Santa Rosa County School District STEAM (Science, Technology, Engineering, Art, and Mathematics)
Evaluation Project: Year Three Report

(2017-2018) – August 31, 2018

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STEAM Evaluation Project Overview

The evaluation component of the STEAM Program serves to examine the impact of the STEAM program on instructional environments and professional development efforts in year three. This year three report also includes the connection to student achievement within STEAM-related courses as requested by the district. The evaluation effort empirically blends five assessment arenas for the purpose of establishing a relational data base for the investigation. The five types of assessment data analyzed from year three include:

(1) Teacher and instructional staff pre and post assessment data relative to the professional development efforts of the district directed toward the STEAM initiative;
(2) Observational data collected weekly by external observers relative to the integration of the STEAM program into classrooms and strategies used within the schools;
(3) Mentor-mentee data retrieved from teachers relative to the impact of the Discovery Education mentoring partnership with the district teachers in STEAM;
(4) Initial administrators' assessment data of the STEAM Initiative within the school district;
(5) The connection of the Florida Standard Assessment (FSA) data to the observational classroom data for the influence of the STEAM Initiative for determining students' achievement outcomes.

The evaluation process involves the use of data from several measures developed and pilot tested for the STEAM program evaluation.

(a) Classroom Observation Tool developed for the project to assess the educational environment and classroom strategies observed relative to the goals of STEAM within the district. External observers from the University of West Florida trained to identify the various strategies that comprise the STEAM integration into schools conducted classroom observations weekly for 10 weeks in year three at 29 schools (18 elementary schools, 6 middle schools, and 5 high schools).

(b) Teacher Professional Development Pre-Post Assessment data retrieved from the pre and post assessments of the STEAM professional development efforts of the district focused on the STEAM program in year three were analyzed to determine the impact/effectiveness of the PD relative to teachers' knowledge and attitudes toward the STEAM initiative who are involved in the STEAM program, teachers' pedagogical discontentment levels, and teachers' knowledge and attitudes toward inquiry-based learning.

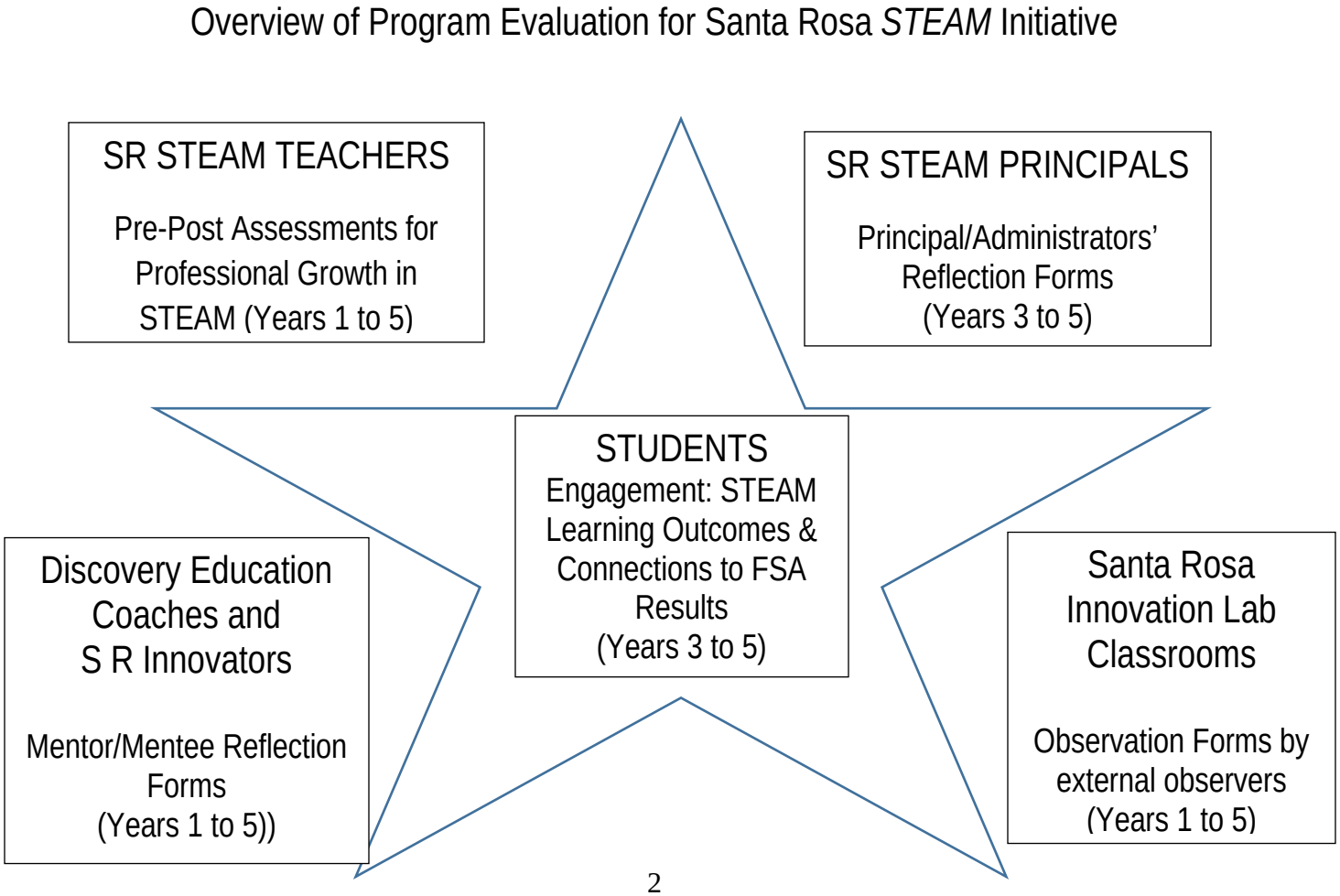
(c) Mentoring/Mentee Assessment data retrieved from the STEAM teachers in year three provided the STEAM teachers' perceptions of the coaching efforts received from the district and Discovery Education mentors.

(d) Administrators' Assessment of the STEAM Initiative data retrieved from the principals and district leaders in year three provided an assessment of administrators' knowledge of the STEAM initiative, the administrators' attitudinal perspectives of the STEAM initiative.

(e) Florida Standard Assessment (FSA) data were retrieved from the district testing and data analyses office to retrieve scores for students in the areas of math science and language arts.

Results provide empirical evidence for determining the impact of the coaching efforts, the impact of the intensive integration of the STEAM program in year three into 29 schools and the connection of the FSA scores for 2017-2018 to the classroom observation data results by school and grade. The findings provide strong empirical evidence for program officials charged with data driven-decision-making regarding the degree of influence and integration of the STEAM program after the conclusion of year three and identify specific areas of need for continued professional development focus areas and next steps efforts in fully implementing the STEAM program in Santa Rosa schools

Figure 1: Overview of Program Evaluation & Collaboration of Santa Rosa County School District and the University of West Florida Community Outreach Research and Learning (UWF CORAL) Center for the *STEAM Initiative Program (2015 to 2020)*



Anticipated Program Evaluation Outcomes:

Positive increases in Professional Development instructional outcomes

Positive increases in Coaching/Innovators outcomes

Positive reflections by school administrators

Positive relationships among classroom observations and students' engagement and FSA Results

Introduction to Year Three Summary Report (2017-2018)

