QuarkNet

Appendix

Statistical Analyses in Support Preliminary Evaluation Results

Kathryn Race

Race & Associates, Ltd.

race_associates@msn.com

2019 QuarkNet Teacher Survey

Examples of Teacher Demographic Data

(See slide notes if helpful.)

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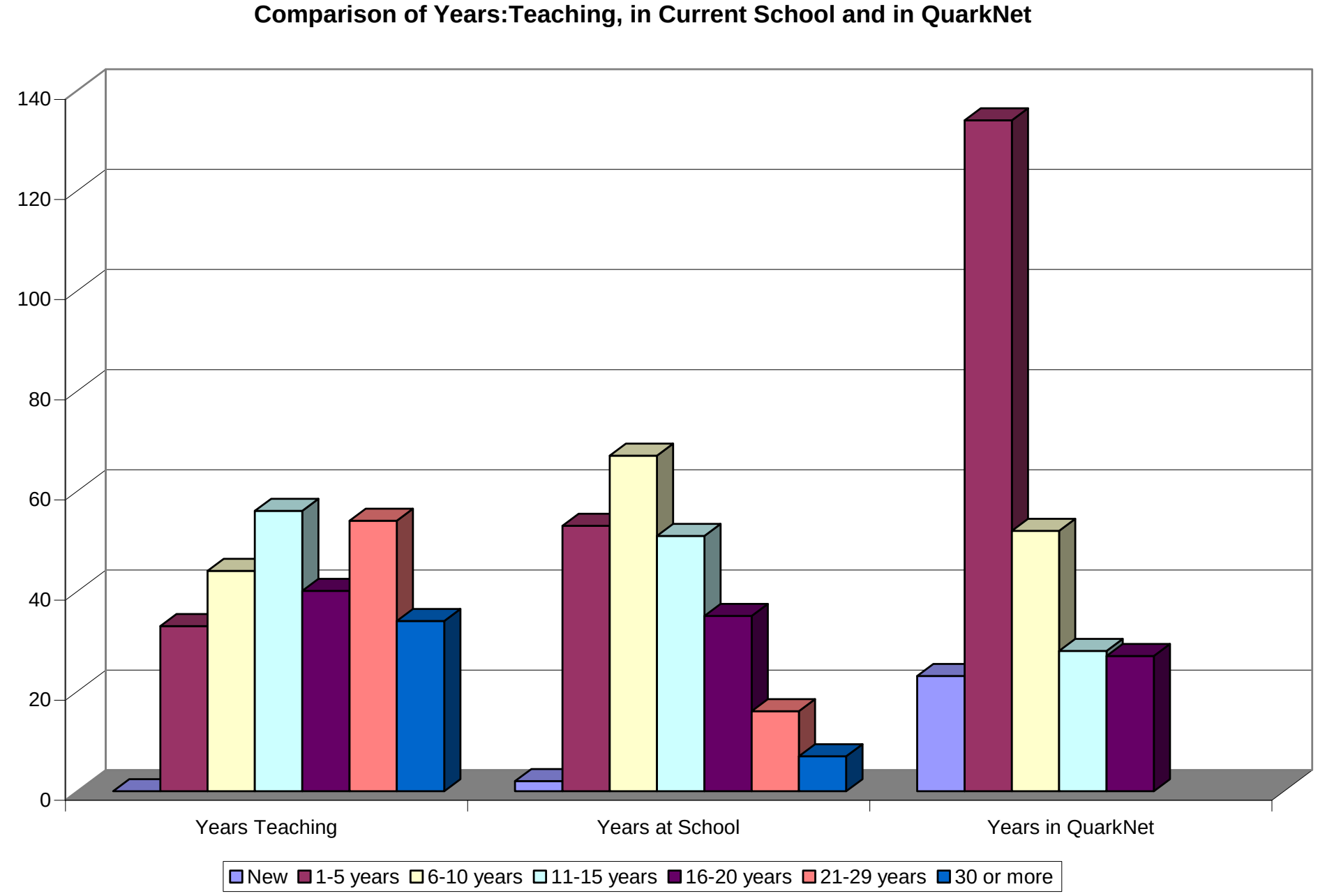
Table 15
Teacher Survey: Gender of QuarkNet Teachers

