only 74 students from four schools (Magnolia High School, Sunny Hills High School, Troy High School, Westminster High School) responded to the study invitation, leaving us with a power of only 75. In effect, the low recruitment rate dropped our ability to detect the effects of the program for all variables except those with more dramatic effects. Still, some significant effects were found. We detail those below.

Of those 74 students who did participate, 55 were male and 19 were female. Ethnically, the sample was fairly diverse, with the majority of respondents of Asian and Hispanic/Latino descent.

Ethnicity	Proportion
Asian/Asian American	77%
Hispanic Latino	12%
Indian	1%
White	5.4%
Multiethnic	4%
TOTAL	N=74

Reported Effects of Program

The figure below shows the mean response of NASEF students on all 19 variables assessed (grouped by color). Students participating in NASEF reported a positive increase on nearly all 19 variables as a result of the program. The highest reported average score was for Critical Thinking (4.02), followed closely by Perseverance (3.97), STEM Career Interest (3.94), and STEM Engagement (3.87). Other noteworthy positive changes were reported for Cooperation (3.76), Relationships with Peers (3.81) and Adults (3.73), and Grit (3.74). The only variable for which students reported negative decrease (less than 3) was Emotional Regulation (2.65), indicating that sampled students in NASEF reported a loss of control over their emotional regulation. Comparing this finding to the first year of qualitative research, we suspect that this reduction in reported self-regulation may reflect a greater awareness of instances of losing emotional control rather than a decrease in actual ability. Further research is needed to disambiguate this, however. Overall then, NASEF students report positive gains, academically, socially, and emotionally, as a result of the year long program.



We then tested each variable to determine whether the average score differed significantly from 3 (i.e. reported no change) using one-tailed single sample t-test. Even with our reduced power to detect differences as a result of our limited sample size (due to lackluster turn-out), every variable was statistically significant (*) except STEM Identity. As the table below shows, the confidence interval (CI) of every variable except STEM Identity (which is not statistically significant) and Emotional Regulation (discussed above) falls entirely above 3.0, indicating a significant, positive gain as a result of the program.

NASEF Participants	Descriptive		Single Sample T Test Results				
	Variable	Mean	SD	P Value	CI Lower Bound	CI Upper Bound	
	STEM Engagement	3.87	0.45	0	3.73	4.01	**
	STEM Career Interest	3.94	0.73	0	3.71	4.17	***
	STEM Activity Participation	3.47	0.45	0	3.33	3.61	**
	STEM Career Knowledge	3.51	0.99	0.0022	3.19	3.82	**
	STEM Identity	3.07	0.37	0.2093	2.96	3.19	
	School Value	3.57	0.52	0	3.40	3.73	**
	School Engagement	3.28	0.53	0.0015	3.12	3.45	*
	Sense of Belonging	3.41	0.55	0	3.24	3.58	**

Effort in School	3.40	0.41	0	3.27	3.52	**
Cooperation	3.76	0.59	0	3.58	3.95	**
Communication	3.65	0.51	0	3.49	3.81	**
Relationships with Peers	3.81	0.54	0	3.64	3.98	**
Relationships with Adults	3.73	0.74	0	3.50	3.97	**
Emotional Regulation	2.65	0.66	0.0015	2.44	2.86	*
Self-Management	3.44	0.42	0	3.31	3.57	**
Grit	3.74	0.65	0	3.53	3.94	**
Perservance	3.97	0.59	0	3.78	4.16	***
Critical Thinking	4.02	0.55	0	3.84	4.19	***
Mastery Orientation	3.40	0.53	0	3.23	3.56	**

Single Sample T-Test with $H_0: \text{Mean} = 3$ vs $H_a: \text{Mean} \neq 3$

NASEF versus non-NASEF Comparisons

Next, in order to assess the impact of NASEF above and beyond a year of regular high school programming, we compared the average responses of NASEF participants to non-participants using a matched pairs design to control for school, gender, and GPA. Recall that the survey was constructed such that NASEF students were asked to reflect on their time spent in the esports club while non-NASEF students were asked to reflect on their time spent in high school generally. With this design, we leave ourselves open to the possibility that we are stacking our one single club (for NASEF students) against all classes and clubs (for non-NASEF students), so any observable differences here should be considered worth attention.

First, for each matched pair, a difference score was calculated by subtracting the non-NASEF student score from the NASEF student score for each separate variable. For example, for a given pair, if the NASEF student had a STEM Engagement Score of 4 and the matched non-NASEF student had a score of 3, the difference would be noted as 1 for that variable. We then calculated the average difference score for each variable and tested whether this average difference score was greater than 0, allowing us to assess whether NASEF participation had a greater (and hopefully positive) impact on participating students compared to the impact of high school broadly on non-participants.