Introduction

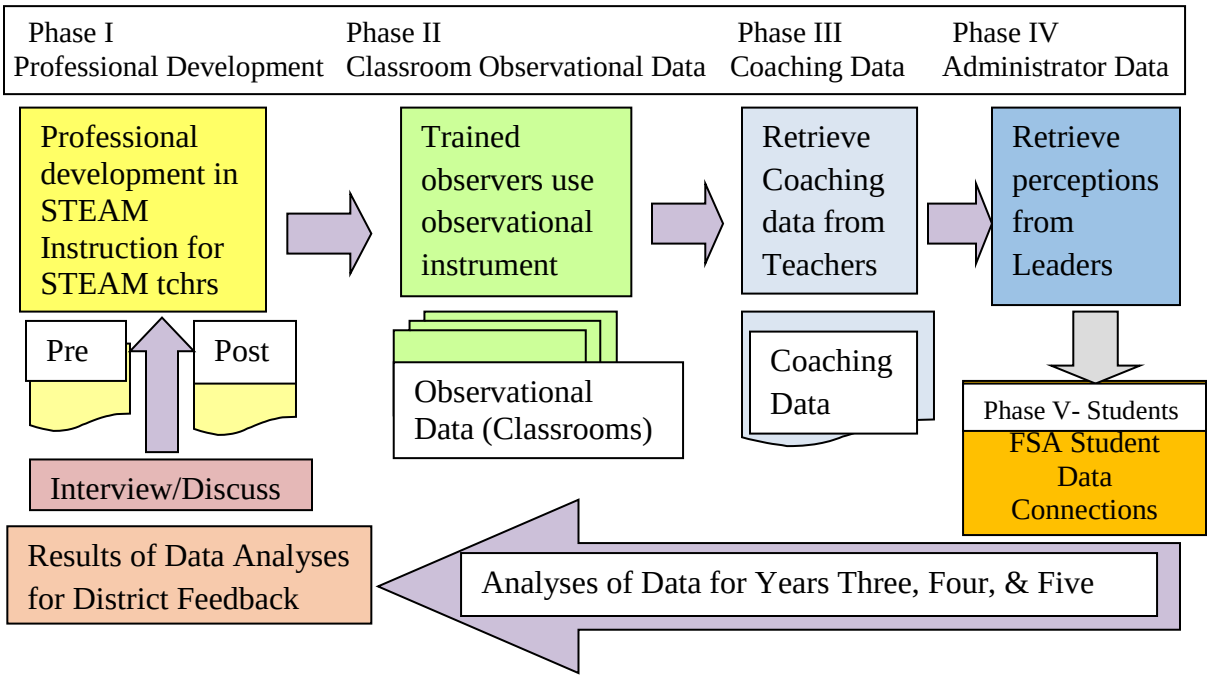
This report provides year three evaluation findings obtained from the relational database connecting five types of assessment data retrieved by the evaluation components in year three: 1) STEAM teachers' pre and post assessment of professional development efforts; (2) observational data collected weekly by external observers relative to the STEAM goals and strategies used in the schools during the fall & spring semesters of 2017-2018; (3) mentoring reactions of STEAM teachers relative to the coaching component delivered by Discovery Education and other coaching efforts within the program; (4) reflective perspectives of the administrators' perceptions of the STEAM Initiative; and (5) Florida Standard Assessment data submitted by the district for mathematics, science, and language arts. A presentation of the overview of the relational database is presented in section one of this report with a brief description of each of the five types of data and their relevance to the objectives and criteria established for the STEAM program. Section two of this report provides the evaluation findings from year three of the STEAM initiative Evaluation Project. Section three of this report provides a summary of the findings with empirical evidence defining the impact of the STEAM program on teachers and classroom instructional environments, and reports the suggested outcomes relative to future professional development efforts in STEAM from year three (2017-2018). The final section of the report provides recommendations to Santa Rosa County School District for moving ahead in year four (2018-2019) with specific focus areas and next steps for continued professional development and focus areas in STEAM efforts.

Section I: Evaluation Project Relational Database

The relational database connecting the five types of assessment data retrieved in year three and posited for subsequent years of the evaluation project include the following: 1) STEAM teachers' professional development self-report efforts; (2) classroom observational data collected weekly by external observers relative to the STEAM goals and strategies used in the schools during the fall and spring semesters of 2017-18; (3) mentoring reactions of STEAM teachers relative to the coaching from Discovery Education; (4) administrators' perspectives of their perceptions of the STEAM initiative and (5) FSA data connected to the classroom observational data. The year three data analyses consists of descriptive empirical information for the four areas listed and inferential analyses for the fifth area (FSA data connection to observational data).

The evaluation relational database concept is exemplified in Figure 2.

Figure 2
Relational Database Structure and Impact (applied annually from 2015 to 2020)



Discussion of Figure 2

Pre and post assessments from the fall and spring semesters 2017-2018 professional development component comprise Phase One of the STEAM evaluation process. Appendix A contains a copy of the Pre/Post Professional Development Assessment Form. Phase Two of the evaluation project or the Implementation of the STEAM strategies within classrooms in the fall and spring of 2017-2018 comprised the observational data collection phase. Trained external observers completed two 15-minute observations once a week per school in randomly selected STEAM classrooms in grades Kindergarten to grade 12 in 18 elementary schools, six middle schools, and five high schools for 10 weeks during the fall and 10 weeks in the spring academic semesters (2017-2018) using an observation form developed and pilot tested prior to the implementation of the evaluation project. Appendix B contains a copy of the observation instrument. Phase Three of the evaluation project report consists of the analysis of coaching reflection data from the STEAM program teachers for the purpose of providing the district information concerning the usefulness and assistance of the mentors/coaches from Discovery Education relative to the implementation of the STEAM program as reflected by the mentees (STEAM teachers). Appendix C contains a copy of the Coaches/Innovators Assessment Form. Phase Four is comprised of the district leaders (principals and district level administrators) reflections on the STEAM initiative within the district whereby administrators provided reflective responses relative to their individual school or office perceptions of the STEAM program. Phase Five of the evaluation program for year three included the empirical connection of the Florida Standard

Assessment (FSA) student data with the classroom observation data for determining and external source of validation of the influence and potential impact of the STEAM Initiative on student performance in math, science, and related content assessed by the FSA to solidify and maintain a seamless cyclical evaluation process.

Section II: Specific Analyses and Results of Year Three (2017-2018) of the Santa Rosa STEAM Evaluation Project

Three areas of discussion comprise the analyses and results reported from Year Three of the Santa Rosa County School District STEAM Evaluation Project: (1) results from the professional development component relative to implementation influences; (2) results of the observational data analyses or influences within STEAM classrooms comprising the Fall 2017 observations and the Spring 2018 observations; (3) results of the STEAM teachers' (Innovators) reflections on coaching and mentoring from the Discovery Education coaches; (4) results from the administrators' perceptions of the STEAM initiative; and (5) results from the empirical connections of the FSA student data from the FLDE with the classroom observation data.

I. Results from the Professional Development Component

Teachers from 29 schools (18 elementary schools. six middle schools, and five high schools) were pre and post assessed using a mixed methods instrument depicting their degree of knowledge, attitudes, and confidence in implementing specific STEAM strategies as per the framework surrounding the Innovation Framework (Discovery Education, 2015). Three areas of data were analyzed with descriptive statistics and frequencies for the following purposes: (1) determining demographic descriptions of the teachers engaged in the professional development as Innovators; (2) determining changes from pre to post using inferential statistical procedures; (3) retrieving qualitative information from the teachers for purposes of discerning attitudes toward implementing the STEAM program. Results of the professional development pre and post assessments are presented in Table 1 and Table 2 with summary commentary.

Table 1
Pre and Post Assessment Results for STEAM Year Two (2017-2018) Professional Development (N=70) Mean Values Based on a Likert Scale of 1 to 5 for Pedagogical Discontentment Scale

Pedagogical Discontentment Scale [Note: Higher scores indicate higher discontentment]	Pre	Post	Sig	Result
1. Teaching STEAM to students of lower ability levels.	1.77	1.87	0.52	*NS*
2. Balancing personal STEAM teaching goals with state and national standards	2.24	2.23	0.90	*NS*
3. Monitoring student understanding through alternative forms of assessment.	2.01	2.10	0.53	*NS*
4. Balancing the needs between both high and low ability level students.	2.13	2.10	0.82	*NS*
5. Preparing students to assume new roles within inquiry-based learning.	2.03	2.00	0.83	*NS*

6. Using inquiry-based teaching within all content areas.	2.13	2.03	0.51	*NS*
7. Assessing students' understandings from inquiry-based learning.	2.10	2.13	0.82	*NS*
8. Assessing students' nature of STEAM understandings.	2.00	1.94	0.63	*NS*
9. Including all ability levels during inquiry-based teaching and learning.	1.79	2.04	0.07	*NS*
10. Teaching STEAM to students from economically disadvantaged backgrounds.	1.54	1.66	0.27	*NS*
11. Planning and using alternative methods of assessment.	1.97	2.26	0.02	<.05*
12. Having sufficient STEAM content knowledge to generate lessons.	2.09	2.19	0.44	*NS*
13. Teaching STEAM to students of higher ability levels.	1.43	1.48	0.69	*NS*
14. Teaching STEAM subject matter that is unfamiliar to me.	2.29	2.36	0.60	*NS*
15. Integrating the nature of STEAM throughout the curriculum.	2.03	2.04	0.91	*NS*
16. Having sufficient STEAM content knowledge to facilitate classroom discussion.	2.03	2.20	0.21	*NS*
17. Using assessment practices to modify STEAM teaching.	2.04	2.29	0.04	<.05*
18. Developing strategies for teaching the nature of STEAM.	2.00	2.06	0.60	*NS*
19. Ability to plan successful inquiry-based activities/learning.	2.07	2.16	0.57	*NS*
20. Balancing personal STEAM teaching goals with state/national testing concerns.	2.33	2.16	0.28	*NS*
21. Balancing the depth versus breadth of science content being taught.	2.09	2.03	0.67	*NS*
Total Pedagogical Discontentment Scores	43.31	41.73	0.001	*<.001***

NS: No significant decreases in pedagogical discontent means, however, pre-assessment levels indicate low levels of pretest scores. Pretest scores for STEAM III are substantially lower than for STEAM II. Overall mean differences between pre and post assessments for the professional development activities when examining teachers' Pedagogical Discontentment levels revealed fewer increases in pedagogical discontentment in STEAM III than in STEAM II with significant decreases ($p < .05^*$ and $p < .001^{**}$) from pre to post (after experiencing the year-long Professional Development sessions) with pedagogy focused on STEAM. These results empirically support a positive professional development impact for STEAM in year three. The overall significant decrease (from 43.31 to 41.73 with $p < .001$) indicates overall pedagogical discontentment decreases with some focused increases on assessment strategies and assessment alternatives (see items 11 and 17). Recommendation: Professional development highlight the use of alternative assessments with STEAM and discuss potential with teachers' customary assessment practices.