Gender	Number	Percent
Male	161	60.8
Female	103	38.9
Not specified	1	0.3
Total	265	100.0

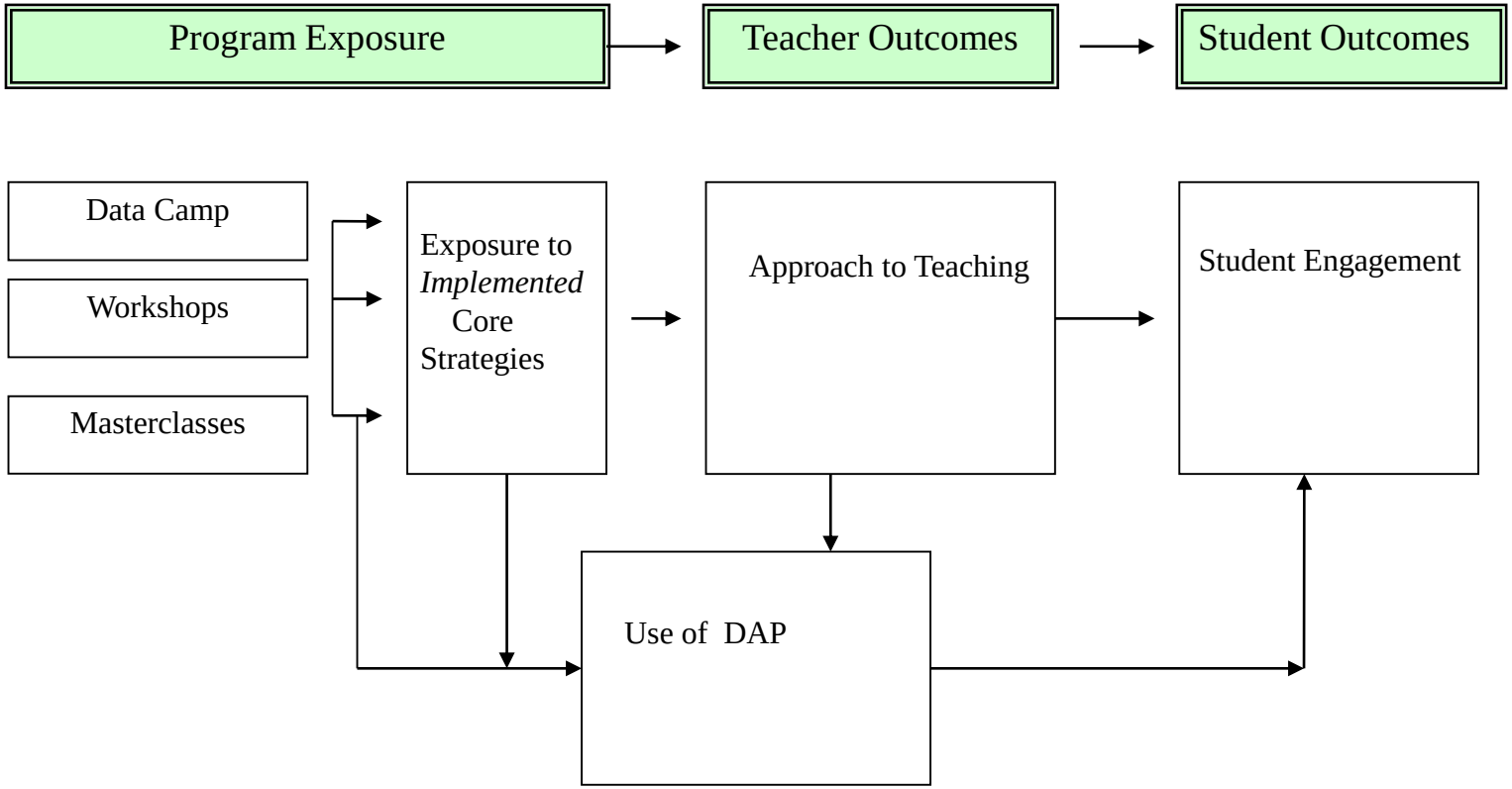
Table 16
Description of School Location and Teaching Physics

	Number	Percent
Best Describe Location of School		
Rural	51	19
Suburban	128	48
Urban	51	19
Urban, Central City	30	11
Not Specified	5	2
Total	265	100
Teaching Physics?		
Yes	228	86
No*	34	13
Not Specified	3	1
Total	265	100

*Responses were explained as for example: Taught in the past; will teach soon by not this year; general science; physic tutor.