Variable	Average Paired Difference Score	P Value	
STEM Engagement	0.205	0.0988	*
STEM Career Interest	0.113	0.3337	
STEM Activity Participation	0.4606	0.0349	**
STEM Career Knowledge	0.467	0.0429	**
STEM Identity	0.174	0.1005	
School Value	0.104	0.2924	
School Engagement	0.104	0.2936	
Sense of Belonging	0.052	0.3874	
Effort in School	0.009	0.48	
Cooperation	0.105	0.2842	
Communication	-0.13	0.8198	
Relationships with Peers	0.174	0.1592	
Relationships with Adults	0.38	0.0796	*
Emotional Regulation	-0.29	0.9642	
Self-Management	-0.078	0.7152	
Grit	0.27	0.0234	**
Perseverance	0.293	0.0737	*
Critical Thinking	0.296	0.0577	*
Mastery Orientation	0.091	0.3117	

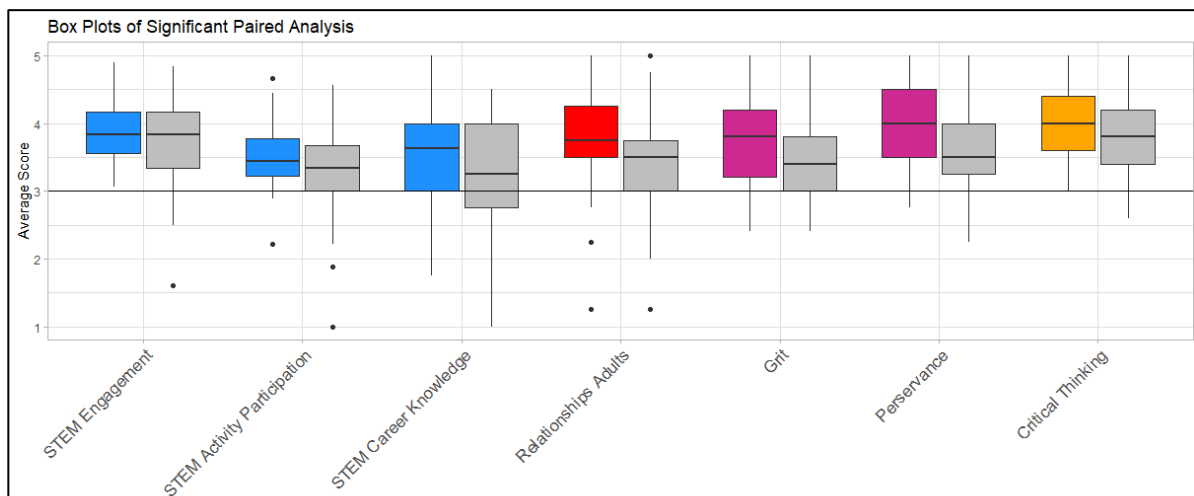
Paired T-Test with H_0 : Difference = 0 vs H_a : Difference > 0

Again, even with our significantly reduced power, several variables showed significant differences between the two groups. STEM Activity Participation, STEM Career Knowledge, and Grit yielded significant results (** $p < 0.05$). STEM Engagement, Relationships with Adults, Perseverance, and Critical Thinking yielded moderate significant results (* $p < 0.10$). All

significant differences favor NASEF. Results of this research show that NASEF significantly, positively improves students’

- STEM activity participation, career knowledge, and engagement
- Grit and perseverance
- Relationships with adults
- Critical thinking

The boxplot diagram below shows all comparisons between groups that are statistically significant. Average NASEF member responses are coded by color and average non-member responses are coded as grey.



Final Remarks

It is always difficult to establish causality in a research design that does not include random assignment to groups since any differences found between groups might always be due to self-selection. For example, it may be that there is something specific about the kind of high school students that opts into NASEF in the first place that leads to the reported positive changes. In this study, the surveys were specifically designed to be retrospective, asking students to reflect specifically on the last year “program” – NASEF (in the case of participants) versus high school generally (in the case of non-participants). Thus, such effects of self-selection seem unlikely. It’s a stretch to state that self-selection into NASEF might incline one to give more generally positive assessments of the last year.

One could still argue that NASEF students are perhaps more prone to a social desirability bias (a known source of error in surveys due to participants’ desire to say what they believe researchers want to hear). Here again, this alternative explanation seems unlikely. Student were recruited via school staff but completed and submitted surveys online with identifiable information removed, so their answers could in no way reflect on them with school or league

staff. Besides, most esports players and fans are not particularly known for their need to conform or “people please” per se.

Therefore, it is our conclusion that these results are meaningful, not spurious, and further research with greater power may well reveal more subtle effects and important relations among variables.