Pre and post assessments for STEAM III focused on teachers' inquiry-based learning perceptions are resented in Table 2 with discussion of the results following Table 2.

Table 2

Pre and Post Assessment Results for STEAM Year Three (2017-2018) Professional Development (N=70) Mean Values Based on Likert Scale of 1 to 5 for the Inquiry-Based Learning Scale

Inquiry-Based Learning (IBL) Implementation Scale [Note: Higher scores indicate greater IBL levels]	Pre	Post	Sig	Result
1. Demonstrate the use of a new instrument or piece of equipment.	3.29	3.49	0.16	*NS*
2. Have students write the problem or activity before doing an experiment.	3.23	3.27	0.79	*NS*
3. Review relevant concepts and skills that were learned in previous lessons.	4.19	4.26	0.59	*NS*
4. Introduce new vocabulary words.	4.29	4.00	<.10	**Post*
5. Ask students to identify and define words.	3.77	3.80	0.87	*NS*
6. Ask students to make predictions about an experiment or STEAM activity outcome.	3.83	4.11	<.05	**Post*
7. Check to see that students understand new procedures before beginning an experiment.	3.80	4.30	<.01	**Post*
8. Discuss how everyday situations directly relate to experiments or STEAM activities.	3.87	4.16	<.05	**Post*
9. Check students' design for safety before conducting experiments or activities.	3.84	3.96	0.52	*NS*
10. Monitor small group progress during experiments or STEAM activity.	4.21	4.57	<.05	**Post*
11. Encourage students to collaborate within their groups.	4.41	4.63	0.22	*NS*
12. Circulate and interact with students while they are conducting experiments.	4.31	4.54	0.17	*NS*
13. Discuss variations in data collected by students following their experiments.	3.76	4.14	<.01	**Post*
14. Have students share their predictions with the class.	3.74	4.00	<.05	**Post*
15. Have students share their data or findings with the class.	3.89	4.17	<.05	**Post*
16. Challenge students to consider the effects of errors on group results.	3.47	3.70	0.18	*NS*
17. Compare and contrast students' explanations of findings.	3.83	3.87	0.80	*NS*
18. Question students as they conduct their experiments.	4.19	4.44	<.10	**Post*
19. Connect new information with students' everyday lives.	3.96	4.23	<.10	**Post*
20. Connect current events with STEAM concepts.	3.71	3.89	0.21	*NS*
21. Use questioning strategies to respond to students' questions about STEAM concepts.	3.83	4.00	0.26	*NS*
22. Have students ask questions about STEAM phenomena addressed activities.	3.46	3.49	0.86	*NS*
Total Inquiry-based Learning Implementation Scores	84.59	89.30	<.01	*+Post*

NS: No significant increases in inquiry-based learning means indicate pre-assessment mean scores and post-assessment mean scores revealed no changes in these areas from the year three professional development, however the pre and post means for the STEAM III are substantially higher than the STEAM II pre-assessment and post assessment IBLI scores. Overall significant (p<.10, .05, .01, and .001) mean differences between pre and post assessments for the professional development activities when examining teachers' Inquiry-based Learning

Implementation (IBLI) levels revealed a significant increase in IBLI from pre to post assessment times (after completion of the professional development sessions) in the indicated "**Post" identified* specific areas. These results provide empirical support of an effective positive professional development effort by the district for advancing STEAM teachers in year three. In addition, the overall Total Mean IBLI Scores increased significantly (84.59 to 89.30 with $p<.01$) with these overall averages beginning and ending at a substantially higher level than the year two data results. These higher pre and post levels as compared with STEAM II scores are indicators of sound implementation of inquiry-based learning rather than possible effects of "new procedures".
A depiction of the overall mean changes from STEAM II to STEAM III is presented in Figure 3.

Figure 3
Visual Representation of STEAM Teachers' Pre and Post Professional Development Outcomes

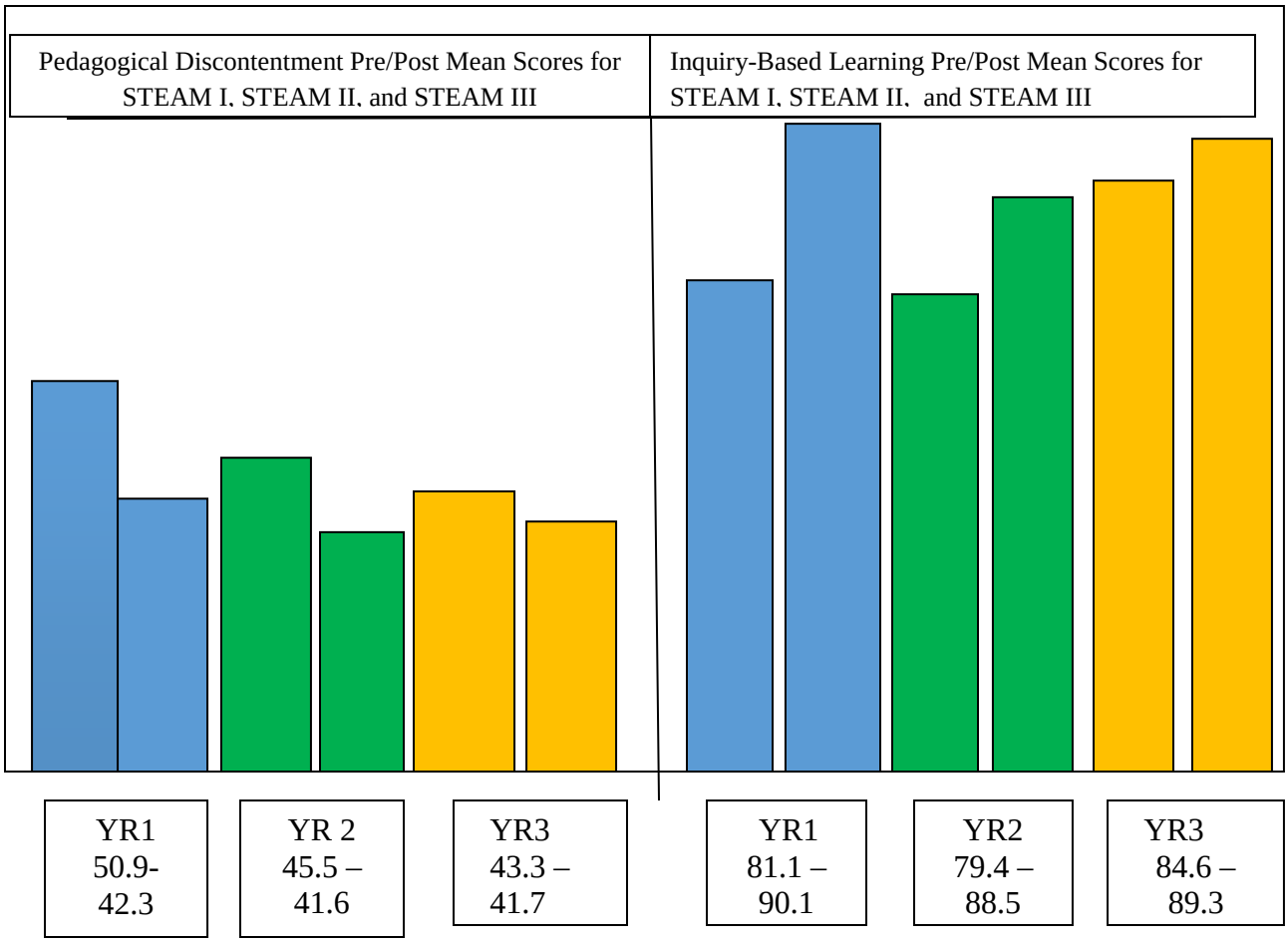


Figure 3 depicts the closing of the gap for pedagogical discontentment (gradually decreasing and closing over years one, two, and three) and closing of the gap for inquiry-based learning (gradually increasing/closing over years one, two, and three) for STEAM teachers' outcomes.

As indicated in Figure 3, the resulting pedagogical discontentment or the moving from a previous pedagogical approach to a new pedagogical approach and the discontentment often created from this movement was covered within the district's planned professional development efforts. The significant ($p<.05$) decrease (Mean of 43.3 changed to a Mean of 41.7) in the STEAM teachers' feelings of "new territory" or "new teaching approaches" in year three. This significant decrease in average pedagogical discontent of the teachers engaged in STEAM teaching demonstrates an effective professional development effort for engaging teachers in a new pedagogical arena. As indicated in Figure 3, the resulting significant ($p<.01$) increase (Mean of 84.6 to a Mean of 89.3) representing STEAM teachers' average attitudes toward Inquiry-Based Learning Implementation increased significantly in year three and demonstrates a strong PD effort for engaging teachers in implementing inquiry-based learning.