Comparison of Years:Teaching, in Current School and in QuarkNet
140
120
100
80
60
40
20
0
Years Teaching
Years at School
Years in QuarkNet
New
1-5 years
6-10 years
11-15 years
16-20 years
21-29 years
30 or more

Overview of Analyses Related to Teacher (and their Students) Outcomes



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Scale Scores for Analyses

Teacher Survey:
Building Scales for Analysis of Program Engagement and Outcomes
(Higher the Score, the more Positive the Assessment)

Scale	What's Measured	# of Items	N	Mean	Standard Deviation	Cronbach's Alpha[a]
Core Strategies	Teachers' perceived exposure to program core strategies articulated in PTM	12	255	54.18	7.26	0.87
Approach to Teaching	Perceived assessment of QN teacher outcomes	12	250	43.11	8.61	0.88
QN's Influence on Teaching	Perceived assessment of how QN's has influenced teaching practices and content	12	227	48.15	9.46	0.92
Student Engagement (SE)	Teachers' perceptions of student engagement in their classroom	5	240	18.87	3.45	0.84
QN's Influence on SE	How QN has influenced this student engagement	5	213	20.04	3.85	0.91

[a]Measure of reliability (internal consistency)

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Exposure to Core Strategies

In preliminary analyses (highlighted in Table 19 next slide) …..

Regarding **Core Strategies**, program engagement and measurement of exposure to core program strategies were shown to be related in a meaningful way (that is, the more engagement by type of event, the higher the perceived exposure to core strategies; and more reported use of activities from the Data Activities Portfolio in the classroom).

This speaks to the fidelity of the *implemented* program as compared to the program as *designed* as perceived by participating teachers who completed the Teacher Survey.

Table 19

Perceived Exposure to QuarkNet **Core Program Strategies** Compared to Type and Variety of Program Engagement and Use of Data Activities Portfolio

Comparison	N	Mean	SD[a]	Analysis Results
Data Camp				
Yes	109	55.55	5.02	$t_{(241.98)}{}^{b} = 2.82, p < .01$
No	146	53.16	8.44	
Variety of Workshops[c]				
No workshops	76	51.58	9.30	$F_{(2, 252)} = 8.13, p < .001$
One workshop[c]	80	54.56	6.32	
Two or more[c]	99	55.88	5.48	
Masterclasses				
None	144	53.02	8.02	$t_{(252.18)}{}^{b} = 3.08, p < .01$
One or More	111	55.69	5.83	
Used DAP Activities				
Yes	130	56.65	4.66	$\chi^2_{(1, 250)} = 36.13, p < .001$ [d]
No	120	51.46	8.61	

[a]Standard deviation

[b]Equal variance not assumed; independent t-test.

[c]This variable refers to the variety of workshops not the total number of events.

[d]Based on a binary, logistic regression analysis.

Approach to Teaching

In preliminary analyses…..

Regarding, **Approach to Teaching,** teaching outcomes were shown to be related to *perceived* QuarkNet's Influence and the use of activities from the Data Activities Portfolio in the classroom as reported by participating teachers. (See Tables 21 and 22 next slides.)

Use of DAP activities was shown to be related to exposure to Core Strategies, Approach to Teaching, and all of the types of QuarkNet program events (Data Camp, Variety of Workshops, and Masterclass engagement). (Summary statistics table is not shown.)

Table 21

Approach to Teaching Outcome Related to

Type and Variety of Program Engagement and Use of Data Activities Portfolio

Comparison	N	Mean	SD[a]	Analysis Results
Data Camp				
Yes	108	44.86	7.95	$t_{(248)} = 2.85, p < .01$
No	142	41.77	8.87	
Variety of Workshops[b]				
No workshops	74	40.93	8.42	$F_{(2,\ 247)} = 7.94, p < .001$
One workshop[b]	79	41.95	9.14	
Two or more[b]	97	45.71	7.67	
Masterclasses				
None	140	41.67	8.47	$t_{(248)} = 3.03, p < .01$
One or More	110	44.94	8.48	
Used DAP Activities				
Yes	128	46.29	7.54	$\chi^2_{(2,\ 244)} = 41.52, p < .001$ [c]
No	117	39.50	8.36	

[a]Standard deviation

[b]This variable refers to the variety of workshops not the total number of events.