Figure 4 Pedagogical Discontent Scale

Selected Qualitative Feedback from Year Three (2017-2018) for Pre and Post Teacher Professional Development Assessments

Qualitative Assessment	Selected Teachers' Responses
1. Describe your perception of the term, "STEAM Initiative".	The STEAM Initiative is: 1. incorporating the real world into the classroom in engaging ways 2. promoting an engaging culture within the classroom 3. teaching skills for preparing students for STEM jobs in the future 4. teachers collaborating and communicating for innovative ways to help bring STEAM into the curriculum 5. preparing kids for jobs that may not yet exist by introducing new and innovative methods for attending to STEAM topics
2. Describe your perception of a STEAM teaching/learning environment.	A STEAM Teaching/learning environment is described as: 1. exciting , but would like to add the R for STREAM (reading) 2. innovative way of making the student goal the same as the teaching goal 3. engaging students actively learning, questioning, and communicating 4. student-centered in teamwork, busy, focused on finding solutions 5. a hands-on technologically driven laboratory for exploration and moveable furniture
3. Describe your perception of a STEAM classroom (physical facilities/resources, etc.)	A STEAM Classroom is described as: 1. an arrangement whereby students have room to move and collaborate with lots of technologies and project space 2. controlled PBL activities with freedom to explore 3. flexible seating, centers, colorful, new technologies everywhere 4. excitement filling the air for experiments with STEAM concepts 5. filled with opportunities for self-discovery and teamwork planning

4. Describe your motivation level for teaching STEAM.	My motivation level for teaching STEAM is: 1. propelled by my intense desire to assist students toward career paths of the future 2. STEAM has ignited my year and my career as a teacher—this is what I love to do as a teacher 3. very high – I want all of my students to share my enthusiasm and excitement for STEAM 4. extremely high –can't wait to bring this excitement to my students 5. a "10" on a scale of 1 to 10 because I want my students to be prepared for today's and tomorrow's workforce

Demographics and Additional Information Concerning the STEAM Teachers/Innovators for Year Three (2017-2018)

The following information is provided to describe the N= 147 teachers who participated in the evaluation component of the Year Three (2017-2018) STEAM Initiative: (a) the distribution of the number of years teaching; (b) the distribution of participants by age, gender, and ethnicity; (c) distributions of participants by their highest degree earned and favorite subject to teach; and (d) the distribution of participating teachers by the current grade they are teaching. Each of these demographic focus areas is captured within the Frequency Distributions delivered in Table 3.

Table 3 Demographics of STEAM Teachers (Innovators) for Year Two (2017-2018)

Number of Years Teaching	f	%		Ages of STEAM Teachers	f	%
< 5 years	25	17%		< 25 years	4	3%
5 to 10 years	44	31%		25 to 35 years	45	31%
11 to 15 years	30	20%		36 to 46 years	51	35%
16- 20 years	27	18%		47 to 57 years	38	26%
>20 years	21	14%		>Age 57	6	4%
Missing data	0	0%		Missing data	3	1%
TOTAL	N= 147	100%		TOTAL	N= 147	100%
Gender of STEAM Teachers	f	%		Ethnicity of STEAM Teachers	f	%
Male	17	11%		Hispanic	2	1%
Female	129	88%		Native American	0	0%
Other	1	1%		Caucasian	140	96%
				African American	2	1%
				Asian	2	1%
				Other	1	1%
TOTAL	N=147	100%		TOTAL	N=147	100%

Highest Degree Held				Favorite Subjects Taught		
Bachelor's Degree	100	68%		Math/Sciences Technology	99	67%
Master's Degree or Higher	47	32%		Liberal Arts/Reading	48	33%
TOTAL	N=147	100%			N=147	100%

II. Results from the Classroom Observational Component [Fall 2017]

Externally trained observers visited each of 29 schools within Santa Rosa County School District during the fall and spring of 2017-2018: elementary schools (N=18), middle schools (N= 6) and high school (N=5) twice per week for 10 weeks in the Fall 2017 and conducting two 15-minute observations of STEAM classrooms selected at random in grades K-12 for each visit. Seven observers trained using the observation coding instrument for conducting the observations conducted a total of N= 382 observations during the fall 2017 semester. The observation instrument and pertinent psychometric information associated with the observation instrument is available in Appendix A. Table 4

Table 4

Frequencies of Observations by Grade Level for ***Fall Semester of 2017*** *(N= 382 observations)*

Grade Level	f	%		Grade Level	f	%
K	14	3.6%		7th	48	12.5%
1st	23	6.0%		8th	34	8.8%
2nd	42	11.7%		9th	25	6.4%
3rd	26	6.7%		10th	21	5.4%
4th	46	12.0%		11th	17	4.5%
5th	36	9.4%		12th	15	3.8%
6th	35	9.2%		TOTAL	382	100%

Table 4 (continued)

Frequencies of Observations by School (N=382) ***for the Fall Semester 2017***

Name of School	f	%		Name of School	f	%
Avalon Middle	16	4.2%		Jay Elementary School	8	2.1%
Bagdad Elementary	11	2.9%		Jay High School	8	2.1%
Berryhill Elementary	16	4.2%		King Middle School	26	2.1%
Central Elementary	16	4.2%		Milton High School	14	3.7%
Chumuckla Elem	16	4.2%		Navarre High School	18	4.7%
Dixon Intermediate	8	2.1%		Oriole Beach Elem	12	3.1%
Dixon Primary	11	2.9%		Pace High School	23	6.0%
East Milton Elem	15	3.9%		Pea Ridge Elementary	12	3.1%

Gulf Breeze Elem	13	3.4%		Rhodes Elementary	14	3.7%
Gulf Breeze Middle	9	2.4%		Russell Elementary	12	3.1%
Gulf Breeze High	14	3.7%		Sims Middle School	22	5.8%
Hobbs Middle School	12	2.1%		West Navarre Inter	9	2.4%
Holly Navarre Int	12	3.1%		West Navarre Primary	8	2.1%
Holly Navarre Prim	8	2.1%		Woodlawn Beach Mid	10	2.6%
Holly Navarre Middle	9	2.4%				
				TOTAL	382	100%

Table 4 (continued)
Distribution of Observed Classroom Layouts, Technology Uses, and Objectives for Success (N=382 observations) for Year Three ***Fall Semester (2017-2018)***

Classroom Environments	f	%		Objectives for Success Classroom	f	%
Traditional Desks Layout	55	15%		Accelerates Math and Science	94	24%
Non-Traditional Layout	146	38%		Promotes STEAM and Problem-based Learning	138	36%
Appropriate Layout	143	37%		Centers-based STEAM Lab Classroom	34	9%
Innovative Layout	38	10%		Creates engaged personalized learning	76	20%
TOTAL	382	100%		Fosters student content creation	34	9%
Technology Usage	f	%		Designs digital assessment lessons	6	2%
Teacher Uses Technology	196	51%		TOTAL	382	100%
Teacher Uses Innovative Technologies	35	9%				
Students Use Technologies	113	30%				
Students Use Innovative Technologies	38	10%				
TOTAL	382	100%				

III. More Results from the Classroom Observational Component [Fall 2017]

Data retrieved from the classroom observations during the fall 2017 semester were focused on 29 schools with 152 teachers and multiple classrooms with six observers employed and trained to conduct two 15 minute observations within randomly selected classrooms/teachers in the 29

targeted schools weekly for the evaluation of the STEAM Initiative. The observation form used in the data collection was piloted for reliability and validation prior to using within the classrooms. The Observation Form is available in Appendix B of this report. An abbreviated form of the observation instrument is depicted in Figure 5.

Figure 5
Abbreviated Form of Classroom Observation Instrument Used by Observers during the Fall Semester 2017 and in the Spring Semester 2018 for Assessing STEAM Classroom Environments

Observer_____ Date _____ School _____ Grade Level _____ Type of Classroom _____

Observed Classroom Characteristics	Rating Level[1] 1	Rating Level 2	Rating Level 3	Rating Level 4
Creative Preparation	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4
Creative Inquiry	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4
Critical Thinking Integration	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4
Critical Thinking Problem Solving	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4
Critical Thinking Logical Thinking	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4
Communication Data/Information Collection	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4
Communication Argumentation	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4
Collaboration Team Work	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4
Collaboration Investigation Skills	Descriptive = 1	Emerging = 2	Developing = 3	Accomplished = 4

[1] Each of the rating levels are distinctively defined for each category of assessment and observers are trained to recognize specific characteristics and exemplars for representing each rating as per defined for each of the nine categories listed. For specific definitions of each of the ratings examine the full instrument used by observers available in Appendix B.

A total of N= 382 observations were performed by six observers trained in using the instrument provided in Figure 5 and Appendix B.

Table 5

Frequency Distributions of Observation Data Retrieved from Six Observers in Year Three (2017-2018) of the STEAM Initiative with N= 382 Observations for the ***Fall Semester 2017***

Creative Prep Rating Levels	f	%		Creative Inquiry Rating Levels	f	%
Descriptive = 1	140	36%		Descriptive = 1	130	34%
Emerging = 2	203	53%		Emerging = 2	206	53%
Developing = 3	37	10%		Developing = 3	44	12%
Accomplished = 4	2	1%		Accomplished = 4	2	1%
TOTAL	382	100%		TOTAL	382	100%
Critical Thinking Integration Rating Levels	f	%		Critical Thinking Problem Solving Rating Levels	f	%
Descriptive = 1	167	43%		Descriptive = 1	161	42%
Emerging = 2	176	46%		Emerging = 2	196	51%
Developing = 3	37	10%		Developing = 3	23	6%
Accomplished = 4	2	1%		Accomplished = 4	2	1%
TOTAL	382	100%			382	100%
Critical Thinking Logical Thinking Rating Levels	f	%		Communication Data & Information Rating Levels	f	%
Descriptive = 1	165	43%		Descriptive = 1	166	44%
Emerging = 2	191	50%		Emerging = 2	190	49%
Developing = 3	24	6%		Developing = 3	24	6%
Accomplished = 4	2	1%		Accomplished = 4	2	1%
TOTAL	382	100%		TOTAL	382	100%
Communication Argumentation Rating Levels	f	%		Collaboration Team Work Rating Levels	f	%
Descriptive = 1	240	63%		Descriptive = 1	233	60%
Emerging = 2	114	30%		Emerging = 2	130	34%
Developing = 3	28	7%		Developing = 3	17	5%
Accomplished = 4	0	0%		Accomplished = 4	2	1%
TOTAL	382	100%		TOTAL	382	100%
Collaboration Investigation Skills Rating Levels	f	%				
Descriptive = 1	195	50%				
Emerging = 2	160	42%				
Developing = 3	25	7%				
Accomplished = 4	2	1%				
TOTAL	382	100%				

Observational results depicted in Table 5 reveal the presence of each of the nine focus areas of innovative thinking skills with Descriptive, Emerging, and Developing levels observed in a majority of the classrooms visited by the six observers. These data reflect a substantive measure of classroom focus on the types of thinking, problem-solving, communication, and collaboration skills necessary to propel the district into a sustaining STEAM system in subsequent years.

IV. Results from the Classroom Observational Component [Spring 2018]

Externally trained observers visited each of 29 schools within Santa Rosa County School District during the spring 2018: elementary schools (N=18), middle schools (N= 6) and high schools (N=5) twice per week for 10 weeks conducting two 15-minute observations of STEAM classrooms selected at random in grades K-12 for each visit. Six observers trained using the observation coding instrument for conducting the observations conducted a total of N= 532 observations during the spring 2018 semester. The observation instrument and pertinent psychometric information associated with the observation instrument is available in Appendix A. A total of N= 532 observations were performed during the spring 2018 academic year.

Table 6

Frequencies of Observations by Grade Level for ***Spring Semester, 2018*** *(N= 532 observations)*

Grade Level	f	%		Grade Level	f	%
K	15	2.8%		7th	50	9.4%
1st	37	7.0%		8th	39	7.3%
2nd	44	8.3%		9th	51	9.6%
3rd	47	8.7%		10th	36	6.7%
4th	67	12.5%		11th	25	4.8%
5th	43	8.1%		12th	33	6.3%
6th	45	8.5%		TOTAL	532	100%

Table 6 (continued)

Frequencies of Observations by School (N=532) ***for the Spring Semester 2018***

Name of School	f	%		Name of School	f	%
Avalon Middle	17	3.2%		Jay Elementary School	16	3.0%
Bagdad Elementary	17	3.2%		Jay High School	24	4.5%
Berryhill Elementary	19	3.6%		King Middle School	24	4.5%
Central Elementary	8	1.5%		Milton High School	37	7.0%
Chumuckla Elem	14	2.6%		Navarre High School	26	4.9%
Dixon Intermediate	20	3.8%		Oriole Beach Elem	16	3.0%
Dixon Primary	13	2.4%		Pace High School	39	7.3%
East Milton Elem	15	2.8%		Pea Ridge Elementary	15	2.8%
Gulf Breeze Elem	16	3.0%		Rhodes Elementary	16	3.0%
Gulf Breeze High	25	4.7%		Russell Elementary	12	2.3%
Gulf Breeze Middle	15	2.8%		Sims Middle School	24	4.5%
Hobbs Middle School	11	2.1%		West Navarre Primary	16	3.0%
Holly Navarre Inter	16	3.0%		West Navarre Inter	16	3.0%
Holly Navarre Prim	16	3.0%		Woodlawn Beach Mid	16	3.0%
Holly Navarre Middle	13	2.4%		TOTAL	532	100%

Table 6 (continued)

Distribution of Observed Classroom Layouts, Technology Uses, and Objectives for Success (N=532 observations) for Year Three ***Spring Semester (2017-2018)***

Classroom Environments	f	%		Objectives for Success Classroom	f	%
Traditional Desks Layout	72	14%		Accelerates Math and Science	164	31%
Non-Traditional Layout	185	35%		Promotes STEAM and Problem-based Learning	154	29%
Appropriate Layout	215	40%		Centers-based STEAM Lab Classroom	54	10%
Innovative Layout	60	11%		Creates engaged personalized learning	94	18%
TOTAL	532	100%		Fosters student content creation	50	9%
Technology Usage	f	%		Designs digital assessment lessons	16	3%
Teacher Uses Technology	211	40%		TOTAL	532	100%
Teacher Uses Innovative Technologies	59	11%				
Students Use Technologies	215	40%				
Students Use Innovative Technologies	47	9%				
TOTAL	532	100%				

Results presented in Tables 4 and 6 indicate less than 10% of the observed classrooms throughout the district maintain traditional desks in rows for the teaching and learning of STEAM concepts while more than 90% of the classrooms have incorporated a non-traditional and/or innovative appropriate classroom arrangement for the teaching and learning of STEAM. Tables 4 and 6 also provide empirical evidence verifying innovative uses of technologies by students and teachers in more than half of the classrooms observed during year three of the STEAM initiative. Three major objectives were strongly evidenced by classroom observers within STEAM classrooms as depicted in Tables 4 and 6 indicating a substantial focused effort for accelerating math and science, promoting STEAM and Problem-Based Learning (PBL), and using centers-based STEAM lab classroom configurations. Year three observations also indicated a more focused approach for creating engaged personalized learning within classrooms than the observed data reports from Years One and Two. The final two objectives (fosters student content creation and designs digital assessment lessons) are emerging in the observational data as the STEAM Initiative begins to become embraced within all classrooms as evidenced by the more than 12% focus in year three.

Table 7

Frequency Distributions of Observation Data Retrieved from Six Observers in Year Three (2017-2018) of the STEAM Initiative with N= 532 Observations for the ***Spring Semester 2018***

Creative Prep Rating Levels	f	%		Creative Inquiry Rating Levels	f	%
Descriptive = 1	148	28%		Descriptive = 1	160	30%
Emerging = 2	231	43%		Emerging = 2	221	41%
Developing = 3	88	17%		Developing = 3	106	20%
Accomplished = 4	65	12%		Accomplished = 4	45	9%
TOTAL	532	100%		TOTAL	532	100%
Critical Thinking Integration Rating Levels	f	%		Critical Thinking Problem Solving Rating Levels	f	%
Descriptive = 1	203	38%		Descriptive = 1	176	33%
Emerging = 2	187	35%		Emerging = 2	231	43%
Developing = 3	97	18%		Developing = 3	77	14%
Accomplished = 4	45	9%		Accomplished = 4	48	1%
TOTAL	532	100%			532	100%
Critical Thinking Logical Thinking Rating Levels	f	%		Communication Data & Information Rating Levels	f	%
Descriptive = 1	198	37%		Descriptive = 1	193	36%
Emerging = 2	218	41%		Emerging = 2	223	42%
Developing = 3	75	14%		Developing = 3	63	12%
Accomplished = 4	41	8%		Accomplished = 4	53	10%
TOTAL	532	100%		TOTAL	532	100%
Communication Argumentation Rating Levels	f	%		Collaboration Team Work Rating Levels	f	%
Descriptive = 1	292	55%		Descriptive = 1	310	58%
Emerging = 2	138	26%		Emerging = 2	102	19%
Developing = 3	70	13%		Developing = 3	57	11%
Accomplished = 4	32	6%		Accomplished = 4	63	12%
TOTAL	532	100%		TOTAL	532	100%
Collaboration Investigation Skills Rating Levels	f	%				
Descriptive = 1	225	42%				
Emerging = 2	180	34%				
Developing = 3	71	13%				
Accomplished = 4	56	11%				
TOTAL	532	100%				

Observational results depicted in Table 7 reveal the presence of each of the nine focus areas of innovative thinking skills with Descriptive and/or Emerging levels observed less frequently than in yeas one and two of the classrooms visited by the six observers in Year Three Spring semester (2018). These data reflect a substantial movement within classroom focus on the types of thinking, problem-solving, communication, and collaboration skills necessary to propel the district into a strong STEAM foundation in subsequent years. The increase in the observed characteristics are moving the classroom focus toward ratings of developing and accomplishment as indicative of a strong growing program. Figure 6 provides a comparative of Years One, Two, and Three observational data summaries.