[c]Based on binary, logistic regression (including Core Strategies and Approach to Teaching scale scores as independent variables).

Table 22

Approach to Teaching: Summary Statistics and Related Variables

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Final	.652[b]	.425	.420	6.33

Coefficients[b]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
QN's Influence on Teaching	.508	.047	.576	10.749	<.0001
Used DAP	3.061	.901	.182	3.399	<.001

[a]Predictors: (Constant), QuarkNet Influence on Teaching, Used DAP

[b]Dependent Variable: Approach to Teaching

Student Engagement

In preliminary analyses (See Table 24)….

Regarding, **Student Engagement,** QuarkNet's Influence on Student Engagement and Approach to Teaching were related to perceived student engagement in inquiry-based science based on the perceptions of their participating teachers.

Table 24

Student Engagement: Summary Statistics and Related Variables

Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Final	.678	.459	.454	2.441

[a]Predictors: (Constant), QuarkNet's Influence on Student Engagement, Approach to Teaching,

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	4.899	1.108		4.42	<.001
QN's Influence on Student Engagement	.375	.049	.437	7.72	<.001
Approach to Teaching	.154	.024	.368	6.52	<.001

[a]Dependent Variable: Student Engagement

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In Summary

So far ….

the weight of these analyses suggests that there is a positive relationship between **Teacher Engagement** in QuarkNet and exposure to **Core Program Strategies;** and, that the type and degree of program engagement is related to teacher outcomes **Approach to Teaching**; the **use** of activities from the **Data Activities Portfolio** in the classroom; and teachers' perceptions of **Student Engagement** in inquiry-based science.

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Center Feedback Template

Just beginning to analyze Center Outcomes –

Here's an example of how we're combining data sources

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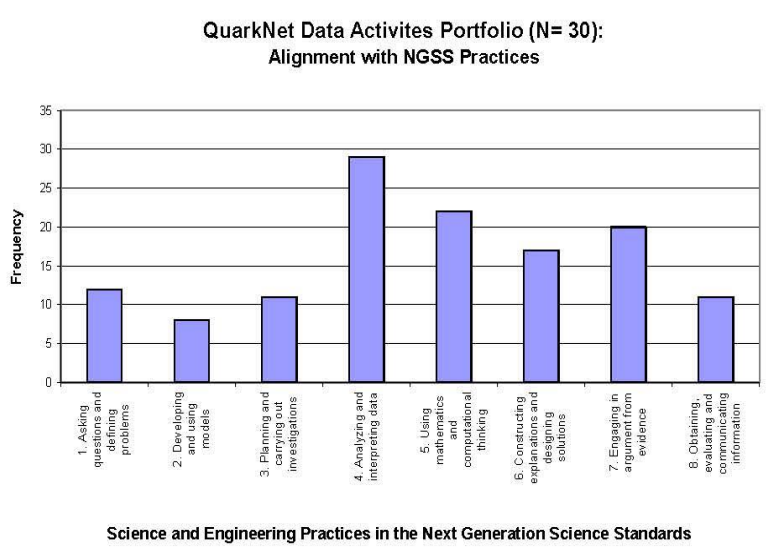
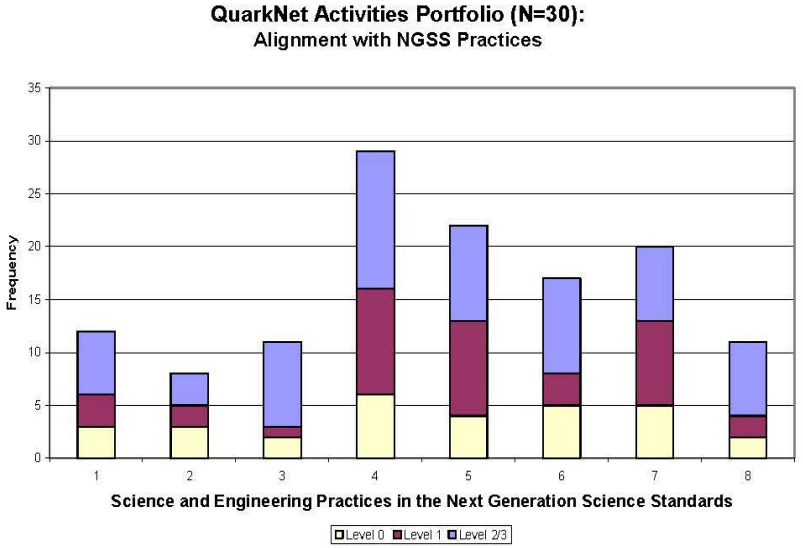
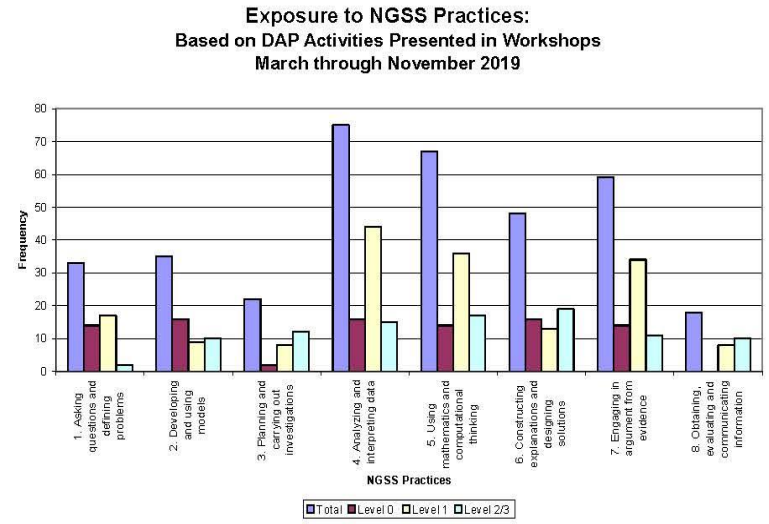
Before we do that