Figure 6

*Descriptions of the Low levels of Observation Ratings for Classrooms in Years One, Two, and Three of the STEAM Initiative (**2015-2016** is **black print**, **2016-2017** is **red print**, and **2017-2018** is **blue print.***

	Descriptive Rating = 1	**Emerging Rating = 2**
Creative Preparation	Lessons incorporated opportunities for students to investigate local and global issues, universal problems, and transdisciplinary ideas. **66% 30% 28%**	The teacher designs guided experiences to support disciplinary core ideas and practices and academic content standards. The teacher designs interdisciplinary lessons that involve local & global issues and universal problems. However, students are asked to follow directions to come to a solution. Students are guided in providing examples of utilizing skills, concepts, and Dispositions leading to success **24% 61% 43%**
Creative Inquiry	Students are taught and expected to ask questions, identify problems, seek appropriate resources, and persevere in problem-solving. **66% 34% 30%**	Inquiry is teacher directed or guided and is limited to a set process. The teacher designs or provides opportunities for students to learn understanding inquiry begins with a question. **22% 56% 41%**
Critical Thinking Integration	Learning experiences are transdisciplinary in nature and focus on authentic content connections, and current real world issues within the context of multiple disciplines **71% 38%36%**	The teacher plans multidisciplinary experiences that focus on a common theme, but stay within the content boundaries. The teacher leads students through prompted discussions associated with a problem or question. The teacher plans lessons that incorporate skills and concepts across two subject areas. **20% 52% 35%**
Critical Thinking Problem-Solving	Students are taught and expected to construct explanation, design, solutions, and solve problems using textual and empirical evidence. **50% 40%33%**	The teacher leads instruction on constructing explanations, designing solutions, and solving problems using evidence. The teacher provides students with resources that provide explanations and solutions based on evidence. The teacher guides students to find supporting evidence **28% 56%43%**

	Descriptive Rating = 1	Emerging Rating = 2
Critical Thinking Logical	Students are taught and provided opportunities to think logically, abstractly, and quantitatively. **50% 44%37%**	The teacher provides students with experiences to explore quantitative and qualitative data. Students are given opportunities to measure quantities, study patterns, create charts and graphs, and apply computations. The teacher provides lessons to support students' development as logical, abstract, and quantitative thinkers **33% 50%41%**
Communication Data & Information Collection	Students are expected to choose appropriate mediums and sources to gather, synthesize, evaluate, and communicate data and information. **48% 36%36%**	The teacher guides experiences that require students to interact with a specific set of media sources ad types. The teacher provides instruction around text and media features that allow students to identify pertinent and accurate information. The teacher guides students to synthesize and evaluate information and data that have been gathered. The teacher directs students to communicate in a specific way **33% 56%42%**
Communication Argumentation	Students engage in constructive argumentation. Students taught and expected to analyze and defend their thinking surrounding the claims of others **69% 66%55%**	The teacher provides instruction on constructing and analyzing arguments. The teacher provides students with activities in which they explain how data support their arguments. The teacher guides students in analyzing personal arguments of others for flawed reasoning, bias, or misconceptions **11% 28%26%**
Collaboration Team Work	Students work together to solve problems, develop ideas, and achieve goals. **60% 65%58%**	The teacher plans experiences in which students are required to work in collaborative groups. The teacher provides guidance on how to work in collaborative groups. Students follow the duties of specific roles in collaborative groups **22% 31%19%**
Collaboration Investigation Skills	Students are taught and expected to plan and carry out investigations. Students are taught ad expected to implement appropriate tools and methods. **57% 47%42%**	The teacher provides instruction on investigation skills. The teacher suggests approaches for student to use to answer questions or solve problems. The teacher selects technological tools and methods that are relevant to the investigation. **22% 46% 34%**

An examination of the findings reported in Figure 6 reveals an overwhelmingly positive effort in classroom activities and environments for supporting the underlying initial skills for the nine key areas of focus expanding the Year Three efforts of the Santa Rosa County Schools STEAM Initiative. The trend revealed in decreasing percentages of Descriptive Ratings for Year Three as compared with Years One & Two for each of the nine key areas of observations focused on considerations in teaching and learning indicate substantial "evidence of engaged personnel and students" promoted by STEAM classroom teachers. Notable changes in percentages from Years One, Two, and Three primarily decreasing percentages for emerging ratings also demonstrates a

strong effort by STEAM teachers for embracing and moving forward in the plan of actively integrating STEAM into the curriculum with these indicators following a pattern of fully integrating STEAM skills into the curriculum over time.

III. Results from the STEAM Teachers' (Innovators) Perceptions of their Coaching Experiences with Discovery Education

The third area of assessment for the Year Three STEAM Initiative for Santa Rosa County Schools is the mentoring or coaching component provided by the Discovery Education professionals with both group and one-on-one mentoring/coaching experiences during the third year of the project. The Santa Rosa STEAM Initiative Coach/Mentee Reflection Form for Mentees is available in Appendix C of this report. This form was used to assess teachers' perceptions of their coaching experiences. Almost 36% or 52 of the N= 145 STEAM teachers in year three completed the online form and returned the form to the evaluation team with no identifier information. The distribution of teachers who completed the online Coach/Mentee Reflection Form includes: (a) 30 elementary teachers, 12 middle school teachers, and 10 high school teachers. Data retrieved from this form were designed to ensure teachers' anonymity or identifiers. Resulting quantitative data retrieved from teachers' perceptions of their coaches are presented in Table 6.

Table 6

Frequency Results of the Coaching/Mentee Reflection Form: For Mentees (N= 93 teachers)

My coach was accessible	f	%		My coach demonstrated professional integrity	f	%
Strongly Disagree	8	15%		Strongly Disagree	5	10%
Disagree	8	15%		Disagree	7	14%
Slightly Disagree	6	12%		Slightly Disagree	7	14%
Slightly Agree	9	18%		Slightly Agree	8	15%
Agree	5	10%		Agree	8	15%
Strongly Agree	8	15%		Strongly Agree	9	17%
NA	8	15%		NA	8	15%
TOTAL	52	100%		TOTAL	52	100%

My coach demonstrated content expertise in my area of need	f	%		My coach was approachable	f	%
Strongly Disagree	5	10%		Strongly Disagree	7	14%
Disagree	4	9%		Disagree	6	12%
Slightly Disagree	5	10%		Slightly Disagree	5	10%
Slightly Agree	10	19%		Slightly Agree	8	15%
Agree	10	19%		Agree	10	19%
Strongly Agree	12	23%		Strongly Agree	10	19%
NA	5	10%		NA	6	11%
TOTAL	52	100%		TOTAL	52	100%

My coach was supportive and encouraging	f	%		My coach provided constructive feedback	f	%
Strongly Disagree	8	15%		Strongly Disagree	5	10%
Disagree	6	12%		Disagree	4	8%
Slightly Disagree	6	12%		Slightly Disagree	2	5%
Slightly Agree	9	18%		Slightly Agree	8	14%
Agree	10	19%		Agree	7	14%
Strongly Agree	10	19%		Strongly Agree	24	45%
NA	3	4%		NA	2	3%
TOTAL	52	100%		TOTAL	52	100%

My coach motivated me to improve my work product	f	%		My coach was helpful in providing direction	f	%
Strongly Disagree	4	8%		Strongly Disagree	5	10%
Disagree	7	14%		Disagree	0	0%
Slightly Disagree	3	6%		Slightly Disagree	1	2%
Slightly Agree	7	14%		Slightly Agree	7	14%
Agree	6	12%		Agree	14	28%
Strongly Agree	23	43%		Strongly Agree	23	43%
NA	2	3%		NA	2	3%
TOTAL	52	100%		TOTAL	52	100%

My coach answered my questions satisfactorily	f	%		My coach acknowledged my contributions	f	%
Strongly Disagree	5	10%		Strongly Disagree	5	10%
Disagree	0	0%		Disagree	0	0%
Slightly Disagree	1	2%		Slightly Disagree	1	2%
Slightly Agree	7	14%		Slightly Agree	7	14%
Agree	11	21%		Agree	11	21%
Strongly Agree	26	50%		Strongly Agree	26	50%
NA	2	3%		NA	2	3%
TOTAL	52	100%		TOTAL	52	100%
My coach suggested appropriate resources	f	%		My coach challenged me to extend my abilities	f	%
Strongly Disagree	5	10%		Strongly Disagree	5	10%
Disagree	0	0%		Disagree	0	0%
Slightly Disagree	2	3%		Slightly Disagree	1	2%
Slightly Agree	10	19%		Slightly Agree	4	8%
Agree	22	43%		Agree	21	39%
Strongly Agree	11	22%		Strongly Agree	20	38%
NA	2	3%		NA	2	3%
TOTAL	52	100%		TOTAL	52	100%