The next set of graphs looks at Next Generation Science Practices, these are ….

1. **Asking questions and defining problems.**
2. **Developing and using models.**
3. **Planning and carrying out investigations.**
4. **Analyzing and interpreting data.**
5. **Using mathematics and computational thinking.**
6. **Constructing explanations and design solutions.**
7. **Engaging in argument from evidence.**
8. **Obtaining, evaluating and communicating information.**







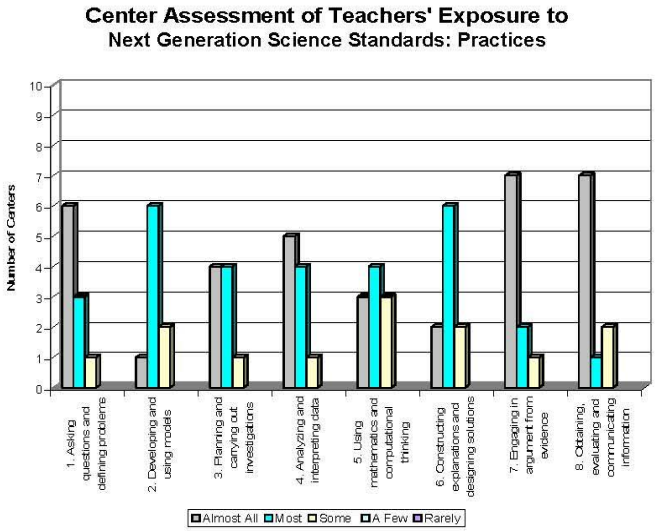


Figure Set 16. Alignment of NGSS Practices and the activities from the Data Activities Portfolio by activity, by activity level, based on activities presented in 2019 QuarkNet workshops, and center assessment of teacher engagement in these practices during QuarkNet workshops

QuarkNet DAP Activities and NGSS Practices

We use this figure set to suggest that there is very good agreement between the alignment NGSS practices with DAP activities, ….

As *Designed*

As *Implemented* in workshops (March - Nov 2019), and,

As *reviewed* by 10 participating QN Centers (those who completed the Center Feedback Template process so far)