As indicated in Table 6, a substantial majority (60% to 90%) of STEAM teachers strongly agreed with the assistance and role of the coach as implemented in the STEAM Initiative. The use of coaches for the STEAM Initiative is strongly supported as an effective component of the STEAM program with all 12 questions rated with a majority of strongly agree responses from the STEAM teachers relative to the following commitment for the STEAM coaching component: Coaches were accessible, approachable, supportive, encouraging, demonstrated professional integrity, demonstrated content expertise aligned with teachers' backgrounds, provided constructive feedback, motivated teachers to improve work product, helpful in providing direction and guidance, answered questions clearly and in a timely manner, acknowledged teachers' contributions appropriately, suggested experts and source materials, and challenged teachers to extend their skills by taking risks and trying innovative activities. Additional information retrieved from the STEAM teachers (N=52 for Year Three) related to teachers' perceptions of the coaches' efforts is depicted in Figure 7 in two qualitative areas of discussion:

Figure 7

Qualitative Data Retrieved from STEAM Teachers' Perceptions of the STEAM Coaches (Discovery Education Partner Coaches) for Year One of STEAM Initiative (2017-2018)

What kinds of activities/experiences do you feel were most beneficial/effective for the coach/mentee relationship?	What activities/experiences/resources do you feel need to be changed or reexamined relative to the STEAM Coach/Mentee program?
1. Excellent assistance for connecting me to resources. 2. Planning days with the coach outside the classroom dedicating time to lesson planning. 3. SOS strategies. 4. One-on-one training out-of-the box. 5. Pushed me to keep trying new things to grow. 6. Personal interaction and sharing advice. 7. Planning sessions are the most beneficial. 8. I always appreciate joint planning time. 9. Our coach is always approachable and available 10. Providing direction and guidance for me 11. Hands-on STEAM activities that could be used in the classroom "more student oriented". 12. Time to talk and plan, try out new materials. 13. Coach would come up with a fabulous lesson no matter what I could think up as a topic. 14. Ability to discuss with my coach & be provided with resources immediately. 15. Coach observed a lesson and provided immediate feedback. 16. She brought me engineering books and ideas. 17. She discussed strategies and ideas. 18. One-on-one conferencing is incredible help. <u>OVERALL #1 Response</u>: Available resources provided with one-on-one discussions of coaches and innovators is fantastic assistance for STEAM teachers.	1. Reduce time away from the classroom. 2. The planning meeting needs to be separated from the lesson implementation with more than a one-day time period. 3. More emphasis on doing STEAM lessons within the PD rather than hearing about STEAM. 4. Reduce the number of training & coaching days 5. Replacing some of the PD with planning units 6. Less time away from students 7. Using coaches to facilitate lesson planning 8. More demonstrations by coaches. 9. Organizing new STEAM teams every three years rather than maintaining the same teams. 10. Allow more planning time among the grade levels. 11. Having concrete plans for STEAM teachers 12. Ensure the accessibility of resources. 13. More detail on what a coaching day is like. 14. More "hands-on" experiments. 15. Connecting training to STEAM lab creation 16. Spread out the coaching days. 17. Five teachers indicated no changes—all great! 18. Less time spent in PD --more time in classroom <u>OVERALL #1 Response</u>: Coaching program is valuable but less time spent out of the classroom. Need more instructional time and planning time.

Section IV: Summary of Findings for Year Three of the STEAM Initiative (2017-2018)

Section four of this report provides a summary of the findings with empirical evidence defining the STEAM Initiative program on teacher professional development efforts, instructional (classroom) environments, and the coaching partnership of Discovery Education with district teachers and professionals. This summary will provide the staging and appropriate recommendations for the continued assessment and evaluation of the Santa Rosa County Schools STEAM Initiative program into Year Four.

Summary: Professional Development of STEAM Teachers as Innovators in Year Three

(1) Overall Impact of Professional Development: The professional development program provided focused training and mentoring by Discovery Education and Santa Rosa teachers for generating positive cognitive and affective outcomes relative to teachers' knowledge levels and attitudes for implementing the STEAM initiative program. Teachers' entering affective and cognitive levels for the Year Three (2017-2018) PD sessions sustained consistently high positive levels indicating a rich infusion (in attitude and understanding) of teachers. A notable conclusion of the PD STEAM assessment data was evidenced in the higher levels of pre-assessments as compared with the Year Two PD pre-assessments. Both quantitative and qualitative results from the Year Three PD evaluation indicate STEAM teachers are fully embracing STEAM approaches within the development and closing gaps in teacher implementation concerns indicating a strong STEAM professional growth pattern.

(2) Specific Focus Areas of Professional Development Assessment: Two areas of focus comprised the professional development assessment for the STEAM Initiative: Pedagogical Discontentment and Inquiry-Based Learning. Both of these scales (Available in Appendix A) depict two critical components of the STEAM Initiative, i.e., the degree to which teachers are able to move away from their traditional pedagogical practices to embrace the pedagogical focus of the STEAM Initiative (scored as Pedagogical Discontentment Scale) and the degree to which teachers are willing and comfortable to embrace inquiry-based learning for their classrooms (scored as the Inquiry-Based Learning Scale).

(3) Quantitative & Qualitative Evaluation Results of Professional Development Assessments:
   (a) Results from the quantitative assessments of teachers perceptions of their ***Pedagogical Discontentment*** levels demonstrated a significant increase and closing the gap in virtually all areas of assessment focused on pedagogical discontentment. The closing of the pedagogical discontentment scale is evidenced in year three results.
   (b) Results from the quantitative assessments of teachers perceptions of their ***Inquiry-Based Learning*** levels also demonsatrated a closing of the gap for the areas of inquiry-based learning and increased inquiry-based learning skills as a direct result of the professional development provided teachers from the STEAM Initiative.
   (c) Summary commentary of these two results from year three again suported the quantiative assessment indicated that the Professional Development component is effective in

providing both pedagogical contentment (affective) and cognitive (inquiry-based instruction) as relevant components for the professional development.

(d) Summary commentary of the qualitative remarks of teachers were found to be in support of the use of coaches with high energy and anticipation as innovators for propelling the implementation of the STEAM Initiative to prepare students as problem solvers and collborators for a global society.

Summary: Classroom Observations of STEAM Classroom Environments

(1) Overall impact of Classroom Observation Component: The N=382 classroom observations were performed at 18 elementary schools, six middle schools, and five high school during the fall 2017 semester utilizing five observers (each observer was responsible for five schools) who had been trained to assess classrooms using the observation form provided in Appendix B. Five observrs were employed to assess classrooms in the spring of 2018 at 29 schools. Interrater reliability and special training sessions were conducted prior to the data collection phase of observing classrooms. Classrooms were assessed using a four-point scaling format of descriptive, emerging, developing, and accomplished relative to nine specific areas of observed classroom environment characteristics. The overall impact of the STEAM Initiative for Year Three (2017-2018) relative to the observed classroom environments is indicative of a new program in its second year of operation, that is, the major observed types of classroom activities in year two represented substantial increases in emerging levels of activities and lower levels of descriptive (the lowest level of observation) as compared with Year One classroom observations. The observations represent a substantially emerging STEAM program evidenced in the distirct classrooms.

(2) Specific results highlighted from the findings of the classroom observation efforts depicted in the nine areas of observed classroom environments indicated varying strong initial efforts to implement the STEAM Initiative as summarized in the following statements:

KEY: Nine Areas of Classroom Observations: (Ratings of Developing and/or Accomplished)
1 = Creative Preparation: approximately 10% to 15% of observed classrooms exhibited this environment
2 = Creative Inquiry: approximately 10% to 20% of observed classrooms exhibited this environment
3 = Critical Thinking Integration: approximately 10% to 15% of observed classrooms exhibited this environment
4 = Critical Thinking Problem-Solving: approximately 30% of observed classrooms exhibited this environment
5 = Critical Thinking Logical Thinking: approximately 20% of observed classrooms exhibited this environment
6 = Communication Data & Information Collection: approximately 20% of observed classrooms exhibited this environment
7 = Communication & Argumentation: approximately 20% of observed classrooms exhibited this environment
8 = Collaboration Team Work: approximately 25% of observed classrooms exhibited this environment
9 = Collaboration Investigation Skills: approximately 25% of observed classrooms demonstrating this environment

Although all observed classrooms exhibited prominent evidence of Descriptive and Emerging ratings of environments from the coded classroom observervations, the above findings also indicate a strong propensity for all classrooms moving forward toward the Developing and Accomplished ratings for STEAM driven classroom environments. Therefore, the Year Three

observational data suggest a high level of evidence for the distirct to move forward with few barriers within classrooms relative to melding exiting classrooms into STEAM classrooms.

Summary: Results of the STEAM Teachers'/Innovators'Perceptions of the Coaching Component of the STEAM Initiative

STEAM teachers/innovators were provided with an online survey instrument at the end of the 2016-2017 academic year evaluation. The online Mentoring/Coaching instrument was designed for the purpose of assessing teachers' relationships, benefits, challenges, and overall perceptions of the coaching component focus of the STEAM Initiative. This instrument is located in Appendix C. Results of the 52 teachers/innovators' who responded to the completed surveys are summarized in the following statements.

(1) Overall findings of coaching perceptions of STEAM Teachers/Innovators indicate a strong majority (approximately 70% to 85%) of teachers strongly agreed and positively assessed the coaching component for all 12 areas of coaching listed:
   (a) Coach accessibility;
   (b) Coach demonstrates content expertise;
   (c) Coach was approachable;
   (d) Coach was supportive and encouraging;
   (e) Coach provided constructive feedback;
   (f) Coach motivated me to improve my work product;
   (g) Coach was helpful in providing direction and guidance;
   (h) Coach answered my questions satisfactorily;
   (i) Coach acknowledged my contributions appropriately;
   (j) Coach suggested appropriate resources and materials;
   (k) Coach challenged and extended my abilities.

(2) Qualitative commentary retrieved from the STEAM Teachers/Innovators are summarized in the third section of the report with the most common summary statements as follows:

   (a) The most beneficial activity involving the coaches for the STEAM initiative is the following: : *Interactive feedback with one-on-one discussions of coaches and innovators is extremely helpful*

   (b) The most needed changes for the coaching component as perceived by the teachers/innovators is the following: *Coaching program is valuable but less time spent out of the classroom. Need more instructional time and planning time.*

Appendix A:

Santa Rosa Schools Professional Development Pre and Post Assessment for STEAM Initiative (2017-2018)

Santa Rosa Schools Professional Development Assessment for *STEAM Initiative*
2016-2017

PRE-Assessment/POST-Assessment

Demographics:

1. Grade(s) you currently teach: **K 1 2 3 4 5 6 7 8 9 10 11 12 (circle all that apply)**

2A) Number of years you have been teaching? _____ 2B) Your Current Age? _____

3. What is your favorite subject to teach? _____

4. Highest Degree (please circle): Bachelors Masters Specialist Doctorate

5. Gender (please circle): Female Male Other

6. Ethnicity (please circle): Hispanic Native American Caucasian African American Asian Other

***STEAM Initiative*: Your Initial Thoughts:**

1. Describe your perception of the term: *STEAM Initiative*:

2. Describe your perception of a *STEAM teaching/learning environment*:

3. Describe your perception of a *STEAM classroom (physical facilities/resources etc):*

4. Describe your motivation level for teaching *STEAM:*
Pedagogical Discontentment Scale:

Please circle the level for each statement relative to your own perceived level of discontentment:
1 = no discontentment 2 = slight discontentment 3 = moderate discontentment 4= substantial discontentment 5=very high discontentment

1.	Teaching STEAM to students of lower ability levels	1 2 3 4 5
2.	Balancing personal STEAM teaching goals with state and national standards	1 2 3 4 5
3.	Monitoring student understanding through alternative forms of assessment	1 2 3 4 5
4.	Balancing the needs between both high and low ability level students	1 2 3 4 5
5.	Preparing students to assume new roles within inquiry-based learning	1 2 3 4 5
6.	Using inquiry-based teaching within all content areas	1 2 3 4 5
7.	Assessing students' understandings from inquiry-based learning	1 2 3 4 5
8.	Assessing students' nature of STEAM understandings	1 2 3 4 5
9.	Including all ability levels during inquiry-based teaching and learning	1 2 3 4 5
10.	Teaching STEAM to students from economically disadvantaged backgrounds	1 2 3 4 5
11.	Planning and using alternative methods of assessment	1 2 3 4 5
12.	Having sufficient STEAM content knowledge to generate lessons	1 2 3 4 5
13.	Teaching STEAM to students of higher ability levels	1 2 3 4 5
14.	Teaching STEAM subject matter that is unfamiliar to me	1 2 3 4 5
15.	Integrating the nature of STEAM throughout the curriculum	1 2 3 4 5
16.	Having sufficient STEAM content knowledge to facilitate classroom discussion	1 2 3 4 5
17.	Using assessment practices to modify STEAM teaching	1 2 3 4 5
18.	Developing strategies for teaching the nature of STEAM	1 2 3 4 5
19.	Ability to plan successful inquiry-based activities/learning	1 2 3 4 5
20.	Balancing personal STEAM teaching goals with state/national testing concerns	1 2 3 4 5
21.	Balancing the depth versus breadth of science content being taught	1 2 3 4 5

Inquiry-Based Learning Implementation Scale

When you teach STEAM how frequently do you perform each of the following?
1 = never 2 = rarely 3 = sometimes 4 = often 5 = always

1.	Demonstrate the use of a new instrument or piece of equipment	1 2 3 4 5
2.	Have students write the problem or activity before doing an experiment	1 2 3 4 5
3.	Review relevant concepts and skills that were learned in previous lessons	1 2 3 4 5
4.	Introduce new vocabulary words	1 2 3 4 5
5.	Ask students to identify and define words	1 2 3 4 5
6.	Ask students to make predictions about an experiment or STEAM activity outcome	1 2 3 4 5
7.	Check to see that students understand new procedures before beginning an experime	1 2 3 4 5
8.	Discuss how everyday situations directly relate to experiments or STEAM activities	1 2 3 4 5
9.	Check students' design for safety before conducting experiments or activities	1 2 3 4 5
10.	Monitor small group progress during experiments or STEAM activity	1 2 3 4 5
11.	Encourage students to collaborate within their groups	1 2 3 4 5
12.	Circulate and interact with students while they are conducting experiments	1 2 3 4 5
13.	Discuss variations in data collected by students following their experiments	1 2 3 4 5
14.	Have students share their predictions with the class	1 2 3 4 5
15.	Have students share their data or findings with the class	1 2 3 4 5
16.	Challenge students to consider the effects of errors on group results	1 2 3 4 5
17.	Compare and contrast students' explanations of findings	1 2 3 4 5
18.	Question students as they conduct their experiments	1 2 3 4 5
19.	Connect new information with students' everyday lives	1 2 3 4 5
20.	Connect current events with STEAM concepts	1 2 3 4 5
21.	Use questioning strategies to respond to students' questions about STEAM concepts	1 2 3 4 5
22.	Have students ask questions about the STEAM phenomena addressed in activities	1 2 3 4 5

Thank you for your participation….

Appendix B:

Santa Rosa School District Classroom Observation Form for STEAM Initiative

(2017-2018)

[insert in landscape mode]

Appendix C:

Santa Rosa School District Coach/Mentee Reflection Form:

For Mentees (STEAM Teachers/Innovators)

For STEAM Initiative

(2017-2018)

Santa Rosa STEAM Initiative Coach/Mentee Reflection Form: For MENTEES

The purpose of this scale is to evaluate the mentoring characteristics of _____ (please enter the name of your coach), with whom you have had a professional, coach/mentee relationship. Indicate the extent to which you agree or disagree with each statement listed below. Please highlight the number that corresponds to your response and return by email. Your responses will be kept confidential. Thank you.

0=Strongly Disagree (SD)
1=Disagree (D)
2=Slightly Disagree (SID)
3=Slightly Agree (SIA)
4=Agree (A)
5=Strongly Agree (SA)
6=Not Applicable (NA)

	SD	**D**	**SID**	**SIA**	**A**	**SA**	**NA**
1. My coach was accessible	0	1	2	3	4	5	6
2. My coach demonstrated professional integrity	0	1	2	3	4	5	6
3. My coach demonstrated content expertise in my area of need	0	1	2	3	4	5	6
4. My coach was approachable	0	1	2	3	4	5	6
5. My coach was supportive and encouraging	0	1	2	3	4	5	6
6. My coach provided constructive and useful critiques of my work	0	1	2	3	4	5	6
7. My coach motivated me to improve my work product	0	1	2	3	4	5	6
8. My coach was helpful in providing direction and guidance on professional issues (e.g., networking)	0	1	2	3	4	5	6
9. My coach answered my questions satisfactorily (e.g., timely response, clear, comprehensive)	0	1	2	3	4	5	6
10. My coach acknowledged my contributions appropriately (e.g., committee contributions, awards)	0	1	2	3	4	5	6
11. My coach suggested appropriate resources (e.g., experts, electronic contacts, source materials)	0	1	2	3	4	5	6
12. My coach challenged me to extend my abilities (e.g., risk taking, try innovative activities)	0	1	2	3	4	5	6

13. What kinds of activities/experiences do you feel were most beneficial or effective for the coach/mentee relationship?

14. What activities/experiences/resources do you feel need to be changed or reexamined relative to the Santa Rosa STEAM Coach/Mentee program?